DRAFT

FINDING OF NO SIGNFICANT IMPACT (FONSI)
FOR THE INCREASE OF CIVIL FLIGHT OPERATIONS
AT DOVER AIR FORCE BASE
DOVER, DELAWARE

PURPOSE AND NEED

The purpose of the Proposed Action is to increase to the total number of civil flight operations at Dover Air Force Base (DAFB) from 13,500 to 25,000 annually. This will include construction and improvement of taxiway connections on DAFB property to the Civil Air Terminal (CAT) aircraft parking ramp. The Delaware Department of Transportation (DelDOT) desires to increase the total annual number of civil flight operations at DAFB. The increase in civil flight operations is needed to attract and support an economically viable tenant at the CAT.

Supporting the economic viability of the CAT would be consistent with Kent County's 2018 Comprehensive Plan. The Kent County Department of Planning Services (KCDPS) recommends "creating economic centers of business and commerce around existing infrastructure and identify areas designated for industrial and business parks, large scale commercial uses and neighborhood commercial uses".

The existing infrastructure in this case is DAFB. Areas for potential future development such as the CAT are shown as "Employment Centers" on the current Comprehensive Plan's future land use map. The Comprehensive Plan also recommends continuing the positive working relationship between Kent County and DAFB and maintaining the zoning requirements that protect the base from any incompatible land uses.

Details of the environmental effects can be found in the *Final Environmental Assessment for the Increase of Civil Flight Operations at Dover Air Force Base, Delaware,* which is included as a reference.

PROPOSED ACTION (Preferred Alternative)

The Proposed Action is to increase to the total number of civil flight operations at Dover Air Force Base (DAFB) from 13,500 to 25,000 annually. The increase in civil flight operations would be defined under Alternative 3, the Preferred Alternative, by way of a fixed base operator (FBO) tenant at the CAT. An FBO would provide aeronautical services such as fueling, short term parking, long term parking, hangaring, tie-down and parking, catering, maintenance, United States Customs services, and car rental. The existing taxiway from Taxiway 'B' to the CAT ramp would be expanded and a new taxiway from Taxiway 'B' to the CAT ramp would be constructed. The increase in flight operations would be defined under a new Joint Use Agreement (JUA) agreement between DAFB and DelDOT.

NO ACTION ALTERNATIVE

Under Alternative 1, the No Action Alternative, civilian flight operations at DAFB and utilization of the CAT would continue as currently conducted. The maximum annual number of civilian aircraft operations would remain at 13,500. Taxiway construction and reconstruction would not occur under the No Action Alternative.

SUMMARY OF FINDINGS

The analysis in the Environmental Assessment (EA) under the Preferred Alternative identified no impacts to airspace, land use, cultural, or visual resources. Under the Preferred Alternative, impacts are anticipated to occur for air quality, noise, biological, earth, and water resources. Based on the analysis, none of the potential environmental effects are expected to be significant. The potential impacts to the affected environmental resources as a result of the Preferred Alternative are discussed in the following section.

Airspace – The airspace where flight operational changes are proposed is predominantly used by military cargo aircraft. The anticipated aircraft mix associated with an FBO tenant would have similar flight operation characteristics as the existing military aircraft operations and would use the same approach and departure patterns, but at an increased rate. The proposed increase in the number of civilian aircraft operating at DAFB would not result in airspace impacts as no new airspace areas would be used under Alternative 3.

Noise – The total number of acres affected by Day-Night Average Sound Level (DNL) greater than 65 decibels (dB) would increase relative to the existing conditions by 61 acres from 4,200 to 4,261 acres. Changes in noise contours and their extent would primarily occur on and near runway centerlines in areas already exposed to frequent overflight noise. However, static engine runs are expected to be conducted in areas not currently used for static engine runs. Noise contours resulting from the Proposed Action would include areas on and near the CAT parking apron. Increases in DNL between current conditions and the proposed conditions are less than 2 percent, and do not exceed thresholds described in Federal Aviation Administration (FAA) Order 1050.1F *Environmental Impacts: Policies and Procedures*.

Safety – All aircraft operations conducted at DAFB including an increase in flight operations would continue to comply with all federal, USAF, and Operations Group Commander requirements. Implementation of the Proposed Action would not change the DAFB aircraft mishap emergency response procedures. DAFB Airport Rescue and Fire Fighting (ARFF) would continue to respond to incidents within 12 miles of the base, as part the Disaster Response Plan and mutual support agreements with local fire departments. However, to account for the increase in civilian flights, additional emergency response capacity or services would need to be included in a new JUA between USAF and DelDOT.

Air Quality – Emissions generated by the Proposed Action would occur from intermittent aircraft operations and aerospace ground equipment (AGE) operations spread across the CAT aircraft parking ramp. Aircraft operations would emit hazardous air pollutants (HAPs) that could

potentially impact public health. These intermittent emissions would be adequately mixed through the large volume of atmosphere constituting DAFB airspace to the point that they would not result in substantial ground-level concentrations in any localized area. Emissions associated with the proposed CAT operations at DAFB are below the United States Environmental Protection Agency's (USEPA) General Conformity Rule de minimis thresholds of 100 tons per year of nitrogen oxide (NOx), 50 tons per year of volatile organic compounds (VOCs), and the Prevention of Significant Deterioration (PSD) threshold of 250 tons per year for all other criteria pollutants. These indicators represent the significance of projected air quality impacts within the DAFB project region.

Cultural (Historic Properties/Sites) – The proposed increased use of DAFB airspace by additional aircraft operations would cause no adverse effect to the 56 historic properties beneath the airspace. Desktop research showed there are no known National Register of Historic Places (NRHP) or National Historic Landmarks (NHL) sites in the vicinity of the proposed CAT taxiway improvements. The incremental increase in overflights of any individual historic resource would be infrequent, short in duration, and would not diminish the characteristics that make the sites eligible for the NRHP or National Historic Landmarks Program (NHLP).

Biological – Due to the limited construction duration and minimal area of ground disturbed, the proposed taxiway construction will not have a significant impact on important vegetation, wetlands, or sensitive habitats. Furthermore, as a measure to protect migratory birds on DAFB, all construction related ground-disturbing activities for the proposed taxiway improvements will not take place during the breeding season. The potential effects on wildlife due to the proposed increase of aircraft operations would be limited to noise and bird-aircraft collisions. All additional aircraft operations would be conducted as they are today, which is in compliance with the DAFB Bird/Wildlife-Aircraft Strike Hazard (BASH) plan. The increase in flight operations would inherently elevate the potential for BASH mishaps, but overall, would not pose threats to wildlife at the behavioral, population, or species level.

Land Use – A key factor in determining future land use is noise, since anticipated DNL can make certain land uses incompatible. No impacts or changes to land use are expected beneath the flight paths because of the minor variations between the existing and projected noise contours. In addition, the construction of a new taxiway and the improvement of the existing taxiway between the CAT and DAFB are compatible with the existing land use of the base.

Water – The construction of the new taxiway, and the reconstruction of the existing CAT taxiway will not impact any wetlands on DAFB property but would add approximately 1.5 acres of new impervious surface. The existing stormwater facility located northwest of the new taxiway could potentially be retrofitted and sized appropriately to address all stormwater on site. However, depending on the configuration of the existing stormwater system (open or covered ditches and underground pipes), additional stormwater facilities may be necessary. All applicable water resource and sediment and erosion control permits will be obtained prior to implementing the proposed taxiway improvements. Any site expansion of the CAT outside of the DAFB would require all necessary permits from federal and state environmental regulators.

Earth – The taxiway construction and reconstruction would disturb approximately 2.8 acres of soil in previously disturbed areas. Due to the modified nature of the DAFB airfield and minimal soil disturbance, no significant impacts on earth resources are expected as a result of the Proposed Action.

Visual – The potential impacts to the visual environment would be in kind with current visual sightings of large military aircraft. However, the majority of new aviation activity would likely consist of smaller jet engine aircraft instead of medium to large cargo aircraft. People within the region of influence (ROI) may observe up to a 150 new civilian aircraft operations per day. The taxiway construction activity would have no adverse impact on the visual environment due to the limited scope and nature of the construction activity.

PUBLIC INVOLVEMENT

The National Environmental Policy Act (NEPA), 40 Code of Federal Regulations (CFR) 1500-1508, and 32 CFR 989 require public review of the EA before approval of the Finding of No Significant Impact (FONSI) and implementation of the Proposed Action. A notice of availability for public review of the Revised Draft EA was published in the Delaware State News and on the DAFB website (https://www.dover.af.mil/). Comments received from agencies and the public have been addressed and incorporated, as appropriate, into the Final EA.

FINDING OF NO SIGNIFICANT IMPACT

Based upon my review of the facts and analyses contained in the attached EA, conducted under the provisions of NEPA, CEQ Regulations and 32 CFR Part 989, and based on review of the public and agency comments submitted during the 30-day public comment period, I conclude that implementing the Preferred Alternative to facilitate the proposed increase in annual civil aircraft operations at the CAT from 13,500 to 25,000 and the associated taxiway construction will not have a significant environmental impact, either directly or cumulatively, in conjunction with other projects at Dover AFB. Accordingly, an Environmental Impact Statement is not necessary and will not be prepared. The signing of this Finding of No Significant Impact completes the environmental impact analysis process.

_____ _____

<wing commander or USAF official> Date
<title>
<group>

Draft
Environmental Assessment
for the
Expansion of Civil Air Terminal Flight Operations
at Dover Air Force Base

436th Airlift Wing
Dover Air Force Base,
Dover, Delaware

March 2021

COVER SHEET

Environmental Assessment for the

Increase of Civil Flight Operations at Dover Air Force Base

a. Privacy Advisory: This Environmental Assessment is provided for public comment in accordance with the National Environmental Policy Act, the President's Council on Environmental Quality National Environmental Policy Act Regulations (40 CFR Parts 1500-1508), and the Environmental Impact Analysis Process (32 CFR Part 989). The Environmental Impact Analysis Process provides an opportunity for public input on Air Force decision making, allows the public to offer inputs on alternative ways for the Air Force to accomplish what it is proposing, and solicits comments on the Air Force's analysis of environmental effects. Public commenting allows the Air Force to make better, informed decisions. Letters or other written or oral comments provided may be published in the Environmental Assessment. As required by law, comments provided will be addressed in the Environmental Assessment and made available to the public. Providing personal information is voluntary. Any personal information provided will be used only to identify your desire to make a statement during the public comment portion or to fulfill requests for copies of the Environmental Assessment or associated documents. Private addresses will be compiled to develop a mailing list for those requesting copies of Environmental Assessment; however, only the names of the individuals making comments and specific comments will be disclosed. Personal home addresses and phone numbers will not be published in the Environmental Assessment.

b. Responsible Agency: United States Air Force

c. Proposals and Actions: The Delaware Department of Transportation requested that the Air Force perform an environmental analysis of the effects of increased civil flight operations proposed as part of an updated Joint Use Agreement with United States Air Force. In accordance with Civil Aircraft Use of United States Air Force Airfields (32 CFR Section 855), the implementation of a Joint Use Agreement would allow the State of Delaware to increase the number of civilian aircraft operations at Dover Air Force Base destined for the adjacent Civil Air Terminal.

d. For Additional Information: Telephone inquiries may be made to the Dover Air Force Base 436th Airlift Wing, Public Affairs Office, by calling (302) 677-3372. Written inquiries can be submitted to 436 CES/CEN, 600 Chevron Avenue, Dover AFB DE 19902-5600, or via e-mail steven.seip@us.af.mil.

e. Designation: Environmental Assessment

f. Abstract: This Environmental Assessment has been prepared in accordance with the National Environmental Policy Act. The Environmental Assessment team focused the analysis on the following resources: noise, air quality, airspace, public safety, land use, earth resources, water resources, biological resources, cultural resources, and visual resources. The potential impacts to the assessed resource areas are insignificant.

Increases in the air emissions from the additional civil operations by the Preferred Alternative will not exceed ambient air quality standards. FAA noise significance criteria will also not be exceeded. No adverse impacts to cultural resources (historic properties and archaeological sites) are anticipated. No wetlands will be impacted on DAFB property. No rare, threatened and endangered species habitats will be affected. Negligible or no impacts regarding socioeconomic conditions, including property values, employment, and environmental justice will occur. No measurable increase in public health or safety risks will occur, as the Air Force has supported civilian flight operations at Dover Air Force Base through previous Joint Use and Special Use agreements since 1997, with no Class A mishaps. This safety record will be expected to be maintained.

EXECUTIVE SUMMARY
ENVIRONMENTAL ASSESSMENT
FOR THE
INCREASE OF CIVIL FLIGHT OPERATIONS
AT DOVER AIR FORCE BASE, DELAWARE

Introduction:

In accordance with the National Environmental Policy Act (NEPA) of 1969, the United States Air Force (USAF) has prepared this Environmental Assessment (EA) for the proposed increase of the number of annual civilian aircraft flights permitted to operate at Dover Air Force Base (DAFB). The Delaware Department of Transportation (DelDOT) desires to increase the total number of permitted annual civilian flight operations at DAFB from 13,500 to 25,000. This increase in civil flight operations will provide the potential for economic viability at the Civil Air Terminal (CAT). This EA discusses the Proposed Action and potential environmental effects of the increased aircraft flight operations. Implementation of the Proposed Action would coincide with the signing of a new Joint Use Agreement (JUA) between USAF and DelDOT in accordance with Civil Aircraft Use of United States Air Force Airfields (32 *CFR* Part 855).

Background/Setting:

In 1982 USAF and DelDOT entered into a JUA to establish the CAT for a state-owned regional airline service. An updated JUA was signed in 1997 which further clarified agency roles and responsibilities. Over the years many business initiatives have been proposed for the CAT, albeit few have been successfully implemented. The majority of CAT aircraft operations occur just twice a year during two annual National Association for Stock Car Auto Racing (NASCAR) weekend race events in the Spring and Fall. In recent years economic hardship has affected Delaware and especially Kent County. In Kent County's 2018 Comprehensive Plan the County recommends investing in and creating centers of economic activity around existing infrastructure. To that end, Delaware and Kent County envision the CAT becoming a viable source of economic activity for the central Delaware region.

Alternative 3 (Preferred Alternative):

Under Alternative 3 (Preferred Alternative), the proposed increase to the maximum number of annual civilian aircraft operations from 13,500 to 25,000 would be facilitated by a fixed base operator (FBO) tenant. An FBO would provide aeronautical services such as fueling, short term parking, long term parking, hangaring, tie-down and parking, catering, maintenance, US Customs services and car rental. The aircraft expected to use the services of an FBO tenant at the CAT would consist of small to medium general aviation aircraft.

A Market Assessment was completed in in October of 2019 by Strategic Planning Services titled "*Strategic Market Assessment, The Central Aviation Terminal – Dover AFB*" (Market Assessment). Based on the findings in the Market Assessment, 25,000 annual operations would be necessary to financially sustain the FBO tenant at the CAT. Civilian aircraft would fly along the same flight paths used by military aircraft.

All CAT flight operations would comply with DAFB Air Traffic Control (ATC) and hours of operation. Military aircraft arriving and departing would continue to have priority of movement throughout the joint use flying facilities (JUFF).

As part of the Preferred Alternative, a new taxiway from DAFB Taxiway 'B' to the CAT ramp would be constructed and the existing taxiway would be expanded. The total area of taxiway construction and reconstruction improvements would cover approximately 2.8 acres.

No Action Alternative:

Under the No Action Alternative, civilian flight operations at DAFB and utilization of the CAT would continue as currently conducted. The maximum annual number of civilian aircraft operations would remain at 13,500. Taxiway construction and reconstruction would not occur under this Alternative.

Environmental Consequences:

Airspace

The airspace where flight operational changes are proposed is predominantly used by military cargo aircraft. The anticipated aircraft mix associated with an FBO tenant would have similar flight operation characteristics as the existing military aircraft operations and would use the same approach and departure patterns, but at an increased rate. The proposed increase in the number of civilian aircraft operating at DAFB would not result in airspace impacts as no new airspace areas would be used under Alternative 3.

Noise

The total number of acres affected by Day-Night Average Sound Level (DNL) greater than 65 decibels (dB) would increase relative to the existing conditions by 61 acres from 4,200 to 4,261 acres. Changes in noise contours and their extent would primarily occur on and near runway centerlines in areas already exposed to frequent overflight noise. However, static engine runs are expected to be conducted in areas not currently used for static engine runs. Noise contours resulting from the Proposed Action would include areas on and near the CAT parking apron. Increases in DNL between current conditions and the proposed conditions are less than 2 percent, and do not exceed thresholds described in FAA (Federal Aviation Administration) Order 1050.1F.

Safety

All aircraft operations conducted at DAFB including an increase in flight operations would continue to comply with all federal, USAF, and Operations Group Commander requirements.

Implementation of the Proposed Action would not change the DAFB aircraft mishap emergency response procedures. DAFB Airport Rescue and Fire Fighting (ARFF) would continue to respond to incidents within 12 miles of the base, as part the Disaster Response Plan and mutual support agreements with local fire departments. However, to account for the increase in civilian flights, additional emergency response capacity or services would need to be included in a new JUA between USAF and DelDOT.

Air Quality

Emissions generated by the Proposed Action would occur from intermittent aircraft operations and aerospace ground equipment (AGE) operations spread across the CAT aircraft parking ramp. Aircraft operations would emit hazardous air pollutants (HAPs) that could potentially impact public health. These intermittent emissions would be adequately mixed through the large volume of atmosphere constituting DAFB airspace to the point that they would not result in substantial ground-level concentrations in any localized area. Emissions associated with the proposed CAT operations at DAFB are below the United States Environmental Protection Agency's (USEPA) General Conformity Rule de minimis thresholds of 100 tons per year of nitrogen oxide (NOx), 50 tons per year of volatile organic compounds (VOCs), and the Prevention of Significant Deterioration (PSD) threshold of 250 tons per year for all other criteria pollutants. These indicators represent the significance of projected air quality impacts within the DAFB project region.

Cultural (Historic Properties/Sites)

The proposed increased use of DAFB airspace by additional aircraft operations would cause no adverse effect to the 56 historic properties beneath the airspace. Desktop research showed there are no known National Register of Historic Places (NRHP) or National Historic Landmarks (NHL) sites in the vicinity of the proposed CAT taxiway improvements. The incremental increase in overflights of any individual historic resource would be infrequent, short in duration, and would not diminish the characteristics that make the sites eligible for the NRHP or National Historic Landmarks Program (NHLP).

Biological

Due to the limited construction duration and minimal area of ground disturbed, the proposed taxiway construction will not have a significant impact on important vegetation, wetlands or sensitive habitats. Furthermore, as a measure to protect migratory birds on DAFB, all construction related ground-disturbing activities for the proposed taxiway improvements will not take place during the breeding season. The potential effects on wildlife due to the proposed increase of aircraft operations would be limited to noise and bird-aircraft collisions. All additional aircraft operations would be conducted as they are today, which is in compliance with the DAFB Bird/Wildlife-Aircraft Strike Hazard (BASH) plan. The increase in flight operations would inherently elevate the potential for BASH mishaps, but overall, would not pose threats to wildlife at the behavioral, population, or species level.

Land Use

A key factor in determining future land use is noise, since anticipated DNL can make certain land uses incompatible. No impacts or changes to land use are expected beneath the flight paths because of the minor variations between the existing and projected noise contours. In addition, the construction of a new taxiway and the improvement of the existing taxiway between the CAT and DAFB are compatible with the existing land use of the base.

Water

The construction of the new taxiway, and the reconstruction of the existing CAT taxiway will not impact any wetlands on DAFB property but would add approximately 1.5 acres of new impervious surface. The existing stormwater facility located northwest of the new taxiway could potentially be retrofitted and sized appropriately to address all stormwater on site. However, depending on the configuration of the existing stormwater system (open or covered ditches and underground pipes), additional stormwater facilities may be necessary. All applicable water resource and sediment and erosion control permits will be obtained prior to implementing the proposed taxiway improvements. Any site expansion of the CAT outside of the DAFB would require all necessary permits from federal and state environmental regulators.

Earth

The taxiway construction and reconstruction would disturb approximately 2.8 acres of soil in previously disturbed areas. Due to the modified nature of the DAFB airfield and minimal soil disturbance, no significant impacts on earth resources are expected as a result of the Proposed Action.

Visual

The potential impacts to the visual environment would be in kind with current visual sightings of large military aircraft. However, the majority of new aviation activity would likely consist of smaller jet engine aircraft instead of medium to large cargo aircraft. People within the region of influence (ROI) may observe up to a 150 new civilian aircraft operations per day. The taxiway construction activity would have no adverse impact on the visual environment due to the limited scope and nature of the construction activity.

Conclusion:

The data presented in this EA documents that the proposed increase in civil flight operations and the proposed taxiway improvements would not result in significant adverse impacts on any environmental resources within the ROI. Therefore, no additional environmental analysis (i.e. Environmental Impact Statement) is warranted.

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ACRONYMS AND ABBREVIATIONS

AC (Advisory Circular)
ACAM (Air Conformity Applicability Model)
AFMAO (Air Force Mortuary Affairs Operations)
AFMES (Armed Forces Medical Examiner System)
AGE (Aerospace Ground Equipment)
AGL (Above Ground Level)
AICUZ (Air Installation Compatible Use Zone)

APE (Area of Potential Effects)
APZ (Accident Potential Zones)
A-R (Aerial Refueling)
ARFF (Airport Rescue and Fire Fighting)
ARTCC (Air Route Traffic Control Center)
ATC (Air Traffic Control)
ATCAA (Air Traffic Control Assigned Airspace)
AW (Airlift Wing)
BASH (Bird/Wildlife-Aircraft Strike Hazard)
BGEPA (Bald and Golden Eagle Protection Act)
BHWG (Bird Hazard Working Group)
BMP (Best Management Practices)
CAA (Clean Air Act)
CAT (Civil Air Terminal)
CDAC (Central Delaware Aviation Complex)
CEQ (Council on Environmental Quality)
CO (Carbon Monoxide)
CO_2 (Carbon Dioxide)
CWA (Clean Water Act)
CZ (Clear Zones)
CZM (Coastal Zone Management)
DAFB (Dover Air Force Base)
dB (Decibel)
dBA (A-weighted Decibels)
DelDOT (Delaware Department of Transportation)
DNL (Day-Night Average Sound Level)
DNREC (Delaware Department of Natural Resources and Environmental Control)
DoD (Department of Defense)
DoDI (Department of Defense Instructions)
DRBA (Delaware River and Bay Authority)
DURMM (Delaware Urban Runoff Management Model)
DWAP (Delaware Wildlife Action Plan)
EA (Environmental Assessment)
EM (Engineer Manual)
EO (Executive Order)
ESA (Endangered Species Act)
FAA (Federal Aviation Administration)
FAA JO (Federal Aviation Administration Joint Order)
FBO (Fixed Base Operator)
FL (Flight Level)
FY (Fiscal Year)
GHG (Greenhouse Gas)
GIS (Geographic Information System)
GKC (Greater Kent Committee)
GPR (Ground Penetrating Radar)

GWP (Global Warming Potential)
HAP (Hazardous Air Pollutants)
HVAC (Heating, Ventilation, and Air Conditioning)
Hz (Hertz)
ICAO (International Civil Aviation Organization)
IFR (Instrument Flight Rule)
IICEP (Interagency/Inter-governmental Coordination for Environmental Planning)
INRMP (Integrated Natural Resources Management Plans)
IPaC (Information, Planning, and Conservation)
IR (Instrument Route)
JPED (Joint Personal Effects Depot)
JUA (Joint Use Agreement)
JUFF (Joint Use Flying Facilities)
KCDPS (Kent County Department of Planning Services)
KIAS (Knots Indicated Airspeed)
Lmax (Maximum Sound Level)
LOD (Limit of Disturbance)
LTO (Landing and Take-off)
MACA (Mid-Air Collision Avoidance)
MBTA (Migratory Bird Treaty Act)
MPH (Miles Per Hour)
MPO (Metropolitan Planning Organization)
MRO (Maintenance, Repair and Overhaul)
MSL (Mean Sea Level)
NAAQS (National Ambient Air Quality Standards)
NAS (National Airspace System)
NASCAR (National Association for Stock Car Auto Racing)
NEPA (National Environmental Policy Act)
NHL (National Historic Landmarks)
NHLP (National Historic Landmarks Program)
NHPA (National Historic Preservation Act)
NM (Nautical Miles)
NOAA (National Oceanic and Atmospheric Administration)
NO_2 (Nitrogen Dioxide)
NOx (Nitrogen Oxide)
NPDES (National Pollutant Discharge Elimination System)
NRHP (National Register of Historic Places)
NWI (National Wetlands Inventory)
NWR (National Wildlife Refuges)
O3 (Ozone)
OCM (Office of Coastal Management)
P3 (Public Private Partnership)
PM_{10} (Particulate matter less than or equal to 10 micrometers in diameter)
$PM_{2.5}$ (Particulate matter less than or equal to 2.5 micrometers in diameter)
PSD (Prevention of Significant Deterioration)

RAPCON (Radar Approach Control)
ROI (Region of Influence)
RPv (Resource Protection Event Volume)
SEL (Sound Exposure Level)
SHPO (State Historic Preservation Officer)
SO_2 (Sulfur Dioxide)
SOx (Sulfer Oxides)
SR (State Route)
SUA (Special Use Airspace)
TCP (Traditional Cultural Properties)
TIP (Transportation Improvement Plan)
TRACON (Terminal Radar Approach Control)
UPS (United Postal Service)
USACE (United States Army Corps of Engineers)
USAF (United States Air Force)
USEPA (United States Environmental Protection Agency)
USFWS (United States Fish and Wildlife Service)
VFR (Visual Flight Rules)
VOC (Volatile Organic Compound)
VR (Visual Routes)

1.0 PURPOSE AND NEED

1.1 INTRODUCTION

DelDOT in coordination with USAF has proposed an increase in the use of the CAT by increasing the permitted number of civil flight operations at DAFB. In response to this proposal, USAF has requested an EA be completed to document the potential impacts of the Proposed Action of increasing the total number of civil flight operations. The increase in flight operations would be realized through a new Joint Use Agreement (JUA) between DelDOT and the USAF, and would incorporate the essential elements of the current 1997 JUA (see **Appendix A**) and related amendments into a single, long-term JUA.

1.2 BACKGROUND

1.2.1 Dover Air Force Base

DAFB is located in Kent County Delaware, southeast of the State's capital city of Dover (see **Figure 1.2-1**). The base is situated on approximately 4,000 acres of land and features two main runways: 01/19 (9,602 feet by 150 feet) and 14/32 (12,903 feet by 150 feet). DAFB hosts two airlift wings (AW), the 436th AW and the Air Force's reserve 512th AW, also known as "Eagle Wing" and "Liberty Wing" respectively. In addition to hosting nearly 9,000 Airmen, DAFB is home to the Air Force Mortuary Affairs Operations (AFMAO), the Armed Forces Medical Examiner System (AFMES) and the Joint Personal Effects Depot (JPED). Collectively, these mission partners are responsible for the dignified return of fallen American service members. Together, along with civilians and families, DAFB is the Department of Defense's (DoD) largest aerial port. DAFB can be accessed from the north from U.S. 13, U.S. 113, and the State Route (SR)-1 Bypass. U.S. 113 and SR-1 also provide access from the southern side of the base. SR- 9 flanks the east side of the base. Access from the west is provided by SR-10 with direct access at the north gate.

Originally established in 1941 to support military operations during WWII, DAFB has played a key role in many of the United States' military operations including the wars in Korea, Vietnam, the Cold War, and the Yom Kippur War. More recently, DAFB established itself as an essential part of the post 9/11 war efforts such as Operation Enduring Freedom and Iraqi Freedom. The current host unit, the 436th AW, has been operating on the base since 1991 under the jurisdiction of the Air Mobility Command following a restructuring of the USAF after the Gulf War. With auxiliary support from the 512th AW, the 436th AW continues its mission to be "America's preeminent expeditionary airlift team".

The 436th AW operates the C-17 Globemaster and the C-5M Galaxy, the largest military plane in the USAF's inventory, to carry out their missions. DAFB also carries out humanitarian operations providing airlift support for victims of natural disasters such as tsunamis, hurricanes, and earthquakes. DAFB-based aircraft include Aero Club operations, an onsite flight training center sponsored by the USAF.

DAFB also supports a range of transient and other users, including aircraft in transit to or from Europe, those participating in world-wide strategic airlift operations, and those supporting DAFB missions such as the Center for Mortuary Affairs. Transient aircraft can include any aircraft in the USAF and broader DoD and allied nation inventory, with a special emphasis on airlift aircraft. Flight operations included in this environmental analysis incorporate DAFB transient and other users. DAFB also utilizes civilian cargo planes to supplement their services should the workload exceed the bases' capacity (DAFB 2018a).

1.2.2 Civil Air Terminal

The CAT is a civilian aviation facility adjacent to DAFB that facilitates civilian aircraft operations on DAFB runways jointly with military aircraft. The CAT is located on the northern end of DAFB and has access to both Runway 14/32 and Runway 1/19 (see **Figure 1.2-1**). The site is adjacent to and east of the Kent County Aeropark and can be accessed by way of Horsepond Road.

The CAT property spans approximately 20 acres (see **Figure 1.2-2**) and features a 6.5-acre aircraft parking ramp, a 1,900 square foot terminal building, a jet fueling facility, and a 100-space auto parking lot. According to Market Assessment analysis research, CAT employees have indicated that the existing parking apron can accommodate a Boeing 737 aircraft. DelDOT constructed a 45-foot-wide taxiway leading to the CAT on the west side of Taxiway 'B' (DRBA 2018). DelDOT also has an easement agreement with DAFB to construct an additional 82-foot-wide taxiway from Taxiway 'B' to the CAT. This easement was granted through a 25-year Easement Agreement No. USAF-AMC-FJXT-17-2-0648, dated March 4, 2018 and may be modified in accordance with Air Force policies and procedures (see **Appendix B**).

Figure 1.2-1 Regional Map of DAFB

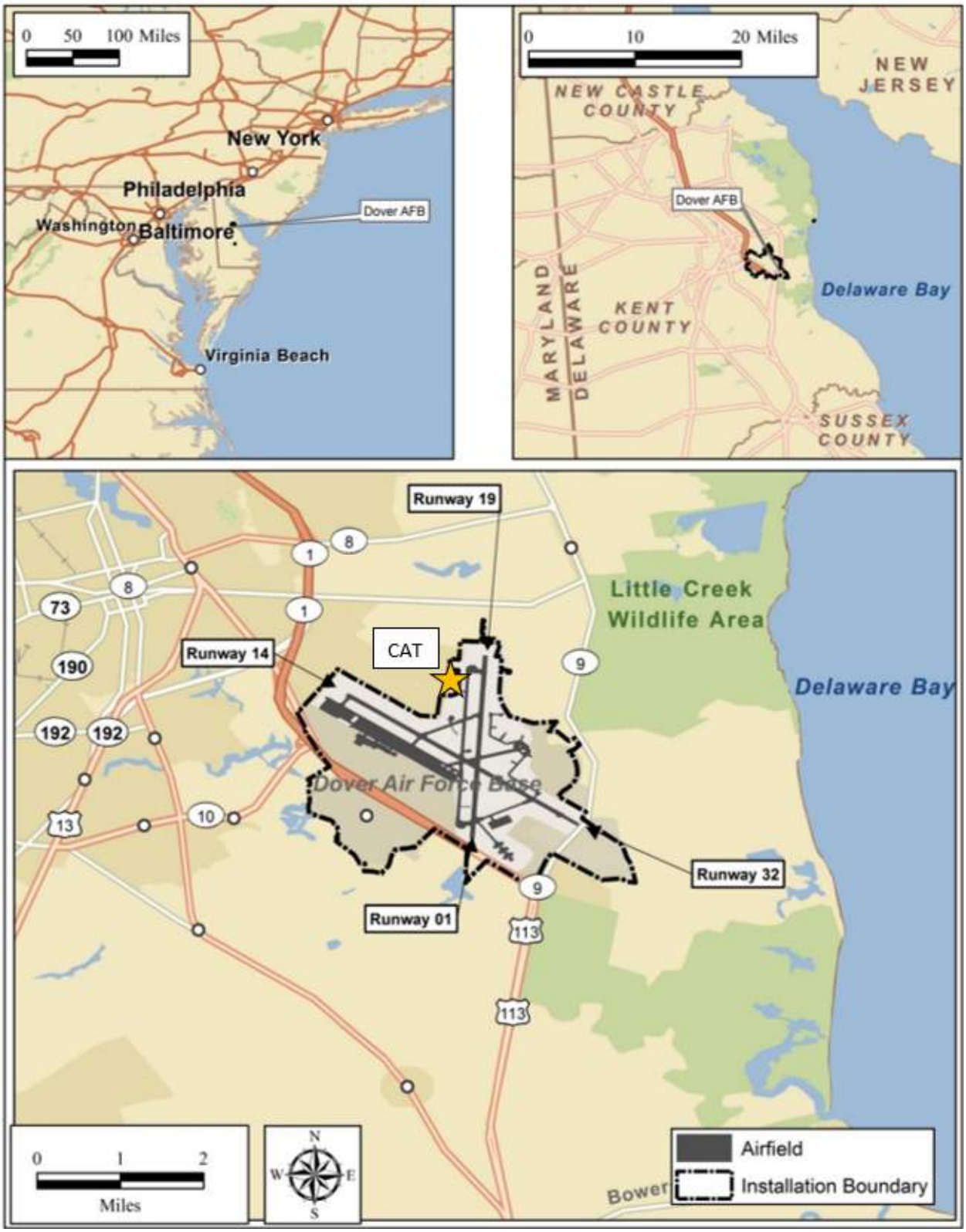


Figure 1.2-2 Existing Civil Air Terminal and DAFB Fence Lines

1.2.3 Existing Operations Overview

The following sections provide a brief overview of current operations conducted at DAFB and at the CAT. The data collected for both facilities details the number of operations, operation type, aircraft type, and time of day when those operations took place.

1.2.3.1 Dover Air Force Base Existing Operations

As the DoD's largest aerial port, DAFB carries out numerous operations daily. An approximate total of 44,400 operations occur on the base every year. An aircraft operation is defined as one takeoff/departure, one approach/landing, or half a closed pattern. A closed pattern or sortie is a single military aircraft flight from the initial takeoff through the termination landing. The minimum number of aircraft operations for one sortie is two operations, one takeoff (departure), and one landing (approach). **Table 1.2-1** summarizes the average annual operations that occur on DAFB, based on information provided by DAFB.

Military operations comprise approximately 99% of all operations. These include DAFB-based aircraft (C-17, C-5M, and Aero Club), transient military aircraft, and military-contracted civilian aircraft. Of the military operations, military aircraft represented 95% of the operations while transient government-contracted aircraft comprised the remaining 5%. Of these military operations, over 33,000 (75%) were closed patterned.

Based on 2016 DAFB records, the majority of flight operations (80.5%) took place during the daytime hours from 7AM to 10PM while the remaining 19.5% occurred at night during the hours of 10PM to 7AM. Comparing departures with arrivals, approximately 95% of departures occur during the daytime hours, and 5% occur during night; while 66% of arrivals occur during the daytime hours and the remaining 34% occur during the nighttime hours.

1.2.3.2 Civil Air Terminal Existing Operations

The frequency of civilian operations is significantly lower than military-based operations experienced on DAFB, approximately 1% annually. The average annual operations performed at the CAT is approximately 400 based on flight records provided by the DRBA. Currently the maximum number of annual operations is capped at 13,500 annually. The total number of civilian operations in 2018 was 358 (see **Table 1.2-2**). Use of the CAT is limited to aircraft adherence to the Mandatory Enhanced Security Procedures established by the Air Force and the issuance of a Prior Permission Request (PPR), approved by the DRBA.

NASCAR is the primary user of the CAT. The CAT experiences its heaviest traffic during the two annual race weekends held by NASCAR in the Spring and Fall. A total of approximately 240 NASCAR related operations occurred in 2018, comprising approximately 70% of the total annual operations. The remaining operations consist of charter flights. The majority, nearly 98%, of all civilian operations occurred during the acoustic daytime hours of 7AM to 10PM. DRBA records indicate jet engine planes, such as the CRJ-2 or the EMB-145, are the primary type of aircraft operating out of the CAT. Propeller-powered planes and helicopters also utilize the CAT, although these types of aircraft were observed much less frequently than their jet powered counterparts.

Table 1.2-1 2018 Average Annual Operations at DAFB

Category/ Aircraft Type	Annual Arrival/ Departure Operations	Annual Closed Pattern Operations*	Total Annual Operations
DAFB-Based Military Aircraft			
C-17	1,528	8,823	19,174
C-5M	1,360	6,135	13,630
Aero Club	3,600	1,560	6,720
Subtotal	***6,488***	***16,518***	***39,524***
Transient Military Aircraft			
C-12	125	0	125
C-130	294	0	294
C-17	706	0	706
C-5	1,141	0	1,141
T-1	30	0	30
F-16	14	0	14
KC-135	83	0	83
C-21	79	0	79
UH-60	14	0	14
Subtotal	***2,486***	***0***	***2,486***
Military-Contracted Civilian Aircraft (non-CAT)			
B-747	1,523	0	1,523
DC-10	532	0	532
Subtotal	***2,055***	***0***	***2,055***
		Total Non-CAT =	***44,065***
Civilian Aircraft (CAT) - 2018			
NASCAR	240	0	240
Non-NASCAR	118	0	118
Subtotal	***358***	***0***	***358***
Total	**11,902**	**16,518**	**44,423**

**Closed patterns consist of two operations (takeoff/departure and an approach/landing)*

Table 1.2-2 2018 Operations at the CAT

Type of Operation	Different Types of Aircraft Models	Number of Daytime (7:00 AM to 10:00 PM)	Number of Nighttime (10:00 PM to 7:00 AM)	Total Number of Operations
NASCAR	29	230	5	240 (67%)
Non-NASCAR	26	116	2	118 (33%)
TOTAL	N/A	346 (98%) Day	7 (2%) Night	358

1.3 PURPOSE AND NEED STATEMENT

The purpose of this project is to increase to the total number of civil flight operations at DAFB. This will include construction and improvement of taxiway connections on DAFB property to the CAT aircraft parking ramp. DelDOT desires to increase the total annual number of civil flight operations at DAFB. The increase in civil flight operations is needed to attract and support an economically viable tenant at the CAT.

Supporting the economic viability of the CAT would be consistent with Kent County's 2018 Comprehensive Plan. The Kent County Department of Planning Services (KCDPS) recommends "creating economic centers of business and commerce around existing infrastructure and identify areas designated for industrial and business parks, large scale commercial uses and neighborhood commercial uses".

The existing infrastructure in this case is DAFB. Areas for potential future development such as the CAT site are shown as "Employment Centers" on the current Comprehensive Plan's future land use map. The Comprehensive Plan also recommends continuing the positive working relationship between Kent County and DAFB and maintaining the zoning requirements that protect the base from any incompatible land uses.

1.4 SUMMARY OF KEY ENVIRONMENTAL REQUIREMENTS

1.4.1 National Environmental Policy Act

The NEPA (42 U.S. Code [U.S.C.] 4321 et seq.) requires federal agencies to consider 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 regulations for implementing the procedural provisions of NEPA (40 *Code of Federal Regulations* [*CFR*] Parts 1500 through 1508).

The activities proposed in this document constitute a new federal action and must therefore be evaluated in accordance with NEPA. To comply with NEPA, as well as other pertinent

environmental requirements, the decision-making process for this action includes the development of documentation to address environmental impacts related to the proposed activities. Each federal agency has its own procedures for implementing NEPA. The USAF implementing procedures are contained in Air Force Instruction (AFI) 32-1015, *Integrated Installation Planning*, which incorporates Title 32 *CFR* Part 989 et seq., *Environmental Impact Analysis Process*.

1.4.2 Additional Statutes and Regulations

Prior to implementing the actions described in this document, permitting and compliance with applicable statutes and regulations would occur. The following is a list of AFIs, Executive Orders (EOs), Acts, AFMANs, Engineer Manuals (EMs), *CFR*s, Department of Defense Instructions (DoDIs), and Technical Orders that are applicable to the Proposed Action:

- 42 U.S.C. 4321 et seq., NEPA;
- 33 U.S.C., 1251 et seq., *Clean Water Act (CWA)*;
- 42 U.S.C., 7401 et seq., *Clean Air Act (CAA)* (1963, amended in 1990);
- 16 U.S.C. 1531 et seq., *Endangered Species Act (ESA)*;
- 16 U.S.C. 703 et seq., *Migratory Bird Treaty Act (MBTA);*
- 15 *CFR* Part 930, *Federal Consistency with Approved Coastal Management Programs*
- 29 *CFR* Part 1910, *Occupational Safety and Health Standards*;
- 32 *CFR* Part 855, *Civil Aircraft Use of United States Air Force Airfields*
- 32 *CFR* Part 989, *Environmental Impact Analysis Process*;
- 40 *CFR* 93.153, *Air Conformity Determination*;
- 40 *CFR* 1500 through 1505, CEQ NEPA regulations;
- 54 U.S.C. 300101 et seq., *National Historic Preservation Act (NHPA);*
- EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*;
- EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*;
- EO 13175, *Consultation and Coordination with Indian Tribal Governments*;
- AFMAN 32-7003*, Environmental Conservation;*
- AFI 11-202V1, *General Flight Rules;*
- AFI 13-201, *Airspace Management*;
- AFI 32-1015, *Integrated Installation Planning*;
- DoDI 4165.57, *Air Installation Compatible Use Zone (AICUZ) Program*;
- FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*; and
- U.S. Army Corps of Engineers (USACE) EM 385-1-1, *General Safety Requirements*.

1.5 INTERAGENCY AND INTERGOVERNMENTAL COORDINATION AND CONSULTATIONS

The USAF, as the proponent of this EA, has distributed information and consulted with stakeholder agencies regarding the Proposed Action during the development of this EA. **Appendix C** contains the list of agencies consulted during this analysis and copies of correspondence, responses, and concurrences (as applicable).

DAFB sent a letter to the Delaware Department of Natural Resources and Environmental Control (DNREC) - Coastal Programs Office seeking comments on the Proposed Action. DNREC indicated that noise from current DAFB flight operations already impacts the programming onsite and staff are unable to be heard over the flight noise and must resume once the aircraft has flown past their facility. DNREC also determined, along with input from the National Oceanic and Atmospheric Administration's (NOAA) Office of Coastal Management (OCM), that the proposed activity of increasing the annual number of permitted flight operations at the CAT is not considered a federal agency activity under 15 CFR part 930, subpart C.

Based on DNREC's correspondence, further Coastal Zone Management (CZM) Program coordination is not required. Regarding biological resources, DAFB consulted with the United States Fish & Wildlife Service (USFWS) and DNREC's Division of Fish & Wildlife. USFWS responded by verifying that consultation per Section 7 of the ESA was not required.

DAFB also consulted with the Delaware State Historic Preservation Officer (SHPO) - Division of Historical and Cultural Affairs seeking concurrence with the finding that the Proposed Action would have no adverse effects on historic properties. The Delaware SHPO indicated that a formal response would be provided after a review of the final version of the *Environmental Assessment for the Increase of Civil Flight Operations at Dover Air Force Base*.

Through email correspondence with DAFB, the FAA indicated that no coordination is needed because there is no change to current flight procedures or the utilization of the Special Use Airspace (SUA) as part of the Proposed Action.

A Notice of Availability (NOA) of the Draft EA was published in Delaware State News and on the DAFB website (https://www.dover.af.mil/) on March 17, 2021, announcing the availability of the Draft EA for public review. The public comment period ended on April 17, 2021. Copies of the Draft EA were made available for review at the following locations:

- DAFB Website (https://www.dover.af.mil/)
- DAFB Air Mobility Command Museum (1301 Heritage Rd, Dover AFB, DE 19902)
- Kent County Library (497 South Red Haven Lane, Dover, DE 19901)
- City of Dover Library (35 Loockerman Plaza., Dover, DE 19901)

1.5.1 Government to Government Consultation

The National Historic Preservation Act (NHPA) Section 106 and its implementing regulations at 36 C.F.R. Part 800 require federal agencies to consult on a government-to-government basis with federally recognized tribes when an undertaking could potentially affect historic properties. EO 13175, *Consultation and Coordination with Indian Tribal Governments* (6 November 2000), directs federal agencies to coordinate and consult with Native American tribal governments whose interests might be directly and substantially affected by activities on federally administered lands.

To comply with legal mandates, federally recognized tribes that are affiliated historically with the DAFB geographic region were invited to consult on all proposed undertakings that have a potential to affect properties of cultural, historical, or religious significance to the tribes. The tribal

coordination process is distinct from NEPA consultation or the Interagency/Inter-governmental Coordination for Environmental Planning (IICEP) processes and requires separate notification of all relevant tribes. The timelines for tribal consultation are also distinct from those of intergovernmental consultations. The DAFB point-of-contact for Native American tribes is the Installation Commander. The DAFB point-of-contact for consultation with the Tribal Historic Preservation Officer (THPO) and the Advisory Council on Historic Preservation is the Cultural Resources Manager.

There are three federally recognized Native American Tribes associated with DAFB. Consultation is ongoing, summarized below and included in **Appendix C**.

- Delaware Nation - DAFB sent a letter to the Delaware Nation at Historic Preservation Department in Anadarko, Oklahoma. The response indicated that there are no objections to the project.
- Delaware Tribe of Indians - DAFB sent a letter to the Delaware Tribe Historic Preservation in East Stroudsburg, PA. The response indicated that there are no objections to the project.
- Stockbridge-Munsee Community Band of Mohican Indians - Consultation has been initiated and is ongoing with the Bonney Hartley, THPO Manager/NAGPRA in Bowler, Wisconsin.

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 POLICY OVERVIEW

USAF regulations (32 *CFR* Part 989) implementing NEPA (40 *CFR* Section 1502.14) require rigorous exploration and objective evaluation of all reasonable alternatives for a federal action. Each alternative must be feasible, reasonable, and meet the stated purpose and need. The following section details the elements of the Proposed Action; identifies alternatives that meet the purpose and need; and, in accordance with CEQ regulations (40 *CFR* §1502.14(d)), includes a No Action Alternative which provides a benchmark to allow decision makers and the public to compare the levels of environmental effects of the alternatives.

2.2 PROPOSED ACTION

The proposed action is to increase the total number of annual civil flight operations from 13,500 to 25,000 using DAFB JUFF. DAFB civil flight operations utilizing the CAT are defined under a JUA between USAF and DelDOT. DelDOT desires to increase the total annual number of civil flight operations at DAFB to support the potential for economic viability at the CAT. This increase is an additional 11,500 operations over the current limit as discussed in **Section 1.2.3**. There are currently approximately 44,500 annual DAFB military operations. Therefore, the total maximum combined military and civilian operations using DAFB runways would increase from 58,000 to 69,500.

To facilitate the increase in flight operations utilizing the CAT, the existing taxiway connection from DAFB Taxiway 'B' to the existing 6.5-acre aircraft CAT parking ramp would be widened to 82 feet. In addition, a new 82-foot-wide taxiway connection would be constructed by DelDOT between DAFB Taxiway 'B' to the CAT ramp on DAFB property. This new taxiway connection would provide increased access to the northern portion of the CAT ramp. **Figure 2.2-1** depicts the proposed taxiway improvements connecting the CAT ramp to Taxiway 'B'. The increase in flight operations would be realized through a new Joint Use Agreement (JUA) between DelDOT and the USAF, and would incorporate the essential elements of the current 1997 JUA (see **Appendix A**) and related amendments into a new, 50-year term JUA.

Figure 2.2-1 Proposed CAT Taxiway Ramp Improvements

2.3 PRELIMINARY ALTERNATIVES

The following alternatives were initially considered as potential business models that may meet the purpose and need for increased civilian aircraft operations at DAFB, utilizing the CAT.

1) Alternative 1 – No Action. Alternative 1 serves as the baseline for comparison of all the potential alternatives developed. Under Alternative 1, CAT flight operations are subject to an approved JUA between USAF and DelDOT. The existing JUA limits the total annual operations at the CAT to 13,500.
2) Alternative 2 – Accommodate an Air Cargo tenant at the CAT to conduct regional, national, and international air cargo delivery services. Under Alternative 2, the maximum number of CAT flight operations would be increased to a total of 25,000 annual operations under a new JUA between USAF and DelDOT.
3) Alternative 3 – Accommodate a Fixed Base Operator tenant at the CAT to provide aeronautical services such as fueling, short term parking, long term parking, hangaring, tie-down and parking, catering, maintenance, US Customs services and car rental. Under

Alternative 3, the maximum number of CAT flight operations would be increased to a total of 25,000 annual operations under a new JUA between USAF and DelDOT.

4) Alternative 4 – Accommodate a flight training facility to provide civilian aircraft operations training and education. This could include in aircraft or flight training simulator and classroom lecture. Under Alternative 4, the maximum number of CAT flight operations would be increased to a total of 25,000 annual operations under a new JUA between USAF and DelDOT.

5) Alternative 5 – Accommodate a Maintenance, Repair, and Overhaul tenant (MRO) at the CAT to provide aftermarket services for airframes, engines, and other critical aircraft components and may include custom aviation interior fit-out services. Under Alternative 5, the maximum number of CAT flight operations would be increased to a total of 25,000 annual operations under a new JUA between USAF and DelDOT.

2.4 PRELIMINARY ALTERNATIVES SCREENING

A screening of preliminary alternatives was conducted based on the Purpose and Need, DAFB operational restrictions, economic viability, and environmental impacts (see **Table 2.4-1**).

A Market Assessment was completed in October of 2019 by Strategic Planning Services titled "*Strategic Market Assessment, The Central Aviation Terminal – Dover AFB*" (Market Assessment) and is included in **Appendix D**. The Market Assessment indicated that over the past 10 to 15 years, the general aviation market has become static which presents specific challenges. Since 2007, global sales of piston aircraft in North America have decreased by 10% while the market for jet engine aircraft has increased by 12%. Although DAFB has the aeronautical infrastructure to accommodate a variety of jet engine aircraft, current DAFB operational restrictions make operating a financially self-sustaining general aviation business difficult.

2.4.1 Selection Standards

A range of preliminary alternatives were developed to address the purpose and need for increased civilian flight operations, as identified in **Section 1.3**. Selection standards were applied to the preliminary alternatives to determine which alternative(s) could meet the project goals, fulfill the purpose, and meet the individual aspects of the project needs. An alternatives screening was conducted to eliminate alternatives that failed to meet selection standards.

The following selection standards are specific to analyzing the increase in aircraft flight operations at DAFB. The selection standards summarize the issues and concerns described in **Section 1.3**, as well as potential constraints mandated by DAFB:

1. Satisfies the Purpose and Need - The purpose of this project is to increase to the total number of civil flight operations at DAFB. This will include construction and improvement of taxiway connections on DAFB property to the CAT aircraft parking ramp. DelDOT desires to increase the total annual number of civil flight operations at DAFB. The increase in civil flight operations is needed to attract and support an economically viable tenant at the CAT.

2. Meets DAFB Operational Restrictions - The strict guidelines and mission requirements of military flight operations at DAFB could limit flexibility and options for added flight operations operating through the CAT. Current military flight operations at DAFB take precedence and may constrain the civilian flight operations. These restrictions and conditions may limit the type of potential tenants that would locate to the CAT.
3. Economically Viable - A 2019 Market Assessment of the CAT, completed in 2019 by Strategic Planning Services, stated that 25,000 annual operations would be needed for a CAT tenant to be profitable.
4. Avoids Environmental Impacts – Compares the magnitude of the environmental impacts due to the construction of the new and expanded taxiway connections.

Table 2.4-1 Preliminary Alternatives Screening

Alternative Descriptions	Selection Standards			
	Fully Satisfies the Purpose and Need	Meets DAFB Operational Restrictions	Economically Viable	Avoids Environmental Impacts
Alternative 1 (No Action)	No	Yes	No	Yes
Alternative 2 (Air Cargo)	No	Yes	No	No
Alternative 3 (FBO)	Yes	Yes	Yes	No
Alternative 4 (Flight Training)	No	No	No	No
Alternative 5 (MRO)	No	Yes	No	No

Key: Yes – Meets selection standards
No – Does not meet selection standards

2.4.2 Alternatives Not Carried Forward Based on Screening

The following sections describe the alternatives that were not carried forward for detailed analysis. Alternatives 2, 4 and 5 were eliminated from further consideration based on the preliminary alternatives screening, selection standards.

2.4.2.1 Alternative 2 – Increase Operations with an Air Cargo Hub Tenant.

An air cargo hub distribution center facility was analyzed as a potential tenant at the CAT. These facilities require predominantly heavy jet aircraft to conduct product/shipping distribution and thus represent the highest anticipated levels of noise and air quality impacts and other potential environmental concerns, both in flight and performing static operations. A preliminary noise and air quality analysis was conducted to determine potential impacts from a cargo aircraft flight mix, and is included as **Appendix M**.

Based on the 2019 Market Assessment, the competition for an air cargo operation is on the national scale. The ability of aircraft to fly virtually anywhere and the supplementary support of logistics and transportation service providers enables air cargo to travel in a variety of ways from origin to destination. Timeliness and efficiency are critical components in any successful air cargo operation.

The CAT's location in the middle of the Delaware Peninsula prevents potentially more efficient surface transportation networks and omnidirectional market access. There are five competing airports within the region that currently provide air cargo services to the State. PHL (Philadelphia International) and BWI (Baltimore/Washington International) are less than 100 miles from Dover and have a drive time of less than two hours. PHL, BWI, IAD (Washington Dulles International), EWR (Newark Liberty International), and JFK (John F. Kennedy International) are all international airports and have U.S. Customs and Borders Protection (CBP) services which are legally required for air cargo imports and exports. The lack of a CBP presence at the CAT presents another obstacle in pursuing a competitive air cargo operation. Establishing an economically sustainable air cargo operation in the current market at the CAT would be very unlikely. Alternative 2 was not carried forward for further analysis based on the lack of economic viability.

2.4.2.2 Alternative 4 – Flight Training

The flight training industry includes two main components, flight lessons and ground school. Flight lessons are performed in the aircraft or in a certified flight training simulator. Ground school consists of classroom lecture and lesson by a flight instructor on aeronautical theory, in preparation for the student's flight pilot certification/licensing examinations. The CAT facility and the aeronautical amenities of DAFB, without the constraints of the JUA, would combine to form an attractive center for aviation training. The CAT site has adequate space for a range of additional facilities and infrastructure to conduct training and related operations. A variety of aircraft types could conduct training due the substantial length of the existing runways. The regional labor costs are reasonable, which would translate into inexpensive operating costs. Unfortunately, training facilities for both classroom and flight training are available within a reasonable proximity to DAFB. There is also no indication of unmet demand for classroom training. Most importantly,

DAFB operational restrictions prohibit civilian flight training on DAFB runways. For these reasons, Alternative 4 was not carried forward for detailed analysis.

2.4.2.3 Alternative 5 – Maintenance, Repair, and Overhaul (MRO)

The aviation MRO industry focuses on the aftermarket servicing of airframes, engines, and other critical aircraft components and may include custom aviation interior fit-out services. The competition for MRO operators is on a national scale due to the ability of aircraft to be serviced virtually anywhere. Demand for MRO services are primarily determined by aircraft fleet size, type, and age. The North American MRO market is the largest single region for MRO demand, accounting for 26% of the global market.

The Market Assessment identified that Delaware's geography is not conducive for an MRO business model, which unfortunately is primarily dependent on geographic location and not on the number of flight operations. This would therefore hinder the economic viability of the CAT.

The fact that Delaware is a peninsula creates travel time challenges and constrains access for a State that in 2019 had a population of 973,764 (2019, US Census). This makes it difficult to create the economies of scale necessary to establish a financially sustainable MRO business. The economic viability of an MRO is further challenged by competing airports in the region that currently offer general aviation type services. In Delaware, there are ten general aviation airports within a 50-mile radius of the CAT/DAFB. For these reasons, Alternative 5 was not carried forward for detailed analysis.

2.5 ALTERNATIVES CARRIED FORWARD FOR DETAILED ANALYSIS

Alternative 1 (No Action) is carried forward as the baseline comparison to Alternative 3. Alternative 3 meets most the selection standards from the preliminary alternatives screening (see **Table 2.4-1**). Alternative 3 - Increase Operations with an FBO Tenant, is recommended as the Preferred Alternative. The taxiway improvements would also be constructed under the Preferred Alternative as discussed in **Section 2.2**. A more in-depth analysis of environmental impacts from the taxiway construction and the analysis of air quality and noise levels for Alternative 3 are discussed in **Section 4**.

2.5.1 Alternative 1 – No Action

Under the No Action Alternative, civilian flight operations at DAFB and utilization of the CAT would continue as currently conducted as identified in **Section 1.2** and as predicated within the 1997 JUA. DAFB flight operations related to the CAT would remain unchanged. Primary guidelines for CAT flight operations established within the 1997 JUA that would continue to be followed include:

- DelDOT would continue to use the flying facilities at DAFB to permit operations by civil aircraft jointly with military aircraft.
- The total number of civil aircraft operations would not exceed one hundred fifty (150) per day, except during the two annual NASCAR race weekends, where (300) operations per day could be authorized.

- Maximum annual civilian operations would remain at 13,500 per the 1997 JUA, which is significantly greater than the approximate 400 average annual operations occurring today.
- If the parking area at DelDOT air terminal ramp reaches capacity, up to twenty-four (24) civil aircraft may park on designated Air Force pavement ramps, subject to military mission requirements and with prior approval from the Commander, 436th AW, and DAFB, until additional ramp space is available on the DelDOT/Kent County property. Access to the CAT parking apron is granted by a 25-year Easement Agreement (USAF- AMC- FJXT-17-2-0648).0648 dated March 4, 2018 and will cease on October 15, 2032 unless sooner terminated.
- Aircraft parking ramp saturation at the CAT may still be mitigated using the JUFF, in coordination with DAFB and defined in the 2018 Licensing Agreement, which has a shorter term than this JUA and may be modified in accordance with Air Force policies and procedures.
- All ground and air movements of civil aircraft using DAFB and movements of all other vehicles across Air Force taxiways would be controlled by the DAFB ATC Tower. Civil aircraft activity would coincide with the DAFB ATC Tower hours of operation. All aircraft would be provided ATC services on a first come, first served basis except for emergencies and military missions that require priority handling.
- Civil aircraft would not conduct training or practice flights at DAFB.

CAT tenants may construct improvements on the current CAT site to meet their operational needs and to support the currently approved maximum of 13,500 annual operations. These changes may include the expansion of existing off-base CAT structures and aircraft fueling capabilities or other enhancements to support a wider range of services than are currently provided.

2.5.2 Alternative 3 – (Preferred Alternative) Increase Operations with an FBO Tenant

An FBO is a commercial business that has been granted the right by an airport authority to operate on the airport grounds, or adjacent to airport property as a "through the fence operation". The FBO would provide aeronautical services such as fueling, short term parking, long term parking, hangaring, tie-down and parking, catering, maintenance, US Customs services and car rental. The services offered at an FBO are varied and wide ranging. Some of these services may be subject to the approval and oversight of the National Aviation Authority (NAA) or their delegated Civil Aviation Authority.

The 2019 Market Assessment determined that an FBO focusing on the rising market for corporate aviation activity is the most financially feasible alternative. Increasing the number of annual operations to 25,000 would be enough to sustain an FBO financially. Under Alternative 3, the region would experience an increase in aircraft activity with the majority of new aviation activity consisting of corporate jet engine aircraft.

Alternative 3 would allow the increase in civil flight operations on DAFB runways that would support an aircraft flight mix that meets the economic needs of an FBO tenant at the CAT. The

ground operations would also include static jet engine runs at the CAT depending upon future FBO tenant needs. In the context of this analysis, a single static jet engine run includes both a pre-flight 'warmup' and a post-flight 'cooldown', for an average of 10 minutes total per flight, or 5 minutes per operation. All aircraft operating out of the CAT would be subject to the terms and conditions of a new JUA between USAF and DelDOT.

To facilitate the increase in flight operations, a new taxiway from DAFB Taxiway 'B' to the CAT ramp would be constructed. The new taxiway would be 82 feet wide and constructed on an existing easement connecting Taxiway 'B' to the existing 6.5-acre CAT aircraft parking ramp. In addition, substantial strengthening and a widening of the existing CAT taxiway ramp would occur to structurally support all anticipated aircraft size and weight that a potential tenant may service. The second taxiway would provide heavy load-bearing capability and would offer more wingtip clearance for larger aircraft than is currently provided by the location of the existing CAT taxiway ramp. The total area of taxiway construction and reconstruction improvements would cover 123,603 square feet or approximately 2.8 acres (see **Figure 2.2-1**).

The CAT property currently spans approximately 20 acres. The size, configuration, and available amenities would need to be substantially improved to accommodate an FBO tenant large enough to be profitable and support 25,000 annual operations. According to the 2019 Market Assessment findings, the CAT site would need to be expanded to approximately 33 acres, encompassing adjacent parcels, lot number 7.00, 7.02, 7.03 and 7.04 within the Kent County Aeropark. The CAT site expansion may require additional environmental analysis to determine the level of impacts to effected resources. The proposed action does not include the CAT site expansion from 20 acres to 33 acres (see **Figure 2.2-1**).

The proposed aircraft mix scenario under Alternative 3 is based on the types of corporate aviation aircraft frequenting FBOs within the Northeast region of the United States. The *2018 Pilots Choice Awards* lists Meridian, App Jet Center, ProJet Aviation, MAC Jets, and Million Air as the top five FBOs in the northeast region of the country. These FBO's are based at Teterboro Airport (New Jersey), Manassas Regional Airport (Virginia), Leesburg Executive Airport (Virginia), Portland International Jetport (Maine), and Albany International Airport (New York) respectively.

The operations from the most common aircraft observed operating from these airports were tallied and extrapolated to 25,000 annual operations to determine a representative aircraft mix at the CAT. Five scenarios of aircraft mixes were developed to span the potential spectrum of future aircraft use at the CAT, from least aggressive to most aggressive. These civilian aircraft mixes were correlated with surrogate military aircraft mixes for the purpose of utilizing the ACAM air quality model to calculate potential air quality impacts, and the NoiseMap model to estimate noise impacts. **Table 2.5-1** summarizes the FBO representative aircraft mix scenarios developed for Alternative 3.

Table 2.5-1 Alternative 3 - Representative FBO Aircraft Mix

Aircraft			*Proposed CAT Operations Scenarios (annual operations)*				
Combined Representative Aircraft Models	**Aircraft Type / Weight (lbs.) / Engine power (lbf or hp)**	**Military Surrogate Aircraft**	**Scenario 1 - least aggressive**	**Scenario 2 - less aggressive**	**Scenario 3 - mid aggressive**	**Scenario 4 - high aggressive**	**Scenario 5 - most aggressive**
Boeing 737-300/700 and McDonnell Douglass M80	*Type 1*, Dual Jet Engine / 140k - 155k / 20k-22k	C-40A	0	0	1095	**4500**	11723
Bombardier CL-600/601 Challenger and Dassault Falcon	*Type 2*, Dual/Triple Jet Engine / 45k - 46k / 4.5k-8.6k	C-38	7902	13841	13841	**11431**	7367
Cessna 500 Citation	*Type 3*, Dual Jet Engine / 9.5k / 2.2k	UC-35A	6715	6715	5620	**4625**	1465
Beechcraft 300/350 King Air and Beechcraft 58 Baron	*Type 4*, Piston Propeller/6.2k - 14k/up to 1050 hp	C-12	10383	4444	4444	**4444**	4444
		Totals:	25000	25000	25000	**25000**	25000

Aircraft mix Scenario 4 (high aggressive) was selected to conduct noise and air quality analysis in **Section 4**. This aircraft mix provides the most flexibility for a robust level of corporate jet engine aircraft flight operations activity for the FBO.

2.5.3 Flight Operations Runway Distribution for Alternative 3

The distribution of the proposed additional flight arrivals and departures are defined as a percentage of the total annual number of flights for each DAFB runway. There are restrictions on flight operations to the west of DAFB due to the existing dense development affecting runway usage patterns. Runway 32 is rarely used for departures and Runway 14 is rarely used for approaches because several noise-sensitive land uses (including the state capitol) are located west of the airfield (and usage of these runways requires low-altitude overflight of these noise-sensitive land uses). The AICUZ program established runway distribution guidelines for DAFB in 2010 (see **Appendix E**). The runway usage is as follows: *Runway 01 = 53%, Runway 19 = 30%, Runway 14 = 5%, Runway 32 = 12%.* Runway usage noise modeling inputs would therefore be assigned based on these percentages and existing DAFB military and civilian flight paths (see **Figures 2.5-1** and **2.5-2**).

Figure 2.5-1 DAFB Departure Flight Paths

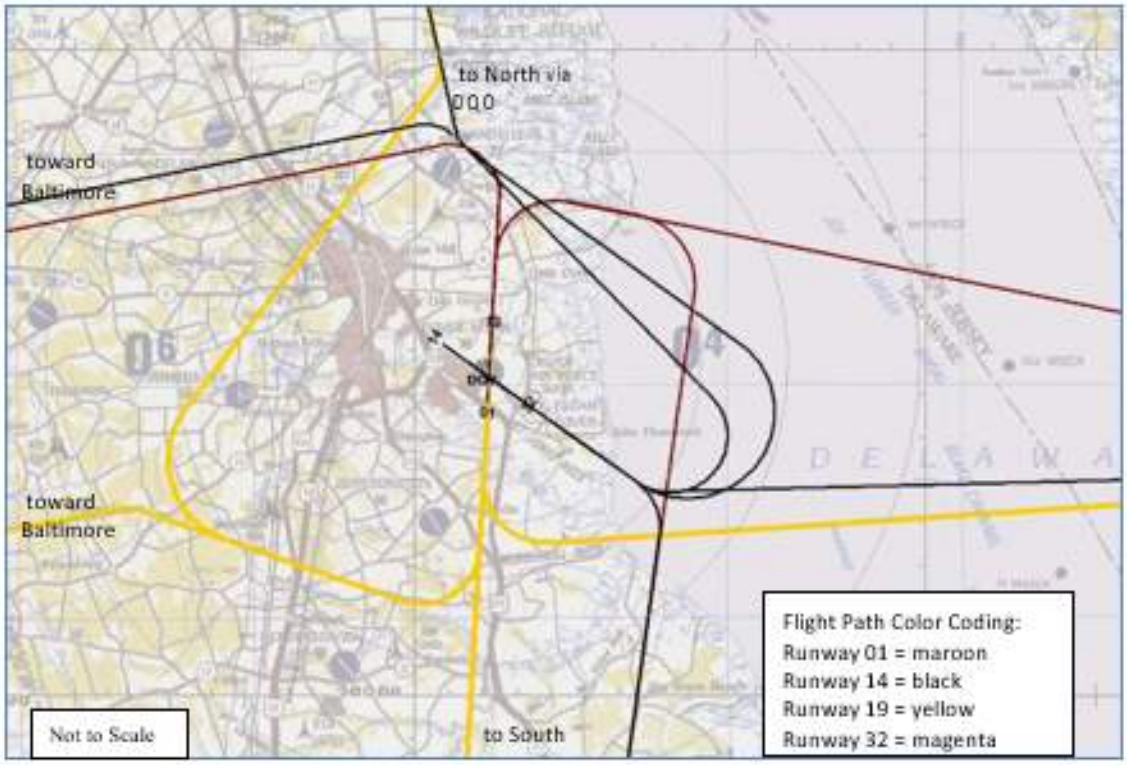
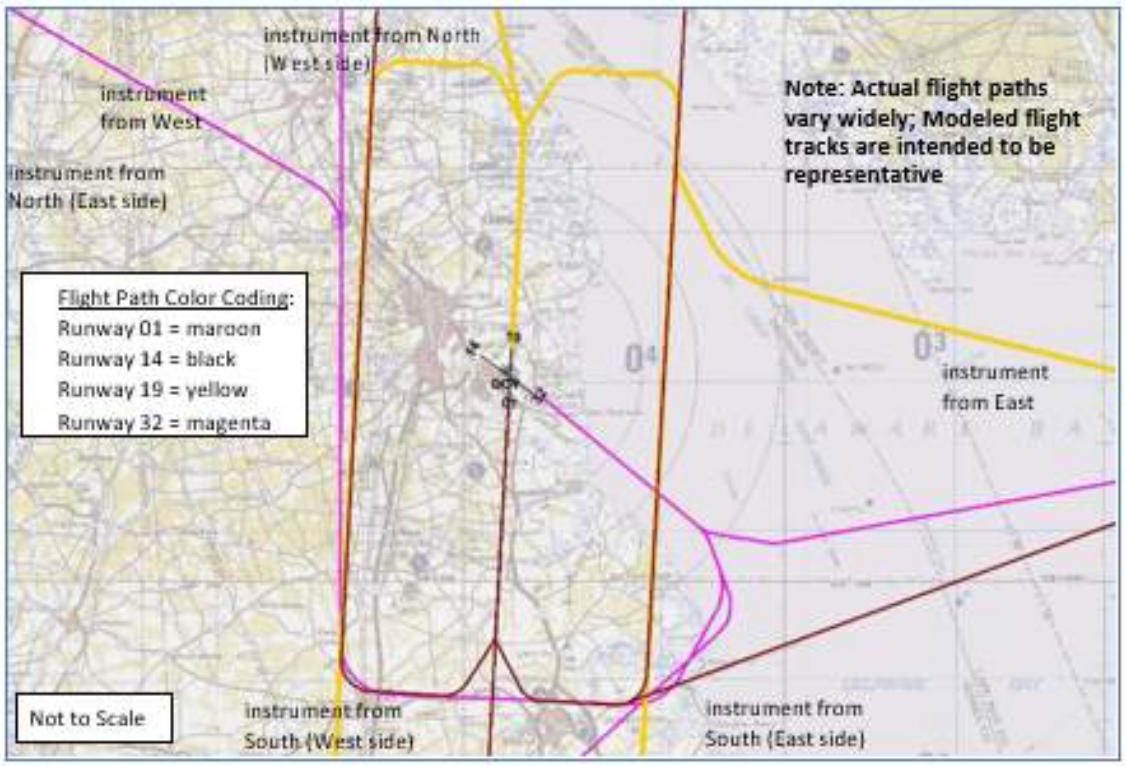


Figure 2.5-2 DAFB Arrival Flight Paths



2.6 JOINT USE AGREEMENT

USAF initially entered into a JUA with DelDOT in 1982. The JUA was established to enable the State to own and operate the CAT for civilian regional airline services while utilizing the existing infrastructure at DAFB. The USAF considers the JUA to be in the public interests and is agreeable to granting continued joint use of the flying facilities under this agreement. An updated JUA was signed in 1997, which allowed the continuation of civil flight operations at DAFB and clarified agency roles and responsibilities. The Delaware River and Bay Authority (DRBA) was designated the manager, and Atlantic Aviation as the operator of the CAT in 1997.

Under the current JUA, DelDOT is authorized to allow scheduled commuter, commercial air cargo flights and charter flights, and general aviation aircraft to use the Joint Use Flying Facilities (JUFF) at DAFB. The maximum number of civil aircraft operations allowed at the CAT is limited to 13,500 annually. On any given day, the maximum number of civil aircraft operations permitted is restricted to 150 per day. All aircraft operating out of the CAT are subject to the terms and conditions described in the JUA and those Federal Aviation Regulations (FARs) applicable to civil aircraft operations. Details of the 1997 JUA can be found in **Appendix A**.

2.6.1 Essential Elements of the Future JUA

USAF and DelDOT intend to incorporate the essential elements of the 1997 JUA and related amendments and agreements into a new, single 50-year term JUA. This new JUA would reference this EA and provide the necessary legal documentation allowing for any expanded flight operations to occur at the CAT. Points of emphasis include:

- A representative from DRBA or a new FBO would be available at the terminal during scheduled civil aircraft operations using the CAT.
- Military aircraft arriving and departing would continue to have priority of movement throughout the jointly used flying facilities.
- The total annual number of civil flight operations at the CAT will not exceed 25,000. The daily number of civil flight operations at the CAT will not exceed 150 except for NASSCAR events.
- All additional aircraft as part of this Proposed Action would be provided ATC on a first come, first served basis. The first come, first serve basis would be used except for emergencies and military missions that require priority handling.
- All ground and air movements of civil aircraft using DAFB and movements of all other vehicles across Air Force taxiways would be controlled by the DAFB ATC Tower. Civil aircraft activity would coincide with the DAFB ATC Tower hours of operation.
- Civil aircraft may use the JUFF at DAFB for landings, take-offs, and movement of aircraft but would park only at the CAT ramp.
- Civil aircraft transporting hazardous cargo must comply with applicable Federal Aviation and Air Force regulations.

Air Force airfields are available for use by civil aircraft as long as such use does not interfere with military operations or jeopardize the military utility of the installation. Air Force requirements take precedence over authorized civil aircraft use. Civilian aircraft using DAFB on official USAF

business would not be subject to Air Force Instruction 10-1001, Civil Aircraft Landing Permits. Exceptions to this instruction are not authorized. Proposed waivers to this instruction will be submitted to Headquarters United States Air Force, Current Operations Directorate, Military and Civilian Aviation Integration Division, (HAF/A3OJ) and evaluated for current and future impact on Air Force policy and operations. Government contracted civilian aircraft, which are taxied or are towed to the CAT after completing their official government business at DAFB, would count towards the 25,000 annual total operations limit at the CAT. However, these operations are expected to be minimal and spread out throughout the year.

An exception to the daily maximum number of flight operations would allow a higher daily maximum number of civil aircraft operations for NASCAR events. This would remain at 300 daily operations during the two annual NASCAR events, for a total of eight days per calendar year.

3.0 ENVIRONMENTAL RESOURCES

The descriptions of environmental inventory within the affected area of the Proposed Action are described by resource area. Some of the resources are not affected by the Proposed Action and are described below. All other environmental resource areas were analyzed in greater detail and are included in **Sections 3.1** through **3.10**. Each section discusses the definition of the resource and a provides a description of the existing environmental conditions.

Descriptions of Resources Not Carried Forward for Detailed Analysis

Per guidelines established by the NEPA, CEQ regulations, 32 *CFR* Part 989 *EIAP*, the description of the affected environments and the associated impact analyses in this EA focus on only those aspects of the environment potentially subject to impacts.

Based on the scope of the Proposed Action, resources with minimal issues or no impacts were identified through a preliminary alternatives screening process. The following describes those resource areas not carried forward for detailed analysis, along with the rationale for their elimination. Regardless of the alternative selected, the following resources would not be affected by the Proposed Action and are not discussed in detail in this EA.

Socioeconomics and Environmental Justice

Socioeconomic factors are defined as the basic attributes and resources associated with the human environment and may include population and housing, economic activity, and public services.

Environmental Justice is defined by the U.S. Environmental Protection Agency (USEPA) as the fair treatment of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (USEPA 1998; USAF 2014b).

Concern that certain disadvantaged communities may bear a disproportionate share (overburdened populations) of adverse health and environmental effects compared to the general population led to the 1994 enactment of EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. This EO directs federal agencies to address disproportionate environmental and human health effects in minority and low-income communities.

In 2011 the USEPA issued Plan Environmental Justice 2014, outlining processes and procedures to help Environmental Justice communities and other sensitive populations more efficiently and effectively engage agencies as they make decisions (USAF 2017).

The Proposed Action does not include any changes that contribute to an increase in population or housing or change the use or requirements for public services. Approximately three residences would be newly affected by noise levels at or above 65 dB DNL (residence count is based on interpretation of aerial photography), and FAA noise impact significance criteria would not be exceeded at any location.

The three newly affected residences are not located in a single area but are instead located in various areas surrounding the airbase. Although the percentage of residents in the three houses that are children, elderly, or minorities is not supported by available data, it is likely the demographics of the three affected residences are similar to nearby residences. Because there are no significant noise impacts to the population in general and because the minimal impacts expected to occur are not focused in one location, there is no expectation of disproportionate impacts to minority, low-income populations, or to children. Therefore, socioeconomics and environmental justice are not carried forward for a more detailed analysis.

Infrastructure

Infrastructure consists of the systems and physical structures or utilities that enable the population of an Air Force base to function. These utilities include water supply and distribution, sanitary sewer and wastewater systems, stormwater drainage, electrical system, natural gas, solid waste, and transportation. Effects on DAFB infrastructure are based on the potential for disruption or improvement of existing levels of service and additional needs for water, energy and natural gas consumption, wastewater and stormwater drainage systems, transportation resources, and solid waste system availability.

Changes in population and development on DAFB are not part of the Proposed Action. An increase in civil flight operations only involves the use of DAFB runways. The Proposed Action would not impact any other DAFB infrastructure, therefore infrastructure analysis was not carried forward for more detailed analysis.

Hazardous Materials and Waste

The terms “hazardous materials” and “hazardous waste” refer to substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristic, may present substantial danger to public health or the environment when released into the environment. Products containing hazardous materials that may result in the generation of hazardous waste include aviation fuel, adhesives, sealants, conversion coatings, corrosion preventative compounds, hydraulic fluids, lubricants, oils, paints, polishes, thinners, and cleaners.

The DoD manages hazardous materials and waste through the DoD Environmental Restoration Program (ERP). The DoD ERP is comprised of the Installation Restoration Program (IRP) and the Military Munitions Response Program (MMRP). The IRP addresses contamination from hazardous substances, pollutants, or contaminants at active installations, Formerly Used Defense Site properties (FUDS) properties, and Base Realignment and Closure (BRAC) locations in the United States. The MMRP addresses former defense sites (i.e., closed military ranges) known or suspected to contain unexploded ordnance (UXO), discarded military munitions, or munitions constituents (DoD, 2019). The USAF complies with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as Superfund, through the DoD ERP.

Desktop analysis indicated no DoD ERP sites in the location or vicinity of the proposed taxiway improvements. All civil aircraft will refuel on site at the CAT. Any additional storage tank(s)

needed to meet CAT tenant operations will be installed and constructed in accordance with federal and state regulations. In addition, USAF would request some Best Management Practices (BMP's) such as sluice gates be installed at the CAT to capture spilled fuel, de-icing agents, or any other hazardous chemicals to ensure no environmental contamination reaches the DAFB conveyance system or DAFB property. Furthermore, taxiway connection construction would comply with federal and state hazardous materials and waste regulations to mitigate any potential leaks or spills on DAFB property. Therefore, hazardous materials and waste analysis was not carried forward for more detailed analysis.

3.1 AIRSPACE

3.1.1 Definition of the Resource

Airspace management is defined as the direction, control, and handling of flight operations in the "navigable airspace" that overlies the geopolitical borders of the United States and its territories. "Navigable airspace" is airspace above the minimum altitudes of flight prescribed by regulations under U.S.C Title 49, Subtitle VII, Part A, and includes airspace needed to ensure safety in the take-off and landing of aircraft (49 U.S.C. § 40102).

Congress has charged the FAA with responsibility for developing plans and policy for the use of the navigable airspace and assigning, by regulation or order, the use of the airspace necessary to ensure the safety of aircraft and its efficient use (49 USC § 40103(b); Federal Aviation Administration Joint Order [FAA JO] 7400.2G). SUA identified by the FAA for military and other governmental activities is charted and published by the National Aeronautical Charting Office in accordance with FAA JO 7400.2G and other applicable regulations and orders. Airspace management considers how airspace is designated, used, and administered to best accommodate the individual and common needs of military, commercial, and general aviation. The FAA considers multiple and sometimes competing demands for aviation airspace relative to airport operations, federal airways, jet routes, military flight training activities, and other special needs. The FAA determines how the National Airspace System (NAS) can best be structured to address all user requirements. Specific rules and regulations concerning airspace designation and management are listed in FAA JO 7400.2G.

3.1.1.1 Airspace Categories and Classifications

Non-regulatory and regulatory airspaces are the two main categories of airspace areas. Within each broad categorization there are a total of four types of airspaces: Controlled, Special Use, Other, and Uncontrolled airspace. Controlled airspace has defined dimensions in which Air Route Traffic Control Center (ARTCC) service is provided to Instrument Flight Rule (IFR) flights and to Visual Flight Rules (VFR) flights according to the relevant airspace classification (FAA 2019). There are five separate classes of controlled airspace. Classes A through E are described in the following sections and depicted in **Figure 3.1-1**. Uncontrolled airspace is designated as Class G. DAFB is located under Class D airspace.

Figure 3.1-1 Controlled/Uncontrolled Airspace

Class A airspace, generally, is the airspace from 18,000 feet mean sea level (MSL) up to and including Flight Level (FL) 600. FL600 is equal to approximately 60,000 feet MSL. Class A airspace requires pilots to utilize an IFR flight plan and receive ATC clearance. FLs are MSL altitudes based on the use of a directed barometric altimeter setting and are expressed in hundreds-of-feet. Class A airspace includes the airspace overlying the waters within 12 nautical miles (NM) of the coast of the 48 contiguous states and Alaska.

Class B airspace, generally, is the airspace from the surface to 10,000 feet MSL around the nation's busiest airports. The actual configuration of Class B airspace is individually tailored, consists of a surface area and two or more layers, and is designed to contain all published instrument procedures.

Class C airspace, generally, is the airspace from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower, are serviced by a Terminal Radar Approach Control (TRACON), and that have a certain number of IFR operations or passenger enplanements. Although the actual configuration of Class C airspace is individually tailored, it usually consists of a surface area with a 5-NM radius and an outer circle with a 10-NM radius that extends from 1,200 feet to 4,000 feet above the airport elevation.

Class D airspace, generally, is the airspace from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and, when instrument procedures are published, the airspace would normally be designed to contain the approved procedures. Arrival extensions for instrument approach procedures (IAPs) may be designated as Class D or Class E airspace. Class E airspace is controlled airspace that is not Class A, B, C, or D. There are seven different types of Class E airspace. Airspace that has not been designated as Class A, B, C, D, or E is categorized as Class G or uncontrolled airspace (FAA 2001).

Along the East Coast, most airspace greater than 1,200 feet above ground level (AGL) is controlled airspace. Controlled airspace classifications become progressively less stringent. For example, aircraft operating in Class A airspace must operate under IFR and all are provided separation services, while aircraft operating in Class E airspace may operate under either VFR or IFR with separation services provided to IFR aircraft only. For a detailed description of ATC airspace classifications see **Appendix F**.

3.1.1.2 Military Airspace Management

The military imposes limitations on aircraft operations that are not a part of mission activities. SUA includes Air Traffic Control Assigned Airspace (ATCAA); aerial refueling (A-R) tracks/anchors; slow routes; and low-altitude tactical navigation areas. Instrument Routes (IRs) and Visual Routes (VRs) are used by DoD and associated Reserve and Air Guard units for the purpose of conducting low-altitude navigation and tactical training. VRs are under VFR conditions (usually below 10,000 feet MSL) at airspeeds in excess of 250 knots indicated airspeed (KIAS) (FAA 2019). IRs are used by DoD, including associated Reserve and Air Guard units, for the purpose of conducting low-altitude navigation and tactical training in both IFR and VFR weather conditions usually below 10,000 feet MSL at airspeeds in excess of 250 KIAS. Several different VRs and IRs cross through the DAFB airspace. These routes are used by a variety of different military aircraft throughout the year.

The USAF manages airspace in accordance with processes and procedures detailed in AFI 13-201, *Airspace Management*. AFI 13-201 implements USAF Planning Document 13-2, *Air Traffic Control, Airspace, Airfield, and Range Management*, and DoD Directive 5030.19, *DoD Responsibilities on Federal Aviation and National Airspace System Matters*. It addresses the development and processing of SUA and covers aeronautical matters governing the efficient planning, acquisition, use, and management of airspace required to support USAF flight operations (FAA 2001).

3.1.2 Existing Conditions

At DAFB, the 436th AW active duty and the reserve associate 512 AW utilize the C-5M and C-17 aircraft to support global airlift missions. DAFB is home to the AFMAO, the AFMES and the JPED. Collectively, these mission partners are responsible for the dignified return of fallen American service members. DAFB also supports military transient aircraft flights. Detailed information regarding operations within SUA, IRs and VRs is included in the *2016 Dover Air Force Base Flight Operations Environmental Assessment.*

The airspace surrounding DAFB is categorized as Class D. The Proposed Action includes increased aircraft operations within FAA's Class C, D and E airspace during approach, departure, terminal and other operations at DAFB. Because of this and for the purpose of this airspace analysis, the ROI for the Proposed Action coincides with the parameters of Class C airspace, which is a 10 NM (11.5 mile) radius of DAFB.

Airspace use within the immediate area surrounding DAFB is influenced by the proximity of existing VRs, several small airports within the ROI, and three larger international airports at Atlantic City, New Jersey; Harrisburg, Pennsylvania; and Richmond, Virginia; all located outside of the ROI (**Figure 3.1-2** and **Figure 3.1-3**). In addition, aircraft from Naval Air Station Patuxent River in Maryland influence airspace use near DAFB. The nearest international airport is Atlantic City International which is located approximately 46 NM northeast of DAFB in New Jersey.

A variety of different civilian airspace uses occur within the ROI. These include general civil aviation operations, civilian flight training, low level medevac operations and agricultural

spraying. Although not as numerous as civilian general aviation, other airspace uses include hot air balloon operations, skydiving activities, gliders and ultralight aircraft.

DAFB hosts two intersecting runways, associated taxiways, facilities, and ramp space to support aircraft operations. Runway 01/19, generally oriented north to south is 9,602 feet long and 200 feet wide. Runway 14/32, oriented northwest to southeast is 12,903 feet long and is 150 feet wide. Runway 01/19 is the primary runway for aircraft assigned to DAFB, transient aircraft, and most instrument arrivals. Increased civil flight operations under the Proposed Action would use either runway, depending on flight conditions and DAFB operations. DAFB has a control tower that provides certain ATC services, including sequencing of all aircraft within the DAFB 4.6-NM radius Class D airspace. In addition, DAFB has a Class E airspace extension that connects the Class D airspace to the overlying Class E airspace up to 17,999 feet MSL.

Before operating in the DAFB Class D airspace, pilots are required to establish radio contact with the DAFB Radar Approach Control (RAPCON) facility. In addition, the associated Class E airspace surface extension contains published arrival/departure procedures for DAFB. Reference the *2016 EA for Flight Operations at DAFB* for a summary of information regarding the airports and heliports in the ROI.

Figure 3.1-2 Existing Airspace in the Vicinity of DAFB

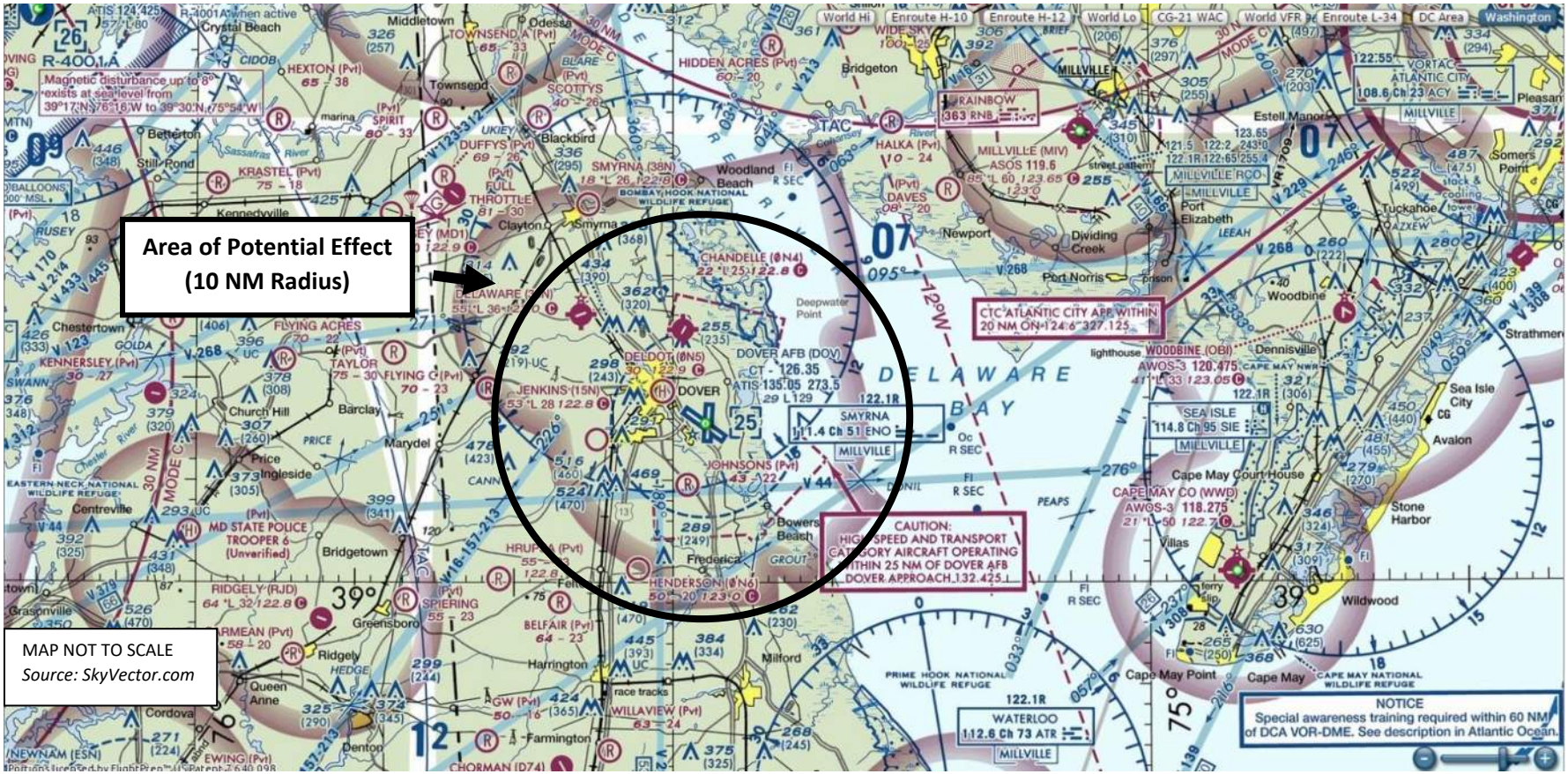
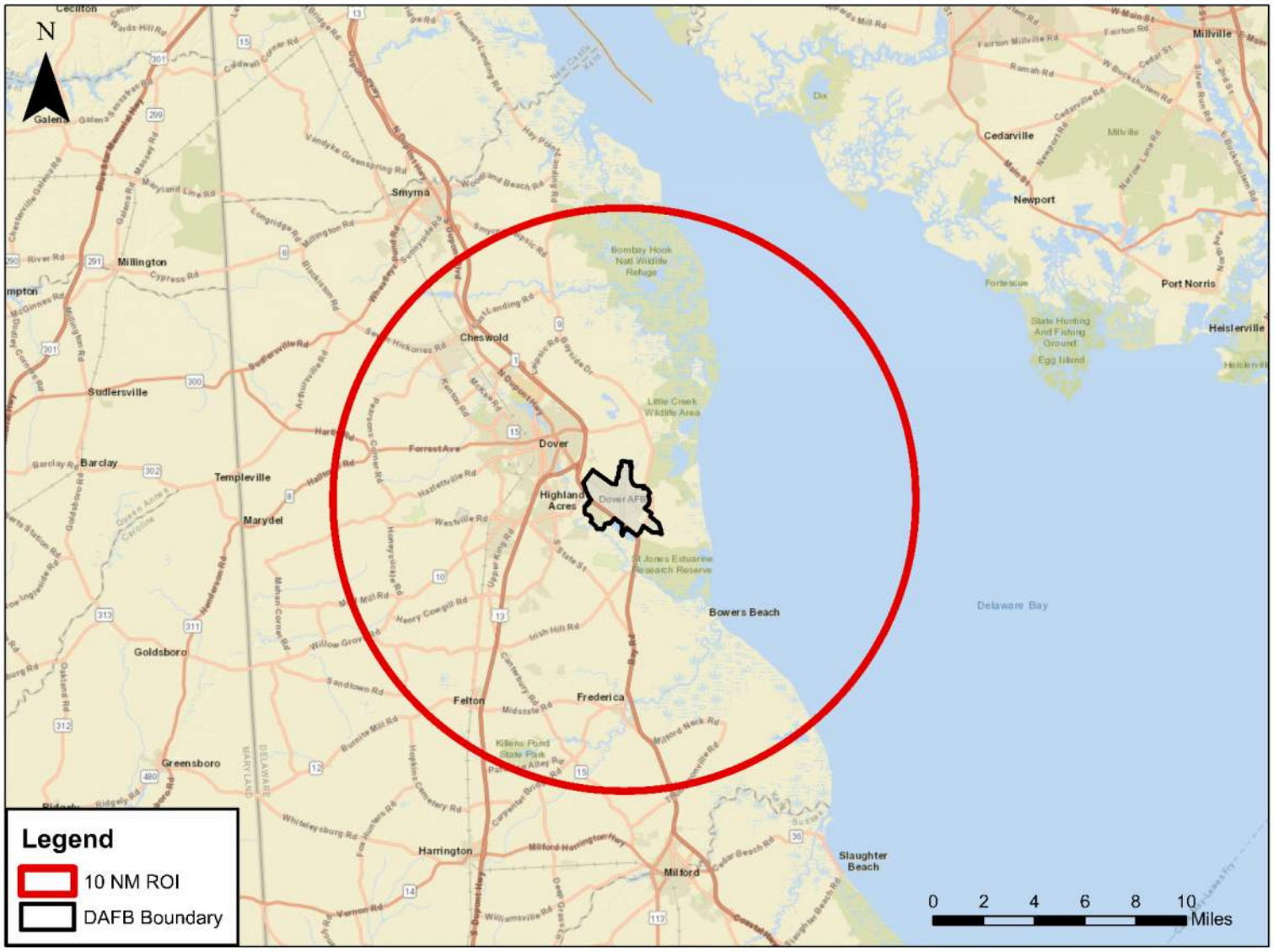


Figure 3.1-3 10 Nautical Mile Region of Influence



3.2 NOISE

3.2.1 Definition of the Resource

Noise is considered unwanted sound that interferes with normal activities or otherwise diminishes the quality of the environment. Responses to noise vary widely according to the characteristics of the sound source, the time of day, the distance between the noise source and the person hearing the sound, and the sensitivity and expectations of the person hearing the sound. This section will discuss noise as it relates to human health and welfare, as well as the potential for noise to affect structures.

Sound intensity varies widely (e.g., from a soft whisper to a jet engine), and it is measured on a logarithmic scale to accommodate this wide range. The logarithm is a mathematical tool used to simplify dealing with very large and very small numbers. For example, the logarithm of the number 1,000,000 is 6, and the logarithm of the number 0.000001 is −6.

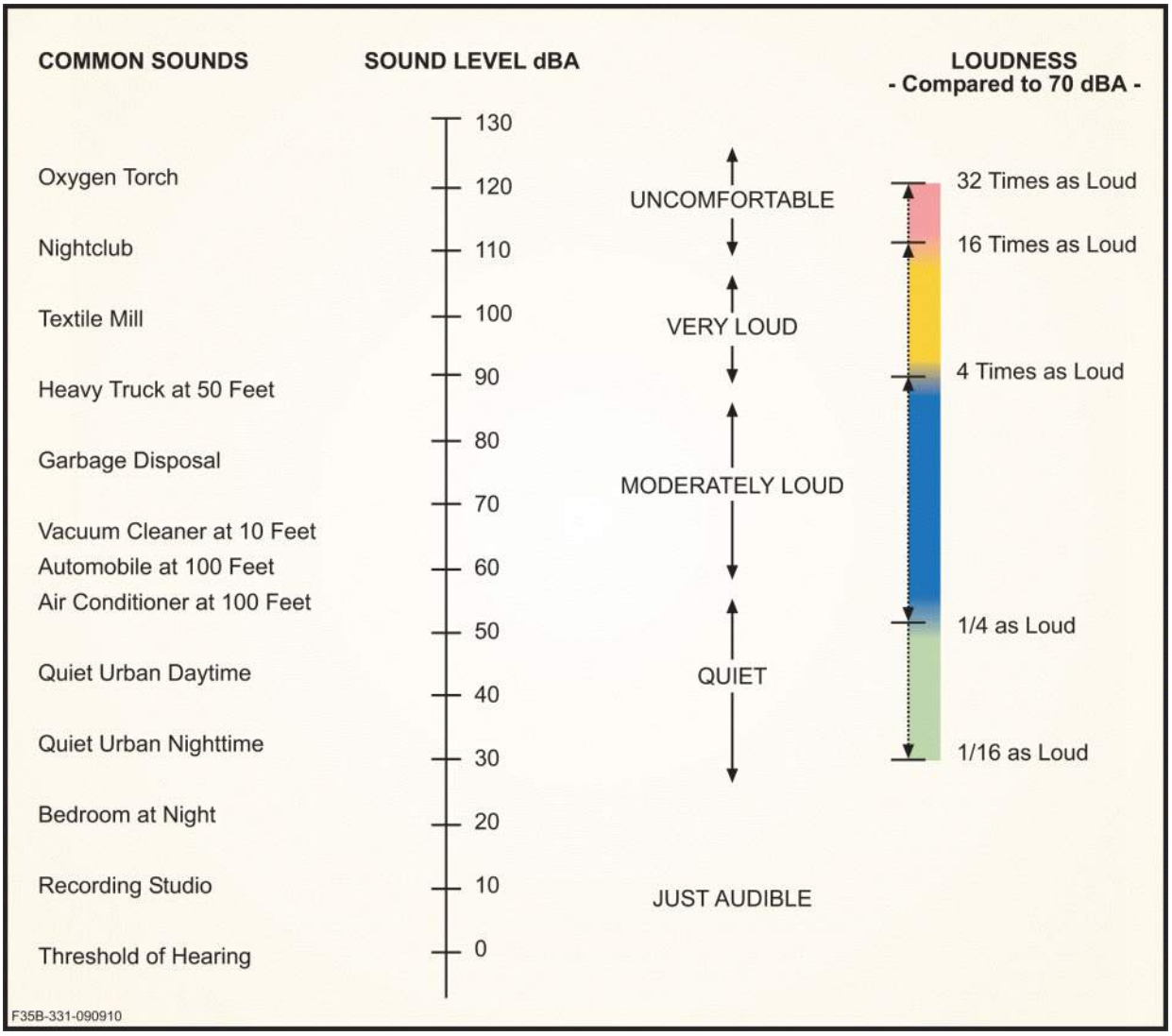
The frequency (or pitch) of sound is measured in cycles per second, or hertz (Hz). This measurement reflects the number of times per second the air vibrates from the acoustic energy. Low-frequency sounds are heard as rumbles or roars, and high-frequency sounds are heard as screeches.

The communication of sound intensity is refined to account for frequency through the use of "A-weighting." The normal human ear can detect sounds that range in frequency from about 20 to 20,000 Hz. However, not all sounds in this range are heard equally well. Therefore, through internal electronic circuitry, some sound meters are calibrated to emphasize frequencies in the 1,000 to 4,000 Hz range and de-emphasize sound energy in other frequencies. The human ear is most sensitive to frequencies in this range, and sounds measured with these instruments are termed "A-weighted." For the purposes of this document, decibel levels provided are A-weighted and provided in A-weighted decibels (dBA) unless otherwise noted. Examples of typical dBA of common sounds are shown in **Figure 3.2-1**.

The word "metric" used to describe a standard of measurement. As used in environmental noise analysis, there are many different types of noise metrics. Each metric has a different physical meaning and was developed by researchers attempting to represent a particular set of noise effects. The metrics supporting the assessment of noise from aircraft operations and other activities evaluated in this document are the maximum sound level (Lmax), sound exposure level (SEL), and DNL.

Maximum Sound Level (Lmax). The Lmax is the highest sound level measured during a noise event which is typically logged in 1/8-second intervals during aircraft noise level measurements. In many situations, noise levels vary over time for one reason or another. In the case of an aircraft overflight, the noise level varies as the aircraft moves closer to or farther away from the observer on the ground. Lmax is a useful metric for judging a noise event's interference with conversation and other common activities.

Figure 3.2-1 Typical A-Weighted Levels of Common Sounds



Sound Exposure Level (SEL). The SEL compresses the total sound energy of an overflight event into a single second reflecting both the intensity and duration of the noise event. For noise events lasting more than one second, the SEL will be higher than the Lmax.

Day-Night Average Sound Level (DNL). The DNL metric sums individual A-weighted noise events and averages the acoustic energy over a 24-hour period. Thus, it is a composite metric that considers the maximum noise levels, the duration of the events, the number of events that occur, and the time of day during which they occur. This metric adds 10 dB to those events that occur between 10:00 P.M. and 7:00 A.M. to account for the increased intrusiveness of noise events that occur at night when ambient noise levels are normally lower than during the daytime.

Ignoring the acoustic nighttime penalty, DNL may be thought of as the continuous or cumulative A-weighted sound level that would be present if all of the variations in sound level over the given

time period were smoothed out so as to contain the same total sound energy. It is fully recognized that the DNL metric does not provide specific information on the number of noise events or the specific individual sound levels that occur. For example, a DNL of 65 dB could result from a few very noisy events or a large number of quieter events. Although it does not represent the sound level heard at any one particular time, DNL does accurately represent the total sound exposure at a location. Social surveys have found the DNL metric to be the best predictor of community annoyance resulting from transportation noise. Its use is endorsed by the scientific community and several governmental agencies (USEPA 1974); (FICN 1992); (FICUN 1980).

3.2.2 Noise Level Calculation Method

Computer noise modeling allows informed decision-making without exposing people to the noise associated with the Proposed Action. The computer program NoiseMap, version 7.3, accepts inputs related to aircraft flight paths, altitudes, engine power settings, and airspeeds as well as inputs related to static engine runs conducted on the ground. The model references a database, known as NoiseFile, containing measured flyover and static engine run noise levels measured for various aircraft types in several configurations. NoiseMap results compare favorably, if not exactly, to those of the Aviation Environmental Design Tool, the noise model used by the Federal Aviation Administration for civilian noise calculation.

Four aircraft types were chosen to represent the aircraft mix for an FBO tenant at the CAT (Alternative 3), as described in **Section 2** of this EA. Noise modeling parameters were then sent for review by the Air Force Civil Engineer Center/CZN and review was completed on April 20, 2020. The approved modeling parameters include frequency of operations, flight paths, flight profiles, and static engine runs. The effects of atmospheric conditions and terrain were also considered in the noise modeling. Noise modeling results are described in **Section 4.2**.

3.2.3 Frequency of Operations

The current ‘Approved’ flight operations scenario (Alternative 1/No-Action) and the ‘Proposed’ flight operations scenario (Alternative 3) includes 13,500 and 25,000 annual civilian operations at the CAT, respectively. **Table 3.2-1** lists the number of operations conducted by each aircraft type and percent of operations conducted during acoustic night (10:00 P.M. to 7:00 A.M.) under the proposed scenario. The modeled percentages of CAT operations during acoustic night were based on the operations of similar transient aircraft types as recorded in baseline noise modeling data.

Table 3.2-1 Operations Per Year under Alternative 3 (Proposed Scenario) and Percent of Operations During Acoustic Night (10p to 7a)

Aircraft Types in Aircraft Mix Scenario	Aircraft Type Used in Modeling	Operations Per Year	Departure	Arrival
Boeing 737-300/700 and McDonnell Douglass M80	Boeing 737-300	4,500	50%	35%
Bombardier CL-600/601 Challenger and Dassault Falcon	Bombardier CL-601	11,431	25%	16%
Cessna 500 Citation	Cessna 500 Citation	4,625	22%	11%
Beechcraft 300/350 King Air and Beechcraft 58 Baron	C-12 (Beechcraft KingAir modified for military use)	4,444	22%	11%

Runway usage and flight paths for CAT aircraft, which are listed in **Table 3.2-2** for departures and in **Table 3.2-3** for arrival operations, were based on noise modeling data used in the 2010 Dover AICUZ study (USAF, 2010). The AICUZ report itself only lists consolidated runway usage percent, and so runway usage values specific to each operation type were taken directly from the AICUZ noise modeling input files. Runway usage was assumed to be limited to Runway 01/19 during acoustic night per direction from DelDOT. Runway 32 is rarely used for departures and Runway 14 is rarely used for approaches because several noise-sensitive land uses (including the state capitol) are located west of the airfield and usage of these runways requires low-altitude overflight of these noise-sensitive land uses.

Table 3.2-2 Departure Operations Runway and Flight Path Usage

Runway	Percent Usage During Day	Percent Usage During Night	Flight Path Description	Percent
1	35	50	Sea Isle	25
			North via DQO	25
			South or West via SBY (East side)	25
			Toward ENO then turn toward Baltimore	25
14	30	0	Sea Isle	25
			North via DQO	25
			South or West via SBY (East side)	25
			Toward ENO then turn toward Baltimore	25
19	35	50	Sea Isle	25
			North via DQO	25
			South or West via SBY (East side)	25
			Toward ENO then turn toward Baltimore	25
32	0	0	Runway 32 departures rare due to flight restrictions	N/A

Table 3.2-3 Arrival Operations Runway and Flight Path Usage

Runway Used	Percent During Day	Percent During Night	Flight Path Description	Percent
1	40	57	Instrument approach from South or West	25
			Instrument approach from Sea Isle	25
			Instrument approach from North (East)	25
			Instrument approach from North (West)	25
14	0	0	Arrivals to Runway 14 are rare due to flight restrictions	N/A
19	30	43	Instrument approach from North	25
			Instrument approach from Sea Isle	25
			Instrument approach from South (East)	25
			Instrument approach from South (West)	25
32	30	0	Instrument approach from South	25
			Instrument approach from East	25
			Instrument approach from North	25
			Instrument approach from West	25

Because the origin and destination of CAT aircraft are not known, an equal percentage of total operations was assigned to flight paths to/from each cardinal direction. CAT aircraft are not expected to fly second approaches to the airfield, and therefore none were modeled.

3.2.4 Representative Flight Paths and Profiles

The noise modeling incorporates the flight tracks shown in **Figures 2.5-1** and **2.5-2**, which are flown by military pilots currently operating at DAFB. They were developed based on published flying procedures and input from pilots, ATC, and other operational points of contact. Members of the operational community updated and validated the flight tracks as part of analysis supporting the *2016 EA for Flight Operations*. The proposed increase in civilian flight operations at DAFB would be expected to follow flight paths that are similar to or the same as the flight paths used currently. Flight paths were selected that transit to/from each cardinal direction. All of the approaches modeled are instrument approaches because transient aircrews can be expected to prefer the procedural certainty of instrument approaches to visual approaches. All flight tracks used in noise modeling are representative of actual flight paths, which vary from one flight to the next due to winds and weather, pilot preference, guidance from ATC, and other factors.

Representative Boeing 737-300 altitude, engine power, and airspeed profiles for departures and approaches were developed and are shown in **Appendix G**. Equivalent representative profiles are also shown for the remaining Alternative 3 aircraft types (CL-601, Cessna 500, and Beechcraft KingAir). Because actual profiles vary from one flight to the next depending on factors such as aircraft load, atmospheric conditions (e.g., winds, temperature, humidity, etc.), ATC guidance, and pilot preference, all modeled flight paths are 'representative.' Flight profiles for the representative aircraft were based on profiles for the same aircraft type as recorded during previous noise modeling efforts at other installations.

3.2.5 Static Engine Runs

Static engine run locations were determined in coordination with DelDOT. These locations (see **Table 3.2-4** and **Figure 3.2-2**) represent where CAT aircraft might park and their orientation (aircraft noise orientation in degrees from magnetic north). All representative CAT static engine runs were modeled as occurring on the existing CAT apron. If future tenant development and/or aircraft operations deviate substantially from modeling parameters, noise impacts could also differ, and supplemental analysis may be appropriate.

Table 3.2-4 Representative CAT Static Engine Run Location Descriptions

Description	Identification Number	Latitude	Longitude	Orientation (Nose Orientation in Degrees Magnetic)
Civil Air Terminal 1	CAT 1	39° 8'32.17"N	75°28'2.12"W	285
Civil Air Terminal 2	CAT 2	39° 8'29.85"N	75°28'2.15"W	285
Civil Air Terminal 3	CAT 3	39° 8'27.79"N	75°28'2.27"W	285

Figure 3.2-2 Representative CAT Static Engine Run Locations

As shown in **Table 3.2-5**, low-power static engine runs are modeled as occurring prior to each departure (warmup) and following each landing (cooldown) for a total of 3 minutes per sortie. Maintenance-driven static engine runs (1,000 low-power and 750 high-power runs annually) were also modeled and were evenly split between the representative CAT static engine run locations. Most maintenance activity is conducted during daytime hours to minimize noise concerns and for worker convenience, and CAT maintenance activity between 10:00 P.M. and 7:00 A.M. was modeled as being rare.

Because the aircraft types selected to represent possible CAT operations were not available in the NoiseMap 'static01' database, the aircraft type in the database with the next higher overall thrust was selected for use in static engine run noise modeling. The B-737-300, CL-601, Cessna 500, and Beechcraft KingAir aircraft were represented by the C-17, C-20, T-1, and C-12 aircraft, respectively.

Table 3.2-5 Alternative 3 Static Engine Run Profiles

Rep. Aircraft Type	Run Description	Engine Runs Per Year (Proposed Scenario)	Run Locations	Engine Power			Number of Engines	Duration (minutes)	% Runs During 2200-0700L
				Description	Setting	Units			
Boeing 737-300/700 and McDonnell Douglass M80	Engine run-up before taxi	2250	split among 3 rep. spots	Idle	77	NC	1	3	50
	Low-Power Runs	180	split among 3 rep. spots	Idle	77	NC	1	10	0
	High-Power Runs	135	split among 3 rep. spots	Idle	77	NC	1	10	0
				Mid	92	NC	1	16	
				Full	95	NC	1	4	
Bombardier CL-600/601 Challenger and Dassault Falcon	Engine run-up before taxi	5716	split among 3 rep. spots	Idle	500	LBS	1	3	25
	Low-Power Runs	457	split among 3 rep. spots	Idle	500	LBS	1	10	0
	High-Power Runs	343	split among 3 rep. spots	Idle	500	LBS	1	10	0
				Mid	2000	LBS	1	16	
				Full	11400	LBS	1	4	
Cessna 500 Citation	Engine run-up before taxi	2313	split among 3 rep. spots	Idle	31	NF	1	3	22
	Low-Power Runs	185	split among 3 rep. spots	Idle	31	NF	1	10	0
	High-Power Runs	139	split among 3 rep. spots	Idle	31	NF	1	10	0
				Mid	70	NF	1	16	
				Full	99	NF	1	4	

Key: CAT: Civil Air Terminal; LBS = pounds of thrust; NC = core engine speed; NF = fan speed; RPM = revolutions per minute

Table 3.2-5 Alternative 3 Static Engine Run Profiles (Continued)

Rep. Aircraft Type	Run Description	Engine Runs Per Year (Proposed Scenario)	Run Locations	Engine Power			Number of Engines	Duration (minutes)	% Runs During 2200-0700L
				Description	Setting	Units			
Beechcraft 300/350 King Air and Beechcraft 58 Baron	Engine run-up before taxi	2222	split among 3 rep. spots	Idle	60	RPM	1	3	22
	Low-Power Runs	178	split among 3 rep. spots	Idle	60	RPM	1	10	0
	High-Power Runs	133	split among 3 rep. spots	Idle	60	RPM	1	10	0
				Mid	70	RPM	1	16	
				Full	100	RPM	1	4	

Key: CAT: Civil Air Terminal; LBS = pounds of thrust; NC = core engine speed; NF = fan speed; RPM = revolutions per minute

3.2.6 Atmospheric Conditions and Terrain

The effects of atmospheric conditions and terrain were also considered in the noise modeling. Local weather conditions (e.g., temperature, relative humidity, and air pressure) influence how quickly sound is absorbed by the atmosphere as it travels outward from its source. The month with median acoustic atmospheric conditions was February, with an average 36 degrees Fahrenheit, 66 percent relative humidity, and air pressure of 29.92 inches of mercury.

Terrain effects on noise include the effects of terrain elevation (e.g., hills, valleys) and terrain impedance (i.e., the amount of sound energy absorbed by the surface). Surface elevation and ground impedance data were obtained from the U.S. Geological Survey and were modeled on a 250-foot grid. In the current version of NoiseMap, ground impedance can take one of two possible values: acoustically hard or acoustically soft. Following standard procedures, all water areas were treated as being acoustically hard and all solid ground (including asphalt, concrete, and vegetation-covered ground) was treated as being acoustically soft. The impedance values for acoustically hard and acoustically soft surfaces are 100,000 and 225 kilopascal seconds per square meter, respectively.

3.3 SAFETY

The safety resource area applies to activities in the air and on the ground associated with aircraft flight and operation. Ground safety considers issues associated with operations and maintenance activities that support base operations, including fire and emergency response. Flight safety considers the aircraft flight risks, including the potential for midair aircraft collisions and BASH.

3.3.1 Definition of the Resource

Flight and ground safety involving aviation operations conducted by the USAF are addressed in this section. This section takes into consideration the safety of personnel and facilities on the ground and in the air that may be placed at risk from aircraft operations. Within the flight safety section, aircraft flight risks and safety issues associated with conducting aviation activities are addressed. Flight risks and safety issues associated with conducting aviation activities at the base and in the near-base airspace are addressed. Any accidents at the airfield would have direct impacts on the ground in the immediate vicinity of the mishap as a result of explosion/fire and debris spread. The ROI for safety for this EA includes the area within a 10-NM radius of DAFB (see **Figure 3.1-3**).

3.3.2 Existing Conditions

3.3.2.1 Ground Safety and Emergency Response

The DAFB ARFF provides emergency response (emergency medical services, fire prevention and protection, firefighting, rescue, and hazardous materials response) capabilities to prevent or minimize injury, loss of life, and damage to property and equipment. DAFB ARFF responds to military aircraft mishaps at the DAFB airfield and an area within 12 miles of the installation. The ARFF can also assist local civil and federal agencies under mutual aid agreements. For non-military aircraft mishaps the USAF agrees to respond to the fire and crash/rescue emergencies

involving civil aircraft outside the hangars or other structures on DelDOT/Kent County property within the limits of its existing capabilities, equipment, and available personnel, at the request of DelDOT or the pilot of an aircraft (see **Appendix A**).

3.3.2.2 Flight Safety

The flight safety program at DAFB is implemented through federal regulations and USAF regulations. Federal, civil, and military laws and regulations govern flight operations at DAFB and in the surrounding airspace. Individually and collectively, they prescribe measures, processes, and procedures required to ensure safe operations and to protect the public, military, and property. Currently, all flight operations conducted at DAFB comply with all federal, USAF, and Operations Group Commander requirements.

DAFB currently has an active Mid-Air Collision Avoidance (MACA) program. The MACA program provides information to local airspace users regarding the types of aircraft that frequent the airspace or are stationed at DAFB. The MACA program and associated pamphlet provides maps of military airspace and radio contact information for Dover Approach Control (DAFB 2018a).

The AICUZ program defines the Clear Zones (CZs) and the Accident Potential Zones (APZs) of the airfield based on analysis of over 800 major Air Force accidents that occurred within 10 miles of an Air Force installation between 1968 and 1995. The CZ has the highest chance of potential accidents, as 27% of all accidents studied occurred in this zone. The Air Force restricts construction in the CZ due to the relatively high accident potential. The APZs have less accident potential than the CZ. Ten percent of the accidents studied occurred in APZ I and six percent of accidents observed occurred in APZ II. Land use restrictions are recommended for APZs I and II, based mostly on the intensity of use. For example, areas where people congregate and uses where people spend a high percentage of time (residential) are not recommended (DAFB 2010).

The ends of each runway at DAFB have a 3,000 foot by 3,000-foot CZ and two APZs. APZ I begins at the outer end of the CZ and is 5,000 feet long and 3,000 feet wide. APZ II begins at the outer end of APZ I and is 7,000 feet long and 3,000 feet wide. APZs I and II at the northwestern end of Runway 14/32 are aligned to reflect the departure and arrival flight track adjustments resulting from existing operational restrictions related to the hangar located off the northwestern end of the runway. **Figure 3.3-1** depicts the APZs and CZs at DAFB.

There have been zero Class A aircraft mishaps at DAFB between 2013-2017. **Table 3.3-1** summarizes the aircraft mishap rates per year for the entire USAF for Fiscal Year (FY) 2013 through 2017. The base maintains a Disaster Response Plan, which establishes procedures for responding to a variety of emergency situations, including aircraft crashes, fires, natural disasters and other emergencies. This plan includes mutual support agreements with local fire departments and procedures for coordination with police and medical personnel in the event of an emergency. Under the mutual support agreement, the base provides assistance to civilian authorities in responding to emergencies that do not involve USAF operations.

Table 3.3-1 Aircraft Mishap Rates

Year	DAFB Class A Mishap	USAF Class A Mishap	USAF Class A Mishap Rate[a]	US AF Fatalities[c] (Pilots)	USAF Fatalities[c] (All)
USAF[b] (All Aircraft)					
FY 13	0	19	1.13	5	14
FY 14	0	7	0.43	2	19
FY 15	0	19	1.07	1	6
FY 16	0	12	0.74	2	16
FY 17	0	12	0.75	1	5

[a] Mishap Rates are expressed in mishaps per 100,000 flying hours and a Class A Mishap is defined as those which result in one or more of the following: a loss of life, permanent total disability, a total cost in excess of $2 million, or destruction of an aircraft.

[b] Source: Air Force Safety Center Air Force (2019)

[c] Fatalities: Pilot totals only include "USAF" personnel designated as "pilot" by the Safety Investigation Board. "All" fatalities include all aviation-related fatalities regardless of designation (USAF, foreign, civilian, etc.) or role (pilot, operator, passenger, etc.)

3.3.2.3 Bird/Wildlife Aircraft Strike Hazard (BASH)

DAFB is located on the Atlantic migratory flyway and several wildlife refuges are within 10 NM of the base. Additionally, the base is surrounded by agricultural fields and farms with several large bodies of water nearby. Therefore, DAFB is in an area of high BASH potential. The DAFB BASH instruction/plan provides a base program to minimize aircraft exposure to potentially hazardous wildlife strikes (DAFB 2013). This plan implements AFI 91-202, *US Air Force Mishap Prevention Program*. **Table 3.3-2** illustrates the USAF and DAFB Class A Mishaps bird strike data for FY 2013 through FY 2018.

Table 3.3-2 BASH FY Class A Mishap Rates

	FY 13	FY 14	FY 15	FY 16	FY 17
Class A Mishaps[a] USAF[b]	0	3	1	3	1
Class A Mishaps[a] DAFB[c]	0	0	0	0	0

[a] Class A Mishaps are those in excess of $2M.

[b] Source: Air Force Safety Center Air Force (2019)

[c] Source: Email 2019

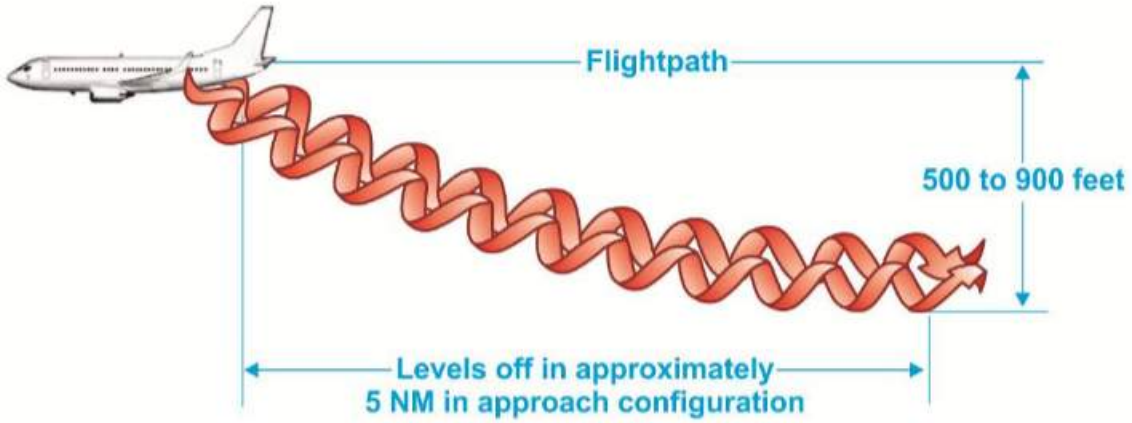
Figure 3.3-1 Existing Clear Zones and Accident Potential Zones at DAFB

3.3.2.4 Wake Vortices

As documented in FAA Advisory Circular (AC) 90-23G (FAA 2014), every aircraft in flight generates wake vortices. These disturbances are caused by a pair of counter-rotating vortices trailing from the wing tips in cruise and from the outer edges of the flaps upon approach and landing. These vortices can pose a hazard to encountering aircraft. For example, the wake of a larger aircraft can impose rolling movements that exceed the roll control authority of smaller encountering aircraft. The FAA has restrictions on aircraft flying through a wake vortex which dissipates close to the ground but may persist for a minute or more at altitude. FAA regulations dictate safe following distances and procedures to avoid wake turbulence both in flight and during landing or takeoff. Additionally, ATC at airports will typically sequence aircraft using time or distance for departures or arrivals to avoid wake vortices. Most wake vortices decay and dissipate quickly, although the existence of wake vortices could be seen as a potential impact by crop dusters or other light aircraft. **Figure 3.3-2** from FAA AC 90-23G shows that vortices from large aircraft sink at several hundred feet per minute, diminishing in strength with time and distance behind the wake-generating aircraft. The FAA encourages pilots to fly at or above the preceding aircraft's flightpath, altering course as necessary to avoid the area behind and below the generating aircraft.

Air traffic controllers are required to apply aircraft separation procedures for separating aircraft that are flying under IFR conditions. However, if a pilot accepts clearance to visually follow a preceding aircraft, the pilot accepts the responsibility for both separation and wake turbulence avoidance. The air traffic controllers will also provide a Wake Turbulence Cautionary Advisory to pilots of VFR aircraft with whom they are in communication and on whom, in the controllers' opinion, wake turbulence could have an adverse effect (FAA 2014).

Figure 3.3-2 Behavior of Wake Vortices Generated by Large Aircraft



3.3.2.5 Rural Agriculture Safety Concerns

Proposed additional aircraft operations would overfly rural agricultural areas which are located predominately north and east of the Base. Livestock response to overflights is highly variable and

depends in part on to how quickly the noise of the aircraft changes from low levels to high levels (rise time). Although it is difficult to determine how individual livestock could respond to overflights of large aircraft, the rise time of overflights of 747-400 and 757-200 aircraft would not be expected to cause a startle reaction (USAF 1993). The low speeds of the aircraft and the gradual increase in noise levels over distance are less likely to cause a startle effect compared to fast moving military aircraft. However, with any large livestock there is always the potential that the animals could "spook" and create a safety hazard at the sudden-onset of sounds, especially sounds accompanied by visual effects created by large, low-altitude aircraft. These reactions can be hazardous to livestock, especially when penned. This is of concern when the animals are penned in a relatively small area, such as during weaning and branding activities. Should horses buck or livestock stampede during such an event, people and livestock could be seriously injured and fencing could be damaged. DAFB coordinates with landowners near the base and seeks to establish temporary avoidance areas around sensitive areas.

3.4 AIR QUAILTY

3.4.1 Definition of the Resource

Air quality in a given location is defined by the size and topography of an air basin, the air emissions that occur within and outside of the air basin, local and regional meteorological influences, and the resulting types and concentrations of pollutants in the atmosphere. The significance of a pollutant concentration often is determined by comparing its concentration to an appropriate national or state ambient air quality standard. These standards represent the allowable atmospheric concentrations at which the public health and welfare are protected and include a reasonable margin of safety to protect the more sensitive individuals in the population. The USEPA establishes the National Ambient Air Quality Standards (NAAQS) to regulate the following criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than or equal to 10 micrometers in diameter (PM_{10}), particulate matter less than or equal to 2.5 micrometers in diameter ($PM_{2.5}$), and lead. Ozone is not directly emitted, but forms in the atmosphere by photochemical reactions between primary emissions of nitrogen oxides (NO_x), which includes both nitric oxide (NO) and NO_2, and reactive VOCs.

The levels of pollutants are generally expressed on a concentration basis in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$) over various periods of time (averaging periods). Short-term standards (1-hour, 8-hour, or 24-hour periods) were established for pollutants with acute health effects and generally may not be exceeded more than once a year. Long-term standards (annual periods) were established for pollutants with chronic health effects and may never be exceeded. Based on measured ambient criteria pollutant concentrations, the USEPA designates areas of the United States as having air quality equal to or better than the NAAQS (attainment) or worse than the NAAQS (nonattainment). Once a nonattainment area meets the standards and designation requirements in CAA Section 107(d)(3)(E), USEPA will designate the area as a "maintenance area." Those areas that cannot be classified based on available information as meeting or not meeting the NAAQS for a particular pollutant are "unclassifiable" and are treated as attainment until proven otherwise.

3.4.2 Existing Conditions and Affected Environment

The USEPA designates all areas of the United States in terms of having air quality better (attainment) or worse (nonattainment) than the NAAQS. An area is in attainment of a NAAQS if its pollutant concentration remains below the standard value, as defined by annual to tri-annual metrics. Former nonattainment areas that have attained NAAQS are designated as maintenance areas. Currently, Kent County is designated by the USEPA as in attainment of the NAAQS for all pollutants (USEPA 2019).

Historically, Kent County did not attain the 1997 ozone standard. The USEPA subsequently revoked the 1997 ozone standard and replaced it with the 2008 ozone standard and Kent County attained that standard. Recent court decisions have labeled such a region as an "orphan area." Since the USEPA has no current guidance on whether the USEPA General Conformity Rule applies to these areas, the USAF takes the conservative approach and treats these areas as if they were nonattainment/maintenance areas. Therefore, the air quality analysis includes an evaluation to determine whether the Proposed Action is subject to the requirements of the General Conformity Rule. The evaluation concludes that the Proposed Action would generate emissions that would be de minimis and therefore would not require a conformity determination (see **Appendix H**).

The DNREC Division of Air Quality is responsible for enforcing air pollution regulations in Delaware. The DNREC implements the NAAQS and additional state ambient air quality standards for purposes of regulating air quality within Delaware.

3.4.2.1 Greenhouse Gas

In addition to criteria pollutants, increased aircraft operations as part of the Proposed Action also would emit additional greenhouse gas (GHG) emissions due to fossil fuel combustion. GHGs are chemical compounds in the earth's atmosphere that trap heat in the atmosphere, thus regulating the Earth's temperature. Gases exhibiting greenhouse properties come from both natural and human sources. Water vapor, carbon dioxide (CO_2), methane, and nitrous oxide are examples of GHGs that have both natural and manmade sources, while other gases such as those used for aerosols are exclusively manmade.

For the purposes of this analysis, estimates of potential GHG emissions generated by the Proposed Action are in terms of CO_2, as about 99 percent of the total global warming potential (GWP) of all pollutants emitted from the combustion of gasoline, diesel, or aviation fuels is in the form of CO_2 **Table 3.4-1** presents baseline annual GHG emissions for Kent County.

Table 3.4-1 Baseline Greenhouse Gas Emissions

Greenhouse Gases (tons/year)				
	CH_4	CO_2	N_2O	CO_2e
Kent County, Delaware	57	1,000,943	30	1,011,432

Source: USEPA 2019a

CO_2 = carbon dioxide; CO_2e = carbon dioxide equivalent; CH_4 = methane; N_2O = nitrous oxide

3.5 CULTURAL RESOURCES

3.5.1 Definition of the Resource

Cultural resources are any prehistoric or historic district, site, building, structure, or object considered important to a culture, subculture, or community for scientific, traditional, religious or other purposes. They include archaeological resources, historic architectural resources, and traditional cultural resources.

Archaeological resources are locations where prehistoric or historic activity measurably altered the earth or produced deposits of physical remains (e.g., arrowheads, bottles). Historic architectural resources include standing buildings and other structures of historic or aesthetic significance. Architectural resources generally must be more than 50 years old to be considered for inclusion in the National Register of Historic Places (NRHP); however, more recent structures, such as Cold War-era resources, may warrant protection if they have the potential to gain significance in the future and are considered extraordinary in nature. Traditional cultural resources are associated with cultural practices and beliefs of a living community which are rooted in its history and are important in maintaining the continuing cultural identity of the community. The National Historic Landmarks Program (NHLP) identifies certain historic properties as National Historic Landmarks (NHL) based on their exceptional value or quality in illustrating or interpreting the heritage of the United States.

Historic properties (as defined in 36 *CFR* 800.16) are any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in the NRHP. Historic properties are evaluated for potential adverse impacts from an action, as are significant traditional cultural resources identified by Native American tribes or other groups. In 1999, the DoD promulgated its *American Indian and Alaska Native Policy*, which emphasizes the importance of respecting and consulting with tribal governments on a government-to-government basis (DoDI 4710.02 and AFI 90-2002). The policy requires an assessment, through consultation, of the effect of proposed DoD actions having the potential to significantly affect protected tribal resources, tribal rights, and Native American lands before decisions are made by the services.

3.5.2 Existing Conditions

The ROI for cultural resources consists of an area within 10 NM of DAFB, where additional flight operations would be conducted (see **Figure 3.1-3**). The ROI for cultural resources is equivalent to the Area of Potential Effects (APE), as defined by 36 *CFR* 800.16(d).

DAFB has an Integrated Cultural Recourses Management Plan (ICRMP). The goal of the ICRMP is to manage Dover AFB's culturally and historically significant resources in a manner that is consistent with the NHPA. NHPA is the primary federal law governing the treatment of historic properties, which is any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on the National Register. In addition to the NHPA, the Cultural

Resources Management Program ensures that Dover AFB is legally compliant with the National Environmental Policy Act.

3.5.2.1 Archaeological Resources

DAFB personnel have been proactive both in identifying through survey and in evaluating through assessment archaeological historic properties withing the DAFB boundary, in accordance with Section 110 of the NHPA. Ground penetrating radar (GPR) was used to conduct a geophysical survey in 1956 to determine if cemetery sites were present prior to the construction of the DAFB North Runway extension (see **Appendix I**). Two cemeteries were found and indicated on the 1956 North Runway as-built plans. Numerous GPR anomalies were identified during the surveys of both cemetery areas. Cemetery 1 appears to have been located in the area between the existing and proposed CAT taxiway ramp connections (see *Cultural Resource Management Map*, **Appendix C**). However, GPR indicated that the area has been extensively disturbed, and anomalies appear to be remnant subsurface features associated with the initial construction of the North Runway taxiway to its east and a tarmac to the west.

3.5.2.2 Historic Architectural Resources

Table 3.5-1 lists the NRHP-listed sites located within the APE. The DAFB approach and departure routes overlie at least part of two mostly rural counties in Delaware (Kent and Sussex). Fifty-five (55) NRHP-listed properties and one NHLP-listed property (see **Table 3.5-2**) have been identified within the APE boundary (NPS 2019). The historical properties mostly consist of houses (town and farm), churches, stores and taverns, farms, railroad stations, and historic boundary monuments, and are representative of the history of the area primarily during the 19th and 20th centuries. In addition, many more eligible and unevaluated but potentially eligible cultural resources associated with the history of the region are likely to underlie the airspace.

Table 3.5-1 NRHP-Listed Sites Within APE Boundary

APE Portion	State	County	City	Resource Name
10 NM radius of DAFB	DE	Kent	Little Creek	Little Creek Methodist Church
10 NM radius of DAFB	DE	Kent	Little Creek	Old Stone Tavern
10 NM radius of DAFB	DE	Kent	Leipsic	Rawley House
10 NM radius of DAFB	DE	Kent	Leipsic	McClary House
10 NM radius of DAFB	DE	Kent	Dover	Mifflin-Marim Agricultural Complex
10 NM radius of DAFB	DE	Kent	Leipsic	Laws, Alexander, House
10 NM radius of DAFB	DE	Kent	Smyrna	Cummins, Timothy House
10 NM radius of DAFB	DE	Kent	Kenton	Denry, T. H., House
10 NM radius of DAFB	DE	Kent	Dover	Bullen, John, House

APE Portion	State	County	City	Resource Name
10 NM radius of DAFB	DE	Kent	Dover	Bradford-Loockerman House
10 NM radius of DAFB	DE	Kent	Camden	Camden Friends, Meetinghouse
10 NM radius of DAFB	DE	Kent	Camden	Brecknock
10 NM radius of DAFB	DE	Kent	Dover	Greenwold
10 NM radius of DAFB	DE	Kent	Dover	Eden Hill
10 NM radius of DAFB	DE	Kent	Dover	Delaware State Museum Buildings
10 NM radius of DAFB	DE	Kent	Dover	Old Statehouse
10 NM radius of DAFB	DE	Kent	Frederica	Bonwell House
10 NM radius of DAFB	DE	Kent	Dutch Neck Crossroads	Allee House
10 NM radius of DAFB	DE	Kent	Leipsic	Snowland
10 NM radius of DAFB	DE	Kent	Magnolia	Truitt, Gov. George, House
10 NM radius of DAFB	DE	Kent	Leipsic	Wheel of Fortune
10 NM radius of DAFB	DE	Kent	Leipsic	Sipple House
10 NM radius of DAFB	DE	Kent	Leipsic	Fennimore Store
10 NM radius of DAFB	DE	Kent	Magnolia	Lowber, Mathew House
10 NM radius of DAFB	DE	Kent	Leipsic	Ruth Mansion House
10 NM radius of DAFB	DE	Kent	Felton	Corsey, Thomas B. House
10 NM radius of DAFB	DE	Kent	Bowers	Saxton United Methodist Church
10 NM radius of DAFB	DE	Kent	Smyrna	Savin Wilson House
10 NM radius of DAFB	DE	Kent	Camden	Star Hill AME Church
10 NM radius of DAFB	DE	Kent	Camden	Zion African Methodist Episcopal Church
10 NM radius of DAFB	DE	Kent	Leipsic	Maggie S. Myers (schooner)
10 NM radius of DAFB	DE	Kent	Leipsic	Katherine M. Lee (schooner)
10 NM radius of DAFB	DE	Kent	Little Creek	Port Mahon Lighthouse
10 NM radius of DAFB	DE	Kent	Leipsic	Reed House
10 NM radius of DAFB	DE	Kent	Little Creek	Stubbs, Elizabeth, House
10 NM radius of DAFB	DE	Kent	Little Creek	Woodley, Jonathan, House
10 NM radius of DAFB	DE	Kent	Cowgill's Corner	Octagonal Schoolhouse
10 NM radius of DAFB	DE	Kent	Dover	Governor's House
10 NM radius of DAFB	DE	Kent	Dover	Loockerman Hall
10 NM radius of DAFB	DE	Kent	Dover	Macomb Farm
10 NM radius of DAFB	DE	Kent	Dover	Palmer Home
10 NM radius of DAFB	DE	Kent	Dover	Town Point
10 NM radius of DAFB	DE	Kent	Dover	Tyn Head Court
10 NM radius of DAFB	DE	Kent	Dover	Great Geneva
10 NM radius of DAFB	DE	Kent	Dupont Station	Durham--Shores House
10 NM radius of DAFB	DE	Kent	Felton	Felton Railroad Station
10 NM radius of DAFB	DE	Kent	Kitts Hummock	Logan School House K-834
10 NM radius of DAFB	DE	Kent	Little Creek	Cherbourg Round Barn
10 NM radius of DAFB	DE	Kent	Woodside	Woodside Methodist Episcopal Church

APE Portion	State	County	City	Resource Name
10 NM radius of DAFB	DE	Kent	Milford	Christ Church
10 NM radius of DAFB	DE	Kent	Frederica	Barratt's Chapel
10 NM radius of DAFB	DE	Kent	Frederica	Mordington
10 NM radius of DAFB	DE	Kent	Frederica	Barratt Hall
10 NM radius of DAFB	DE	Kent	Wyoming	Wyoming Railroad Station
10 NM radius of DAFB	DE	Kent	Magnolia	Lindale, John B., House

Source: (NPS; NRHP Website)

Table 3.5-2 NHLP-Listed Sites Within APE Boundary

APE Portion	State	County	City	Resource Name
10 NM radius of DAFB	DE	Kent	Dover	John Dickinson Plantation

Source: (NPS; NHLP Website)

3.5.2.3 Traditional Cultural Resources

There are no federally recognized Native American tribes resident in Delaware. However, there are three federally recognized tribes that have potential historic and cultural ties to the land now occupied by DAFB. They are the Delaware Nation, the Delaware Tribe of Indians and the Stockbridge-Munsee Community Band of Mohican Indians of Wisconsin. The Delaware Nation and the Delaware Tribe of Indians are currently located in Oklahoma. Consultation with the Stockbridge-Munsee Community Band of Mohican Indians of Wisconsin is pending. Consultation with the federally recognized Native American tribes can be found in **Section 4.5.3.2.**

3.6 BIOLOGICAL RESOURCES

3.6.1 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 supports the occupancy of a plant or animal. 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 the purposes of this analysis, these resources are divided into three major categories: vegetation, wildlife, and special status species.

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.

Wildlife generally includes all fish, amphibian, reptile, bird, and mammal species with the exception of those identified as special status species, which are treated separately. Wildlife also includes those bird species protected under the federal MBTA, the Bald and Golden Eagle Protection Act (BGEPA), 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 on 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 ESA. The federal ESA protects federally listed endangered and threatened plant and animal species. Federally identified candidate species (species proposed for listing) are not protected under law; however, these species could become federally listed over the near-term, and therefore are considered herein to avoid future conflicts if they were to be listed during the preparation of this EA. In addition, the DNREC Division of Fish and Wildlife protects state-listed plant and animal species through state environmental conservation administrative codes.

For the purposes of this EA, sensitive and protected biological resources that are federally listed (USFWS) or state-listed (DNREC) for protection were researched within the 10 NM ROI (see **Figure 3.1-3**).

3.6.1.1 Regulations and Policies

Endangered Species Act (ESA)

The ESA of 1973 (16 USC §§ 1531–1544, as amended) established measures for the protection of plant and animal species that are federally listed as threatened and endangered, and for the conservation of habitats that are critical to the continued existence of those species. Federal agencies must evaluate the effects of their Proposed Actions through a set of defined procedures, which can require formal consultation with the USFWS under Section 7 of the Act.

Compliance with the ESA requires communication and consultation with the USFWS in cases where a federal action could affect listed threatened or endangered species, species proposed for listing, or candidates for listing. The primary focus of this consultation is to request a list of these species that may occur in the ROI. If any of these species are present, a determination of the potential effects is made. Should no species protected by the ESA be affected by the Proposed Action, no additional action is required. Letters were sent to the appropriate state agencies informing them of the Proposed Action, alternatives, and requested data regarding protected species (see **Appendix C**).

Migratory Bird Treaty Act (MBTA) (16 USC 703 et seq.) and EO 13186

The MBTA governs the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests. The take of all migratory birds is governed by the MBTA's regulation that affects educational, scientific, and recreational purposes and requires harvest to be limited to levels that prevent overuse.

EO 13186 (effective January 10, 2001), outlines the responsibilities of federal agencies to protect migratory birds, in accordance with the MBTA, the BGEPA, ESA, and NEPA. This order specifies the following:

- The USFWS as the lead for coordinating and implementing EO 13186;

- Requires federal agencies to incorporate migratory bird conservation measures into their activities; and
- Requires federal agencies to obtain permits from USFWS before performing intentional take (depredation), and to consult with USFWS before taking an action that is likely to have a measurable negative effect on migratory bird populations.

Bald and Golden Eagle Protection Act (BGEPA)

The BGEPA provides for the protection of the bald and golden eagles (as amended in 1962) by prohibiting the take, possession, sale, purchase, barter, offer to sell, purchase or barter, transport, export or import, of any bald or golden eagle, alive or dead, including any part, nest, or egg, unless allowed by permit (16 U.S.C. 668(a); 50 *CFR* 22). 'Take' includes pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb (16 U.S.C. 668c; 50 *CFR* 22.3).

Sikes Act (16 USC 670)

The Sikes Act applies to federal land under DoD control and requires military services to establish Integrated Natural Resources Management Plans (INRMPs) to conserve natural resources for their military installations. The INRMPs include evaluations of threatened and endangered species, other fish and wildlife resources, wetlands, migratory bird habitat, and forest lands. INRMPs are developed in cooperation with the USFWS and State Fish and Wildlife agencies but are not required for DAFB since it has been designated a 'Category II' installation since 2006 in accordance with AFMAN 32-7003, paragraph 3.4.2. DAFB does not have an INRMP.

3.6.2 Existing Conditions

3.6.2.1 Vegetation and Wildlife

DAFB is located within the Middle Atlantic Coastal Plain, Mid-Atlantic USEPA Ecoregion. Specifically, the proposed ROI falls in between the Delmarva Uplands and Delaware River Terraces and Uplands (Woods 1999).

According to *DNREC's 2015-2025 Delaware Wildlife Action Plan (DWAP),* the Delmarva Uplands Ecoregion includes sandy ridges, swales, marshes, swamps, and the central ridge of the Delmarva Peninsula. Many wet, shallow elliptical depressions, characteristic of Delmarva bays occur in this Ecoregion. Parsonsburg Sand covers broad areas; its surface consists of sinuous, low sand ridges and broad, seasonally wet, swales. Ultisols soil are common, supporting a natural vegetation of mostly oak-hickory pine forest. Sandy soils are nutrient poor and have a limited water holding capacity. Streams and rivers are low gradient, often tidally influenced, and have wide valleys.

The areas adjacent to the Delaware River and Bay, the Delaware River Terraces and Uplands, are narrow, marshy, and nearly level to rolling lowlands dominated by tidal marshes and meandering, low gradient streams. Saline marsh deposits, and alluvial and estuarine sand and silt are underlain and easily eroded Quaternary gravels, sands, and silts.

The majority of the grounds at DAFB are landscaped, resulting in well maintained grounds with a predominance of short turf grasses. Approximately 130 acres of the base's 3,300 acres are native woodland and wetlands, with the rest being semi-improved and improved lawn, open fields, and

impervious surfaces. The woodlands present are relatively young, disturbed, and occur within successional habitats of shrub-scrub thicket.

Due to DAFB's highly developed nature, minimal forest cover, and degraded habitat; there is limited natural habitat for birds, small mammals, fish, reptiles, and amphibians.

Habitat types include coastal marine waters of Delaware Bay, brackish marshes, tidal and non-tidal freshwater streams and wetlands, and upland forests and meadows. Delaware supports more than 1,000 species of wildlife, with more than 125 different habitat types. For a comprehensive list of species by habitat type, refer to the 2015-2025 DWAP (DNREC 2019c).

3.6.2.2 Rare Threatened or Endangered Species (Federally Listed)

The USFWS Information, Planning, and Conservation (IPaC) system was accessed to identify current USFWS trust resources, including species proposed or listed under the ESA, with potential to be affected by the Proposed Action (see **Appendix K**). Desktop research of the DAFB ROI identified two endangered species [one bird, the red knot (*Calidris canutus rufa*) and one flowering plant, the swamp pink (*Helonias bullata*)] in the region. The life histories and habitat requirements of these two endangered species are discussed in the following paragraphs. See **Appendix J** for a list of all threatened and federally listed species in the state of Delaware.

Red Knot -- Description and Distribution

The red knot (*Calidris canutus rufa*) has been listed as threatened under the ESA since December 2014 and is protected under the MBTA. As a threatened species, the red knot is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Adult red knots are 25–28 cc in length and can migrate extraordinarily long distances from breeding grounds near the arctic tundra in North America and Russia to wintering habitats in South America, Africa, Europe, Australia, and New Zealand (up to a 9,300-mile trip each way).

In Delaware, red knots are frequently observed in the Delaware Bay. Migration occurs every spring and autumn, needing to encounter favorable habitat, food and weather conditions within narrow seasonal windows along migration stopovers between wintering and breeding areas. During migration red knots use marine habitats, preferring to rest and forage along sandy shores at or near tidal inlets or at mouths of bays and estuaries.

Swamp Pink – Description and Distribution

Swamp pink (*Helonias bullata*) is a plant species that has been listed as threatened under the ESA since September 1988. As a threatened species, swamp pink is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Swamp pink has smooth, oblong, dark green leaves that can produce a flowering stalk in the spring and can grow over 3 feet tall. The stalk is topped by a 1 to 3-inch-long cluster of 30 to 50 small, fragrant, pink flowers dotted with pale blue anthers. The evergreen leaves of swamp pink can be seen year-round, and flowering occurs between March and May. Swamp pink occurs in variety of wetland habitats in areas that are perennially saturated by floodwater. Swamp pink is listed as threatened wherever it is found. The species historical range include the states of Delaware, Georgia, Maryland, New Jersey, New York, North Carolina and Virginia.

3.6.2.3 Migratory Birds

The USFWS IPaC website identified 52 migratory bird species. DAFB is located within the Atlantic migratory flyway bird migration route that generally follows the Atlantic Coast of North America and the Appalachian Mountains. The installation is in proximity to grain and bean producing farms, water bodies, and wildlife refuges frequented by migratory birds. This area is a stop-over zone for migrating birds from September to April each year (DAFB 2013). DAFB has an active Bird Hazard Working Group (BHWG). This group is tasked with collecting, compiling, and reviewing data on bird strikes, identifying and recommending actions to reduce hazards, recommending changes in operational procedures, prepping informational programs for aircrews, and serving as a point of contact for off-station BASH. Migratory bird hazards identified by the BHWG at DAFB include waterfowl, birds of prey, gulls and blackbirds.

3.6.2.4 Bald Eagle

Bald eagles (*Haliaeetus leucocephalus*) are federally protected by the MBTA and the BGEPA. No critical habitat designated for the bald eagle occurs within the ROI (USFWS 2019a).

The preferred habitats of bald eagles are bodies of water with a diverse and abundant prey base with areas of shallow water away from human development and disturbance (Buehler 2000). More than 100 eagles migrate to the Upper Delaware River each winter in search of open water, fresh and abundant fish and undisturbed habitat. Wintering habitat occurs nationwide throughout the Chesapeake Bay, along major Midwestern rivers, Intermountain West rivers, the Klamath Basin, Oregon-California rivers, and Pacific Northwest rivers. Birds may concentrate in large numbers where open water occurs and prey is available. Records of breeding bald eagles occur in all U.S. states except for Rhode Island, Vermont, and Hawaii. The species breeds throughout Canada and a small breeding population is found in Baja California and northern Mexico.

Bald eagle nesting sites often occur in mature riparian forests near lakes, large rivers, and oceans. Bald eagles select one of the largest trees that is available with easily accessible limbs capable of holding the weight of their heavy nests. Bald eagles may build more than one nest a breeding season but only select a single nest to use. This species is also known to use the same nest year after year (Buehler 2000). Since 2011, DAFB has conducted annual bald eagle monitoring surveys, and the USFWS maintains records of active eagle nests throughout this area. DAFB also holds a Migratory Bird Depredation Permit which allow for the non-lethal harassment of eagles to prevent site-specific property damage or threats to human health.

3.6.2.5 Natural Resource Areas of Concern

The USFWS IPaC site also identified several state and federal natural resource areas of concern within the ROI. These include the Bombay Hook and Prime Hook National Wildlife Refuges (NWRs) and the state-owned Little Creek and Ted Harvey wildlife areas. However, no critical habitats or fish hatcheries were identified within the ROI. Refer to **Appendix K** for IPaC website findings.

3.6.2.6 State – Listed Species

DNREC provides annual updates to statewide special status species lists. Based on findings from the Wildlife Species Conservation and Research Program (DNREC 2019d), there are 21 birds, 8 reptiles, 3 amphibians, 9 mammals, 7 fish, 7 mollusks, and 31 insects (see **Appendix J**).

3.7 LAND USE

3.7.1 Definition of the Resource

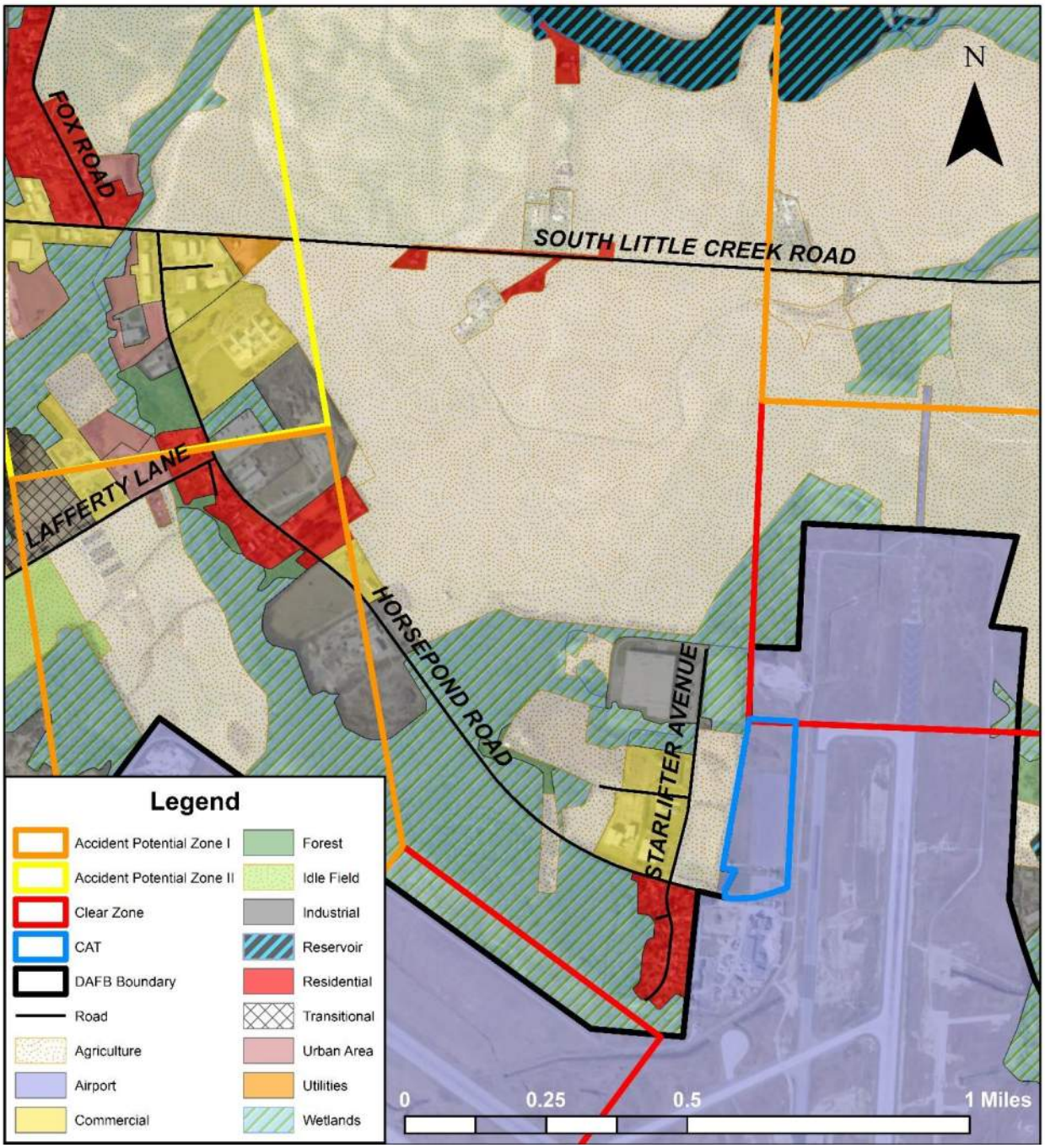
Land Use describes the ways in which people manage and utilize the resources of the land. General land use categories include agricultural, residential, institutional, recreational, commercial, transportation, forest, rangeland, and other developed use areas. These broad categorizations of land use often support multiple uses. State and local land management plans determine the type and extent of land use allowed within their respective jurisdictions. Land management plans tend to protect special use areas, environmentally sensitive areas, and sensitive noise areas.

3.7.2 Existing Conditions

Land use within the DAFB boundary is broadly categorized as transportation, communication, and utilities. DAFB primarily consists of the airfield and the supporting aeronautical infrastructure needed to conduct military operations. Additional land uses include institutional, recreational, commercial, and residential. Outside the boundaries of DAFB the land uses are mixed and varied (State of Delaware 2019). The land uses north and east of the base are largely agricultural, interspersed with forested areas. South of the base, the primary land uses are a mix of agricultural, residential, and open space. The land uses west of the base are mainly residential with some commercial. Northwest of DAFB, toward Dover, the land uses are mostly a combination of commercial, institutional, industrial, and residential.

Safety is a driving factor when considering land use decisions. As previously discussed in **Section 3.3.2.2**, the AICUZ program was developed to guide local authorities when designating land uses near USAF bases. Due the catastrophic nature of aircraft accidents, the USAF approaches safety from a land use perspective. The CZ has the highest probability of a mishap occurring and the most stringent land use restrictions. The APZs have less accident potential and subsequently fewer land use restrictions.

Figure 3.7-1 Land Use and Safety Zones



Noise is another key factor in determining land use since excessive noise levels can make certain land uses incompatible. For example, when noise levels exceed 65 dB, residential land uses are considered incompatible. Therefore, the ROI for land use is based on the largest expected DAFB and civilian aircraft noise contours.

Although adequate sound attenuation can achieve indoor noise level goals in certain situations, structural sound attenuation does not benefit people while outdoors, and noise-sensitive land uses

remain incompatible per DoD guidelines regardless of extraordinary structural sound attenuation. **Figure 4.2-1** and **Figure 4.2-2** depict noise contours of the existing operations at DAFB. Outside of the base, the noise contours to the north, east, and south are over agricultural land and open space. The land use west and northwest of the base and within the noise contours is a mix of low intensity development with some forested, agricultural, and residential areas. The majority of these land uses west and northwest of the base reside within the city limits of Dover.

3.8 WATER RESOURCES

3.8.1 Definition of the Resource

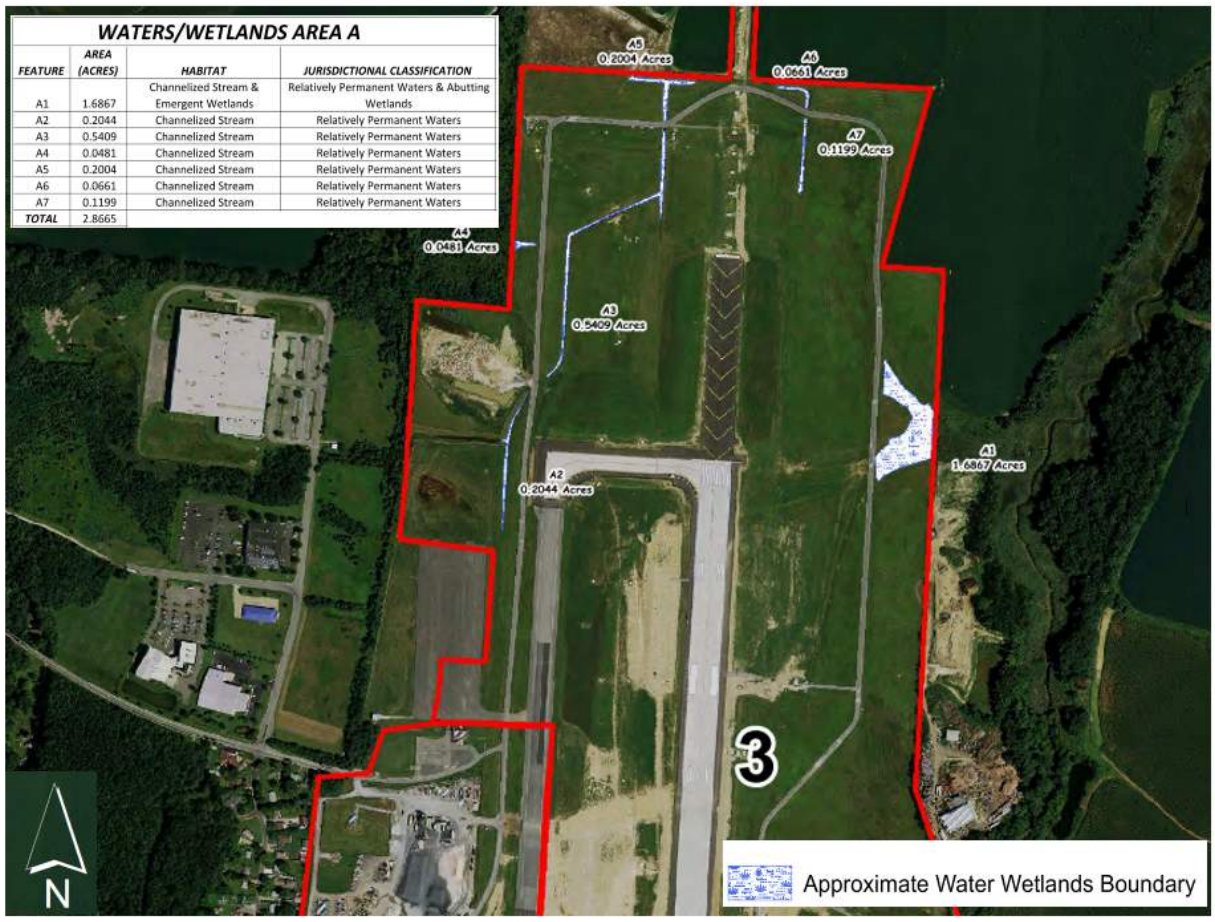
Water resources include natural and man-made sources of water that are available for use by and for the benefit of humans and the environment. Water resources include groundwater, floodplains, surface water, stormwater runoff, wetlands, and CZM. The evaluation of water resources considers the quantity and quality of the resources and their demand for various purposes.

Water resources on DAFB are regulated for Section 438 regulation compliance by EPA, while areas off DAFB are regulated by the State of Delaware, Department of Natural Resources and Environmental Control (DNREC) Division of Watershed Stewardship (DWS).

3.8.2 Existing Conditions

DAFB is located in the Little Creek Watershed, which is part of the greater Delaware Bay Drainage Basin (DNREC 2019b). Within the immediate area surrounding the CAT, there are no significant or navigable bodies of water. **Figure 3.8-1** displays delineated wetland areas within the DAFB boundary. Wetland A2 (channelized stream) is the nearest system, located northeast of the CAT and north of runway 01/19.

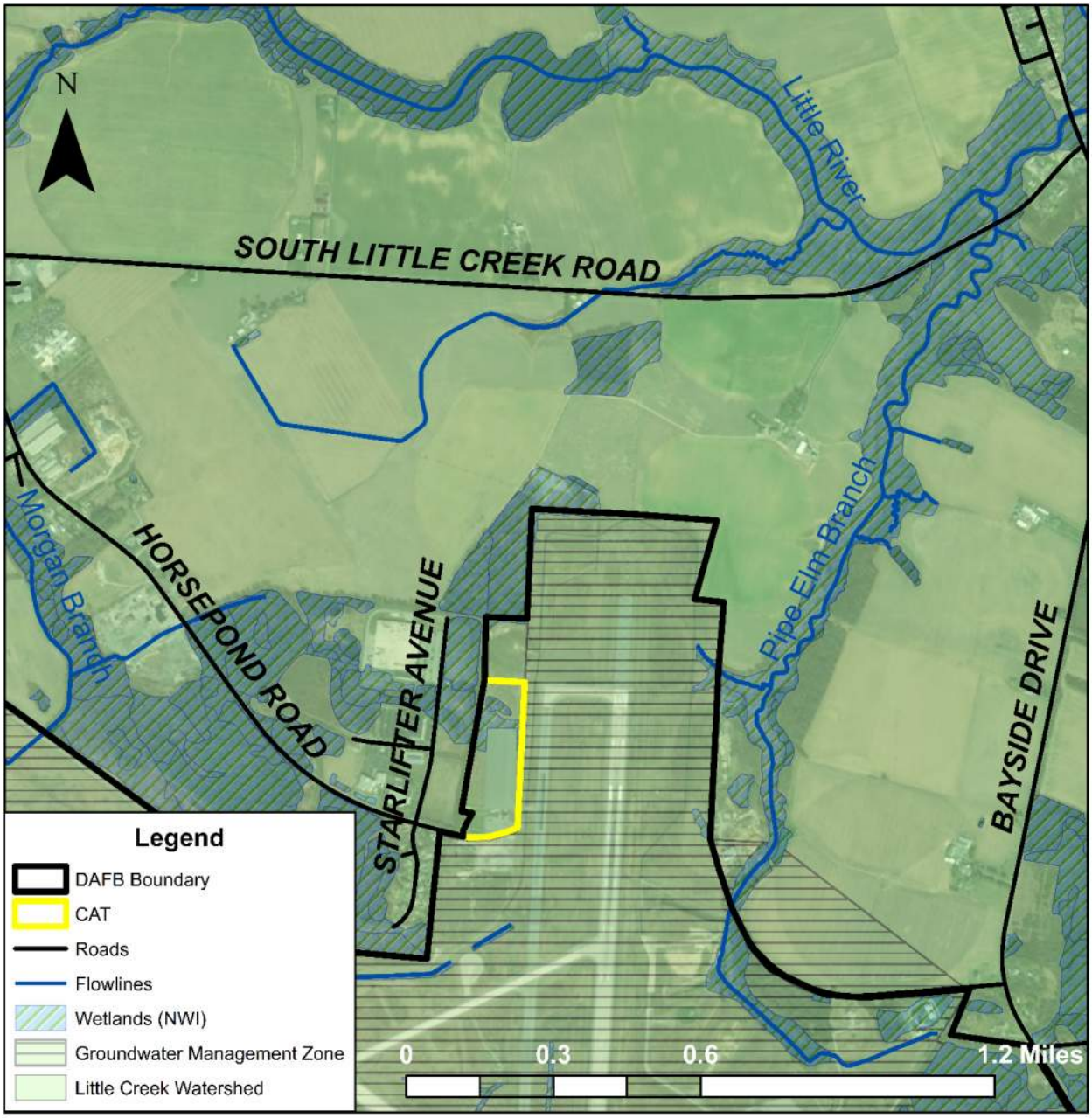
Figure 3.8-1 DAFB Delineated Wetlands



Geographic Information System (GIS) analysis of the National Wetlands Inventory (NWI) mapping depicts the presence of palustrine emergent wetlands and palustrine forested wetlands west and north of the CAT. Approximately 3.2 acres of wetland exist on CAT property. In addition, the CAT is located adjacent to a groundwater contamination management zone which encompasses the entirety of DAFB property (see **Figure 3.8-2**).

The CAT and its existing taxiway utilize the same stormwater systems that serve DAFB. These systems consist primarily of open ditches and underground pipes. DAFB's stormwater drainage surface runoff flows into two main watersheds: The Little Creek and the St. Jones River watersheds (USGS 2000). Both the Little River and the St. Jones River drain into the Delaware Bay, a 752 square mile body of brackish water, approximately 2.5 miles east of DAFB. Surface water on the northeastern side of the base flows toward the Little River via the Morgan and Pipe Elm Branches, while surface water on the southwestern side of the base discharges in the St. Jones River.

Figure 3.8-2 Water Resources



3.9 EARTH RESOURCES

3.9.1 Definition of the Resource

Earth resources are defined as the topography, geology, and soils of a given area. Topography refers to terrain, dominant landforms, and other visible features. The geology of an area includes bedrock materials, mineral deposits and fossil remains. Soil refers to unconsolidated earthen materials overlying bedrock or other parent material. Soil structure, elasticity, strength, shrink-swell potential, liquification potential, and its potential to erode, all determine the ability of the

ground to support structures and facilities. The ROI for earth resources includes the DAFB installation and the lands within a 10 NM radius of the base (see **Figure 3.1-3**).

3.9.2 Existing Conditions

The topography throughout Kent County is nearly flat with gentle to moderately steep local relief. Elevations range from 20 ft to less than 100 ft, with some areas having a local relief of less than 50 ft (USEPA 1999). DAFB is situated on the Delmarva Uplands which is the interior region of the Delmarva Peninsula. This subregion is generally underlain by semi-consolidated to unconsolidated sediments consisting of silt, clay, and sand with some gravel. The soil types within the area of the proposed taxiway improvements are classified as silty loams which are aerobic soil types with a very high-water capacity and very low risk of shrinking or swelling (USDA NRCS 2020). Because of the land use designation of the DAFB airfield, as well as the history of construction and modification on this site, the area of the proposed taxiway improvements is exempt from the prime farmland soil type classification given to other silty loam units in adjacent areas.

3.10 VISUAL RESOURCES

3.10.1 Definition of the Resource

Visual resources are the individual physical features that collectively define the aesthetic character of an area. These features can be manmade such as buildings and historical sites, or natural such as mountains and lakes. Visual resources, and subsequently visual character, can provide a sense of community, identity, and pride. In addition, visual resources often have an influence on local economies as well. The ROI for this resource area is defined as a 10-NM radius surrounding DAFB (see **Figure 3.1-2** and **Figure 3.1-3**).

3.10.2 Existing Conditions

Visual observation of large military and civilian aircraft is commonplace within the ROI. DAFB's airspace is dominated by the presence of the C-17 Globemaster and the C-5M Galaxy. The C-5M is the largest aircraft in the USAF's inventory.

DAFB is situated on a vast physiographic region called the Atlantic Coastal Plain. This physiographic region spans a large swath of the east coast of the United States and almost the entirety of the State of Delaware. The Atlantic Coastal Plain is typically characterized by its flat, low elevation terrain and quantity of wetlands due to its proximity to the Atlantic Ocean.

The predominant visual characteristics on DAFB are primarily industrial and administrative. These consists of runways, taxiways, parking ramps, administrative buildings, industrial facilities, community centers, housing, recreational facilities, and open space. DAFB was originally constructed in a less developed area of Kent County. The land north, east, and southeast of the base consist mainly of farmland, wetlands, and some forested areas. Development near DAFB has primarily occurred northwest, west, and southwest of the base. In these areas, predicated by residential and municipal development, the predominant visual characteristics are more urban in nature. Further east of the base, the visual characteristics are dictated by the Delaware Bay.

4.0 ENVIRONMENTAL CONSEQUNECES

The analysis of environmental consequences is described for each effected resource. The operational characteristics and aircraft flight mix of Alternative 3 was applied to the increase in the number of flight operations and construction elements described in the Proposed Action (see **Section 2.2)**. For resources such as noise and air quality, it was necessary to describe the environmental analysis results independently from the construction related analysis results.

4.1 AIRSPACE

4.1.1 Analysis Methodology

Environmental consequences evaluated in this section include potential impacts and interference to the airspace associated with civil aviation, airports, airfields and heliports in the 10-NM vicinity of DAFB. Airspace impacts could be considered significant if the Proposed Action poses a substantial risk to civil aviation, airports, airfields and heliports within the ROI or if the Proposed Action creates extensive changes to airport traffic patterns, IFR or ATC procedures or changes to FAA airspace classifications.

4.1.2 Alternative 1 – No Action Alternative

Under the No Action Alternative, day and night military mission and training flight operations at DAFB would continue as currently conducted with no modifications. Civil flight operations at DAFB and utilization of the CAT would also continue as currently conducted, as discussed in **Section 1.2** and **Section 2.5**.

4.1.3 Alternative 3 – Increase Operations with an FBO Tenant

Under Alternative 3, the increase in the number of aircraft utilizing the DAFB JUFF would not result in airspace impacts. The airspace where flight operational changes are proposed is predominantly used by military cargo aircraft. The aircraft mix associated with Alternative 3 has similar flight operation characteristics as the existing military aircraft operations. All additional flights would continue to use the same approach and departure patterns as they use now but at an increased rate. All aircraft would also remain under DAFB ATC/RAPCON control per the new JUA. These flight operational changes are not considered significant.

4.2 NOISE

4.2.1 Analysis Methodology

The most common impact associated with exposure to elevated noise levels is public annoyance. Annoyance due to aircraft noise can be predicted based on the noise metric DNL (Schultz, 1978; Finegold, 1994). When subjected to DNL of 65 dB, approximately 12 percent of persons exposed would be “highly annoyed” by the noise. At levels below 55 dB, the percentage of annoyance is correspondingly lower (less than 3 percent). The percentage of people annoyed by noise never drops to zero, but at levels below 55 dB, noise is reduced enough to be essentially negligible. Based on numerous sociological surveys and recommendations of federal interagency councils,

the most common benchmark referred to is 65 dB DNL. This threshold is often used to determine residential land use compatibility around airports, highways, or other transportation corridors.

The USAF considers "significance" of noise impacts in the context of NEPA in terms of context and intensity and has not defined uniformly applicable significance thresholds. The FAA, on the other hand, defines a threshold for "significant" noise impacts in FAA Order 1050.1F as any increase relative to the No Action Alternative of greater than 1.5 dB DNL in noise level in noise-sensitive areas that are exposed to greater than or equal to 65 dB DNL.

The likelihood of sleep disturbance by aircraft noise depends on a host of situational factors, including depth of sleep, previous exposure to aircraft noise, familiarity with the surroundings, and the physiological and psychological condition of the sleeper. A typical residential structure provides approximately 15 dB outdoor-to-indoor noise level reduction with windows open and 25 dB reduction with windows closed. An overflight generating 96 dB SEL outdoors could generate roughly 76 dB SEL indoors and would be expected to result in 8 percent of sleepers being awakened. Regarding indoor speech interference, this analysis used a conservative indoor noise threshold of 50 dBA is used to indicate flight events, which have the potential to interfere, at least momentarily, with speech. The average number of events per hour exceeding 50 dB during 7:00 A.M. to 10:00 P.M. was calculated under each scenario for a person outdoors, indoors with windows open, and indoors with windows closed.

A DNL of 75 dB is a threshold above which impacts other than annoyance may occur. For the purposes of this noise analysis, noise impacts would be considered potentially significant if the FAA thresholds described above were exceeded. The degree of change in probabilities of sleep disturbance and speech interference were also considered in assessment of impacts significance.

The ROI for noise includes areas on and near DAFB that experience elevated aircraft noise levels during DAFB aircraft operations. Additional details regarding the noise impacts assessment methodology are included in **Appendix G**.

4.2.2 Alternative 1 – No Action Alternative

Under the No Action Alternative, noise levels at DAFB would continue to be present with potential noise levels ranging between the Existing Condition noise levels and the Approved Scenario (Alternative 1/No-Action) noise levels. The noise level at Resident #4 located closest to the CAT site, will range from a DNL between 63.5 to 63.8.

Civil flight operations at DAFB and utilization of the CAT would also continue as currently conducted, as discussed in **Section 1.2** and **Section 2.5**.

4.2.3 Alternative 3 - Increase Operations with an FBO Tenant

Under Alternative 3 civil flight operations would be expected to follow the same flight paths currently used by military aircraft. Changes in noise contours would primarily occur on and near the extended runway centerlines in areas already exposed to frequent overflight noise. Static engine runs are also expected to increase in areas currently used for static engine runs. Noise contours resulting from Alternative 1 and Alternative 3 expand to include areas on and near the existing CAT parking apron (located northwest of the intersection of Runway 01 and Runway 19).

4.2.3.1 Day/Night Average Sound Level

Several points of interest were identified to represent DNL noise sensitive locations (see **Figure 4.2-1** and **Figure 4.2-2** for locations). The locations studied include residences (e.g., residence #1), towns (e.g., Little Creek), historic sites (e.g., Dickinson Mansion), and commercial centers (e.g., Target store). Each type of location has its own set of sensitivities that might not be shared by other types of locations. For example, historic sites, such as the Dickinson Mansion, are used primarily during the day, and are particularly sensitive to loud events that could interfere with speech. Residences are sensitive to daytime events that could interfere with speech and are also sensitive to nighttime noise that could disrupt sleep. For the purposes of this Noise Report, all noise metrics are presented for all representative points of interest. Even though the Target store is not a location where people sleep, sleep disturbance results for the Target store are useful as a proxy for nearby residences where people do sleep.

Table 4.2-1 DNL at Representative Noise Sensitive Points of Interest

Representative Points of Interest	Existing Condition	Approved Scenario	Proposed Scenario	Change from Approved	Exceed FAA Thresholds
Bowers Beach	50.2	50.3	50.4	0.1	No
Dickinson Mansion	57.0	57.1	57.2	0.1	No
Kitts Hummock	54.5	54.6	54.6	0.0	No
Little Creek	57.2	57.3	57.5	0.2	No
Magnolia	57.1	57.3	57.5	0.2	No
Pickering Beach	53.2	53.2	53.3	0.1	No
Residence 1	70.0	70.1	70.2	0.1	No
Residence 2	65.0	65.2	65.3	0.1	No
Residence 3	58.1	58.2	58.3	0.1	No
Residence 4	63.5	63.8	64.1	0.3	No
Round Barn	65.4	65.5	65.6	0.1	No
Target (Store)	48.4	48.4	48.5	0.1	No
Trailer Park 1	64.3	64.3	64.3	0.0	No

Table 4.2-2 lists the number of acres affected by each contour interval under each aircraft mix scenario. Under Alternative 3, the total number of acres affected by DNL greater than 65 dB would increase relative to the Alternative 1 by 61 acres from 4,200 to 4,261 acres.

Table 4.2-2 Acres Affected by DNL of 65 dB or Greater from Each Aircraft Mix Scenario

Contour Interval (dBA DNL)	Existing Condition	Approved Scenario (Alternative 1/ No-Action)	Proposed Scenario (Alternative 3)	Increase from Alternative 1
65-69	2,393	2,420	2,461	41 (1.7%)
70-74	1,028	1,046	1,055	9 (0.9%)
75-79	536	552	560	8 (1.4%)
80-84	173	176	179	3 (1.7%)
>=85	6	6	6	0
Total	**4,136**	**4,200**	**4,261**	**61 (1.5%)**

The areas of DNL noise increase are primarily located to parcels directly adjacent to the west of the existing CAT property and to the northeast of Runway 19/01. An estimated three residences would be newly affected by noise levels at or exceeding 65 dBA DNL (residence count estimate

based on interpretation of aerial photography). The three newly affected residences are located in various areas surrounding the airbase in which the 65 dB DNL contour line shifts by less than 100 feet relative to the Approved Scenario 65 dB DNL contour line. Increases in DNL between the Alternative 1 and Alternative 3 do not exceed thresholds described in FAA 1050.1F. No residences are present in areas affected by noise levels at or above 75 dB DNL. Therefore, no impacts other than annoyance would occur. DNL at the representative points of interest under each scenario are listed in **Table 4.2-1**.

Noise levels resulting from the Approved (Alternative 1/No-Action) and Proposed (Alternative 3) scenarios were compared and shown in **Figure 4.2-1** and **Figure 4.2-2** as contours in 5-dB intervals ranging from 65 to 85 dB DNL.

Figure 4.2-1 DNL Contours Comparing Alternatives (Northern Section)

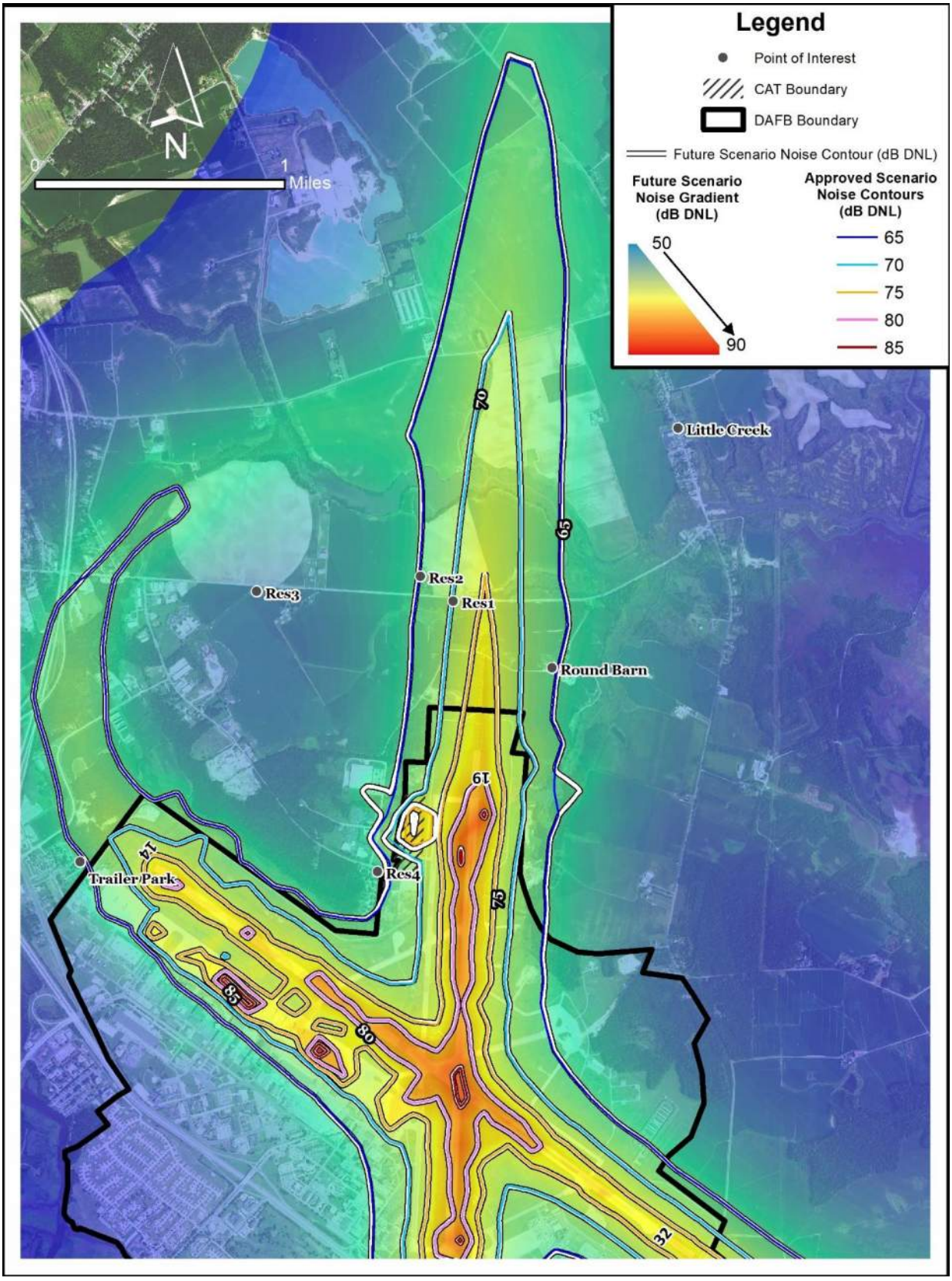


Figure 4.2-2 DNL Contours Comparing Alternatives (Southern Section)

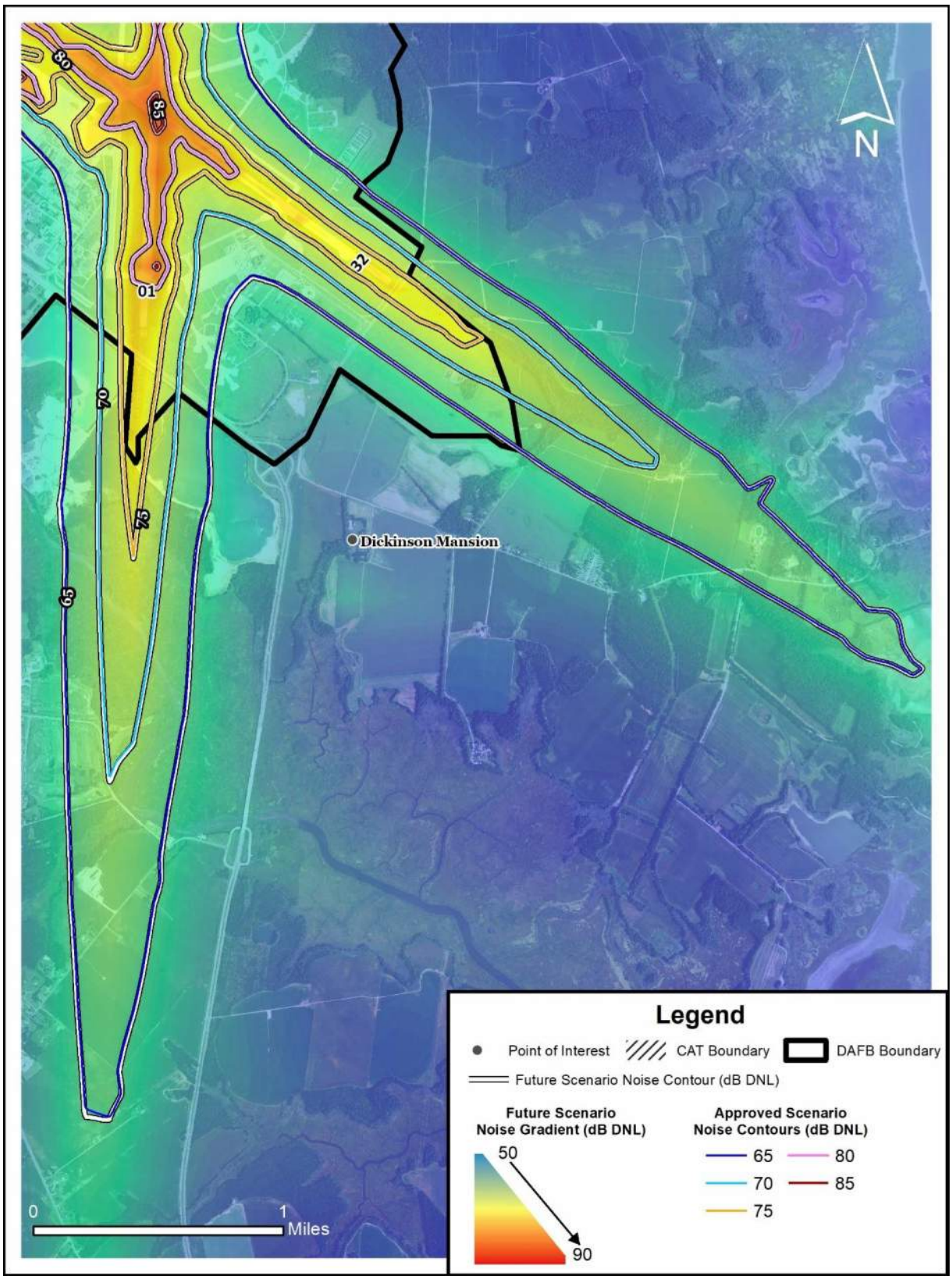
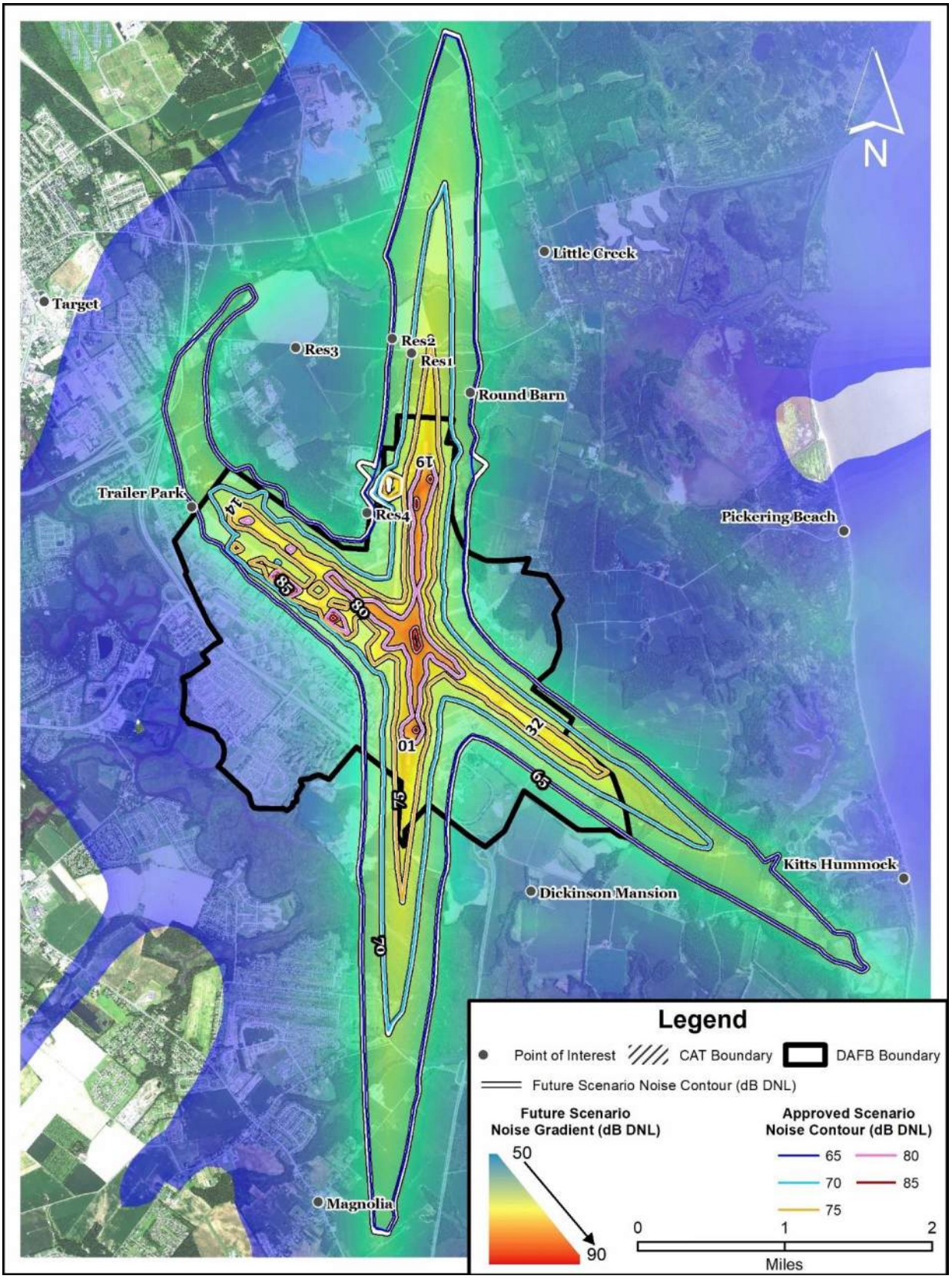


Figure 4.2-3 DNL Contours Comparing Alternatives



4.2.3.2 Nighttime Aircraft Noise

The operational aircraft mix scenario modeled includes a large fraction of overall CAT aircraft operations being conducted during acoustic night – and these late-night operations could result in an increased potential for sleep disturbance. The probability of being awakened at least once per night by aircraft noise was estimated using the method prescribed by ANSI/ASA S12.9-2008/Part 6. The method used to estimate sleep disturbance remains the approach recommended by the DoD Noise Working Group despite ANSI's recent withdrawal of the standard due primarily to concerns that the method overestimates impacts. Probabilities were calculated with windows open, reflecting a 15 dB attenuation provided by the structure, and with windows closed, reflecting a 25 dB structural attenuation.

As shown in **Table 4.2-3**, the probability of awakening would increase relative to the Approved Scenario by as much as 5 percent under the 'Proposed' scenario with windows open and by as much as 3 percent under the 'Proposed' scenario with windows closed. Awakenings could result in an increased likelihood of annoyance and disruption of quality sleep can result in increased tiredness during the day for affected people (Finegold 1994). The ongoing military mission at DAFB currently involves late-night operations. Therefore, most of the people living near the base currently experience nighttime aircraft noise.

Table 4.2-3 Minimum Probability (Percentage) of Being Awakened per Night by Aircraft Noise Resulting from Each Scenario

Representative Points of Interest	Existing Condition		Approved Scenario Alternative 1		Proposed Scenario Alternative 3		Change Relative to Approved vs Proposed	
	Windows Open	Windows Closed	Windows Open	Windows Closed	Windows Open	Windows Closed	Windows Open	Windows Closed
Bowers Beach	7	2	8	2	8	2	0	0
Dickinson Mansion	13	8	17	9	20	10	3	1
Kitts Hummock	11	6	11	6	11	6	0	0
Little Creek	13	8	17	9	20	10	3	1
Magnolia	9	5	25	16	30	19	5	3
Pickering Beach	10	4	22	14	27	17	5	3
Residence 1	19	1	17	9	20	10	3	1
Residence 2	17	1	24	14	29	17	5	3
Residence 3	13	8	23	14	28	17	5	3
Residence 4	18	1	8	3	8	3	0	0
Round Barn	17	1	16	8	18	8	2	0
Target (Store)	8	3	25	16	30	19	5	3
Trailer Park 1	14	8	22	14	27	17	5	3

Notes: Percentage probability of being awakened at least once per night by aircraft noise was estimated using the method prescribed by ANSI/ASA S12.9-2008/Part 6. Probabilities were calculated with windows open, reflecting a 15-dBA attenuation provided by the structure, and with windows closed reflecting a 25-dBA structural attenuation.

4.2.3.3 Speech Interference

Table 4.2-4 lists the number of events per average daytime hour (i.e., 7:00 A.M. to 10:00 P.M.) that have some potential to disrupt speech (i.e., background sound level exceeds 50 dBA L_{max}). This assessment assumes that voices are not raised when background noise levels increase thereby allowing conversation to continue. Values are presented for people outdoors where no structure is present to block noise, indoors with windows open, and indoors with windows closed. Typical residential structures provide 15 dB noise level reduction with windows open and 25 dB noise level reduction with windows closed. At most of the locations evaluated, the number of events per hour with the potential to interfere with speech would not measurably increase. Under the 'Proposed' scenario, the number of events with the potential to interfere with speech would increase relative to the Approved scenario by as much as 1.2 events per hour for people outdoors at Residences #1-4.

Table 4.2-4 Interference with Speech Resulting from Each Scenario

Representative Points of Interest	Existing Condition			Approved (Alternative 1)			Proposed (Alternative 3)			Change Relative to Approved vs Proposed		
	Outdoor	Open	Closed	Outdoor	Open	Closed	Outdoor	Open	Closed	Outdoor	Open	Closed
Bowers Beach	0.9	0.4	0.0	1.4	0.4	0.0	1.8	0.4	0.0	+0.4	+0	+0
Dickinson Mansion	1.8	0.8	0.1	3.0	0.8	0.1	4.0	0.8	0.1	+1	+0	+0
Kitts Hummock	1.3	0.6	0.2	2.0	0.7	0.2	2.5	0.7	0.2	+0.6	+0	+0
Little Creek	1.6	1.0	0.5	2.3	1.0	0.5	3.0	1.1	0.5	+0.6	+0	+0
Magnolia	1.1	0.5	0.1	1.8	0.7	0.1	2.4	0.8	0.1	+0.6	+0.1	+0
Pickering Beach	1.5	0.5	0.2	1.6	0.5	0.2	1.7	0.5	0.2	+0.1	+0	+0
Residence 1 (Res1)	2.2	1.4	1.2	3.4	2.0	1.5	4.5	2.5	1.7	+1	+0.5	+0.2
Residence 2 (Res2)	2.2	1.4	1.1	3.4	1.9	1.1	4.4	2.4	1.2	+1	+0.5	+0
Residence 3 (Res3)	2.1	1.2	0.4	3.1	1.2	0.4	3.9	1.2	0.4	+0.8	+0	+0
Residence 4 (Res4)	2.3	1.7	1.2	3.8	2.3	1.3	5.0	3.0	1.3	+1.2	+0.7	+0
Round Barn	2.1	1.4	0.9	3.3	2.0	0.9	4.4	2.5	0.9	+1	+0.5	+0
Target (Store)	1.3	0.5	0.0	1.3	0.5	0.0	1.3	0.5	0.0	+0	+0	+0
Trailer Park 1	2.0	1.1	0.5	3.0	1.1	0.5	3.8	1.1	0.5	+0.8	+0	+0

4.2.3.4 Construction Noise

Construction activities generate noise that is localized (i.e., limited to the area immediately surrounding the construction site) and temporary (i.e., lasting only for the duration of the construction project). The proposed construction would require the use of several types of heavy equipment. **Table 4.2-5** shows maximum noise levels generated by each potential type of equipment at a reference distance of 50 feet and an overall noise level on a hypothetical day when all equipment types simultaneously operate. Equipment noise levels were calculated in the FHWA's Roadway Construction Noise Model (FHWA 2006).

Table 4.2-5 Typical Construction Equipment Noise Levels

Equipment Type	Noise Level (dBA Lmax)	
	At 50 feet	At 550 feet
Backhoe	78	57
Dozer	82	61
Concrete Mixer Truck	79	58
Dump Truck	77	56
Roller	80	59
TOTAL	83	61

Source: Roadway Construction Noise Model

The closest noise-sensitive locations to the proposed CAT are several residences that are located approximately 550 feet south of the proposed facility. At this distance, the overall L_{max} generated at the construction site would be 61 and the DNL would also be 61. Heavy-duty trucks carrying equipment and materials to and from the construction site would use Route 438 (Horsepond Road) and would pass within approximately 50 feet of the residences. At this distance, heavy trucks generate a L_{max} of approximately 77 dBA. Truck trips would be expected to be relatively infrequent, occurring primarily at the beginning and end of the construction project. Construction and transportation noise could be considered annoying at these closest residences. This noise could temporarily interfere with activities that involve listening (e.g., conversation or watching television) at times when particularly loud activities are under way.

The proposed construction would occur in the context of frequent military aircraft operations noise generating approximately 64 dB DNL. The combined noise level, including both temporary construction noise and ongoing aircraft noise would be approximately 65 dB DNL. Construction activity would be expected to be limited to normal working hours (7:00 A.M. to 5:00 P.M.). As mentioned previously, the noise would be temporary lasting only the duration of the project. Construction workers would use hearing protection when necessary in accordance with applicable laws and regulations.

Under Alternative 3, the impacts to/on noise resources are determined to be insignificant. The total number of acres affected by DNL greater than 65 dB would increase relative to the existing conditions by 61 acres from 4,200 to 4,261 acres. However, increases in DNL between existing

conditions and the Proposed Action are less than 2 percent, and do not exceed thresholds described in FAA 1050.1F.

4.2.3.5 Summary of Noise Impacts

The FAA noise significance criteria identified in **Section 4.2.1** are not exceeded under Alternative 3. Assessment of speech interference and sleep disturbance due to CAT aircraft operations reveals incremental increases that are worth noting but which do not imply impact significance. Construction and day-to-day operations noise would also likely be noticed by residents near the CAT, but noise impacts associated with these activities would not be significant. In conclusion, no significant noise impacts would occur under Alternative 3.

4.3 SAFETY

4.3.1 Analysis Methodology

Adverse impacts to safety would occur if the implementation of the Proposed Action resulted in a substantial increase in risk to the safety of personnel, the public and property. The flight operational changes associated with the Proposed Action are considered to determine whether additional or unique safety risks are associated with their undertaking.

There is no recognized threshold for ground/flight safety above which hazards are considered to be significant and below which they are considered acceptable. As a result, airspace managers have adopted a variety of measures to manage and minimize risks. These include, but are not limited to, eliminating or managing airspace hazards, providing and disseminating timely information to airspace users, requiring various levels of training for those using the airspace, setting appropriate standards for equipment maintenance and performance, defining rules governing the use of airspace, and assigning well-defined responsibilities to aviators and airspace managers. These measures can never eliminate risk, but their adoption can minimize risk.

4.3.2 Alternative 1 – No Action Alternative

Under the No Action Alternative, flight operations and training at DAFB would continue as currently conducted. No impacts to safety would occur. See **Section 3.3.2** for the existing conditions at DAFB describing ground and flight safety.

4.3.3 Alternative 3 – Increase Operations with an FBO Tenant

Under Alternative 3, the additional civil flight operations would be conducted following existing DAFB safety policies and protocols. Landings, take-offs and ground operations occurring on DAFB property would follow existing military flight operations described in **Section 3**.

Ground operations that may occur on the CAT site would be subject to additional safety analysis. Future tenants of the CAT may be required to address ground operations safety issues that are specific to site activities as a condition in a new JUA between USAF and DelDOT

Increasing the number of civil flight operations at DAFB introduces significant additional or unique ground and emergency response or flight safety risks on the base and within the ROI (see **Figure 3.1-2** and **Figure 3.1-3**). The ARFF under the current JUA has the emergency response capacity to support the military at DAFB. The USAF has no obligation to maintain any fire

protection and crash rescue organization or to provide any increase in fire protection and crash rescue equipment or personnel (see **Appendix A**). To account for the increase in civilian flights, additional emergency response capacity or services would need to be included in a new JUA between USAF and DelDOT.

4.3.3.1 Ground Safety and Emergency Response

Increased flight operations under Alternative 3 increases the potential for incidents requiring emergency response. DAFB emergency responders would continue to operate under their existing mutual aid agreements for emergency response and would coordinate with fire departments and other state and local emergency response agencies to adequately respond to incidents.

Implementation of Alternative 3 would not change the DAFB aircraft mishap emergency response procedures. DAFB ARFF would continue to respond to incidents within 12 miles of the base, as part of the Disaster Response Plan and mutual support agreements with local fire departments as described in **Section 3.3.2.1.**

4.3.3.2 Flight Safety

All aircraft operations conducted at DAFB including an increase in civil flight operations would continue to comply with all federal, USAF, and Operations Group Commander requirements. FAA regulation on minimum altitudes during visual navigation would be strictly adhered to.

In cases of emergency, such as firefighting, air ambulance, law enforcement, or other emergencies, civilian flight aircrews would immediately respond to ATC direction to remain clear of these areas.

To avoid potential impacts to general aviation, active civilian airports and airfields would be avoided by three nautical miles (**Figure 3.1-2**). Civilian flight aircrews would specifically avoid areas where skydiving, hot air balloon, glider and ultralight activity occurs throughout the proposed corridor. As with any other VFR flight, civilian flight aircrews would visually identify any airspace conflicts and coordinate with other airspace users to minimize potential impacts to medevac, agricultural spraying and other airspace operations. Dover has an active MACA program, as described in **Section 3.3.2**, which further reduces the chance of a conflict.

DAFB would continue to operate under their existing mutual aid agreements for emergency response and would coordinate with fire departments and other state and local emergency response agencies to establish new mutual aid agreements included in a new JUA. Therefore, no significant impacts to ground/flight safety and emergency response are anticipated to result from implementation of Alternative 3.

4.3.3.3 Wake Vortices

The trail of disturbed air that follows an aircraft is called a wake vortex. Larger aircraft, lower altitudes, and longer wingspans produce a greater potential for a wake vortex effect. At cruising altitudes, wake turbulence directly behind the aircraft can cause handling difficulties for following aircraft, especially when a small aircraft trails a larger aircraft (FAA 2014).

FAA regulations dictate safe following distances and procedures to avoid wake turbulence, both in flight and during landing or takeoff. For aircraft en route and under IFR, the FAA Aeronautical

Information Manual has specified separation minimums of 4 miles between a heavy aircraft (such as a Boeing 757) and any smaller aircraft which is following or crossing behind at the same level or less than 1,000 feet below. No special longitudinal wake turbulence separations based on time are required (FAA 2017).

Aircraft flying closer to the ground create wake turbulence, which trails behind the aircraft generally moving downward and lessening in intensity. Depending upon a variety of factors, including the wingspan, speed, altitude, and aircraft mass, a wake vortex can vary from a light breeze to a strong, brief wind turbulence and can dissipate quickly near the ground or last for a minute or more at altitude. This creates an interface between flight safety and ground safety.

The Proposed Action includes additional aircraft operations, consisting of the 757-200 and the 747-400 aircraft. These large aircraft could approach each runway at a minimum altitude of 500 feet AGL. At this lower altitude, the aircraft could produce a strong, brief wind turbulence of up to 30 miles per hour (MPH), which could result in large branches in motion and cause difficulty using an umbrella (USAF 2014b). However, such a wake vortex would likely dissipate before reaching the ground. FAA also regulates aircraft operations to minimize impacts resulting from wake vortices.

According to 2018 wind data at DAFB, the windier part of the year lasts for 7.1 months in 2018, from October 7 to May 10, with average wind speeds of more than 9.8 MPH. The windiest day of the year is February 26, with an average hourly wind speed of 12.1 MPH. The highest sustained hourly windspeed recorded for 2018 at DAFB was on March 2, 2018, at 41.4 MPH, and the highest gust speed was recorded at 62.2 MPH (Weatherspark 2019). These wind speeds are higher than expected wake vortices wind gust speeds. Wake vortices from increased aircraft operations would only occur in existing DAFB flight paths, where development has been restricted due to APZ zones. Therefore, the implementation of Alternative 3 would not cause additional wake vortices impacts above and beyond existing conditions.

4.3.3.4 Bird/Wildlife-Aircraft Strike Hazard

With the implementation of Alternative 3, all additional flight operations would continue to operate in compliance with the DAFB BASH plan which provides a base program to minimize aircraft exposure to potentially hazardous wildlife strikes (DAFB 2013). Bird Watch Conditions (Severe, Moderate, or Low) and associated restrictions would continue to be established. The BASH Program Wildlife Control Contractor would continue bird and other wildlife abatement. Therefore, no significant impacts are anticipated to result from BASH issues.

When BASH risks increase, limits are placed on low-altitude flight and some operations (e.g., arrivals, departures) in the airport and airspace environments. Under Alternative 3, pilots would be subjected to notifications whenever the potential for bird strikes is high within DAFB airspace.

4.3.3.5 Rural Agricultural Areas

Additional aircraft operations would occur only within current DAFB airspace approach/departure zones. No new rural agricultural areas would be impacted. Due to the existing nature of DAFB military overflights of large aircraft, the increase in civilian flight operations as described in Alternative 3 is not anticipated to cause unexpected startle reactions from livestock. However, the

increase in overall aircraft activity within the existing approach/departure zones could cause additional startle incidents. Past studies of the effects of aircraft noise on livestock indicate some behavioral responses to aircraft overflight; however, domestic animals generally seem to habituate to the disturbances over a period of time (Wyle 2008). The literature suggests no proven cause-and-effect link between overflight startle effect and cattle abortion rates or lower milk production (Wyle 2008). Cattle that are corralled seem to exhibit stronger startle reactions than individual animals that are not confined. Horses and cattle have been known to stampede when aircraft fly overhead, breaking through fences and injuring themselves (Air Force 1993). Several studies noted that horses gallop more randomly or exhibit biting and kicking behavior in response to low-altitude overflight.

The Air Force has a policy of compensation should confirmed loss of livestock occur from military flight operations. The ramifications of loss of livestock due to new civilian flight operations will be outlined in the new JUA.

4.4 AIR QUALITY

4.4.1 Analysis Methodology

The air quality analysis estimated annual emissions that would result from these activities were analyzed using the USAF Air Conformity Applicability Model (ACAM) version 5.0.16 (Solutio Environmental, Inc. 2020).

Aircraft emissions from fuel combustion associated with increased aircraft operations associated with the Proposed Action are the primary contributor to air quality effects. The other contributor is ground emissions from construction activities. Potential impacts to air quality are evaluated with respect to the extent, context, and intensity of the impact in relation to relevant regulations, guidelines, and scientific documentation. This requires that the significance of an action be analyzed in respect to the setting of the action and severity of the impact. Specific details regarding the assumptions and analysis calculations used to estimate air pollutant emissions are shown in more detail in **Appendix H**.

In the context of criteria pollutants for which the project region is in attainment of a NAAQS, the analysis compared the annual net increase in emissions estimated for the Proposed Action to the USEPA PSD Regulation permitting threshold of 250 tons per year as an initial indicator of significance of potential impacts to air quality. The PSD permitting threshold represents the level of potential new attainment pollutant emissions below which a new or existing stationary source may acceptably emit without triggering the requirement to obtain a permit. Thus, if the intensity of any net emissions increase is below 250 tons per year of an attainment pollutant, the indication is the air quality impacts for that pollutant would be insignificant. In the case of criteria pollutants for which the project region does not attain or is in maintenance of a NAAQS, the analysis compared the net increase in annual emissions to the applicable conformity de minimis thresholds.

It is important to note that the proposed indicator thresholds only provide a clue to the potential impacts to air quality. If projected emissions exceeded an indicator threshold, further analysis was conducted to determine whether impacts were significant. In such cases, if emissions (1) do not contribute to an exceedance of an ambient air quality standard or (2) conform to the approved State Implementation Plan, then impacts would not be significant.

The DAFB project region within Kent County currently attains all of the NAAQS. However, the USAF treats this region as an orphan nonattainment/maintenance area for ozone. Therefore, the air quality analysis used the USEPA General Conformity Rule de minimis thresholds of 100 tons per year of NOx, 50 tons per year of VOCs, and the PSD threshold of 250 tons per year for all other criteria pollutants as indicators of the significance of projected air quality impacts within the DAFB project region.

4.4.2 Alternative 1 – No Action Alternative

Under the No Action Alternative, emissions would increase from the Existing Condition to reflect the flight mix of the Approved Scenario (Alternative 1/No-Action) as defined by the existing JUA. Alternative 1 is considered the baseline within ACAM.

4.4.3 Alternative 3 – Increase Operations with an FBO Tenant

The increase in civil aircraft operations would generate air emissions from (1) commercial aircraft operations, (2) commercial aircraft engine maintenance and testing, and (3) usage of AGE. To estimate emissions from proposed aircraft operations and AGE, the analysis employed the ACAM. The analysis incorporated an aggressive approach, assuming that the project would reach the maximum number of proposed operations and the resulting emissions in year 2025, incorporating all required infrastructure improvements. Some of the specifics of the air quality analysis include the following:

- The analysis considered a range of cargo, passenger, and private aircraft types and sizes that feasibly would operate under the Proposed Action. The aircraft fleet chosen for analysis included (1) Type 1 - Boeing 737-300/700 and McDonnell Douglas M80, (2) Type 2 - Bombardier CL-600/601 Challenger and Dassault Falcon, (3) Type 3 - Cessna 500 Citation, and (4) Type 4 - Beechcraft 300/350 King Air.
- Military aircraft surrogates were used for the civilian aircraft chosen for analysis to match military aircraft in the ACAM database (Century Engineering, 2020).
- Aircraft engine Time in Mode (TIM) values for a landing and take-off (LTO) cycle were obtained for civilian aircraft from Table 2-4 of the USAF Mobile Emissions Guide (Air Force Civil Engineer Center, 2018a).
- The analysis evaluated activities associated with a proposed maximum increase of 25,000 annual civilian fight operations, or 12,500 annual LTOs at full buildout.
- AGE usages for each project aircraft type were obtained from Table 3-3 and Table 3-5 of the 2018 AF Mobile Source Guidelines (Air Force Civil Engineer Center 2018b).
- The analysis used the assumptions internal to the ACAM model to estimate on-wing or static aircraft engine tests.
- AGE usages for each project aircraft type were obtained from Table 3-3 and Table 3-5 of the 2018 AF Mobile Source Guidelines (Air Force Civil Engineer Center 2018b), as ACAM AGE defaults pertain to military and not commercial/civilian aircraft. The analysis matched AGE listed for aircraft categories in Table 3-5 to the project aircraft types and corresponding usage durations from data in Table 3-3 to develop reasonable worst-case AGE usages for each project commercial/civilian aircraft type.
- The analysis used the assumptions internal to the ACAM model to estimate on-wing or static aircraft engine tests. The annual number of trim tests per aircraft were lowered from

the ACAM default value of 12 to 4 to simulate more typical engine testing activities for commercial/civilian aircraft (personal communications, Austin Naranjo, Air Force Civil Engineer Center/CZTQ July 2, 2020).

The analysis of proposed aircraft operations focuses on operations that would occur within the lowest 3,000 feet of the atmosphere. Emissions generated by the proposed aircraft operations would occur from intermittent (1) aircraft operations up to an altitude of 3,000 feet AGL and across several square miles that make up the Dover AFB airspace and adjoining aircraft flight patterns and (2) AGE operations spread across the CAT aircraft parking ramp. These intermittent emissions would be adequately mixed through this large volume of atmosphere to the point that they would not result in substantial ground-level concentrations in any localized area. Therefore, emissions associated with the increased civil flight operations at DAFB would result in less than significant impacts to all air pollutant levels.

Proposed aircraft operations would emit HAPs that could potentially impact public health. As discussed above for project criteria pollutant impacts, since proposed aircraft operations would occur intermittently over a volume of atmosphere, they would produce minimal ambient impacts of HAPs in a localized area.

The potential effects of GHG emissions from the increased civil flight operations are by nature global. Given the global nature of climate change, 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 analysis presents estimates of GHG emissions as a result of Alternative 3 for use as indicators of their potential contributions to climate change effects.

Table 4.4-1 summarizes the increase in annual operational emissions that would result from the full implementation of Alternative 3. The data in **Table 4.4-1** show that proposed aircraft operations and AGE usages would result in emissions that would remain below all annual indicator and conformity *de minimis* thresholds. Therefore, no mitigation measures are needed.

Table 4.4-1 Projected Annual Emissions Increases from Aircraft Operations (Year 2025) – Alternative 3

Aircraft Type/Activity	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2e (mt)
Type 1							
Aircraft Landing and Take-offs and Trim Tests	2.57	21.30	28.68	2.42	0.16	0.14	6,451
Aerospace Ground Equipment	2.14	11.96	13.67	2.70	1.91	1.90	1,909
Total Annual Type 1 Aircraft Emissions	**4.71**	**33.26**	**42.35**	**5.12**	**2.07**	**2.04**	**8,360**
Type 2							
Aircraft Landing and Take-offs and Trim Tests	3.24	17.02	5.98	0.81	0.15	0.08	2,242
Aerospace Ground Equipment	2.89	15.85	19.60	4.03	2.78	2.76	2,809

Total Annual Type 2 Aircraft Emissions	**6.13**	**32.87**	**25.58**	**4.84**	**2.93**	**2.84**	**5,051**
Type 3							
Aircraft Landing and Take-offs and Trim Tests	17.00	15.88	1.15	0.25	0.14	0.13	680
Aerospace Ground Equipment	0.78	3.26	6.82	1.27	0.68	0.67	885
Total Annual Type 3 Aircraft Emissions	**17.78**	**19.14**	**7.97**	**1.52**	**0.82**	**0.80**	**1,565**
Type 4							
Aircraft Landing and Take-offs and Trim Tests	6.54	8.11	0.96	0.22	0.07	0.07	591
Aerospace Ground Equipment	0.71	2.80	6.51	1.15	0.59	0.58	803
Total Annual Type 4 Aircraft Emissions	**7.25**	**10.91**	**7.47**	**1.37**	**0.66**	**0.65**	**1,394**
Total Annual Aircraft Emissions	**35.87**	**96.17**	**83.39**	**12.85**	**6.49**	**6.34**	**16,369**
Indicator Threshold	**NA**	**250**	**NA**	**250**	**250**	**250**	**NA**
Conformity *de minimis* Threshold	**50**	**NA**	**100**	**NA**	**NA**	**NA**	**NA**
Exceed Threshold	**No**	**No**	**No**	**No**	**No**	**No**	**NA**

Note: Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.
Key: CO_2e (mt) = carbon dioxide equivalent in metric tons; NA = not applicable.

The increase in civil flight operations would require construction of an 82-foot-wide taxiway and widening of the existing taxiway to 82 feet, both connecting Runway 1/19 to the existing 6.5-acre CAT ramp. Air quality impacts resulting from the proposed construction activities would occur from (1) combustive emissions due to the use of fossil fuel-powered trucks and nonroad equipment and (2) fugitive dust emissions (PM10/PM2.5) from the operation of equipment on exposed soil.

Construction activity data was developed to estimate construction equipment usages and areas of disturbed ground due to the proposed construction activities. This data was used to estimate air emissions from proposed construction activities. Factors needed to derive construction source emission rates were obtained from the Compilation of Air Pollutant Emission Factors, AP-42, Volume I (USEPA, 1995) for fugitive dust and the USEPA MOVES2014b model (USEPA,2018) for on-road trucks and nonroad equipment. The analysis assumed the use of standard construction practices, which would reduce fugitive dust emissions generated from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels. The air quality analysis assumed that all proposed construction activities would occur in year 2022, which assumes a new JUA is executed between USAF and DelDOT, and all funding is programmed.

Table 4.4-2 presents estimates of emissions from the construction activities for the CAT taxiway at DAFB. This data shows that even if total construction emissions occurred in one year, the construction emissions would be well below the annual indicator and conformity *de minimis* thresholds. Therefore, construction emissions associated with the proposed CAT taxiway improvements would not result in significant air quality impacts. Therefore, no mitigation measures are needed.

Table 4.4-2 Total Construction Emissions from the CAT Taxiway at DAFB

Construction Activity	Air Pollutant Emissions (tons)						
	VOCs	CO	NOx	SOx	PM_{10}	$PM_{2.5}$	CO_{2e} (mt)
Taxiway Site Preparation	0.002	0.01	0.03	0.00	0.06	0.01	12
Taxiway Paving	0.001	0.004	0.01	0.00	0.02	0.00	5
Total Emissions[a]	**0.003**	**0.014**	**0.04**	**0.00**	**0.08**	**0.01**	**17**
Indicator Threshold	**NA**	**250**	**NA**	**250**	**250**	**250**	**NA**
Conformity *de minimis*	**50**	**NA**	**100**	**NA**	**NA**	**NA**	**NA**
Exceed Threshold	**No**	**No**	**No**	**No**	**No**	**No**	**N/A**

Note: Calculated values and totals have been rounded
Key: CO_2e (mt) = carbon dioxide equivalent in metric tons; N/A = not applicable

4.5 CULTURAL RESOURCES

4.5.1 Analysis Methodology

Cultural resources are subject to review under both federal and state laws and regulations. Under the NHPA of 1966 (as amended), federal agencies must determine the significance of cultural resources under their jurisdiction by evaluating them relative to NRHP eligibility criteria. The NRHP criteria for evaluation (ACHP 2015) state that, "The quality of significance in American history, architecture, archeology, 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 distinctive characteristics of a type, period, or method of construction, or 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

(d) that have yielded, or may be likely to yield, information important in prehistory or history."

Cultural resources that have been determined to be significant are eligible for listing on the NRHP and are called historic properties. Section 106 of the NHPA and its implementing regulations (36 *CFR* Part 800) require federal agencies to take into account the effects of their undertakings (i.e., any federally initiated, licensed or permitted projects) on historic properties. An effect may be considered adverse if it changes those qualities of a historic property that qualify it for the NRHP. The NHPA also requires the agency to consult with the SHPO regarding the undertaking and any effects to historic properties.

DoD *American Indian and Alaska Native Policy* and implementing instructions (DoDI 4710.02; AFI 90-2002) provide guidance for interacting and working with federally recognized Native

American governments. DoD policy requires that installations provide timely notice to, and consult with, tribal governments prior to taking any actions that may have the potential to significantly affect protected tribal resources, tribal rights, or Native American lands.

Analysis of potential impacts to cultural resources considers impacts that may occur by:

- Physically altering, damaging, or destroying all or part of a resource.
- Altering characteristics of the surrounding environment that contribute to the resource's significance.
- Introducing visual or audible elements that are out of character with the property or alter its setting.
- Neglecting the resource to the extent that it deteriorates or is destroyed.

Direct impacts can be assessed by identifying the types and locations of proposed activities and determining the exact location of cultural resources that could be affected. Indirect impacts occur later in time or farther from the Proposed Action.

4.5.2 Alternative 1 – No Action Alternative

Under the No Action Alternative, there would be no changes in DAFB operations relative to baseline conditions. Therefore, there would be no additional impacts to historic properties under the No Action Alternative.

4.5.3 Alternative 3 – Increase Operations with an FBO Tenant

Under Alternative 3, the construction of a new 82-foot-wide taxiway and the reconstruction of the existing taxiway would be required to support the proposed increase in civil aircraft operations at the CAT. The DAFB ICRMP ensures that Dover AFB is legally compliant with the NEPA. Archeological findings as a result of construction related activities associated with Alternative 3 would be managed by the ICRMP. Potential impacts to cultural resources associated with the proposed increase in annual civilian operations are described in the subsections below.

4.5.3.1 Archaeological Resources

Numerous cultural resource studies have been conducted on Dover AFB in compliance with Section 106 and Section 110 of the NHPA. One archaeological study identified the potential for the presence of historical burial sites. The burial site Cemetery 1 is in the area between the existing and proposed CAT taxiway ramp connections. The probability for encountering historic burials within the project area is low. However, the only way to conclusively determine if the recorded anomalies represent grave shafts is to conduct stripping or excavation. Therefore, due to the inability of the GPR survey and background research to definitively demonstrate the presence or absence of a historic cemetery, it is recommended in the ICRMP that ground-disturbing activities be monitored by a professional archaeologist when the CAT taxiway connections are constructed (see **Appendix I**).

Increasing use of DAFB airspace with additional aircraft operations would cause an increase in overall time-averaged noise levels to the 56 historic properties beneath the airspace (see **Table 3.5-1** and **Table 3.5-2**). As described in **Appendix G**, scientific studies of the effects of noise and vibration on historic properties have demonstrated that flight operations would be unlikely to cause damage. The incremental increase in overflights of any individual historic resource would be

infrequent and of a short duration and would not diminish the characteristics that make the sites eligible for the NRHP or the NHLP. This action and change to the historic setting would not change the character or use of the historic properties. The minimal increase in visual or audible elements introduced by the undertaking would not diminish the integrity of the properties' significant historic attributes and would not alter the characteristics that qualify them for inclusion in the NRHP or the NHLP.

DAFB ATC instructions take precedence over noise abatement procedures and they have indicated that all aircraft are to avoid flights over of the Dickinson Mansion, Round Barn, and the Manor at Cool Springs. Furthermore, unless there is a risk to flight safety, DAFB ATC prohibits multi-engine aircraft from flying over the Dover Capitol Area below 3,000 feet AGL. Compliance with Section 106 of the NHPA, including continued SHPO consultation to identify any known historic resources, would be accomplished prior to implementation of any action at DAFB. Therefore, the proposed increased use of DAFB airspace by additional aircraft operations would cause no adverse effect to the 56 historic properties beneath the airspace.

4.5.3.2 Traditional Cultural Resources

There are three federally recognized tribes that have potential historic and cultural ties to the land now occupied by DAFB. The USAF has completed consultation with the Delaware Nation and the Delaware Tribe of Indians. Consultation covers all proposed undertakings that have a potential to affect properties of cultural, historical, or religious significance to the tribes. The tribes were also asked to concur with USAF's position that allowing the increased flights described in the Proposed Action would not have an adverse effect on historic properties. Neither the Delaware Nation nor the Delaware Tribe of Indians identified any Native American traditional resources, Traditional Cultural Properties (TCPs), or places of traditional religious and cultural significance in the APE. Both the Delaware Tribe of Indians and the Delaware Nation confirmed they had no objections to the project. Consultation with the Stockbridge-Munsee Community Band of Mohican Indians of Wisconsin is pending (see **Appendix C**).

4.5.3.3 Consultation

The USAF's consultation with the SHPO has determined that the undertaking will have no adverse effects on historic properties in accordance with 36 CFR § 800.4(d)(1). The Delaware SHPO responded that they have no concern for potential effects on historic architectural resources with regards to the construction of the second taxiway (see **Appendix C**).

The Delaware SHPO - Division of Historical and Cultural Affairs requested, and was provided, a copy of the Final Noise Report (see **Appendix G**) to aid in their review. The DE SHPO will review this EA to provide a response to the ongoing Section 106 consultation with DAFB regarding additional flights authorized in the new JUA with the State of Delaware (see **Appendix C**).

4.6 BIOLOGICAL RESOURCES

4.6.1 Analysis Methodology

Significance criteria for assessing impacts to biological resources are based on four major elements:

- The *importance* of the resource, in legal, commercial, recreational, ecological or scientific terms;
- The *proportion* of the resource that would be affected, relative to its abundance in the region;
- The *sensitivity* of the resource to proposed activities; and
- The *duration* of the ecological consequences.

Impacts to biological resources would be significant if important species or habitats (i.e., species or habitats considered significant by state or federal natural resource agencies) are adversely affected over relatively large areas; a large proportion of an important species or habitat within a region is adversely affected; or if disturbances related to Alterative 3 cause significant reductions in population size or distribution of an important species. The duration of an impact also affects its significance level. For example, temporary impacts (i.e., noise associated with overflights) are typically considered less significant than permanent impacts (such as a land conversion).

4.6.2 Alternative 1 – No Action Alternative

Under the No Action Alternative, there would be no changes in DAFB operations relative to baseline conditions. Therefore, there would be no additional impacts to biological resources.

4.6.3 Alternative 3 – Increase Operations with an FBO Tenant

Under Alternative 3, the potential impacts to biological resources are described in the subsections below.

4.6.3.1 Vegetation and Wildlife

The construction of the new CAT taxiway and reconstruction of the existing CAT taxiway would result in minor ground disturbance. Due to the limited construction duration and minimal area of ground disturbed, the proposed taxiway construction will not have a significant impact on important vegetation, wetlands or sensitive habitats.. The potential effects on wildlife due to increased aircraft operations would be limited to noise and bird-aircraft collisions.

Increased civil aircraft operations would increase the potential for aircraft to strike birds. The DAFB BASH Plan establishes procedures and actions to minimize the potential for aircraft to strike birds. The additional 11,500 aircraft operations that would utilize the CAT represents less than 20% of the overall DAFB annual flight operations. This increase would inherently increase the potential for BASH mishaps, but overall, would not pose threats to wildlife at the behavioral, population, or species level.

Potential sources of noise impacts to wildlife would be from daily military and civilian operations at DAFB (such as touch-and-go operations, takeoffs, and landings). Alternative 3 noise modeling results indicate minor increases in these noise exposure levels (see **Section 4.2.3**). Therefore, the overall proposed noise levels may affect, but would not likely adversely affect wildlife since resident species would likely have acclimated to existing noise. However, subjecting wildlife to any increase in noise levels has the potential to elicit startle responses and increased expenditure of energy during critical periods such as nesting.

4.6.3.2 Threatened, Endangered, and Other Special Species (Federal List)

Red Knot (Threatened)
The red knot *(Alidris canutua rufa)* is a threatened migratory shorebird likely to become endangered within the foreseeable future throughout all or a significant portion of its range, which is encompassing of the ROI (see **Figure 3.1-3**). No critical habitat has been designated for this species and there are no red knots present in the proposed area of construction. To minimize potential collisions with birds, all additional aircraft operations would be conducted as they are today, which is in compliance with the DAFB BASH plan.

USFWS consultation verified the majority of red knots are present along the shores of the Delaware Bay during their brief Spring stay from May 7 to June 7. During this time, red knots can be observed from the Bombay Hook National Wildlife Refuge to the Prime Hook National Wildlife Refuge. The areas between these two Refuges also support many red knots with the highest concentrations found at Mispillion Harbor and the Milford Neck Wildlife Areas. USFWS mitigation recommendations are discussed in **Section 4.6.3.5**.

Swamp Pink (Threatened)
Swamp pink (*Helonias bullata*) is a threatened flowering plant likely to become endangered within the foreseeable future throughout all or a significant portion of its range, which is encompassing of the ROI (see **Figure 3.1-3**). No critical habitat has been designated for this species. The Alternative 3 results in minor ground disturbance adjacent to existing taxiways connecting to the CAT. Therefore, it is determined that Alternative 3 would have no effect on this species.

Bald Eagle (Federally Listed)
Since 2011, DAFB has conducted annual bald eagle monitoring surveys. Bald eagle presence has been documented, including overflight and perching within habitat areas in the vicinity of the DAFB runways. Bald eagles are known to nest throughout the ROI (see **Figure 3.1-3**). DAFB holds a Migratory Bird Depredation Permit which allows for non-lethal harassment of eagles to prevent harm to property or human health. Any known bald eagle nest locations would be avoided during sensitive nesting periods. Furthermore, existing flight patterns do not impact any documented bald eagle habitats. Therefore, the implementation of Alternative 3 may affect, but not likely adversely affect bald eagles.

4.6.3.3 State Listed Species

Although a variety of state listed species are known to occur within the ROI, most are either flowering plants, reptiles or small mammals. Due to the minor area of ground disturbance anticipated with the taxiway construction, Alternative 3 may affect, but not likely adversely affect these species. Effects to avian state listed species are discussed under Migratory Birds.

4.6.3.4 Migratory Birds

Due to its location within the Atlantic migratory flyway and proximity to grain and bean producing farms, water bodies, and wildlife refuges, DAFB is in an area of high BASH potential.

The BHWG meets quarterly to review wildlife strike data, identify and recommend actions to reduce hazards, and recommend changes in operational procedures. BHWG meetings discuss but are not limited to the following topics: wildlife strike statistics, bird activity, habitat management/modification, BASH plan procedures, BASH awareness and education, and activities/results of the wildlife management contractor.

By incorporating specific practices into the base land management plan, DAFB maintains a flight line habitat less attractive to birds and other wildlife. In an effort to reduce BASH potential, DAFB manages grass heights throughout the entire installation, controls weeds, and removes edge effects conducive to attracting species that could interfere with aircraft operations.

Although the increase in civil flight operations at DAFB would inherently increase the potential for BASH mishaps, tenants utilizing the CAT for aircraft operations would continue to follow the habitat modification procedures developed for DAFB's BASH program to minimize risk. Bird-aircraft strikes are rare and would not likely adversely affect any species on the population or regional level and the potential for aircraft collisions with listed species are so low as to be discountable.

4.6.3.5 Mitigation

To minimize potential impacts to red knots during their Spring migration, USFWS recommended classifying the entire shoreline between Bombay Hook National Wildlife Refuge and Prime Hook National Wildlife Refuge as a noise sensitive area between May 7 and June 7. In addition, USFWS recommended all flights stay 2,000 feet AGL while traversing through noise sensitive areas. USFWS indicated that if these recommendations are followed and included in a future JUA, then potential impacts to red knots can be avoided.

All additional civilian flight operations would continue to use the same approach and departure flight patterns as DAFB aircraft and would remain under DAFB ATC/RAPCON control. Current DAFB flight profiles over Bombay Hook National Wildlife Refuge and Prime Hook National Wildlife Refuge are above 2000' AGL. Therefore, it is determined that Alternative 3 may affect, but would not likely adversely affect the red knot (see **Appendix C**).

4.6.3.6 Consultation

DAFB consulted with the federal and state agencies seeking concurrence with the finding that the Proposed Action under Alternative 3 may affect, but would not likely adversely affect biological resources. The USFWS and DNREC's Division of Fish & Wildlife both agree that the Proposed Action, under Alternative 3, would have minimal population level impacts and disturbance to biological resources if the USFWS mitigation recommendations are followed and incorporated into a new JUA (see **Appendix C**). Continued consultation between DAFB and USFWS will confirm a "not likely to adversely affect" finding.

4.7 LAND USE

4.7.1 Analysis Methodology

Land use and recreational resources are evaluated to determine if any proposed project activity would preclude or alter the suitability of an area for ongoing or intended land uses. In general, land use impacts would occur if project activities were (1) inconsistent or noncompliant with applicable land use plans and policies, (2) preventing or displacing continued use or occupation of an area or severely diminishing its attributes for ongoing uses, or (3) incompatible with affected areas to the extent that public health or safety is threatened.

4.7.2 Alternative 1 – No Action Alternative

Under the No Action Alternative, flight operations at DAFB and utilization of the CAT would continue as currently conducted, as discussed in **Section 1.2** and **Section 2.5**. The Kent County and City of Dover master plan updates will continue to define future land use changes within the ROI. Under the No Action alternative, future CAT site expansion would not be viable.

4.7.3 Alternative 3 – Increase Operations with an FBO Tenant

Under Alternative 3, the additional 11,500 civil flights would result in an increase of 61 acres affected by a DNL greater than 65 dB compared to the approved scenario (Alternative 1). A key factor in determining future land use is noise, since anticipated DNL can make certain land uses incompatible. However, the increases in DNL under Alternative 3 do not exceed the thresholds described in FAA Order 1050.1F. In addition, as previously discussed in **Section 4.2.3**, most of the resulting noise from Alternative 3 are along existing noise contours (see **Appendix G**).

Under Alternative 3, the impacts to land use are determined to be insignificant. No impacts to land use are anticipated beneath the flight paths due to the minor variations between the existing and projected noise contours. In addition, the construction of a new taxiway and the improvement of the existing taxiway between the CAT and DAFB are compatible with the existing land use of the base.

4.8 WATER RESOURCES

4.8.1 Analysis Methodology

The impacts to the water resources are evaluated by the extent in which water quality and quantity are affected by the Proposed Action. The CWA of 1972 is the primary policy that regulates the discharge of pollutants and establishes water quality standards nationwide. Within the state of Delaware, the DNREC oversees the implementation and enforcement of the CWA via the National Pollutant Discharge Elimination System (NPDES) program.

Utilizing the Delaware Urban Runoff Management Model (DURMM), a conservative approach was used to analyze the proposed improvements with regards to stormwater management, using the following assumptions:

1. Proposed improvements are categorized as new impervious area
2. Pre-developed conditions are identified as "Woods/Meadow"

3. HSG (Hydrologic Soil Group) C was assumed for the project site
4. Drainage area is assumed to be at the Limit of Disturbance (LOD)
5. The LOD is assumed to equal the area of the proposed improvements
6. Proposed improvements are not considered "Redevelopment" under the 5101 Sediment and Stormwater Regulations

The stormwater management analysis is limited in scope and does not specify the type, location, or quantity of any potential BMPs. In addition, it is also assumed that any additional runoff resulting from the Proposed Action would be treated by existing stormwater facilities on DAFB.

4.8.2 Alternative 1 – No Action Alternative

Under the No Action Alternative, flight operations at DAFB and utilization of the CAT would continue as currently conducted, as discussed in **Section 1.2** and **Section 2.5**. Therefore, there would be no impacts to water resources under the No Action Alternative.

4.8.3 Alternative 3 – Increase Operations with an FBO Tenant

Under Alternative 3, preliminary stormwater analysis was conducted for the construction of the new 82-foot-wide taxiway, and the reconstruction of the existing CAT taxiway. This construction would add approximately 1.5 acres of new impervious surface. Preliminary stormwater analysis determined the Resource Protection Event Volume (RPv) to be 2.50 inches (see **Appendix L**). The RPv is the post-development annualized volume of runoff produced by a storm having a 99% probability of occurrence, or the 1-year, 24-hour rainfall event. The target runoff for an equivalent wooded condition is 0.91 inch. According to Section 5.2.3.1.1 from the *5101 Sediment and Stormwater Regulations* for forested areas within the LOD, the treatment volume shall be the difference between the post-developed condition and an equivalent wooded condition, up to a maximum of 1 inch of runoff (DNREC 2019a). Based on the DURMM analysis and to comply with the RPv criteria, a maximum of up to 1 inch of runoff would need to be treated. On a volumetric basis, 1 inch of runoff across 1.5 acres of new impervious surface is approximately 5,627 cubic feet of stormwater runoff.

The existing stormwater facility located northwest of the new taxiway could potentially be retrofitted and sized appropriately to treat all stormwater on site. However, depending on the configuration of the existing stormwater system (open or covered ditches and underground pipes), additional BMPs such as sluice gates may be necessary to ensure no environmental pollutants enter the DAFB stormwater conveyance system.

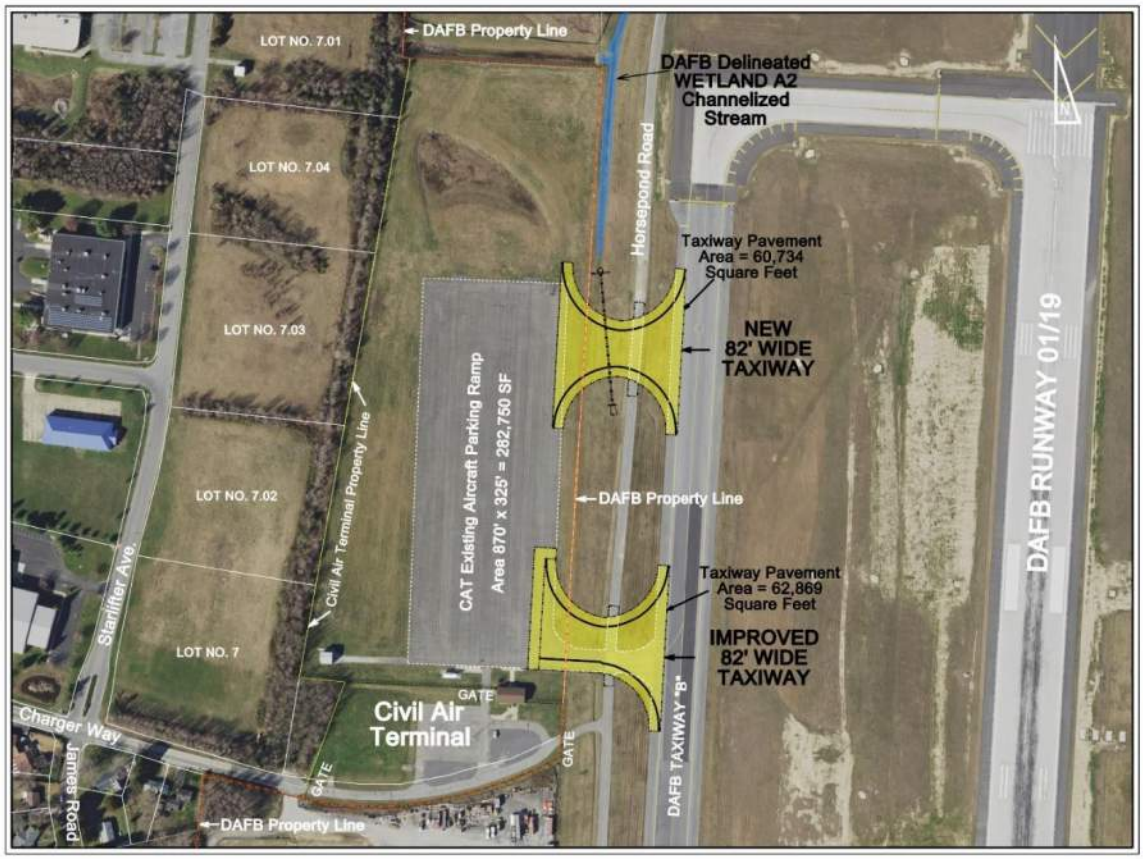
Figure 4.8-1 shows the location of wetlands in relation to CAT taxiway improvements. Delineated wetlands on DAFB property closest to the taxiway improvements consist of wetland A2, 0.2044 acres of channelized stream(s). This wetland is located to the north of the proposed taxiway ramp construction and is not impacted. Federal Emergency Management Agency flood zone mapping indicates that the CAT taxiway improvements will not occur in a 100-year or 500-year floodplain.

All applicable water resource and sediment and erosion control permits will be obtained prior to implementing the proposed taxiway improvements. The location of wetlands outside of the DAFB

boundary would require a subsequent wetland delineation and jurisdictional determination prior to CAT site expansion construction activities on the CAT site. The potential impacts and the appropriate mitigation measures would need to be identified prior to CAT site expansion construction activities. Any site expansion of the CAT outside of the DAFB would require all necessary permits from federal and state environmental regulators.

A stormwater analysis of the CAT site and surrounding properties outside of the DAFB boundary was conducted to ensure that any future CAT site expansion projects will comply with Section 438 Regulations and the State of Delaware Sediment and Stormwater Regulations. The overall small area of potential impervious cover, combined with the information collected from studies on the off-base portion of the proposed taxiway improvements, indicates that meeting stormwater requirements while using LID practices is highly feasible. The ability to incorporate infiltration and LID practices into any future project ensures that surface water quality levels are not negatively impacted, and stream flows are not increased.

Figure 4.8-1 Delineated Wetland Locations



4.9 EARTH RESOURCES

4.9.1 Analysis Methodology

The impacts to earth resources are evaluated by considering the protection of unique geological features, soil erosion mitigation, and the siting of facilities in relation to potential geologic hazards and soil limitations. Impacts may be considered significant if the Proposed Action substantially affects any of these factors. Typically, impacts to earth resources can be reduced or avoided if proper construction techniques, erosion controls, geotechnical analysis, and structural engineering designs are incorporated into project development.

The analysis of impacts to earth resources involves identification of potentially affected resources, examination of the potential effects the Proposed Action may have on the resources, assessment of the significance of potential impacts, and provision of management measures in the event that potentially significant impacts are identified.

4.9.2 Alternative 1 – No Action Alternative

Under the No Action Alternative, flight operations at DAFB and utilization of the CAT would continue as currently conducted, as discussed in **Section 1.2** and **Section 2.5**. Therefore, there would be no impacts to earth resources under the No Action Alternative.

4.9.3 Alternative 3 – Increase Operations with an FBO Tenant

Under Alternative 3, the taxiway construction and reconstruction would disturb approximately 1.5 acres of soil in total, with approximately 1.3 acres on DAFB and 0.2 acres on CAT property. This soil disturbance would occur in grassy, landscaped and previously disturbed areas (see **Figure 2.2-1**). Adverse impacts to soils and the associated potential indirect impacts to water resources can be mitigated through the implementation of BMPs. Under the NPDES program, DNREC requires a Construction General Permit for surface disturbance of one acre or more. Compliance with this permit involves development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) and erosion and sediment control plan that includes site-specific management measures.

Implementation of Alternative 3 would cause insignificant impacts to the geologic units underlying the land within the ROI and no unique geologic features are present in the area of proposed construction (DGS 1966). Although the mattapex loam soil in this area is classified as prime farmland, the aeronautical land use designation and highly modified nature of the DAFB airfield negates that classification. Therefore, no significant impacts on earth resources are expected as a result.

4.10 VISUAL RESOURCES

4.10.1 Analysis Methodology

Visual impact analysis typically considers whether the Proposed Action obstructs, alters, or removes any visual resource fundamental to the aesthetic integrity of an area. Construction, demolition, and development are common activities which have the potential to affect visual resources. Potential impacts to the viewsheds of any cultural, biological, or other relevant impact category are discussed in their respective sections.

4.10.2 Alternative 1 – No Action Alternative

Under the No Action Alternative, flight operations at DAFB and utilization of the CAT would continue as currently conducted, as discussed in **Section 1.2** and **Section 2.5**. Therefore, there would be no impacts to visual resources under the No Action Alternative.

4.10.3 Alternative 3 – Increase Operations with an FBO Tenant

Under Alternative 3, the potential impacts to the visual environment would be in kind with current visual sightings of large military aircraft. However, the majority of new aviation activity would likely consist of smaller jet engine aircraft instead of medium to large cargo aircraft.

In addition to the presence of military operations, individuals within the ROI may observe up to 150 new civil aircraft operations per day. Communities along DAFB flight paths like Little Creek and Kitts Hummock would be the most affected by any potential visual impacts associated with an increase in aircraft sightings.

The construction of the new 82-foot-wide taxiway, and the reconstruction of the existing CAT taxiway, would have no adverse impact on the visual environment due to the limited scope and nature of the construction activity.

5.0 CUMULATIVE EFFECTS

The federal CEQ regulations that implement the procedural provisions of NEPA defines cumulative effects as the "impact on the environment which results from the incremental impact of the action when added to past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). Cumulative effects are considered the 'total' effects on an environmental resource when there is a relationship between a Proposed Action and other actions expected to occur in a similar location or during a similar time period. The effects may then be incremental and result in cumulative impacts.

The scope of the cumulative effects analysis involves both the geographic extent of the effects and the timeframe in which the effects could be expected to occur. For the resources not carried forward for analysis that are listed in **Section 3**, a detailed cumulative effects analysis is not meaningful given the lack of impacts associated with implementation of the Proposed Action under Alternative 3. The resources that were evaluated for potential impacts, are included in the cumulative effects analysis.

5.1 PAST, PRESENT, AND RESONABLY FORESSEABLE ACTIONS

Past, present, and reasonably foreseeable projects were reviewed to determine the potential cumulative impacts based on Alternative 3's effect on environmental resources. Past and present projects are accounted for in the environmental baseline described in **Section 3** of this EA. Projects within DAFB are listed in **Table 5.1-1**.

Table 5.1-1 Past, Present, and Reasonably Foreseeable DAFB Projects

Project Number	Project Name	Military Construction (MILCON) or Project Number (if applicable)	Fiscal Year
New Construction			
1	Security Forces Complex – Southeast and South Sides of Base	FJXT103000	2016
2	Install Concrete Pad and Gate	N/A	2017
3	Install Bird Netting and Vinyl Curtains in East Opening of Outsized Cargo B551	N/A	2018
4	Civil Engineering Compound – West and South Sides of Base	FJXT173000	N/A
5	Museum Conference Center	FJXT123002	N/A
Facility Renovation and/or Repair			
6	Building 212 (Child Development Center) Renovation	FJXT151032	N/A
7	Repair Multiple Roofs	N/A	2017
8	Repair HVAC and 1st Floor Interiors B203	N/A	2017

Project Number	Project Name	Military Construction (MILCON) or Project Number (if applicable)	Fiscal Year
9	Repair Exterior Finishes Air Traffic Control B502	N/A	2017
10	Repair Bay Fire Suppression System B550		2018
11	Repair Taxiway Echo	N/A	2018
12	Maintain N. Ramp Pavement - Replace Spall Damaged Slabs		
13	Maintain N. Ramp Pavement – Replace Spall Damaged Slabs	N/A	2018
14	Repair Munitions Gate Road Pavement	N/A	2018
15	Repair Computer Room Exhaust System B310	N/A	2018
16	Maintain Exterior Paint	N/A	2018
Infrastructure			
17	Recreational Vehicle Parking Expansion	FJXT115003	2011
18	Softball Field Improvements	FJXT121122	2013
19	Runway 01/19 Replacement		2014
20	Intersection of Atlantic Street and Evreux Street Realignment	FJXT111249	2015
21	Taxiway Echo Replacement	FJXT051003	2015
22	Type III Hydrant System Construction	FJXT073020	2017
23	Maintain Roofs Multiple Buildings	N/A	2017
24	Airfield Rubber Removal and Stripping	N/A	2017
25	Add/Alter Dorm Landscaping	N/A	2017
26	Aircraft Maintenance Hangar	N/A	2017
27	Stormwater Maintenance Papa Row Swale	N/A	2017
28	Maintain/Improve Running Trail	N/A	2017
29	Maintain/Improve Playing Fields	N/A	2017
30	Maintain Exterior Pain B401	N/A	2017
31	Improve Outdoor Patio B403	N/A	2017
32	Maintain Surface Refinishing Tennis and Basketball Courts	N/A	2017
33	Overhead Utilities Burying	N/A	2018
34	Construct LRS Personnel Door and Stairway for Fire Egress and Operations B639	N/A	2018
35	Repair (SUS) EOD Shop B727 and Construct Secure Parking	N/A	2018
Demolition			
36	PMEL Facility 913 and 919	N/A	2017
37	Building 459	N/A	N/A
38	Demolition and Reconstruction of the Dover AFB Middle School/Welch Elementary School	N/A	N/A

Project Number	Project Name	Military Construction (MILCON) or Project Number (if applicable)	Fiscal Year
Other			
39	Environmental Compliance Support for Storm Water Programs	N/A	2017
40	Allied Support for DFAC Refrigerator Pad and Kitchen Receptacles B403	N/A	2017
41	Purchase of 11.25 acres of property within safety easements	N/A	2019
42	Purchase of 100 acres of property between DAFB and St. Jones River	N/A	2020
43	Environmental Assessment for Monster West and Altered C-5M, C-17 Flight Operations at DAFB	N/A	2016

Source: DAFB 2018b, Draft Environmental Assessment for Purchase of 100 Acres of Privately-Owned Land

The 2018 Kent County Comprehensive Plan and the Dover - Kent County Metropolitan Planning Organization (MPO) Transportation Improvement Plan (TIP) do not identify any residential, commercial or industrial development projects or actions that would directly affect DAFB environmental resources. However, **Table 5.1-2** highlights projects in Kent County and the City of Dover that may indirectly result in cumulative effects on resources in the DAFB environment. The majority of projects listed in **Table 5.1-2** are those associated with the expansion and renovation of the Kent County regional resource facility (i.e. the wastewater treatment plant). Investment and improvement in conveyance systems, sanitary sewer districts, pump stations, and other related infrastructure is planned to take place throughout Kent County.

Table 5.1-2 Past, Present, and Reasonably Foreseeable Dover and Kent County Projects

Project Number	Project Name	Project Number (if applicable)	Fiscal Year
City of Dover			
1	Dover AFB, Danner Farm, Lebanon Consolidation (Electric substation)	N/A	2021
Dover - Kent County Metropolitan Planning Organization (MPO)			
2	Garrison Oak Connector Road	N/A	2022-2030
Kent County			
3	TMDL Study for Support of Site-Specific Water Quality Standards	T1	2008-2022
4	TMDL Offsite Nutrient Reduction Project - Additional Site	T3	2019-2022

Kent County Continued			
5	Land Acquisition & Permitting to Extend Effluent Flow Limitations Beyond Stream Discharge	T5	2009
6	Replace Pumps and Valves at Recycle Pump Stations 1 & 2	T6	2018-2020
7	Plant-wide Power Generator	T7A	2013-2017
8	Air Blower System Optimization	T7B	2017-2018
9	Biosolids Capacity Expansion with Waste Activated Sludge Screens	T8C	2018
10	Site Lighting Replacement	T9	2017
11	Clarifier improvements: Sludge Blanket Detectors for 4 units	T12	2017
12	Clarifier improvements: Floor Rehabilitation of 2 units	T13	2017
13	Replace Influent Bar Rake#2 (Influent Building)	T14	2018
14	South Aeration Basin Liner Replacement	T15A	2018
15	South Aeration Basin Liner Replacement	T15B	2017
16	Site Improvements Replace Paved Surfaces	T16	2018-2019
17	Sand filter Covers For Cells & Cascade	T17	2018-2021
18	Clarifier Improvement - Weir Covers	T18	2020-2021
19	Solids Handling Building Roof	T19	2017
20	North Aeration Basin Diffuser Replacement	T20A	2017
21	North Aeration Basin Liner Venting	T20B	2019-2021
22	Aeration Basin Diffuser Replacement	T21	2022-2023
23	Clarifiers 3 & 4 Mechanism Replacement	T22	2022-2023
24	Pipeline Condition Assessment	CS4	2017-2019
25	Double Run Area: Hilltop Area Sanitary Sewer Expansion - Phase 2	SSD2B	2016

Kent County Continued			
26	Milford Neck Area Sanitary Sewer Expansion	SSD3	2015-2016
27	Double Run Area: PARIS Villa/London Village Sanitary Sewer Expansion -Phase 1	SSD4A	2015
28	Double Run Area: Paris Villa/London Village Sanitary Sewer Expansion - Phase 2	SSD4B	2016
29	Pump Station 1 Myrna) Lag Pump Replacement	Pl	2020-2021
30	Pump Station 3 (Dover) New Pump for Position 3	P2B	2016
31	Pump Station 3 (Dover) Wet well capacity Improvements	P2C	2017-2018
32	Pump Station 3 (Dover) Wet Well Isolation Valve	P2E	2019
33	Pump Station 4 (Rising Sun) Pump Replacement	P3	2018
34	Pump Station 4 (Rising Sun) Suction Valve Replacement	P3B	2019
35	Pump Station 7 (Milford) Lead Pump Replacement	P4	2018
36	Pump Station 14 (lsaacs) Lead Pump Replacement	P5	2020
37	Replace Emergency Power Generator for Various Pump Stations	P8	2018-2023
38	Purchase Spare Pumps for Various Pump Stations	P9	2018-2023
39	Relocate Control and Transfer Switches	P10	2017-2020
40	Relocate Septage Screen and Build Pre-Treatment System (W Dennevs Road)	P11	2013-2016
41	Pump Station 2 Pump #3 Replacement	P12	2022

Source: City of Dover 2019 Comprehensive Plan, Kent County 2018 Comprehensive Plan, Dover/Kent MPO 2017 Metropolitan Transportation Plan

5.2 CUMULATIVE EFFECTS ANALYSIS

As described in the **Section 4** of this EA, the effects of Alternative 3 range from zero to limited impacts to noise and air quality, airspace, safety, cultural resources, biological resources, land use,

visual, and water resources. The following sections discuss potential cumulative effects Alternative 3 would have on environmental resources on DAFB.

5.2.1 Airspace

A review of past and recent NEPA documents and FAA proposed plans or projects did not indicate any plans or projects that would result in cumulative impacts to regional airspace, including the recent implementation of the DAFB Monster West training corridor (DAFB 2016). Although expansion of the Cheswold Airport and Delaware Airpark north of Dover (Kent 2018) along with various minor improvements at surrounding international airports, no changes to airspace are proposed. The airspace surrounding DAFB is currently used on a daily basis by both C-5M, C-17 and transient military and civilian aircraft.

Because the proposed increase in civil flight operations at DAFB would follow the same flight paths and procedures as current flight operations, the Proposed Action under Alternative 3 would not result in cumulative impacts to any of the resource areas discussed in this EA. Therefore, implementation of the Proposed Action under Alternative 3 would not be expected to result in any significant cumulative airspace effects in combination with other past, present, or reasonably foreseeable actions.

5.2.2 Noise

USAF recently upgraded their military aircraft to newer models of the C-17 and C-5M. The *Final Environmental Assessment for Flight Operations at Dover AFB, Delaware. April 2016*, involving the changes to C-17, C-5M and transient aircraft operations concluded that noise impacts were decreased as a result. For the purposes of evaluating noise impacts, these findings serve as the baseline condition representing current operations.

The increase of civil flight operations are anticipated to result in minor noise increases resulting from the increase of civil flight operations from 13,500 to 25,000. Because civil flight operations would be expected to follow the same flight paths currently used by military aircraft, changes in noise contour and extent between the Approved and Proposed scenarios would primarily occur on and near the extended runway centerlines in areas already exposed to frequent overflight noise. This includes the parcels northeast of Runway 19/01, but these increases in DNL are less than 2% and do not exceed thresholds described in FAA 1050.1F.

Static engine runs on the CAT parking ramp are anticipated to result in minor noise increases. If future CAT tenant development and/or aircraft operations deviate substantially from the modeling parameters described in **Section 4.2**, noise impacts could also differ, and supplemental analysis may be appropriate.

The construction of the new CAT taxiways would result in temporary minor noise increases from construction equipment and concrete demolition. Day-to-day operations of the expanded CAT could include increased vehicular traffic (e.g., delivery trucks) and equipment noise (e.g., forklifts; heating, ventilation, and air conditioning [HVAC]). The nature of the noise would be dependent on the future tenant at the expanded CAT. For example, extensive nighttime activities may include frequent truck traffic. If heavy trucks were used as part of the CAT operations, noise

levels generated by the trucks would be similar to levels stated for dump trucks in **Section 4.2.3.4**. Future noise analysis and a traffic impact study may be required depending on future tenant activities.

Noise generated from programed DelDOT construction roadway projects within the vicinity of DAFB do not require noise mitigation due to the temporary nature of the construction activity. In addition, reviews of the Kent County Comprehensive Plan 2018, the Dover-Kent County MPO TIP, and the DelDOT 2019-2022 TIP did not identify future projects that would create noise that would result in significant cumulative noise impacts. There are no reasonably foreseeable DAFB projects that would contribute to a cumulative effect to noise. Therefore, implementation of the Proposed Action under Alternative 3 would not be expected to result in any significant cumulative noise effects in combination with other past, present, or reasonably foreseeable actions.

5.2.3 Safety

The *FAA Strategic Plan FY2019-FY2022* identifies a variety of different initiatives, including the utilization of data-driven safety approaches. The FAA Strategic Plan is continually updated to reflect best safety practices. These initiatives are being implemented to increase flight safety throughout the NAS. The FAA Strategic Plan and DAFB safety guidelines were reviewed to determine if Alternative 3 would result in a significant impact to safety. This review determined that Alternative 3 did not present a significant safety concern when FAA strategic plan initiatives are followed.

There are no reasonably foreseeable DAFB projects that would contribute to a cumulative effect to safety. Therefore, implementation of the Proposed Action under Alternative 3 would not be expected to result in any significant cumulative safety effects in combination with other past, present, or reasonably foreseeable actions.

5.2.4 Air Quality

The majority of emissions generated by the project would occur from commercial aircraft operations up to an altitude of 3,000 feet AGL and across several square miles that make up the DAFB airspace and adjoining aircraft flight patterns. As detailed in **Section 4.4**, these emissions would be adequately mixed through this volume of atmosphere to the point that they would not result in substantial ground-level concentrations in any localized area.

A variety of infrastructure projects that have been recently implemented within the Dover 'region of influence' contribute towards cumulative air emissions and are quantified as 'Kent County Year 2014 Emissions' for use in air quality modeling purposes. The project region currently attains all NAAQS and emissions from the Proposed Action under Alternative 3 and would account for no more than 2.8% of any air pollutant identified in the Kent County Year 2014 emissions, representing an annual average.

Therefore, implementation of the Proposed Action under Alternative 3 would not be expected to result in any significant cumulative emissions from proposed operational activities, in combination with emissions from past, present, or reasonably foreseeable projects (see **Tables 5.1-1** and **5.1-2**).

5.2.5 Cultural Resources

No direct impacts to NRHP or NHL would occur with implementation of the Proposed Action under Alternative 3. The incremental changes in the visual and audible elements introduced by the Alternative 3 would not diminish the integrity of any properties' significant historic attributes and would not alter the characteristics that qualify properties as eligible for the NRHP or NHLP. The increase of the DNL between the currently approved number of CAT civil flight operations and the proposed number of civil flight operations does not exceed noise thresholds described in FAA 1050.1F.

DAFB ATC instructions take precedence over noise abatement procedures and they have indicated that all aircraft are to avoid flights over NRHP listed sites; Dickinson Mansion, Round Barn, and the Manor at Cool Springs. Furthermore, unless there is a risk to flight safety, DAFB ATC prohibits multi-engine aircraft from flying over the Dover Capitol Area below 3,000 feet AGL.

The DAFB ICRMP indicates that no cultural resources other than archaeological sites, cemeteries, and built resources have been identified at Dover AFB. The ICRMP will continue to manage any existing and future cultural resources on the DAFB.

It is reasonably foreseeable that implementation of Alternative 3 would result in construction activities associated with the future expansion of the CAT site. The ICRMP indicated that a Phase I archaeological survey for the CAT future expansion was conducted in 1998. The survey found historical artifacts associated with the Slaughter Farm in disturbed contexts. The 7K-D-131 site number was assigned. It was determined that the sites lack integrity and was determined not eligible for listing in the NRHP (see **Appendix I**). Therefore, implementation of the Proposed Action under Alternative 3, would not result in a cumulative effect to cultural resources.

5.2.6 Biological Resources

Impacts to biological resources from past projects are incorporated into the baseline data as presented in **Section 3**. Under Alternative 3, a minimal area of ground disturbance by the taxiway construction (2.8 acres) would result in minor ground disturbance to a maintained grass area between the CAT parking ramp and DAFB Taxiway "B". Due to the limited construction duration and minimal area of ground disturbed, the proposed taxiway construction will not have a significant impact on important vegetation, wetlands or sensitive habitats.

The DAFB BHWG meets quarterly to review wildlife strike data, identify, and recommend actions to reduce hazards, and recommend changes in operational procedures. The DAFB BHWG meetings discuss but are not limited to the following topics: wildlife strike statistics, bird activity, habitat management/modification, BASH plan procedures, BASH awareness and education, and activities/results of the wildlife management contractor.

Current DAFB flight profiles over Bombay Hook National Wildlife Refuge and Prime Hook National Wildlife Refuge are above 2000' AGL (see **Appendix G**). Therefore, it is determined that Alternative 3 may affect, but would not likely adversely affect the red knot. There is no critical habitat for red knots in the construction area. Existing and proposed flight patterns do not impact

any documented bald eagle habitats. No critical habitat has been designated for flowering plant species swamp pink, in the vicinity of the construction ground disturbance.

USFWS informed the USAF that increased flights at low altitudes have the potential to impact noise sensitive areas. However, as previously discussed in **Section 4.6**, no flights will occur below the 2,000-foot elevation threshold over these areas. DNREC's Division of Fish & Wildlife indicated that the Proposed Action under Alternative 3, would have minimal population level impacts to biological resources.

Therefore, implementation of the Proposed Action under Alternative 3, would not be expected to result in any significant cumulative impacts to biological resources in combination with past, present, or reasonably foreseeable projects (see **Tables 5.1-1 and 5.1-2**).

5.2.7 Land Use

Under Alternative 3, the Proposed Action of increasing the permitted annual number of flight operations and increasing access between the CAT and DAFB runways via the taxiway construction, would lay the groundwork, allowing a future tenant the potential to conduct a variety of aeronautical-related services at the CAT.

The City of Dover and Kent County have indicated in future land use plans the desire to establish a Central Delaware Aviation Complex (CDAC) to the north and west of the CAT. Development of the CDAC would require a new land use designation prior to any construction. The current land use of the areas where the CDAC may occur is comprised of primarily agricultural land uses with some industrial, commercial, and residential land uses interspersed.

If the CDAC is developed, the City of Dover would establish a new zoning district called "Industrial Park Manufacturing – Aeropark" or "IPM 3". This zoning would specifically support aviation and aerospace employment center type uses. This new zone would coincide with the land use strategy of Kent County.

Existing and future land use surrounding DAFB is managed by the City of Dover and Kent County through respective Comprehensive Plans. Due to the uncertainty of the development of the CDAC, cumulative land use effects are uncertain. Land use on DAFB property would not change as a result of the Proposed Action under Alternative 3. Therefore, implementation of the Proposed Action under Alternative 3would not be expected to result in any significant cumulative effects to land use in combination with other past, present, or reasonably foreseeable actions.

5.2.8 Water Resources

Under Alternative 3 it is reasonably foreseeable that NWI wetlands will be impacted on CAT property. NWI wetlands were identified on CAT property and are part of a larger wetland system associated with the Little Creek Watershed. The location of wetlands outside of the DAFB boundary would require a subsequent wetland delineation and jurisdictional determination prior to CAT site expansion construction activities. Delineated wetlands on DAFB property will not be impacted by the Proposed Action under Alternative 3 (see **Figure 4.8-1**).

Stormwater runoff generated by future CAT site expansion outside of the DAFB boundary has been subject to a detailed stormwater design and analysis that included in-situ infiltration testing, stormwater BMP sizing, and hydraulic analysis. It was determined through this analysis that stormwater management requirements for future projects could be met through infiltration practices, thereby reducing runoff volume, peak flow rate, and pollutant load from existing conditions. Small-scale LID practices could also potentially be incorporated into the design to reduce heat islands and encourage evapotranspiration.

DNREC is committed to preserving statewide natural resources. The 2018-2021 DNREC Capital Plan highlights several programs and projects aimed at conserving and investing in Delaware's natural infrastructure. Upon review of the Capital Plan, past NEPA documents, and municipal Master Plans, it is anticipated that the implementation of the Proposed Action under Alternative 3 in relation to the existing infrastructure on DAFB would not result in significant cumulative effects on water resources. Therefore, implementation of the Proposed Action under Alternative 3 would not be expected to result in any significant cumulative effects to water resources in combination with other past, present, or reasonably foreseeable actions.

5.2.9 Earth Resources

The increase in the number of permitted annual civil flight operations at DAFB using the CAT will have no impact on earth resources. Minor soil disturbance is an expected result of taxiway construction and would not adversely affect any earth resources on DAFB property. The quantity of soil disturbed would be minor in scale compared to the 4,000-acre total area of DAFB.

However, it is reasonably foreseeable that soil disturbance on CAT property would occur with the CAT site expansion. The magnitude of this soil disturbance related to CAT site expansion has not been determined. Construction activities associated with the CAT site expansion, may require an analysis of impacts to earth resources.

A review of other implemented projects within the ROI did not identify any projects that would contribute to significant cumulative impact to earth resources (see **Tables 5.1-1 and 5.1-2**). Therefore, it is not reasonable to anticipate that the implementation of the Proposed Action under Alternative 3 would result in a cumulative effect to earth resources in combination with other past, present, or reasonably foreseeable actions.

5.2.10 Visual Resources

An increase in civil flight operations at DAFB would be consistent with current visual sightings of large military aircraft. The observation of aircraft is a short duration event that does not remove or obstruct any visual resource fundamental to the aesthetic integrity of visual resources within the ROI.

Construction of the new CAT taxiway and reconstruction of the existing CAT taxiway would result in a new paved area between the CAT parking ramp and DAFB Taxiway "B". This paved area would not be visually intrusive to the surrounding area due to its low profile and is visually consistent with existing runway surfaces.

A review of other implemented projects within the ROI did not identify any significant cumulative effects on visual resources. Therefore, it is not reasonable to anticipate that the implementation of the Proposed Action under Alternative 3 would result in a cumulative effect to visual resources in combination with other past, present, or reasonably foreseeable actions.

6.0 LIST OF PREPARERS

Government Agency Development Team			
Name/Title		**Role**	
Environmental Element		Environmental Planning/Lead EA Development	
Dover Air Force Base		Proponent	
Government Development Team			
Name/Title	**Project Role**	**Location**	
Steve Seip	Chief, Installation Mgt	Dover AFB	
Austin Najaro	Environmental Review	AFCEC	
Frank Castaneda	Environmental Review	AFCEC	
Stephanie Johnson	Project Oversight	Delaware DOT	
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Mike Perrotta, A.I.C.P., P.E., Century Senior Transportation Planner B.S. Civil Engineering M.S. Engineering	Quality Assurance/ Quality Control	Proposed Action, Airspace	25 years transportation planning
Alex Schmidt, P.E., Century Senior Transportation Engineer B.S. Civil Engineering M.S. Environmental Engineering	Quality Assurance/ Quality Control	Background, Purpose and Need	15 years engineering/planning
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Tom Daues, PMP, Leidos Biologist M.S. Natural Resources B.S. Biology	Project Manager, Section Author, Editor	Noise, Air Quality	25 years environmental science

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Appendix A

Agreement for Joint Use – Dover Air Force Base (1997)

AGREEMENT FOR JOINT USE

AT

DOVER AIR FORCE BASE, DELAWARE

This Joint Use Agreement ("Agreement") is made and entered into this 18th day of December, 1997, by and between the Secretary of the Air Force, for and on behalf of the United States of America ("Air Force") and the Delaware Department of Transportation ("DELDOT"), a public body eligible to sponsor a public airport.

WHEREAS, the Air Force owns and operates the runway and associated flight facilities (collectively "flying facilities") located at Dover Air Force Base, Delaware ("DAFB"); and

* WHEREAS added

WHEREAS, DELDOT desires to continue using the flying facilities at DAFB to permit operations by civil aircraft jointly with military aircraft; and

WHEREAS, DELDOT has constructed a taxiway leading to the DELDOT air terminal on approximately 1.4256 acres of land on the west side of the main north-south runway at DAFB as described in Attachment A; and has an additional easement to construct another 75 foot wide taxiway from DAFB to the Kent County AeroPark; and

* described legal
* WHEREAS added

WHEREAS, the Air Force considers that this Agreement will be in the public interest and is agreeable to granting continued joint use of the flying facilities under this Agreement and an additional easement in a separate instrument;

NOW, THEREFORE, it is agreed:

1. **JOINT USE**

a. The Air Force hereby authorizes DELDOT to permit scheduled commuter, commercial charters as approved by DELDOT and the installation commander, and general aviation aircraft with two-way radios for communicating with the DAFB Air Traffic Control Tower to use the flying facilities at DAFB, subject to the terms and conditions set forth in this Agreement and those Federal Aviation Regulations (FARs) applicable to civil aircraft operations.

(1) Charter aircraft operations will be limited and authorized on a case-by-case basis. Organizations desiring to conduct charter operations at DAFB must receive approval in advance from DELDOT and the DAFB installation commander for each operation.

Removed Wing will get approval

b. The total number of civil aircraft operations shall not exceed 37 per day, except NASCAR race days, and no more than 13,500 per calendar year. Fifty (50) operations per day shall be authorized during NASCAR race days (two (2) weekends per year). Each landing is a single operation and each take-off is a single operation.

↗150 Changed to 100

Changed to 300

c. Aircraft using DAFB under the authority granted to DELDOT by this Agreement shall be entitled to use the flying facilities at DAFB for landings, take-offs, and movement of aircraft but shall park only at the DELDOT air terminal ramp. If the parking area at DELDOT air terminal ramp reaches capacity, no further civil aircraft landings shall be permitted until parking space is available except as stipulated herein for NASCAR race weekends.

~~(1) The ramp at the DELDOT air terminal has insufficient space to park~~ the numbers of civil aircraft associated with NASCAR race weekends. Plans for the DELDOT/Kent County property include additional ramp space. Therefore, subject to

military mission requirements, civil aircraft may park on the Air Force ramps designated as compass rose and pad 4 on NASCAR race weekends with prior approval from the Commander, 436th Airlift Wing (AW), DAFB, until such time as additional ramp space is available on the DELDOT/Kent County property. Procedures for parking on the Air Force ramps will be established in a Local Operations Letter. Parking on Air Force ramps will cease no later than five (5) years from the effective date of this Agreement or upon construction of additional ramp space on the DELDOT/Kent County property, whichever is sooner.

d. All ground and air movements of civil aircraft using DAFB under this Agreement and movements of all other vehicles across Air Force taxiways shall be controlled by the DAFB Air Traffic Control Tower. Civil aircraft activity will coincide with the DAFB Air Traffic Control Tower hours of operation. Any additional hours of the DAFB Air Traffic Control Tower or other essential airfield management, or operational requirements beyond those needed by the Air Force, shall be funded (or reimbursed) by DELDOT. These charges, if any, shall be in addition to the charges specified in paragraph 4 of the Joint Use Implementation Plan (Attachment B) and shall be payable not less frequently than quarterly.

e. In the absence of DELDOT employees or their designated representatives to assist civil aircraft operators at the DELDOT air terminal, civil aircraft operations shall be suspended until such assistance is available.

f. All aircraft shall be provided air traffic control services on a first-come, first-served basis except for emergencies and military missions that require priority handling. The decision to implement military priority shall be made by the Commander,

436th AW, DAFB. Civil aircraft activity shall coincide with the DAFB Air Traffic Control Tower's hours of operations.

g. Civil aircraft shall not conduct training or practice flights at DAFB.

h. Civil aircraft transporting hazardous cargo must comply with applicable Federal Aviation and Air Force regulations.

i. Civil aircraft using DAFB on official government business, as provided in Air Force Instruction 10-1001, *Civil Aircraft Landing Permits*, are not subject to this Agreement.

j. The Joint Use Implementation Plan at Attachment C establishes procedures for aircraft movement, air traffic control, snow and ice removal, preventing foreign object damage, and other necessary operational and security measures.

2. MAINTENANCE AND CONSTRUCTION

a. Air Force-owned airfield pavements made available for use under this Agreement shall be for use on an "as is, where is" basis. In easement areas and DELDOT-owned areas, DELDOT shall be responsible for pavement maintenance at no cost to the Air Force.

b. Dust or any other erosion or nuisance that is created by, or arises out of, activities or operations by civil aircraft authorized use under this Agreement shall be corrected by DELDOT at no expense to the Air Force, using standard engineering methods and procedures.

c. The Air Force shall not be liable for any damage or destruction to civil aircraft or for personal injuries or death arising from bird or wildlife collision with civil aircraft.

d. DELDOT shall comply with the procedural and substantive requirements established by the Air Force, Federal, State, and local government agencies with respect to the control of air, water, and noise pollution; and hazardous and solid waste disposal on premises used in connection with this Agreement, including those available through easement and DELDOT-owned properties.

e. DELDOT shall be responsible for cleaning up fuel and hazardous waste spills and for controlling materials that could cause foreign object damage to aircraft in easement and DELDOT-owned areas. Such responsibilities shall be shared in the joint use areas if caused by civil aircraft authorized use under the terms of the Agreement. All such clean-ups shall be at no expense to the Air Force.

f. The Air Force shall be responsible for snow removal only as required for accomplishing the military mission. DELDOT shall be responsible for snow removal in easement and DELDOT-owned areas.

g. Coordination with the DAFB Base Civil Engineer is required for planning and construction of new structures or exterior alteration of existing structures that are owned by DELDOT to ensure compliance with airfield obstruction and clearance criteria. Further, billboards or signs of any nature shall not be erected on or adjacent to the airfield without prior written approval from the DAFB Base Civil Engineer. Construction of the new taxiway is subject to the standards and requirements set forth in Attachment C.

3. DELDOT ASSIGNS

DELDOT's obligations under this Agreement may be performed by a fixed based operator pursuant to a contract with DELDOT. Such fixed based operator shall have the right to use the flying facilities in accordance with the terms and conditions of this Agreement, subject to any limitations contained in its contract with DELDOT.

4. PAYMENT

DELDOT may collect landing fees and other fees and or charges from civil aircraft authorized use of DAFB under this Agreement. DELDOT shall reimburse the Air Force in accordance with the provisions set forth in Attachment B. Reimbursement shall be made whether or not fees are charged or collection efforts are successful.

5. SERVICES

DELDOT shall be responsible for providing services, maintenance, and emergency repairs for civil aircraft authorized to use DAFB under this Agreement, at no cost to the Air Force. Air Force assistance may only be provided when necessary to satisfy or protect the interests of the Air Force or otherwise authorized by law. If Air Force assistance is required to repair an aircraft, DELDOT shall reimburse the Air Force for all expense of such services. Any required reimbursement shall be not less frequently than quarterly. These charges are in addition to the charges specified in Attachment B.

6. FIRE PROTECTION AND CRASH RESCUE

a. The Air Force maintains the level of fire fighting and crash/rescue capability required to support the military mission at DAFB. Air Force fire fighting and crash/rescue equipment shall not be routinely parked on the airfield during non-emergency landings by civil aircraft. However, the Air Force agrees to respond to fire and crash/rescue emergencies involving civil aircraft outside the hangars or other structures on DELDOT/Kent County property within the limits of its existing capabilities, equipment, and available personnel, at the request of DELDOT or the pilot of an aircraft, subject to subparagraphs b, c, and d below. The senior fire official shall determine when the emergency is terminated.

b. DELDOT shall be responsible for installing, operating, and maintaining, at no cost to the Air Force, the equipment and safety devices required for all aspects of handling/support for aircraft on the ground in accordance with the FARs and National Fire Protection Association (NFPA) procedures and standards.

c. DELDOT agrees to release, acquit, and forever discharge the Air Force, its officers, agents, and employees from all liability arising out of or connected with the use of or failure to supply in individual cases, Air Force fire fighting and/or crash/rescue equipment or personnel for fire control and crash/rescue activities pursuant to this Agreement. DELDOT further agrees to indemnify, defend, and hold harmless the Air Force, its officers, agents, and employees against any and all claims, of whatever description, arising out of or connected with such use of, or failure to supply Air Force fire fighting and/or crash/rescue equipment or personnel.

d. DELDOT shall reimburse the Air Force for expenses incurred by the Air Force for fire fighting and/or crash/rescue materials expended in connection with providing such service to civil aircraft. The Air Force may, at its option, with concurrence of the National Transportation Safety Board (NTSB), remove crashed civil aircraft from Air Force-owned pavements or property and shall follow existing Air Force directives and/or instructions in recovering the cost of such removal.

e. Failure to comply with the above conditions may result in termination of fire protection and crash/rescue response upon reasonable notice to cure and/or termination of this Agreement under the provisions of paragraph 10 herein.

f. The Air Force commitment to assist DELDOT with fire protection shall continue only so long as a fire fighting and crash/rescue organization is authorized for military operations at DAFB. The Air Force shall have no obligation to maintain or provide a fire fighting, and crash/rescue organization or fire fighting crash/rescue equipment; or to provide any increase in fire fighting and crash/rescue equipment or personnel; or to conduct training or inspections for purposes of assisting DELDOT with fire protection.

g. DELDOT and its operating contractor or fixed base operator shall provide the DAFB Base Civil Engineer with an executed release and indemnification undertaking as specified in Air Force Instruction 32-2001, *The Fire Protection Operations and Fire Prevention Program.* DELDOT's responsibility under such an undertaking is limited by paragraph 8 herein. DELDOT shall not permit any operations under this Agreement unless the responsible contractor or fixed base operator has such an undertaking in effect.

7. LIABILITY AND INSURANCE

a. DELDOT shall assume all risk of loss and/or damage to property or injury to or death of persons by reason of civil aircraft use of DAFB under this Agreement, including but not limited to risks connected with the provision of services or goods by the Air Force to DELDOT or to any user under this Agreement. DELDOT further agrees to indemnify and hold harmless the Air Force against, and to defend at DELDOT expense to the extent allowable under Delaware law, all claims for loss, damage, injury, or death sustained by any individual or corporation and arising out of the provision of services or goods by the Air Force to DELDOT or to any user, whether the claims be based in whole or in part on the negligence or fault of the Air Force or its contractors or any of their officers, agents, and employees, or based on any concept of strict or absolute liability, or otherwise.

b. DELDOT shall carry a policy of liability and indemnity insurance satisfactory to the Air Force, naming the United States of America as an additional insured party, to protect the Government against any of the aforesaid losses and/or liability, in the sum of not less than six million dollars ($6,000,000) bodily injury and property damage combined for any one accident. The policy shall provide that: (1) no cancellation, reduction in amount, or material change in coverage thereof shall be effective until at least thirty (30) days after receipt of notice to the Commander, 436th AW, 201 Eagle Way, Room 101, DAFB, Delaware 19902-7209; (2) any losses shall be payable notwithstanding any act or failure to act or negligence of DELDOT or the Air Force or any other person; and (3) the insurer shall have no right of subrogation against the Air Force. The amount of coverage is subject to periodic review at the request of either the Air Force or DELDOT and shall be changed only by mutual agreement of both parties.

8. DELDOT CONFINES

Notwithstanding any other provision to the contrary contained in this Agreement, it is expressly agreed by the Air Force, and any assigns, that DELDOT's monetary obligations, including performance of any covenant requiring or resulting in the expenditure of money, under this Agreement, are expressly limited to the extent of appropriations made by the General Assembly or any applicable Federal appropriating body and nothing contained in any other paragraph of this Agreement shall be construed as creating any monetary obligation on the part of DELDOT beyond such current and specific appropriations. In the event that the General Assembly of Delaware or any appropriate Federal body fails to appropriate the specific funds necessary to continue this Agreement, the Agreement shall be terminated at the end of the last fiscal year for which such appropriation is available. In such event, all obligations of DELDOT requiring the expenditure of money shall cease. If a default has occurred by DELDOT hereunder, then DELDOT's obligations to pay any amounts due or perform any covenants requiring or resulting in the expenditure of money are expressly limited to the extent of the sum of the following: (a) specific appropriations made to fund this Agreement; (b) any other funds of DELDOT legally available to be applied to the payment or satisfaction of DELDOT's obligations hereunder, and nothing in this Agreement shall be construed as creating any monetary obligation on the part of DELDOT beyond the amount as set forth in this sentence.

9. TERM OF AGREEMENT

This Agreement shall become effective on the day immediately following the date of its execution by both parties hereto and shall remain in force and effect for a term of 25 years, unless otherwise renegotiated or terminated under the provisions of

paragraph 10 herein, but in no event shall the Agreement survive the termination or expiration of DELDOT's right to use by easement of the land areas used in connection with joint use.

10. RENEGOTIATION AND TERMINATION

a. The Commander, 436th AW, DAFB, may suspend the civil aircraft operations authorized under the terms of this Agreement at any time for up to forty-five (45) days or for the duration of a military exercise or for contingency operations when required by military necessity. DELDOT shall be provided as much notice as feasible for any such suspension. The Commander, 436th AW, shall determine what constitutes "feasible notice."

b. DELDOT may terminate this Agreement at any time by giving ninety (90) days written notice to the Commander, 436th AW, DAFB.

c. Notwithstanding any other provision of this Agreement, the Air Force may terminate this Agreement (1) at any time by the Secretary of the Air Force, or (2) at any time during any national emergency, present or future, declared by the President or the Congress of the United States, or (3) in the event that DELDOT ceases to operate the civil facilities at DAFB for reasons other than lack of appropriated monies as cited in paragraph 8 herein for a period of one (1) year, or (4) in the event DELDOT violates any of the terms and conditions of this Agreement and continues and persists therein for thirty (30) days after written notification.

d. The failure of either the Air Force or DELDOT to insist, in any one or more instances, upon the strict performance of any of the terms, conditions, or provisions of this Agreement shall not be construed as a waiver or relinquishment of the right to the future performance of any such terms, conditions, or provisions. No provision of this Agreement shall be deemed to have been waived by either party unless such waiver be in writing signed by such party.

11. SUPERSEDED AGREEMENT

This Agreement supersedes and replaces the Joint Use Agreement between the Air Force and DELDOT, dated 18 June 1982, upon its execution by both parties hereto.

IN WITNESS WHEREOF, the respective duly authorized representatives of the parties hereto have executed this Agreement on the date set forth below opposite their respective signatures.

UNITED STATES AIR FORCE

Date: 12/18/97

By: _____
JIMMY G. DISHNER
Deputy Asst Secretary of the Air Force
(Installations)

DELAWARE DEPARTMENT OF TRANSPORTATION

Date: 12/18/97

By: _____

ATTACHMENT A

DESCRIPTION OF TAXIWAYS

Taxiway 1

Beginning at a point in the Northwesterly boundary of lands of the United States of America (Dover Air Force Base), said point being 26.26 feet Northerly of the intersection of said boundary line with the Northerly right-of-way line for lands of the State of Delaware (County Road Number 348, also known as Horsepond Road); thence by said boundary line North 11 degrees 27 feet East, a distance of 270.0 feet; thence South 78 degrees 33 feet East, a distance of 230 feet to the Westerly edge of the paved taxiway parallel to the Dover Air Force Base primary runway (01/19); thence along the edge of said taxiway South 11 degrees 27 feet West, a distance of 270.0 feet; thence North 78 degrees, 33 feet West, a distance of 230 feet to the point of beginning.

Taxiway 2

Beginning for an aircraft access easement at a property corner for the lands of the United States of America, Dover Air Force Base, as described in Deed Book W-33 at page 317; said corner being common to the aforementioned lands of the United States of America, Dover Air Force Base, and the lands of the State of Delaware, as described in Deed Book D-35 at Page 65; said corner also being the intersection between the North 11 degrees, 27 feet East 1224 feet line and the North 78 degrees, 33 feet West 450.11 feet line on the aforementioned boundary of Dover Air Force Base; running thence from said point of beginning, across said lands of Dover Air Force Base, the following courses: South 78 degrees, 33 feet East 230 feet to a point on the westerly edge of the paved taxiway that runs parallel to the paved main runway

(01/19) for Dover Air Force Base; thence, with said westerly edge of the paved taxiway, South 11 degrees, 27 feet West 320 feet to a point; thence, departing said westerly edge of the paved taxiway, continuing across the lands of Dover Air Force Base, North 78 degrees, 33 feet West 230 feet to the aforementioned property line separating the lands of Dover Air Force Base from the lands of the State of Delaware; running thence, with said property line separating Dover Air Force Base from the lands of the State of Delaware, North 11 degrees, 27 feet East 320 feet to the point of beginning; containing 73,600 square feet, or 1.68962 acres; subject to conveyances, covenants, easements and/or restrictions of record.

JOINT USE IMPLEMENTATION PLAN

This plan implements the Agreement for Joint Use of DAFB between the Air Force and the Delaware Department of Transportation (DELDOT). It establishes procedures governing civil aircraft use of the flying facilities at DAFB and provides specific instructions concerning civil aircraft operations, emergencies, facility maintenance, and other matters.

1. Operations

a. Civil aircraft operations at DAFB shall be pursuant to the Joint Use Agreement and DAFB Regulation 55-1, which is hereby made a part of this document by reference. Copies of the regulation shall be provided to DELDOT and its representatives.

b. Individuals entering DAFB without proper authority and civil aircraft taxiing without approval from ground control are subject to disciplinary action as outlined in Air Force and DAFB security directives. All personnel and vehicles entering or exiting the DELDOT air terminal complex shall be by use of Horsepond Road. Roads on DAFB shall not be used for employee or passenger convenience or for servicing at the air terminal or of civil aircraft. Except for taxiing aircraft, entry to the DELDOT air terminal complex from DAFB is strictly limited to emergency dispatch of security personnel, the fire department, and medical and disaster response teams. DELDOT or its representatives shall be responsible for the security of the civil facility.

c. DELDOT shall be responsible for the maintenance of its taxiway and apron lighting. The Air Force shall operate runway and taxiway lights and maintain lighting on its runways and taxiways.

d. DELDOT or its representatives shall be responsible for monitoring aircraft parking capacity at the DELDOT air terminal complex and for requesting that DAFB Base Operations take action to temporarily suspend civil landings when capacity has been reached. Civil aircraft landings shall remain suspended until DAFB Base Operations receives notification that space is again available for civil aircraft parking.

e. DELDOT shall be responsible for arranging for removal of civil aircraft that become inoperable for any reason, including aircraft accidents, while on the Air Force runways or taxiways. However, the Air Force reserves the right to remove such aircraft, if required, as stipulated in paragraph 6d of the Joint Use Agreement. Removal operations shall not begin without approval from DAFB Base Operations and such activity shall be under positive radio control at all times.

f. DELDOT or its representatives shall provide DAFB Base Operations with commuter flying schedules on a quarterly basis. Timely notification of anticipated schedule changes is also required.

g. DELDOT shall provide DAFB Base Operations a list of approved, potential general aviation users, to include aircraft type and Federal Aviation Administration registration numbers. DELDOT shall update the list as required. It is understood that use may be denied to general aviation operators if their aircraft are not on the DELDOT list.

h. DELDOT shall advise eligible general aviation operators that prior permission is required from DAFB Base Operations before landing and that operators failing to obtain final approval from DAFB Base Operations may be denied landing.

i. DELDOT or its representatives shall coordinate with DAFB Base Operations concerning non-flying activities at the DELDOT air terminal that may impact on DAFB or its operations.

2. Emergencies

a. DELDOT or its representatives shall notify DAFB Air Traffic Control Tower of all emergencies as soon as possible.

b. DELDOT or its representatives may contact DAFB Air Traffic Control Tower for assistance in responding to an aircraft fire or explosion. Assistance for all other fire emergencies, including automobile fires, shall be provided by local community fire departments. DELDOT or its representatives shall provide the Fire Department at DAFB with a fire rescue plan for the aircraft types that shall be using the DELDOT air terminal facilities.

c. Medical assistance from the hospital staff at DAFB shall not be provided for illness occurring in the facilities at DELDOT air terminal or on a civil aircraft. However, medical assistance shall be provided as follows:

(1) On-scene emergency medical care at aircraft accidents that occur on DAFB. If required, a patient shall be taken to the hospital at DAFB for stabilization. When stabilized, the patient shall be transported to a civilian hospital by ambulance.

(2) On-scene emergency medical care if requested and directed by civil authorities at aircraft accidents that occur outside the boundaries of DAFB, if approved by appropriate military authority. Normally, victims of off-base accidents shall not be treated at the DAFB hospital.

d. Wreckage removal is addressed in paragraph 1e herein.

e. DELDOT or its representatives shall immediately notify DAFB Air Traffic Control Tower of aircraft hijackings, bomb threats, or other criminal activities that pose a threat to personnel, operations, or facilities on DAFB. Procedures set forth in *FAA Handbook 7110.65, Air Traffic Control,* and appropriate Air Force and DAFB directives shall be used in responding to such incidents.

f. Media inquiries concerning aircraft accidents/incidents shall be handled by Public Affairs at DAFB if it involves military aircraft and by DELDOT or its representatives if it involves civil aircraft. DELDOT shall direct all inquiries on military aircraft accidents/incidents to the DAFB Public Affairs Office and advise the DAFB Public Affairs Office of its response to inquiries on civil aircraft accidents/incidents.

3. Maintenance

a. DELDOT or its representatives shall coordinate all snow removal or other maintenance activities with DAFB Base Operations prior to entering DAFB. Maintenance must not interfere with use of the DAFB perimeter security road or taxiway.

b. DELDOT or its representatives must notify DAFB Base Operations of any potential hazard to military operations by foreign objects attributable to DELDOT or civil aircraft activities.

4. Payment

DELDOT's payment obligation shall be calculated on the actual number of civil operations conducted under the terms of this Agreement. DELDOT shall be charged $20.00 for each civil aircraft landing. On the first workday of January, April, July, and October, DAFB Base Operations shall compute the number of civil aircraft landings for the previous quarter. Computations shall be coordinated with DELDOT or its representatives, certified, and billed to DELDOT. Payment is due thirty (30) days from receipt of the bill and shall be sent to 436 AW/FM, Dover AFB DE 19902. Such charges are subject to review and renegotiation as determined by the Air Force.

5. Communication

a. Questions, complaints, or inquiries concerning joint use shall be directed to DAFB Airfield Operations Flight Commander.

b. Complaints concerning aircraft noise shall be directed to the Public Affairs Office at DAFB. DELDOT assistance and coordination shall be required in responding to noise complaints associated with civil aircraft operations.

ATTACHMENT C

CONSTRUCTION STANDARDS AND REQUIREMENTS FOR TAXIWAY

1. Subject to the approvals required herein, and granting of an easement for a new 75 ft runway, the Delaware Department of Transportation (DELDOT) is authorized to construct, on the land granted in easement, a single taxiway, approximately 75 feet wide, from DAFB to the DELDOT air terminal.

2. All taxiway construction shall be accomplished at no expense to the Air Force.

3. Prior to commencement of taxiway construction, all plans, drawings, specifications, and sitings must be submitted to and approved by the DAFB Base Civil Engineer.

4. The taxiway, taxiway lighting, markings, and other appurtenances must be constructed to Air Force standards.

5. Construction is subject to inspection by representatives of the Federal Aviation Administration and Air Force to ensure compliance with approved plans and specifications and the terms of this Agreement.

6. To ensure minimum interference with military activities during construction, DELDOT must obtain written approval for the construction schedule from the DAFB Base Civil Engineer prior to execution of the construction contract. DELDOT shall require its contractors to adhere to the approved schedule and to perform work at such times and in such a manner as not to unnecessarily interfere with military facilities or operations.

7. The Commander, 436th AW, DAFB, shall have the right to temporarily suspend work if necessary for mission requirements and or safety considerations. The contractor may be required to temporarily vacate the premises. In such instances, DELDOT, its agents, or contractors shall have no claim of any character on account thereof against the Air Force, or any officer, agent, contractor, or employee thereof.

AMENDMENT 1
TO
JOINT USE AGREEMENT
BETWEEN
DELAWARE DEPARTMENT OF TRANSPORTATION
AND
UNITED STATES AIR FORCE

This Agreement made and entered into this 15th day of May 2000, by and between the Secretary of the Air Force, for and on behalf of the United States Government ("Air Force"), and the Delaware Department of Transportation (DELDOT),

RECITALS:

The parties hereto entered into an agreement for joint use of the runway and certain associated flight facilities at Dover Air Force Base (DAFB), Delaware, dated December 18, 1997 ("Joint Use Agreement"), in order to permit the operation of civil aircraft jointly with military aircraft;

The parties desire to amend the Joint Use Agreement to change the description of the second taxiway and increase the number of civil aircraft operations authorized on NASCAR race days and other days;

AGREEMENT

NOW, THEREFORE, the parties do hereby mutually agree as follows:

1. The Joint Use Agreement is hereby modified in the following particulars, but no other:

a. The text of the third "WHEREAS" is deleted and the following inserted in its place:

> **"WHEREAS,** DELDOT has constructed a taxiway leading to the DELDOT air terminal on approximately 1.4256 acres of land on the west side of the main north-south

runway at DAFB as described in Attachment A; and has requested an additional easement to construct another 75 foot wide taxiway from DAFB to the civil air terminal; and"

b. The text of paragraph 1b is deleted and the following inserted in its place:

"b. Civil aircraft operations are limited to 100 per day except during two NASCAR race weekends when 300 operations per day for four days shall be authorized; however, the total number of operations per calendar year shall not exceed 13,500. Each landing is a single operation and each take-off is a single operation."

c. The description of Taxiway 2 in Attachment A is deleted and the following inserted in its place:

"Beginning at a point in the northwesterly boundary of lands of the United States of America (Dover Air Force Base), said point 26.26 feet northerly of the intersection of said boundary line with the northerly right-of-way line for lands of the State of Delaware (County Road Number 348, also known as Horsepond Road); thence by said boundary line north 11 degrees 27 feet east, a distance of 929.5 feet; thence south 78 degrees 33 feet east, a distance of 242.72 feet to the westerly edge of the paved taxiway parallel to the Dover Air Force Base primary runway (01/19); thence along the edge of said taxiway south 11 degrees 27 feet west, a distance of 185.0 feet, thence north 78 degrees, 33 feet west a distance of 242.72 feet to the point of beginning."

2. All other terms and conditions of the Joint Use Agreement shall be and remain the same.

3. This Amendment shall be effective immediately.

IN WITNESS WHEREOF, the parties hereto have executed this Amendment as of the date first above written.

UNITED STATES OF AMERICA

By: _____
JIMMY G. DISHNER
Deputy Assistant Secretary of the Air Force
(Installations)

DELAWARE DEPARTMENT OF TRANSPORTATION

By: _____
ANNE P. CANBY
Secretary

Appendix B

DelDOT Easement Agreement No. USAF-AMC-FJXT-17-2-0648

DEPARTMENT OF THE AIR FORCE

GRANT OF EASEMENT

FOR

DELAWARE DEPARTMENT OF TRANSPORTATION

ON

DOVER AIR FORCE BASE, DELAWARE

Form Approved By
SAF/GCN 29 Oct 2014
Previous Versions Obsolete

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DEPARTMENT OF THE AIR FORCE

GRANT OF EASEMENT

PREAMBLE

THE UNITED STATES OF AMERICA, acting by and through the Secretary of the Air Force (the "Grantor"), under and pursuant to the authority granted in 10 U.S.C. § 2668, the Secretary of the Air Force having determined that no more land than needed for the Easement is included herein, and the granting of this Easement is not against the public interest, does hereby grant and convey to the Delaware Department of Transporation, (Grantee), an exclusive Easement for a right-of-way for the purpose of utilizing and maintaining two taxiways in-joint use with the Air Force on, over, under, and across the property on Dover Air Force Base (AFB), Delaware, as described in Exhibit A and depicted on Exhibit B (the "Easement Area"). The Grantor and Grantee may be referred to as Parties or separately as a Party.

BASIC TERMS

1. TERM

1.1. Term.
This Grant shall be for a term of 25 years commencing at the expiration of the previous easement, 16 October 2007, and ending 15 October 2032 unless sooner terminated.

1.2. Termination. The Government may terminate this easement at any time in the event of national emergency as declared by the President or the Congress of the United States, base closure, deactivation or substantial realignment, or in the interest of national defense upon 120 days' written notice to Grantee. If the giving of such notice is impracticable under the circumstances, the Secretary will use good faith efforts to give Grantee such advance written notice as the circumstances permit.

2. RENT

In lieu of Grantee making annual payments associated with this easement, Grantee shall allow Grantor to access the Civil Air Terminal parking apron utilizing either of the two taxiways associated with this agreement as access to the the Civil Air Terminal parking apron.

3. CORRESPONDENCE

Any written notices under this instrument shall be made by mailing or hand delivering such notice to the parties at the following addresses.

GRANTOR:
436 CES/CEIAP
Dover Air Force Base

600 Chevron Ave, Dover AFB, DE 19902

GRANTEE:

State of Delaware
Department of Transportation
P.O. Box 778, Dover, DE 19901

COURTESY COPY SENT TO:

Delaware Airport Manager
DRBA
P.O. Box 71, New Castle, DE 19720

4. USE OF EASEMENT AREA

4.1. Permitted Uses. The Grantee shall use the Easement Area solely for purposes of a right-of-way for the purpose of utilizing and maintaining two taxiways in-joint use with the Air Force. Grantee's use of the Easement Area shall comply, at Grantee's sole cost and expense, with all Applicable Laws. The Grantee shall not use or occupy the Easement Area in any manner that is unlawful, dangerous, or that results in waste, unreasonable annoyance, or a nuisance to the Government.

4.2. Grantee Access. Grantee is granted the nonexclusive right to use the walkways, streets, and roads on Dover AFB, Delaware in common with the Grantor and its grantees and licensees for access to and from the Easement Area and the nearest public street or highway.

4.3. Grantor's Right of Access And Inspection. Grantor shall have the right to enter the Easement Area at any time and shall have the right to reasonably inspect Grantee's use of it and any of Grantee's improvements or property placed thereon, without notice.

4.4. Grantor's Reasonable Regulation. The use and occupation of the Easement Area and the exercise of the rights herein granted shall be subject to Grantor's reasonable restrictions and regulations regarding ingress, egress, safety, sanitation, and security, as Grantor, or its duly authorized representatives, may from time to time impose.

4.5. No Obstructions. Neither party shall use the property nor construct, erect, or place any objects, buildings, structures, signs, or wells of a permanent nature on, under, or over the Easement Area that will unreasonably interfere with the other Party's use of the premises, as set out in this Easement or its reservations.

4.6. Limitation Of Grantee Rights. Except as is reasonably required to effect the purpose of this Easement, the Grantee has no right of use, license, easement, servitude, or usufruct, for any purpose, by necessity or otherwise, express or implied, on, over, across, or under any of the real property of the Grantor, and the Grantee agrees not to assert any such right or interest by reason of this Easement.

5. ABANDONMENT OR TERMINATION OF EASEMENT

5.1. Termination. This Easement may be terminated in whole or in part by the Grantor for Grantee's failure to comply with the terms of this Easement, and Grantor may terminate it for any part of the Easement Area that is abandoned or not used by the Grantee for 24 consecutive months. The Grantor shall give written notice of any termination, which shall become effective 120 days after the date of such notice, unless the Grantee commences use or reuse of the unused portion of the Easement Area within that time.

5.2. Remedies For Non-Compliance. In the event the Grantee fails to comply with any obligation under this Easement, the Grantor may pursue monetary damages, equitable relief, or both, and the Grantee shall reimburse the Grantor for its attorney fees and costs.

OPERATION OF THE EASEMENT AREA

6. EASEMENTS AND RIGHTS OF WAY (RESERVED)

7. CONDITION OF EASEMENT AREA

The Grantee has inspected and knows the condition of the Easement Area. It is understood that the Easement is granted "as is, where is" without any warranty, representation, or obligation on the part of the Grantor to make any alterations, repairs, improvements, or corrections to conditions or to defects whether patent or latent. The Parties shall jointly perform and sign or otherwise authenticate a Physical Condition Report at the beginning of the Easement term to document the condition of the Easement Area. This report will be made a part of this Easement as Exhibit C.

8. MAINTENANCE OF EASEMENT AREA

8.1. Maintenance of Easement Area. The Grantee, at no expense to the Government, shall at all times preserve, maintain, repair, and manage the Easement Area, Grantee improvements, and Grantee equipment in an acceptable, safe, and sanitary condition in accordance with this Easement.

8.2. Damage to Government Property. If the Grantee damages or destroys any real or personal property of the Government, the Grantee shall promptly repair or replace such real or personal property to the reasonable satisfaction of the Government. In lieu of such repair or replacement, the Grantee shall, if so required by the Government, pay to the Government money in an amount sufficient to compensate for the loss sustained by the Government by reason of damage or destruction of Government property, including natural resources.

9. TAXES

The Delaware Department of Transportation, as a state entity, does not pay taxes, thus, this section is not applicable.

10. INSURANCE

10.1. Risk of Loss. Any third party operator of the premises shall in any event and without prejudice to any other rights of the Government bear all risk of loss or damage or destruction to the Easement Area, and any building(s), Easement Area improvements, Grantee equipment, fixtures, or other property thereon, arising from any causes whatsoever, with or without fault by the Government, provided, however, the Government shall not be relieved of responsibility for loss or damage that is solely the result of the gross negligence or willful misconduct of the Government. The Delaware River Bay Authority (DRBA) as agent for the State of Delaware, Department of Transportation (DELDOT) will carry necessary insurance. Additionally, any third party operator of the Premises, upon showing proof of insurance satisfactory Grantee and the Government of adequate insurance may provide the necessary insurance relieving the DRBA of its obligation to provide insurance.

10.2 Grantee Insurance Coverage. The Grantee, as a State of Delaware entity, has not waived its sovereign immunity and is not required to maintain insurance.

10.3. Damage or Destruction of Easement Area. In the event all or part of the Easement Area is damaged (except de minimis damage) or destroyed, the risk of which is assumed by the Grantee under Paragraph 10.1, the Grantee shall promptly give notice thereof to the Government and the Parties shall proceed as follows:

10.3.1. In the event that the Government, in consultation with the Grantee, determines that the magnitude of damage is so extensive that the Easement Area cannot be used by the Grantee for its operations and the repairs, rebuilding, or replacement of the Easement Area cannot reasonably be expected to be substantially completed within three (3) months of the occurrence of the casualty ("Extensive Damage or Destruction of Easement Area"), either Party may terminate this Easement as provided in Paragraph 5.1.

10.3.2. In the event that the Government, in consultation with the Grantee, shall determine that Extensive Damage or Destruction of the Easement Area has not occurred, then neither Party shall have the right to terminate this Easement. The Grantee shall, as soon as reasonably practicable after the casualty, restore the Easement Area as nearly as possible to the condition that existed immediately prior to such loss or damage.

11. ALTERATIONS

11.1. Alterations. At least 30 days before doing any work to repair, build, alter, modify, or demolish any improvements in the Easement Area, Grantee shall give written notice of its plans to the Installation Commander through the Base Civil Engineer, who shall have the right to review and approve or reasonably modify the plans and to place reasonable restrictions on Grantee's access, equipment, methods, materials, and manpower related to accomplishing the work, in order to ensure it is done consistent with Grantor's use of the Easement Area and the operation of the Installation.

11.2. Airfield Construction. Any new construction or alteration at the end of the runway, or within lateral clear zones for the runway, shall comply with any applicable Air Force requirements, such as those contained in Unified Facilities Criteria (UFC) 3-260-01 titled "Airfield and Heliport Planning and Design," dated 17 November 2008.

12. COSTS OF UTILITIES/SERVICES

Reserved

13. RESTORATION

13.1. Grantee's Removal Obligation. Upon the expiration, abandonment, or termination of the Easement, Grantor may elect, in its sole discretion, to require Grantee to remove all its improvements and other property from the Easement Area and restore the Easement Area at Grantee's sole expense to substantially the same condition that existed immediately before the grant, all to Grantor's satisfaction. Grantor shall give notice to Grantee of such election within a reasonable time after learning of Grantee's abandonment, or together with Grantor's notice of termination. Alternatively, at those same times, Grantor may elect and give written notice to Grantee that some or all of Grantee's easement improvements and any other property Grantee may leave on the Easement Area will revert or be transferred to Grantor. Such reversion or transfer in lieu of Grantee's removal and restoration obligation shall be automatic and at no cost to Grantor and shall be effective on the Easement Term Expiration Date or the effective date of any abandonment or termination, without additional consideration therefore. Grantee shall execute any documentation reasonably requested by the Grantor to confirm any transfer or conveyance.

13.2. Government Restoration of Easement Area. If Grantee fails to timely satisfy its removal and restoration obligations, then at Grantor's option, Grantee's improvements and personal property located on the Easement Area shall either become Grantor's property without compensation therefore or the Government may cause them to be removed or destroyed and the Easement Area to be so restored at the expense of Grantee; and no claim for damages against Grantor, its officers, employees, agents, or contractors shall be created by or made on account of such removal or destruction and restoration work. Grantee shall reimburse Grantor for any expenses it incurs to restore the Easement Area to the condition required by this grant within thirty (30) days after the Government provides written notice to Grantee of the reimbursement amount together with reasonable documentary support of the reimbursement amount.

CHANGES IN OWNERSHIP OR CONTROL

14. ASSIGNMENT

Except for the Grantee's use of Delaware River Bay Authority as its agent, the Grantee may not assign this Easement without the prior written consent of the Grantor.

15. LIENS AND MORTGAGES

Reserved

ENVIRONMENT

16. ENVIRONMENTAL PROTECTION

16.1. Compliance with Applicable Laws. Grantee shall comply with all applicable federal, State, and local laws, regulations, and standards for environmental protection, including flood plains, wetlands, and pollution control and abatement, as well as for payment of all fines and assessments by regulators for the failure to comply with such standards. In the event that any actions by Grantee including those of its officers, agents, employees, contractors, subcontractors, licensees, or invitees cause or contribute to a spill or other release of a substance or material, Grantee shall conduct any required cleanup, abatement, or response action in accordance with all applicable federal, State and local laws and regulations.

16.2. Environmental Permits. The Grantee shall obtain at its sole cost and expense any environmental and other necessary permits required for its operations under this Easement, independent of any existing permits.

16.3 Reserved.

16.4. Government Caused Environmental Damage. Grantee does not assume any of Grantor's liability or responsibility for environmental impacts and damage resulting from Grantor's activities; however, this provision does not relieve Grantee of any obligation or liability it might have or acquire with regard to third parties or regulatory authorities by operation of law.

16.5. Records Maintenance and Accessibility. The Government's rights under this Easement specifically include the right for Government officials to inspect the Easement Area, upon reasonable notice as provided under Paragraph 5.3, for compliance with Applicable Laws, including environmental laws, rules, regulations, and standards. Such inspections are without prejudice to the right of duly constituted enforcement officials to make such inspections. Violations identified by the Government will be reported to the Grantee and to appropriate regulatory agencies, as required by Applicable Law. The Grantee will be liable for the payment of any fines and penalties that may be imposed as a result of the actions or omissions of the Grantee.

16.6. Grantee Response Plan. The Grantee shall comply with all Installation plans and regulations for responding to hazardous waste, fuel, and other chemical spills.

16.7. Pesticide Management. Any pesticide use will require prior Government approval.

16.8. Compliance with Water Conservation Policy. The Grantee will comply with the Installation water conservation policy, as amended from time to time (to the extent that such

policy exists and the Grantee receives copies thereof), from the Term Beginning Date through the Term Expiration Date.

16.9. Protection of Environment and Natural Resources. The Grantee will use all reasonable means available to protect environmental and natural resources, consistent with Applicable Laws and this Easement. Where damage nevertheless occurs, arising from the Grantee's activities, the Grantee shall be fully liable for any such damage.

16.10. Pesticides and Pesticide Related Chemicals in Soil. The Grantee acknowledges that the surface soil on the Easement Area may contain elevated levels of pesticides and pesticide-related chemicals applied in the normal course of maintaining the Easement Area. The Grantee shall manage all such soil on the Easement Area in accordance with the requirements of any Applicable Laws. The Government will not be responsible for injury or death of any person affected by such soil conditions whether the person is warned or not.

17. ASBESTOS-CONTAINING MATERIALS (ACM) AND LEAD-BASED PAINT (LBP)

Reserved

18. SAFETY, HAZARDOUS MATERIALS, AND WASTE MANAGEMENT

18.1. Compliance With Health and Safety Plan. The Grantee agrees to comply with the provisions of any health or safety plan in effect under the Installation Restoration Program (IRP) (to the extent the Grantee has received notice thereof), or any hazardous substance remediation or response agreement of the Government with environmental regulatory authorities (to the extent the Grantee receives notice thereof if the agreement is not of public record) during the course of any of the response or remedial actions described in Paragraph 20.3. Any inspection, survey, investigation, or other response or remedial action will, to the extent practicable, be coordinated with representatives designated by the Grantee. The Grantee and any assignees, licensees, or invitees shall have no claim on account of such entries against the United States or any officer, agent, employee, contractor, or subcontractor thereof, except to the extent permitted under federal law, including the Federal Tort Claims Act.

18.2. Occupational Safety and Health. The Grantee must comply with all Applicable Laws relating to occupational safety and health, the handling and storage of hazardous materials, and the proper generation, handling, accumulation, treatment, storage, disposal, and transportation of hazardous wastes.

19. HISTORIC PRESERVATION

The Grantee shall not remove or disturb, or cause or permit to be removed or disturbed, any historical, archeological, architectural, or other cultural artifacts, relics, remains, or objects of antiquity. In the event such items are discovered on the Easement Area, the Grantee shall immediately notify the Government and protect the site and the material from further disturbance until the Government gives clearance to proceed.

20. INSTALLATION RESTORATION PROGRAM (IRP)

20.1. IRP Records. On or before the Term Beginning Date, the Government shall provide the Grantee access to the IRP records applicable to the Easement Area, if any, and thereafter shall provide to the Grantee a copy of any amendments to or restatements of the IRP records affecting the Easement Area. The Grantee expressly acknowledges that it fully understands the potential for some or all of the response actions to be undertaken with respect to the IRP may impact the Grantee's quiet use and enjoyment of the Easement Area. The Grantee agrees that notwithstanding any other provision of this Easement, the Government shall have no liability to the Grantee or any assignees, licensees, or invitees should implementation of the IRP or other hazardous waste cleanup requirements, whether imposed by law, regulatory agencies, or the Government or the Department of Defense, interfere with the Grantee's or any of its assignee's, licensee's, or invitee's use of the Easement Area. The Grantee shall have no claim or cause of action against the United States, or any officer, agent, employee, contractor, or subcontractor thereof, on account of any such interference, whether due to entry, performance of remedial or removal investigations, or exercise of any right with respect to the IRP or under this Easement or otherwise.

20.2. Government Right of Entry. The Government and its officers, agents, employees, contractors, and subcontractors shall have the right, upon reasonable notice to the Grantee, to enter upon the Easement Area for the purposes enumerated in this Paragraph.

20.2.1. To conduct investigations and surveys, including, where necessary, drilling, soil and water samplings, testpitting, testing soil borings, and other activities related to the IRP;

20.2.2. To inspect field activities of the Government and its contractors and subcontractors in implementing the IRP;

20.2.3. To conduct any test or survey related to the implementation of the IRP or environmental conditions at the Easement Area or to verify any data submitted to the EPA or the State Environmental Office by the Government relating to such conditions; and

20.2.4. To construct, operate, maintain, or undertake any other response or remedial action as required or necessary under the IRP, including, but not limited to, monitoring wells, pumping wells, and treatment facilities. Any investigations and surveys, drilling, testpitting, test soil borings, and other activities undertaken pursuant to this Subparagraph 20.2.4 shall be conducted in a manner that is as inconspicuous as practicable. Any monitoring wells, pumping wells, and treatment facilities required pursuant to this Paragraph 20.2.4 shall be designed and installed to be as inconspicuous as practicable. The Government shall attempt to minimize any interference with the Grantee's quiet use and enjoyment of the Easement Area arising as the result of such wells and treatment facilities. The Government shall, subject to the availability of appropriations therefor, repair any damage caused by its exercise of the rights in this Paragraph.

20.3. ACCESS FOR RESTORATION

20.3.1. Nothing in this Easement shall be interpreted as interfering with or otherwise limiting the right of the Air Force and its duly authorized officers, employees, contractors of any tier, agents, and invitees to enter upon the Premises for the purposes enumerated in Paragraph 20.3 and for such other purposes as are consistent with the provisions of an Federal Facility Agreement (FFA) or required to implement the IRP conducted under the provisions of 10 U.S.C. §§ 2701-2705. The Grantee shall provide reasonable assistance to the Air Force to ensure Air Force's activities under this Paragraph 20.3 do not damage property of the Grantee on the Easement Area.

20.3.2. The United States Environmental Protection Agency (USEPA) and State of Delaware, including their subordinate political units, and their duly authorized officers, employees, contractors of any tier, and agents may, upon reasonable notice to the Grantee and with Air Force's consent, enter upon the Premises for the purposes enumerated in Paragraph 20.3 and for such other purposes as are consistent with the provisions of an FFA. The Grantee shall provide reasonable assistance to USEPA and the State to ensure their activities under this Paragraph 20.3 do not damage property of the Grantee on the Easement Area.

21. ENVIRONMENTAL BASELINE SURVEY / ENVIRONMENTAL CONDITION OF PROPERTY

An Environmental Baseline Survey ("EBS") for the Easement Area dated 1 Sep 2015 has been delivered to the Grantee and is attached as Exhibit D hereto. The EBS sets forth those environmental conditions and matters on and affecting the Easement Area on the Easement Beginning Dateas determined from the records and analyses reflected therein. The EBS is not, and shall not constitute, a representation or warranty on the part of the Government regarding the environmental or physical condition of the Easement Area, and the Government shall have no liability in connection with the accuracy or completeness thereof. In this regard the Grantee acknowledges and agrees that the Grantee has relied, and shall rely, entirely on its own investigation of the Easement Area in determining whether to enter into this Easement. A separate EBS for the Easement Area shall be prepared by the Government, after the expiration or earlier termination of this Easement ("Final EBS"). Such Final EBS shall document the environmental conditions and matters on and affecting the Easement Area on the Term Expiration Date as determined from the records and analyses reflected therein. The Final EBS will be used by the Government to determine whether the Grantee has fulfilled its obligations to maintain and restore the Easement Area under this Easement including, without limitation, Paragraph 13 and Paragraph 16.

GENERAL PROVISIONS

22. GENERAL PROVISIONS

22.1. Covenant Against Contingent Fees. The Grantee warrants that it has not employed or retained any person or agency to solicit or secure this Easement upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee. Breach of this warranty shall give the Government the right to annul this Easement without liability or in its discretion to recover from the Grantee the amount of such commission, percentage, brokerage, or contingent fee, in addition to the consideration herewith set forth. This warranty shall not apply

to commissions payable by the Grantee on the Easement secured or made through bona fide established commercial agencies retained by the Grantee for the purpose of doing business. "Bona fide established commercial agencies" has been construed to include licensed real estate brokers engaged in the business generally.

22.2. Officials Not to Benefit. No Member of, or Delegate to the Congress, or resident commissioner, shall be admitted to any part or share of this Easement or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this Easement if made with a corporation for its general benefit.

22.3. Facility Nondiscrimination. As used only in this Condition, the term "Facility" means lodgings, stores, shops, restaurants, cafeterias, restrooms, and any other facility of a public nature in any building covered by, or built on land covered by, this Easement.

22.3.1. The Grantee agrees that it will not discriminate against any person because of race, color, religion, sex, or national origin in furnishing, or by refusing to furnish, to such person or persons the use of any Facility, including any and all services, privileges, accommodations, and activities provided on the Easement Area. This does not require the furnishing to the general public the use of any Facility customarily furnished by the Grantee solely for use by any assignees, licensees, or invitees or their guests and invitees.

22.3.2. The Parties agree that in the event of the Grantee's noncompliance, the Government may take appropriate action to enforce compliance, and may terminate this Easement for default and breach as provided in Paragraph 5, or may pursue such other remedies as may be provided by law.

22.4. Gratuities.

22.4.1. The Government may, by written notice to the Grantee, terminate this Easement if, after notice and hearing, the Secretary of the Air Force or a designee determines that the Grantee, or any agent or representative of the Grantee, offered or gave a gratuity (e.g., an entertainment or gift) to any officer, official, or employee of the Government and intended, by the gratuity, to obtain an easement or other agreement or favorable treatment under an easement or other agreement, except for gifts or benefits of nominal value offered to tenants of the Easement Area in the ordinary course of business.

22.4.2. The facts supporting this determination may be reviewed by any court having lawful jurisdiction.

22.4.3. If this Easement is terminated under Paragraph 22.4.1, the Government shall be entitled to pursue the same remedies against the Grantee as in a breach of this Easement by the Grantee, and in addition to any other damages provided by law, to exemplary damages of not fewer than three (3), or more than ten (10), times the cost incurred by the Grantee in giving gratuities to the person concerned, as determined by the Government.

22.4.4. The rights and remedies of the Government provided in this Paragraph shall not be exclusive, and are in addition to any other rights and remedies provided by law or under this Easement.

22.5. No Joint Venture. Nothing contained in this Easement will make, or shall be construed to make, the Parties' partners or joint venturers with each other, it being understood and agreed that the only relationship between the Government and the Grantee under this Easement is that of landlord and tenant. Nothing in this Easement will render, or be construed to render, either of the Parties liable to any third party for the debts or obligations of the other Party.

22.6. Records and Books of Account. The Grantee agrees that the Secretary of the Air Force, the Comptroller General of the United States, or the Auditor General of the United States Air Force, or any of their duly authorized representatives, shall, until the expiration of three (3) years after the expiration or earlier termination of this Easement, have access to, and the right to examine, any directly pertinent books, documents, papers, and records of the Grantee involving transactions related to this Easement.

22.7. Remedies Cumulative; Failure of Government to Insist on Compliance. The specified remedies to which the Government may resort under the terms of this Easement are distinct, separate, and cumulative, and are not intended to be exclusive of any other remedies or means of redress to which the Government may be lawfully entitled in case of any breach or threatened breach by the Grantee of any provisions of this Easement. The failure of the Government to insist on any one or more instances upon strict performance of any of the terms, covenants, or conditions of this Easement shall not be construed as a waiver or a relinquishment of the Government's right to the future performance of any such terms, covenants, or conditions, but the obligations of the Grantee with respect to such future performance shall continue in full force and effect. No waiver by the Government of any provisions of this Easement shall be deemed to have been made unless expressed in writing and signed by an authorized representative of the Government.

22.8. Counterparts. This Easement is executed in two (2) counterparts, each of which is deemed an original of equal dignity with the other and which is deemed one and the same instrument as the other.

22.9. Personal Pronouns. All personal pronouns used in this Easement, whether used in the masculine, feminine, or neuter gender, will include all other genders.

22.10. Entire Agreement. It is expressly agreed that this written instrument, together with the provisions of other documents that are expressly incorporated by reference by the terms of this Easement, embodies the entire agreement between the Parties regarding the use of the Easement Area by the Grantee. In the event of any inconsistency between the terms of this Easement and of any provision that has been incorporated by reference, the terms of this Easement shall govern. There are no understandings or agreements, verbal or otherwise, between the Parties except as expressly set forth in this Easement. This instrument may only be modified or amended by mutual agreement of the Parties in writing and signed by each of the Parties.

22.11. Partial Invalidity. If any term or provision of this Easement, or the application of the term or provision to any person or circumstance, is, to any extent, invalid or unenforceable, the remainder of this Easement, or the application of the term or provision to persons or circumstances other than those for which the term or provision is held invalid or unenforceable, will not be affected by the application, and each remaining term or provision of this Easement will be valid and will be enforced to the fullest extent permitted by law.

22.12. Interpretation of Easement. The Parties and their legal counsel have participated fully in the negotiation and drafting of this Easement. This Easement has been prepared by the Parties equally, and should be interpreted according to its terms. No inference shall be drawn that this Easement was prepared by, or is the product of, either Party.

22.13. Identification of Government Agencies, Statutes, Programs, and Forms. Any reference in this Easement, by name or number, to a government department, agency, statute, regulation, program, or form shall include any successor or similar department, agency, statute, regulation, program, or form.

22.14. Approvals. Any approval or consent of the Parties required for any matter under this Easement shall be in writing and shall not be unreasonably withheld, conditioned or denied unless otherwise indicated in this Easement.

22.15. Third-Party Beneficiaries. There shall be no third-party beneficiaries of this Easement other than the Delaware River Bay Authority (DRBA) or assigned future managers and none of the provisions of this Easement shall be for the benefit of, or enforceable by, any creditors of the Grantee.

22.16. No Individual Liability of Government Officials. No covenant or agreement contained in this Easement shall be deemed to be the covenant or agreement of any individual officer, agent, employee, or representative of the Government, in his or her individual capacity, and none of such persons shall be subject to any personal liability or accountability by reason of the execution of this Easement, whether by virtue of any constitution, statute, or rule of law, or by the enforcement of any assessment or penalty, or otherwise.

22.17. Excusable Delays. The Government and Grantee shall be excused from performing an obligation or undertaking provided for in this Easement, and the period for the performance of any such obligation or undertaking shall be extended for a period equivalent to the period of such delay, so long as such performance is prevented or unavoidably delayed, retarded, or hindered by an act of God; fire; earthquake; flood; explosion; war; invasion; insurrection; riot; mob; violence; sabotage; act of terrorism; inability to procure or a general shortage of, labor, equipment, facilities, materials, or supplies in the open market; failure or unavailability of transportation, strike, lockout, action of labor unions; a taking by eminent domain, requisition, laws, orders of government, or of civil, military, or naval authorities (but only such orders of a general nature pertaining to the Easement Area and comparable properties in the state of Delaware; governmental restrictions (including, without limitation, access restrictions imposed by the Government and arising without fault or negligence on the part of the Grantee that significantly hinder the Grantee's ability to access the Easement Area and perform its obligations under the

Development Plan in a timely manner); required environmental remediation; or any other cause, whether similar or dissimilar to the foregoing, not within the reasonable control, and without the fault or negligence of, the Government or the Grantee, as the case may be, and/or any of their respective officers, agents, servants, employees, and/or any others who may be on the Easement Area at the invitation of the Grantee, or the invitation of any of the aforementioned persons, specifically excluding, however, delays for adjustments of insurance and delays due to shortage or unavailability of funds (collectively, "Excusable Delays"). Nothing contained in this Paragraph 22.17 shall excuse the Grantee from the performance or satisfaction of an obligation under this Easement that is not prevented or delayed by the act or occurrence giving rise to an Excusable Delay.

23. SPECIAL PROVISIONS

Reserved

24. RIGHTS NOT IMPAIRED

24.1. Rights Not Impaired. Nothing contained in this Easement shall be construed to diminish, limit, or restrict any right, prerogative, or authority of the Government over the Easement Area relating to the security or mission of the Installation, the health, welfare, safety, or security of persons on the Installation, or the maintenance of good order and discipline on the Installation, as established in law, regulation, or military custom.

24.2. Installation Access. The Grantee acknowledges that it understands that the Installation is an operating military Installation that could remain closed to the public and accepts that the Grantee's operations may from time to time be restricted temporarily or permanently due to the needs of national defense. Access on the Installation may also be restricted due to inclement weather and natural disasters. The Grantee further acknowledges that the Government strictly enforces federal laws and Air Force regulations concerning controlled substances (drugs) and that personnel, vehicles, supplies, and equipment entering the Installation are subject to search and seizure under 18 U.S.C. § 1382. The Government will use reasonable diligence in permitting the Grantee access to the Easement Area at all times, subject to the provisions of this paragraph. Notwithstanding the foregoing, the Grantee agrees the Government will not be responsible for lost time or costs incurred due to interference, delays in entry, temporary loss of access, barring of individual employees from the Installation under federal laws authorizing such actions, limitation, or withdrawal of an employee's on-base driving privileges, or any other security action that may cause employees to be late to, or unavailable at, their work stations, or delay arrival of parts and supplies. The Government retains the right to refuse access to the Easement Area by the Grantee's parties. The Grantee, its assignees, employees, and invitees fully agree to abide with all access restrictions imposed by the Government in the interest of national defense.

24.3. Permanent Removal and Barment. Notwithstanding anything contained in this Easement to the contrary, the Government has the right at all times to order the permanent removal and barment of anyone from the Installation, including but not limited to assignees, if it believes, in its sole discretion, that the continued presence on the Installation of that person

represents a threat to the security or mission of the Installation, poses a threat to the health, welfare, safety, or security of persons occupying the Installation, or compromises good order and/or discipline on the Installation.

24.4. No Diminishment of Rights. Except as provided in Paragraph 24.1, nothing in this Easement shall be construed to diminish, limit, or restrict any right of the Grantee under this Easement, or the rights of any assignees, licensees, or invitees as prescribed under their easements or Applicable Laws.

25. APPLICABLE LAWS

25.1. Compliance With Applicable Laws. The Grantee shall comply, at its sole cost and expense (except for matters for which the Government remains obligated hereunder pursuant to Paragraph 16), with all Applicable Laws including without limitation, those regarding construction, demolition, maintenance, operation, sanitation, licenses, or permits to do business, protection of the environment, pollution control and abatement, occupational safety and health, and all other related matters. The Grantee shall be responsible for determining whether it is subject to local building codes or building permit requirements, and for compliance with them to the extent they are applicable.

25.1.1. "Applicable Laws" means, collectively, all present and future laws, ordinances, rules, requirements, regulations, and orders of the United States, the State where the Easement Area is located and any other public or quasi-public federal, State, or local authority, and/or any department or agency thereof, having jurisdiction over the Project ("Project" means, collectively, the Easement Area and the Easement Area Improvements) and relating to the Project or imposing any duty upon the Grantee with respect to the use, occupation, or alteration of the Project during the Easement Term.

25.2. Permits, Licenses, and Approvals. The Grantee will be responsible for and obtain, at its sole expense, prior to the commencement of construction and demolition, and upon completion of the building of Easement Area improvements, any approvals, permits, or licenses that may be necessary to construct, occupy, and operate the Grantee improvements and Grantee equipment in compliance with all Applicable Laws.

25.3. No Waiver of Sovereign Immunity. Nothing in this Easement shall be construed to constitute a waiver of federal supremacy or federal sovereign immunity. Only laws and regulations applicable to the Easement Area under the Constitution and statutes of the United States are covered by this Paragraph. The United States presently exercises propertiary federal legislative jurisdiction over the Easement Area.

25.4 Grantee Responsibility for Compliance. Responsibility for compliance as specified in this Paragraph 25 rests exclusively with the Grantee. The Government assumes no enforcement or supervisory responsibility, except with respect to matters committed to its jurisdiction and authority.

25.5. Grantee Right to Contest. The Grantee shall have the right to contest by appropriate proceedings diligently conducted in good faith, without cost or expense to the Government, the validity or application of any law, ordinance, order, rule, regulation, or requirement of the nature referred to in this Paragraph 25. The Government shall not be required to join in or assist the Grantee in any such proceedings.

26. AVAILABILITY OF FUNDS

The obligations of any Party to this Easement or of any transferee of the Easement shall be subject to the availability of appropriated funds for any such obligation, unless such Party or transferee is a non-appropriated fund instrumentality of the United States. No appropriated funds are obligated by this Easement.

27. CONGRESSIONAL REPORTING

This Easement is not subject to 10 U.S.C. § 2662.

28. AMENDMENTS

This Easement may be amended at any time by mutual agreement of the Parties in writing and signed by a duly authorized representative of each of the respective Parties. Such amendments may include, but are not limited to, extensions of the Easement Termination Date.

29. LIABILITY

No Government Liability. Except as otherwise provided in this Easement, the Government shall not be responsible for damage to property or injuries or death to persons that may arise from, or be attributable or incident to, the condition or state or repair of the Easement Area, or the use and occupation of the Easement Area, or for damages to the property of the Grantee, or injuries or death of the Grantee's officers, agents, servants, employees, or others who may be on the Easement Area at their invitation or the invitation of any one of them.

30. ENTIRE AGREEMENT

It is expressly understood and agreed that this written instrument embodies the entire agreement between the Parties regarding the use of the Premises by the Grantee, and there are no understandings or agreements, verbal or otherwise, between the Parties except as expressly set forth in this Easement.

31. CONDITION AND PARAGRAPH HEADINGS

The brief headings or titles preceding each Paragraph are merely for purposes of identification, convenience, and ease of reference, and will be completely disregarded in the construction and interpretation of this Easement.

32. STATUTORY AND REGULATORY REFERENCES

Any reference to a statute or regulation in this Easement shall be interpreted as being a reference to the statute or regulation as it has been or may be amended from time to time.

33. PRIOR AGREEMENTS

This Easement supersedes all prior agreements, if any, to the Grantee for the Easement Area, but does not terminate any obligations of the Grantee under such prior easements that may by their terms survive the termination or expiration of those easements, except to the extent such obligations are inconsistent with this Easement.

34. RESERVED.

35. ADDITIONAL CONDITIONS

35.1 That the Government retains the right to continued use and access to include, but not limited to maintain and repair existing roads, grounds, pavements, and underground utilities, and to improve, replace or construct new roads and underground utilities and traverse the state's taxiway by personnel, vehicles and equipment.

35.2 That the Government shall continue other general grounds maintenance in the eaement (including grass cutting) except for the area within the edge lights lining each side of the state's taxiway.

35.3 The Government will not provide snow removal for any of the state's facilities. During snow removal operations, the Government will endeavor to free the state's taxiway intersection of spoil from Government snow plowing operations.

35.4 That the Government shall recognize the right-of-way for taxying aircraft.

35.5 That the Government recognizes the obligation to inform and coordinate with the operating agent of the state when it is necessary to perform excavations for trenching within the easement area.

35.6 The lessee does, by acceptance of this lease, covenant and agree for itself, its assigns, sublessees, and successors in interest to the property herein leased or any part thereof;

35.6.1 That the leased premises (and buildings and facilities erected thereon) will be operated as a taxiway in full compliance with Title VI of the Civil Rights Act of 1964 and all requirements imposed by or pursuant to the regulations issued thereunder by the Department of the Air Force and in effect on the date of this lease to the end that no person in the United States shall, on the

ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any programs or activities provided thereon;

35.6.2 That the United States shall have the right to judicial enforcement of these covenants not only as to the lessee, its successors and assigns, but also as to sublessees and licensees doing business or extending services under contractural or other arrangements on the land herein; and

36. EXHIBITS

Four (4) exhibits are attached to and made a part of this Grant, as follows:

Exhibit A - Description of Premises
Exhibit B - Map of Premises
Exhibit C - Physical Condition Report
Exhibit D – Environmental Baseline Survey

IN WITNESS WHEREOF, I have hereunto set my hand at the direction of the Secretary of the Air Force.

THE UNITED STATES OF AMERICA
acting by and through the Secretary of the Air Force

By: _____
ETHAN C. GRIFFIN, Colonel, USAF
Commander

ACCEPTANCE

The Grantee hereby accepts this Grant of Easement and agrees to be bound by its terms.

GRANTEE:

DELAWARE DEPARTMENT OF TRANSPORTATION

APPROVED AS TO FORM:

_____
Annie Cordo
Deputy Attorney General

_____
JENNIFER COHAN
Secretary, Delaware Department of Transportation

Attest:

_____
CHARLANNE THORTON
Finance Director

Form Approved By
SAF/GCN 29 Oct 2014
Previous Versions Obsolete

CENTURY ENGINEERING, INC.
LAND SURVEYORS / ENGINEERS / PLANNERS
4134 North DuPont Highway
Dover, Delaware 19901

ADDRESS:	Dover Air Force Base, Dover Delaware
GRANTOR:	United States of America, Dover Air Force Base
GRANTEE:	State of Delaware, Department of Transportation
TAX PARCEL NO:	ED-05-087.00-01-06.00 (p/o)

PERMANENT EASEMENT-1 (PE-1)

ALL that certain lot, piece or parcel of land situated in the City of Dover, East Dover Hundred, Kent County and State of Delaware; Said parcel being a Permanent Easement required for the State of Delaware Civil Air Terminal Joint Use Agreement; Said parcel being a portion of lands now or formerly (n/f) of United States of America, Dover Air Force Base (DAFB), being bounded on the north, east and south by these lands of DAFB, and on the west by lands n/f of State of Delaware as shown on a recent survey by Century Engineering, Inc., Drawing No. 115013.08 CAT (EXHIBIT A), dated October 13, 2015 and more particularly bounded and described as follows, to-wit:

Beginning at a point located on a division line between these lands n/f of DAFB and lands n/f of DelDOT at Point No. 1000 as shown on the attached EXHIBIT A; said point having a Northing Coordinate of 415046.5281 and an Easting Coordinate of 641979.0075;

Thence from the said **Point and Place of Beginning**, running along said division line, North 03 deg. 13 min. 54 sec. East, a distance of 400.00 feet to a point; said point being Point No. 1001 as shown on the attached EXHIBIT A; said point having a Northing Coordinate of 415445.8920 and an Easting Coordinate of 642001.5567; thence

Turning and running through these lands n/f of DAFB in an easterly direction, South 86 deg. 46 min. 06 sec. East, a distance of 210.00 feet to a point; said point being Point No. 1002 as shown on the attached EXHIBIT A; said point having a Northing Coordinate of 415434.0538 and an Easting Coordinate of 642211.2214; thence

Turning and continuing through these lands n/f of DAFB in an southerly direction, South 03 deg. 13 min. 54 sec. West, a distance of 400.00 feet to a point; said point being Point No. 1003 as shown on the attached EXHIBIT A; said point having a Northing Coordinate of 415034.6898 and an Easting Coordinate of 642188.6722; thence

Turning and continuing through these lands n/f of DAFB in an westerly direction, North 86 deg. 46 min. 06 sec. West, a distance of 210.00 feet to the **Point and Place of Beginning** and containing 84,000 +/- square feet or 1.928 +/- acres of land be the same more or less.

PERMANENT EASEMENT-2 (PE-2)

ALL that certain lot, piece or parcel of land situated in the City of Dover, East Dover Hundred, Kent County and State of Delaware; Said parcel being a Permanent Easement required for the State of Delaware Civil Air Terminal Joint Use Agreement; Said parcel being a portion of lands now or formerly (n/f) of United States of America, Dover Air Force Base (DAFB), being bounded on the north, east and south by these lands of DAFB, and on the west by lands n/f of State of Delaware as shown on a recent survey by Century Engineering, Inc., Drawing No. 115013.08 CAT (EXHIBIT B), dated October 13, 2015 and more particularly bounded and described as follows, to-wit:

Beginning at a point located on a division line between these lands n/f of DAFB and lands n/f of DelDOT at Point No. 2000 as shown on the attached EXHIBIT B; said point having a Northing Coordinate of 415713.1871 and an Easting Coordinate of 642016.6476;

Thence from the said **Point and Place of Beginning**, running along said division line, North 03 deg. 13 min. 54 sec. East, a distance of 400.00 feet to a point; said point being Point No. 2001 as shown on the attached EXHIBIT B; said point having a Northing Coordinate of 416112.5511 and an Easting Coordinate of 642039.1968; thence

Turning and running through these lands n/f of DAFB in an easterly direction, South 86 deg. 46 min. 06 sec. East, a distance of 210.00 feet to a point; said point being Point No. 2002 as shown on the attached EXHIBIT B; said point having a Northing Coordinate of 416100.7127 and an Easting Coordinate of 642248.8629; thence

Turning and continuing through these lands n/f of DAFB in an southerly direction, South 03 deg. 13 min. 54 sec. West, a distance of 400.00 feet to a point; said point being Point No. 2003 as shown on the attached EXHIBIT B; said point having a Northing Coordinate of 415701.3488 and an Easting Coordinate of 6422226.3136; thence

Turning and continuing through these lands n/f of DAFB in an westerly direction, North 86 deg. 46 min. 06 sec. West, a distance of 210.00 feet to the **Point and Place of Beginning** and containing 84,000 +/- square feet or 1.928 +/- acres of land be the same more or less.

Exhibit A – Private Aircraft Parking on Dover AFB Airfield

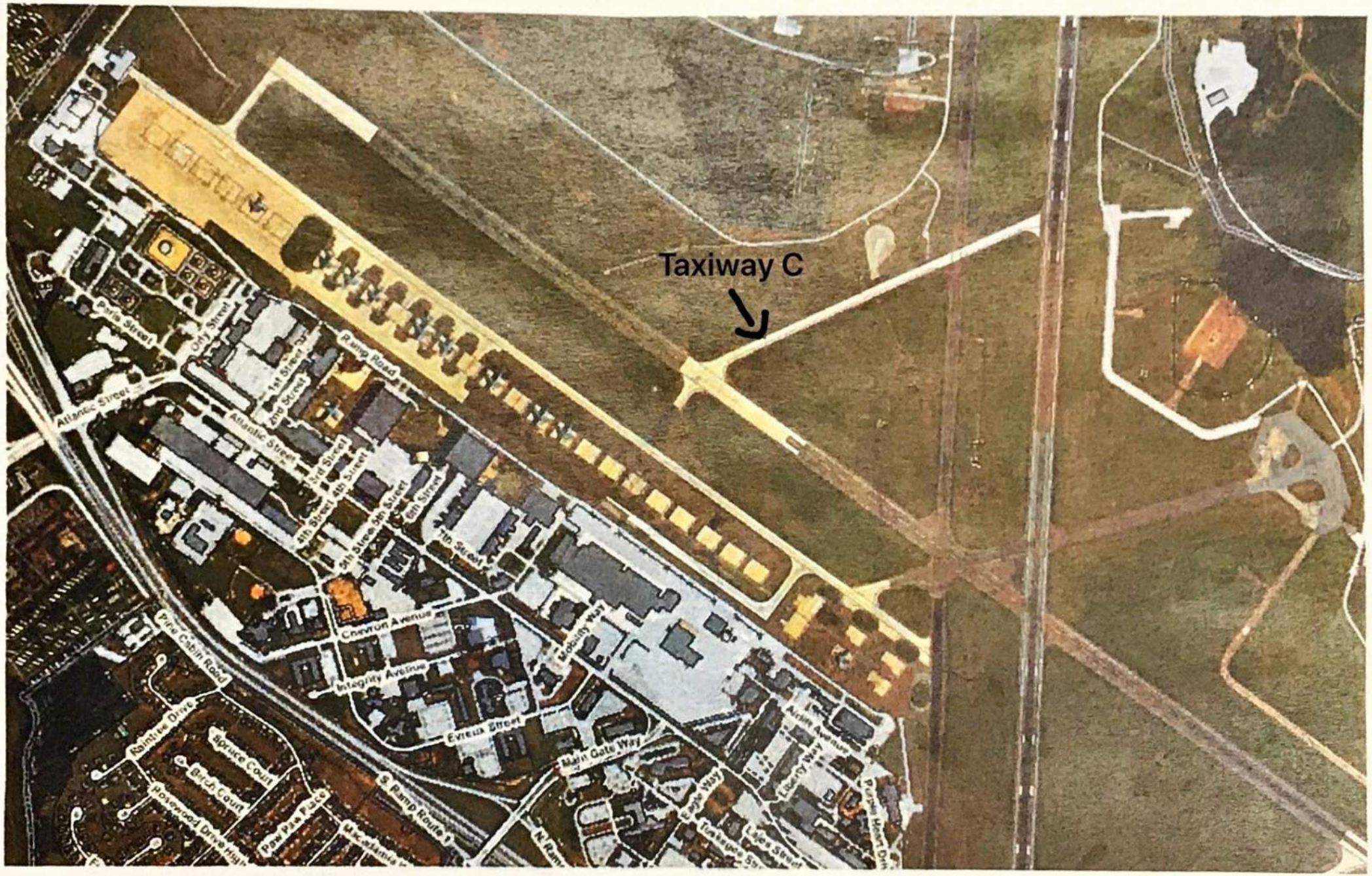
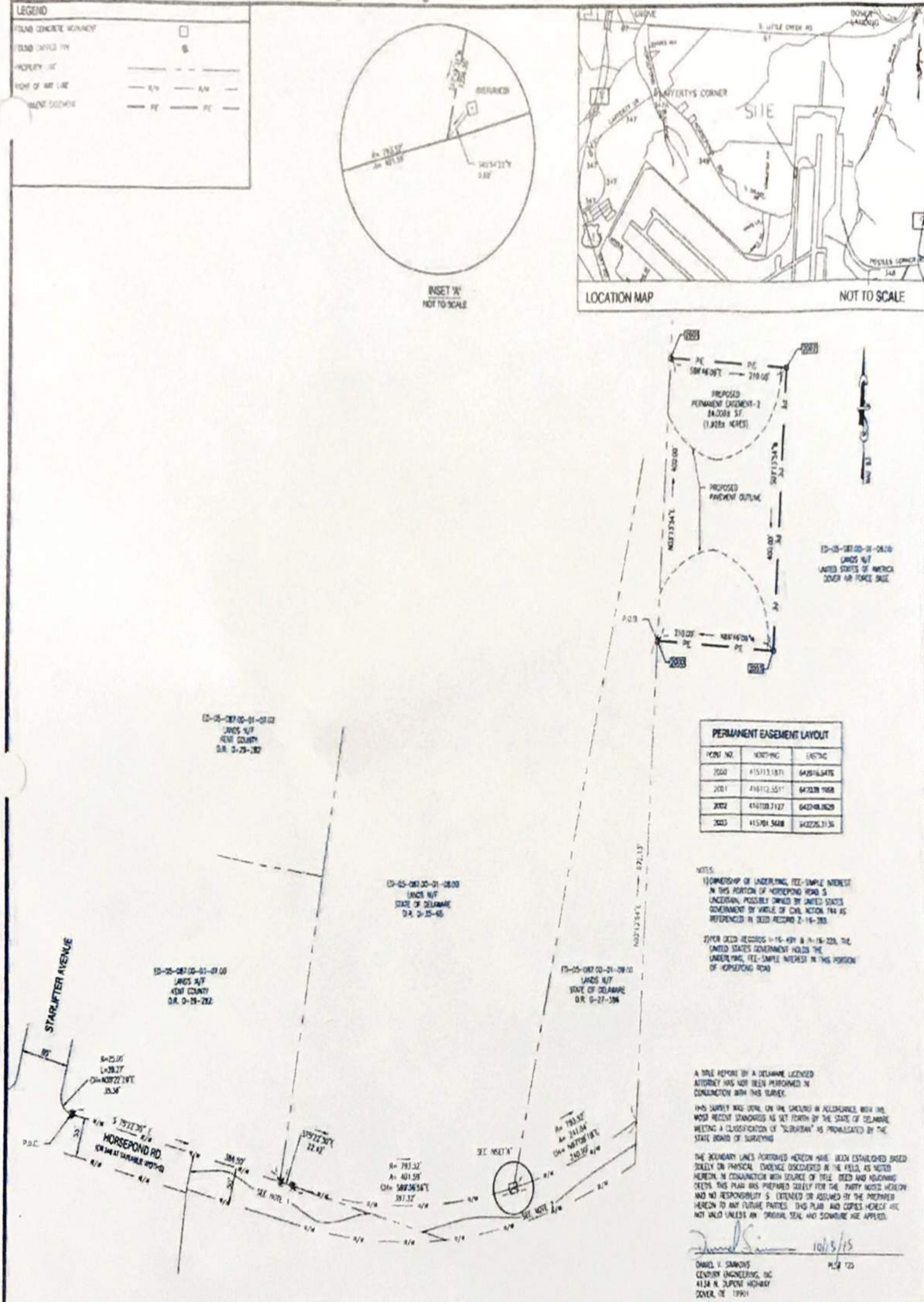


Exhibit A – Private Aircraft Parking on Taxiway C on Dover AFB

Exhibit A - Civil Air Terminal Northern Entrance Engineer Drawing



PERMANENT EASEMENT LAYOUT		
POINT NO.	NORTHING	EASTING
2000	415713.1871	642016.5475
2001	416112.5511	642228.1958
2002	416100.7127	642248.2629
2003	415701.5488	642225.3136

NOTES:

1) OWNERSHIP OF UNDERLYING, FEE-SIMPLE INTEREST IN THIS PORTION OF HORSEPOND ROAD IS UNCERTAIN, POSSIBLY OWNED BY UNITED STATES GOVERNMENT BY VIRTUE OF CIVIL ACTION 744 AS REFERENCED IN DEED RECORD Z-16-283.

2) PER DEED RECORDS I-16-491 & H-16-228, THE UNITED STATES GOVERNMENT HOLDS THE UNDERLYING, FEE-SIMPLE INTEREST IN THIS PORTION OF HORSEPOND ROAD

A TITLE REPORT BY A DELAWARE LICENSED ATTORNEY HAS NOT BEEN PERFORMED IN CONJUNCTION WITH THIS SURVEY.

THIS SURVEY WAS DONE ON THE GROUND IN ACCORDANCE WITH THE MOST RECENT STANDARDS AS SET FORTH BY THE STATE OF DELAWARE MEETING A CLASSIFICATION OF "SUBURBAN" AS PROMULGATED BY THE STATE BOARD OF SURVEYING

THE BOUNDARY LINES PORTRAYED HEREON HAVE BEEN ESTABLISHED BASED SOLELY ON PHYSICAL EVIDENCE DISCOVERED IN THE FIELD, AS NOTED HEREON, IN CONJUNCTION WITH SOURCE OF TITLE DEED AND ADJOINING DEEDS. THIS PLAN WAS PREPARED SOLELY FOR THE PARTY NOTED HEREON AND NO RESPONSIBILITY IS EXTENDED OR ASSUMED BY THE PREPARER HEREON TO ANY FUTURE PARTIES. THIS PLAN AND COPIES HEREOF ARE NOT VALID UNLESS AN ORIGINAL SEAL AND SIGNATURE ARE APPLIED.

10/13/15

DANIEL V. SIMMONS
CENTURY ENGINEERING, INC
4134 N. DUPONT HIGHWAY
DOVER, DE 19901

PLS# 725

UNITED STATES OF AMERICA DOVER AIR FORCE BASE
LANDS OF

KENT COUNTY	EAST DOVER HUNDRED	ED-05-087.00-01-06.00 P/O TAX ASSMT. PAR. NO.
N/A CONTRACT NO.	CIVIL AIR TERMINAL JOINT USE AGREEMENT PROJECT TITLE	
N/A CONTRACT PARCEL NO.	N/A DEED RECORD	N/A DEED DATE
SCALE: 1 INCH = 100 FEET	FULL SIZE DWG. IS 17" x 22" FOR 8 1/2" x 11" COPIES SCALE x 2	84,000 S.F. (1.928 ACRES) AREA OF

REVISIONS: INCREASE EASEMENT AREA 10/13/2015

STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION

P.O. BOX 778
DOVER, DELAWARE 19903

EXHIBIT B

DRAWN BY	DATE	SHEET NO.	CEI DWG. NO.	DELDOT PLOT NO.
DLD@CEI	10/13/2015	1 OF 1	115013.08 CAT	

Appendix C

Correspondence and Outreach

Agencies Consulted

Delaware Department of Natural Resources and Environmental Control

Delaware Nation

Delaware Tribe of Indians

Delaware State Historic Preservation Office

United States Federal Aviation Administration

United States Fish and Wildlife Service

DEPARTMENT OF THE AIR FORCE
436th Civil Engineer Squadron (AMC)
Dover Air Force Base, Delaware 19902-5600

436 CES/CEI
600 Chevron Ave
Dover AFB DE 19902-5600

JUL 0 8 2019

Received 7/8/19

Jennifer Holmes
Delaware Coastal Programs
Dept. of Natural Resources & Environmental Control
100 W. Water Street, Suite 7B
Dover DE 19904

SUBJECT: Negative Determination for Increasing Private Flights Authorized to Utilize Dover AFB Airfield Under National Environmental Policy Act (NEPA) Evaluation

Dear Ms. Holmes

Dover AFB is preparing an Environmental Assessment (EA) in conjunction with a proposal to increase the number of flights authorized in the new Joint Use Agreement with the State of Delaware. The State of Delaware, in attempts to develop the Civil Air Terminal adjacent to DAFB, has requested additional flights be authorized as a part of the new agreement. The draft environmental assessment for increasing the number of flights on the DAFB airfield, which will be released for public comment in the next few months, identified no significant impacts to the Coastal Zone Management Program or other environmental media. With no significant impacts to environmental media, a draft Finding of No Significant Impact has also been prepared which has led to our submission of this negative determination as defined in 15 CFR 930.35.

Please direct any questions or comments regarding this determination to Mr. Lee DiSalvo at (302) 677-4753 or Ms. Tami Calhoun at (302) 677-5415.

Sincerely

Steven M. Seip

STEVEN M. SEIP, P.E.
Chief, Installation Management Flight

Attachment:
Location Map for Civil Air Terminal

From: Michael Perrotta
Sent: Friday, October 16, 2020 11:12 AM
To: SEIP, STEVEN M GS-14 USAF AMC 436 CES/CEN; Johnson, Stephanie (DelDOT); Alex Schmidt; James Morton
Cc: William Carver
Subject: RE: DAFB Civil Air Terminal Flight Increase

Follow Up Flag: Follow up
Flag Status: Flagged

Great – thanks Steve.

James, please address and insert this wording at the end of Chapter 1 'agency coordination' and also other areas within chapter 3 and 4 that discuss Coastal Zone Mgmt (CZM).

mike

From: SEIP, STEVEN M GS-14 USAF AMC 436 CES/CEN <steven.seip@us.af.mil>
Sent: Friday, October 16, 2020 10:49 AM
To: Johnson, Stephanie (DelDOT) <Stephanie.Johnson@delaware.gov>; Alex Schmidt <aschmidt@centuryeng.com>; Michael Perrotta <mperrotta@centuryeng.com>
Subject: FW: DAFB Civil Air Terminal Flight Increase

Alex/Mike,

FYI, regarding CZM, reference this email in the EA regarding CZM coordination not being required as it does not meet the definition of a federal agency activity.

Steve

From: Mensch, Laura (DNREC) <laura.mensch@delaware.gov>
Sent: Friday, October 16, 2020 10:27 AM
To: SEIP, STEVEN M GS-14 USAF AMC 436 CES/CEN <steven.seip@us.af.mil>
Cc: Johnson, Stephanie (DelDOT) <Stephanie.Johnson@delaware.gov>; JORDAN, MATTHEW W CIV USAF AMC 436 CES/CENPL <matthew.jordan.9@us.af.mil>; CALHOUN, TAMI S GS-12 USAF AMC 436 CES/CEIEC <tami.calhoun.2@us.af.mil>
Subject: [Non-DoD Source] RE: DAFB Civil Air Terminal Flight Increase

Hello Steve,

After seeking input from the National Oceanic and Atmospheric Administration, Office of Coastal Management, the Delaware Coastal Management Program (DCMP) has determined that the proposed project will be not be considered a federal agency activity under 15 CFR part 930, subpart C. That means that, for the proposed activity of increasing flights on the Civil Air Terminal, DAFB does not need to submit for a federal consistency review with the DCMP. I look forward to continuing to work with you on future projects at the DAFB and I encourage you to continue to reach out for early coordination on any future projects.

Laura Mensch | Principal Planner | Regulatory Programs Manager
Department of Natural Resources and Environmental Control
Division of Climate, Coastal and Energy | Delaware Coastal Programs
100 West Water Street, Dover DE 19904 | Office: 302.739.9255

From: SEIP, STEVEN M GS-14 USAF AMC 436 CES/CEN <steven.seip@us.af.mil>
Sent: Thursday, October 15, 2020 3:57 PM
To: Mensch, Laura (DNREC) <laura.mensch@delaware.gov>
Cc: Johnson, Stephanie (DelDOT) <Stephanie.Johnson@delaware.gov>; JORDAN, MATTHEW W CIV USAF AMC 436 CES/CENPL <matthew.jordan.9@us.af.mil>; CALHOUN, TAMI S GS-12 USAF AMC 436 CES/CEIEC <tami.calhoun.2@us.af.mil>
Subject: RE: DAFB Civil Air Terminal Flight Increase

Thanks Laura,

Does that mean that Dover AFB can submit a negative determination for this action?

Steve

From: Mensch, Laura (DNREC) <laura.mensch@delaware.gov>
Sent: Thursday, October 15, 2020 3:33 PM
To: Johnson, Stephanie (DelDOT) <Stephanie.Johnson@delaware.gov>
Cc: Alex Schmidt <aschmidt@centuryeng.com>; SEIP, STEVEN M GS-14 USAF AMC 436 CES/CEN <steven.seip@us.af.mil>; Michael Perrotta <mperrotta@centuryeng.com>; Krofft, Heidi (DelDOT) <Heidi.Krofft@delaware.gov>; Tulou, Christophe (EPW) <Christophe_Tulou@epw.senate.gov>
Subject: [Non-DoD Source] RE: DAFB Civil Air Terminal Flight Increase

Hi Stephanie,

Thank you for your patience. The DCMP has been assessing whether the JUA qualifies as a federal license or permit under 15 CFR Part 930. It appears that the JUA does not qualify as a federal license or permit, which means that, barring the need for obtaining any other federal authorization, DelDOT would not require a federal consistency review for the proposed activities.

Laura Mensch | Principal Planner | Regulatory Programs Manager
Department of Natural Resources and Environmental Control
Division of Climate, Coastal and Energy | Delaware Coastal Programs
100 West Water Street, Dover DE 19904 | Office: 302.739.9255

From: Johnson, Stephanie (DelDOT) <Stephanie.Johnson@delaware.gov>
Sent: Thursday, October 15, 2020 2:30 PM
To: Mensch, Laura (DNREC) <laura.mensch@delaware.gov>
Cc: Alex Schmidt <aschmidt@centuryeng.com>; SEIP, STEVEN M GS-14 USAF AMC 436 CES/CEN <steven.seip@us.af.mil>; Michael Perrotta <mperrotta@centuryeng.com>; Krofft, Heidi (DelDOT) <Heidi.Krofft@delaware.gov>; Tulou, Christophe (EPW) <Christophe_Tulou@epw.senate.gov>
Subject: RE: DAFB Civil Air Terminal Flight Increase

Hi Laura,

Just checking in to see if the information I provided regarding our planned project and the related existing Joint Use Agreement and draft language have assisted in making a determination on next steps for DNREC's comments to our EA.

If any additional information is needed, please let me know. We're on a tight schedule so feel free to contact me with any questions.

Thanks,
Stephanie

Stephanie J. Johnson
Assistant Director, Planning
Delaware Department of Transportation
O: (302) 760-2117 C: (302) 222-4383

From: Johnson, Stephanie (DelDOT)
Sent: Friday, October 09, 2020 1:16 PM
To: Mensch, Laura (DNREC) <laura.mensch@delaware.gov>; Krofft, Heidi (DelDOT) <Heidi.Krofft@delaware.gov>
Cc: Alex Schmidt <aschmidt@centuryeng.com>; SEIP, STEVEN M GS-14 USAF AMC 436 CES/CEN <steven.seip@us.af.mil>
Subject: RE: DAFB Civil Air Terminal Flight Increase

Laura,

As a follow-up to our phone call yesterday, please find attached the following documents:

- PDF of Dover JUA Dec. 1997 – This is the existing Joint Use Agreement currently in place. This agreement expires 12/2022.
- Word Document of the JUA Final Draft.DelDOT – This is the working draft that is almost finalized. You will see within the document that the 13,500 figure for the number of operations is highlighted as we are awaiting the acceptance of the EA before we can change this number to the proposed 25,000 operations.

Let me know if you have any questions or need any additional information. Feel free to call me at the number highlighted below.

Thanks!
Stephanie

Stephanie J. Johnson
Assistant Director, Planning
Delaware Department of Transportation
O: (302) 760-2117 C: (302) 222-4383

From: Mensch, Laura (DNREC) <laura.mensch@delaware.gov>
Sent: Thursday, October 08, 2020 9:23 AM
To: Krofft, Heidi (DelDOT) <Heidi.Krofft@delaware.gov>; Johnson, Stephanie (DelDOT) <Stephanie.Johnson@delaware.gov>
Subject: DAFB Civil Air Terminal Flight Increase

Hi Heidi and Stephanie,

I wanted to touch base with you about the proposed DAFB Civil Air Terminal flight increase project. Based on my discussions with Steve Seip, I understand that there is an established Joint Use Agreement between DelDOT and DAFB that adds a bit of complexity to the issue of who is taking what actions for this project. Basically, if DelDOT is obtaining any federal authorizations for the work (for example, an airport layout change request from FAA), then DelDOT would need to submit a certification to the Delaware Coastal Management Program for a federal consistency review.

Please feel free to reach out by email or phone to discuss further. Thank you.

Laura Mensch | Principal Planner | Regulatory Programs Manager
Department of Natural Resources and Environmental Control
Division of Climate, Coastal and Energy | Delaware Coastal Programs
100 West Water Street, Dover DE 19904 | Office: 302.739.9255

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL
DIVISION OF FISH & WILDLIFE
RICHARDSON & ROBBINS BUILDING
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

DIRECTOR'S OFFICE

PHONE
(302) 739-9910

November 20, 2020

Ms. Tami Calhoun
Dover Air Force Base
600 Chevron Ave.
Dover Air Force Base, DE 19902

Re: DAF 2020 Civil Air Terminal

Dear Ms. Calhoun:

Thank you for contacting the Species Conservation and Research Program (SCRP) about information on rare, threatened and endangered species, unique natural communities, and other significant natural resources as they relate to the above referenced project.

State Natural Heritage Site
A review of our database indicates that there are currently no records of state-rare or federally listed plants, animals or natural communities at this project site. As a result, at present, this project does not lie within a State Natural Heritage Site, nor does it lie within a Delaware National Estuarine Research Reserve which are two criteria used to identify "Designated Critical Resource Waters" in the Army Corps of Engineers (ACOE) Nationwide Permit General Condition No. 22. A copy of this letter shall be included in any permit application or pre-construction notification submitted to the Army Corps of Engineers for activities on this property.

Migratory Birds and Bats
After consultation with several taxa experts, we concur with the findings of the Environmental Assessment that the increase in flight operations will have a minimal population level impacts on these species. Following the guidelines outlined in the Bird/Wildlife Aircraft Strike Hazard (BASH) plan will help reduce the probability of bird and wildlife aircraft strikes. Continued monitoring and reporting of species that experience mortality from air strikes will help guide more site-specific recommendations in the future.

Fisheries
After reviewing the project description, it does not appear that any waterways will be impacted; therefore, there are no fisheries concerns at present.

We are continually updating our records on Delaware's rare, threatened and endangered species, unique natural communities and other significant natural resources. If the start of the project is delayed more than a year past the date of this letter, please contact us again for the latest information.

Please feel free to contact me with any questions or if you require additional information.

Sincerely,

Katie Kadlubar
Environmental Review Coordinator
Phone: (302) 735-8665
6180 Hay Point Landing Road
Smyrna, DE 19977

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 436TH AIRLIFT WING (AMC)
Dover Air Force Base, Delaware 19902

436 CES/CEI
600 Chevron Avenue
Dover AFB DE 19902-5600

Delaware Nation
Nicole Alligood
Director, Delaware Nation Historic Preservation Office
31064 State Highway 281
Anadarko, OK 73005

Subject: Expansion of Flights Authorized Under Joint Use Agreement

Dear Ms. Alligood

Dover AFB is proposing to allow expanding authorized flights on our airfield to the State of Delaware and associated tenants of Civil Air Terminal adjacent to Dover AFB. The current Joint Use Agreement authorizes 13,500 flights annually to the Civil Air Terminal. The State of Delaware is requesting that authorization be increased to 25,000 annually. The State of Delaware, through partnerships with Kent County and local governments is trying to develop the adjacent Civil Air Terminal in to a larger facility that may attract jobs to the State of Delaware and specifically the local region. Obtaining a larger flight authorization is essential for them to pursue that plan. The State of Delaware already maintains an easement with Dover AFB for the existing taxiway from the Civil Air Terminal to the Dover AFB airfield. Within that easement, they plan to construct a second taxiway to accommodate potentially larger aircraft and increase the footprint of the existing taxiway. No additional ground disturbing activities are proposed on Dover AFB property.

In accordance with the Department of Defense and Air Force policies, Dover AFB is contacting the Delaware Nation to see if authorizing the increase in flights to the Civil Air Terminal under the Joint Use Agreement has the potential to affect tribal interests. To this end, we are preparing appropriate documents in accordance with the National Environmental Policy Act to evaluate the potential impacts of this project on the human environment.

In addition, with this letter, Dover AFB initiates government-to-government consultation with the Delaware Nation pursuant to Section 106 of the National Historic Preservation Act, 36 CFR Part 800 in order to provide the tribe an opportunity to exchange information, ask questions, and advise DAFB of any concerns or suggestions it may have regarding the increased flight authorization. We have included a map of the base that shows the Dover AFB airfield and the location of the current Civil Air Terminal along with the taxiways. It is our position that allowing the increased flights on our airfield for the Civil Air Terminal tenants would not have an adverse effect on historic properties. Per 36 CFR 800.4(d)(1), we request your concurrence with this finding.

We request you forward your responses to Mr. Steven Seip, 436 CES/CEI, 600 Chevron Avenue, Dover AFB, Delaware 19902-5600 or via email to steven.seip@us.af.mil. Please contact me at (302) 677-6839 or Ms. Tami Calhoun at (302) 677-6709 regarding any questions or comments pertaining to this correspondence. Thank you for your assistance.

Sincerely

STEVEN M. SEIP, P.E.
Installation Management Flight, Dover AFB

Attachment:
Location Map of Civil Air Terminal

The Delaware Nation
Historic Preservation Department
31064 State Highway 281
Anadarko, OK 73005
Phone (405)247-2448

December 2, 2019

To Whom It May Concern:

The Delaware Nation Historic Preservation Department received correspondence regarding the following referenced project(s).

Project: Expansion of Flights Authorized Under Joint Use Agreement

Our office is committed to protecting tribal heritage, culture and religion with particular concern for archaeological sites potentially containing burials and associated funerary objects.

The Lenape people occupied the area indicated in your letter during prior to European contact until their eventual removal to our present locations. According to our files, the location of the proposed project does not endanger cultural, or religious sites of interest to the Delaware Nation. **Please continue with the project as planned** keeping in mind during construction should an archaeological site or artifacts inadvertently be uncovered, all construction and ground disturbing activities should immediately be halted until the appropriate state agencies, as well as this office, are notified (within 24 hours), and a proper archaeological assessment can be made.

Please note the Delaware Nation, the Delaware Tribe of Indians, and the Stockbridge Munsee Band of Mohican Indians are the only Federally Recognized Delaware/Lenape entities in the United States and consultation must be made only with designated staff of these three tribes. We appreciate your cooperation in contacting the Delaware Nation Cultural Preservation Office to conduct proper Section 106 consultation. Should you have any questions, feel free to contact our offices at 405-247-2448 ext. 1403.

Erin N. Paden

Erin Paden
Director of Historic Preservation
Delaware Nation
31064 State Highway 281
Anadarko, OK 73005
Ph. 405-247-2448 ext. 1403
epaden@delawarenation-nsn.gov

From: Michael Perrotta
Sent: Tuesday, November 24, 2020 11:50 AM
To: William Carver; James Morton
Subject: FW: [Non-DoD Source] Re: Civil Air Terminal Flight increase Comments

See below

Michael A. Perrotta, PE, AICP
Vice President – Planning

Century Engineering, Inc.

T 443.589.2433 | C 443.618.2409

From: SEIP, STEVEN M GS-14 USAF AMC 436 CES/CEN <steven.seip@us.af.mil>
Sent: Wednesday, September 16, 2020 1:34 PM
To: Michael Perrotta <mperrotta@centuryeng.com>
Cc: Alex Schmidt <aschmidt@centuryeng.com>; Johnson, Stephanie (DelDOT) <Stephanie.Johnson@delaware.gov>
Subject: FW: [Non-DoD Source] Re: Civil Air Terminal Flight increase Comments

Just FYI, no objections from the DE Tribe of Indians. See below

We have responses from both federally recognized tribes.

Steve

From: Eastern Historic Preservation <temple@delawaretribe.org>
Sent: Wednesday, September 16, 2020 11:27 AM
To: CALHOUN, TAMI S GS-12 USAF AMC 436 CES/CEIEC <tami.calhoun.2@us.af.mil>
Subject: [Non-DoD Source] Re: Civil Air Terminal Flight increase Comments

Hi, Tami.
It was a pleasure speaking with you this morning.
Thank you for reaching out to the Delaware Tribe of Indians regarding this project. We have no objection or comment at this time.
Best,
Susan Bachor, M.A.
Archaeologist
Delaware Tribe Historic Preservation
126 University Circle
Stroud Hall, Rm. 437
East Stroudsburg PA 18301
office - 1.570.422.2023
sbachor@delawaretribe.org
cell-1.610.761.7452

From: "CALHOUN, TAMI S GS-12 USAF AMC 436 CES/CEIEC" <tami.calhoun.2@us.af.mil>
To: "sbachor@delawaretribe.org" <sbachor@delawaretribe.org>
Sent: 9/16/2020 10:07 AM
Subject: Civil Air Terminal Flight increase Comments

Good morning,
We spoke on the phone regarding the Civil Air Terminal Flight increases here at Dover AFB in Dover Delaware. The increase involves going from 13,500 to 25,000 allowed takeoffs and landings.

You mentioned on the phone that there is no tribal interest in this particular project. If you could please draft a quick response back to confirm that in writing I would appreciate it.

Thanks,
Tami

Tami Calhoun
Natural and Cultural Resource Manager
436 CES/CEIEC
(Currently on Telework)

State of Delaware
Historical and Cultural Affairs

21 The Green
Dover, DE 19901-3611

Phone: (302) 736.7400 Fax: (302) 739.5660

December 23, 2014 Project: 2005.06.07.01

Mr. Steven Seip
Department of the Air Force
436th Civil Engineer Squadron (AMC)
600 Chevron Avenue
Dover Air Force Base, Delaware 19902-5600

SUBJECT: Geophysical Survey of Cemetery 1 and Cemetery 2 at Dover Air Force Base

Dear Mr. Seip,

Our office has reviewed the report *Geophysical Survey of Cemetery 1 and Cemetery 2 at Dover Air Force Base, Kent County, Delaware.* The authors investigated two cemeteries with ground penetrating radar, but did not receive conclusive results with these methods. We concur with the authors that stripping or excavation will be the only certain way of determining whether any graves are present. Please be aware that the Section 110 is not the only legislation involved with cemeteries. The State of Delaware also has legislation protecting places of human burial. Please refer to the following sections of the Delaware State Code: (1) Title 11 Sub-Chapter 1340, titled "Desecration of Burial Places"; and (2) Title 7 Chapter 54, known as the "Delaware Unmarked Human Remains Act

The report meets our standards as is, and we would be grateful if you could send in a final paper copy along with a digital copy for the Research Center.

I can be reached at 302-736-7407 if you would care to discuss this further.

Sincerely,

Craig Lukezic
Archaeologist
E-Mail: craig.lukezic@state.de.us

cc: Gwen Davis, Deputy SHPO, Division of Historical and Cultural Affairs

CULTURAL RESOURCE MANAGMENT MAP

Potential Cemetery #2

Potential Cemetery #1

7K-D-143

7K-D-126

7K-D-129

7K-D-26

7K-D-5

7K-D-2

RWY 01-19

Perimeter Road

Perimeter Road

Perimeter Road

Heritage Road

Reno Road

Las Vegas Street

Ramp Road

Airlift Avenue

Paris Street

1st Street

4th Street

5th Street

7th Street

Mobility Way

Eagle Way

Lajes Street

Chad Street

Arnold Street

Evreux Street

Chevron Avenue

Integrity Avenue

Main Gate Way

N. Ramp Route 1

S. Ramp Route 1

Green Way Street

Raintree Drive

Avocado Avenue

Macadamia Way

Brazil Nut Way

High Street

W. Hawthorne Drive

Lebanon Road

Retreat Drive

Circle Drive

Center Raod

Larch Court

Hazelnut Drive

Legend

- Fence
- Gate
- Wall
- Cultural Survey Area
- Cult Probable Sensitive Area
- Airfield Surface Area
- Buildings
- Base Area

0 500 1,000 2,000 3,000 4,000 Feet

Path: L:\GIS\Specialty maps\Environmental\cultural_resource\MXD\Cultural Resource Managment Map.mxd

DEPARTMENT OF THE AIR FORCE
436th Civil Engineer Squadron (AMC)
Dover Air Force Base, Delaware 19902-5600

436 CES/CEI
600 Chevron Avenue
Dover AFB DE 19902-5600

SEP 17 2015

Ms. Gwenyth Davis
Delaware State Historic Preservation Office
21 The Green, Suite B
Dover DE 19901

Dear Ms. Davis

In accordance with 36 CFR 800.3(c) (3), Dover Air Force Base (DAFB) is requesting a Section 106 consultation with your office with regards to the construction of a second entrance on to the DAFB airfield from the State of Delaware owned Civil Air Terminal as well as minor enlargements to the existing entrance as shown on the attached location map. The State of Delaware has requested the establishment of a second entrance from the Civil Air Terminal on to the DAFB airfield to facilitate larger aircraft due to its proposed location away from the existing facility. The State of Delaware and Kent County have been marketing the Civil Air Terminal within the aviation community in attempts to develop businesses and jobs for Kent County and the State of Delaware. Frequent meetings on the subject have led to potential tenants. The State of Delaware is in the process of securing funds to construct the second and modify the existing entrance to show potential tenants that all required infrastructure for access to the airfield is available.

There are no known cultural resource sites in the area of the Civil Air Terminal. However, the 1956 runway as-built drawings indicated the presence of a small cemetery in the vicinity. In 1997/1998 the area was subjected to a Phase I archaeological survey; however, shovel testing did not reveal evidence of burials. In an effort to confirm these results, DAFB performed a geophysical survey of the area in 2012 and found no anomalies consistent with grave shafts or burials. The subsequent report was sent to your office on 29 November 2012. Attached is a copy of the transmittal letter.

DAFB has evaluated and determined the proposed construction of a second entrance and the enlargement of the existing entrance to the State of Delaware owned Civil Air Terminal onto the DAFB airfield qualify as a Finding of No Adverse Effect. If you have any questions or comments pertaining to this correspondence, please contact myself at 677-6839 or Mr. Lee DiSalvo at 677-4753.

Sincerely

Steven M. Seip

STEVEN M. SEIP, P.E.
Chief, Installation Management Flight

2 Attachments:
1. Civil Air Terminal Location Map
2. 29 Nov 2012 Transmittal Letter Regarding Geophysical Survey for Cemetery 1

State of Delaware
Historical and Cultural Affairs

21 The Green
Dover, DE 19901-3611

Phone: (302) 736.7400 Fax: (302) 739.5660

FINDINGS OF NO HISTORIC PROPERTIES AFFECTED

Review Code: 2015.09.17.01 October 21, 2015

Steven M. Seip
Chief, Installation Management Flight
436 CES/CEI
600 Chevron Avenue
Dover AFB DE 19902-5600

Project: Civil Air Terminal Second Entrance
Dover Air Force Base
Dover, Delaware

The staff of the State Historic Preservation Office has reviewed the materials submitted. All of the work will occur in previously disturbed soils. Based on this review, we have made the determination that no historic properties, eligible for or listed in the National Register of Historic Places, will be affected by this project.

Craig Lukezic
Archaeologist

cc: Gwen Davis, Deputy SHPO, Division of Historical and Cultural Affairs

SAVING DELAWARE HISTORY

DEPARTMENT OF THE AIR FORCE
436th Civil Engineer Squadron (AMC)
Dover Air Force Base, Delaware 19902-5600

436 CES/CEI
600 Chevron Avenue
Dover AFB DE 19902-5600

JUN 0 5 2019

Ms. Gwenyth Davis
Delaware State Historic Preservation Office
21 The Green, Suite B
Dover DE 19901

Dear Ms. Davis

Dover AFB is preparing an Environmental Assessment (EA) in conjunction with a proposal to increase the number of flights authorized in the new Joint Use Agreement with the State of Delaware. The State of Delaware, in attempts to develop the Civil Air Terminal adjacent to DAFB, has requested additional flights be authorized as a part of the new agreement. As a federal undertaking, this proposal to increase the number of flights on the DAFB airfield is subject to 36 CFR Part 800, the regulations implementing Section 106 of the National Historic Preservation Act (16 USC § 470f); with this letter Dover AFB is initiating consultation regarding the revision to the new Joint Use Agreement.

Previous consultation occurred with regards to the construction of an additional taxiway associated with the Civil Air Terminal on DAFB. That consultation concluded on 21 Oct 2015 with your office concurring with our finding of no adverse effect. This consultation is associated with additional private flights to the Civil Air Terminal. These additional flights would follow already established DAFB approach and departure patterns. The State of Delaware and Kent County have been marketing the Civil Air Terminal within the aviation community in attempts to develop businesses and jobs. A formal request for proposals will be released, however, not until a new Joint Use Agreement is finalized. The EA and this consultation must be complete before the new Joint Use Agreement can be signed.

DAFB has evaluated and determined the proposed increase in flights to the Civil Air Terminal associated with the joint use agreement qualify as a Finding of No Adverse Effect. If you have any questions or comments pertaining to this correspondence, please contact myself at 677-6839 or Ms. Tami Calhoun at 677-5415.

Sincerely

Steven M. Seip

STEVEN M. SEIP, P.E.
Chief, Installation Management Flight

From: Michael Perrotta
Sent: Monday, November 9, 2020 3:31 PM
To: SEIP, STEVEN M GS-14 USAF AMC 436 CES/CEN; Johnson, Stephanie (DelDOT)
Cc: CALHOUN, TAMI S GS-12 USAF AMC 436 CES/CEIEC; Alex Schmidt; JORDAN, MATTHEW W CIV USAF AMC 436 CES/CENPL; William Carver; James Morton
Subject: SHPO coordination

Follow Up Flag: Follow up
Flag Status: Flagged

Thanks much, Steve. We will summarize this level of coordination into our Section 1.5 (Agency coordination) for our public review submittal

James – please see below.

mike

Michael A. Perrotta, PE, AICP
Vice President – Planning
Century Engineering, Inc.
T 443.589.2433 | C 443.618.2409

From: SEIP, STEVEN M GS-14 USAF AMC 436 CES/CEN <steven.seip@us.af.mil>
Sent: Monday, November 9, 2020 2:28 PM
To: Johnson, Stephanie (DelDOT) <Stephanie.Johnson@delaware.gov>
Cc: CALHOUN, TAMI S GS-12 USAF AMC 436 CES/CEIEC <tami.calhoun.2@us.af.mil>; Michael Perrotta <mperrotta@centuryeng.com>; Alex Schmidt <aschmidt@centuryeng.com>; JORDAN, MATTHEW W CIV USAF AMC 436 CES/CENPL <matthew.jordan.9@us.af.mil>
Subject: FW: Environmental Assessment for the Expansion of Civil Air Terminal Flight Operations at Dover Air Force Base

FYI, looks like we won't get a formal response from DE SHPO until the next version of the EA is provided.

Steve

From: Briggs, Kara (DOS) <Kara.Briggs@delaware.gov>
Sent: Monday, November 9, 2020 1:43 PM
To: SEIP, STEVEN M GS-14 USAF AMC 436 CES/CEN <steven.seip@us.af.mil>
Subject: [Non-DoD Source] RE: Environmental Assessment for the Expansion of Civil Air Terminal Flight Operations at Dover Air Force Base

Hello Steve,
I really appreciate this. Yes, please to sending the final version to us.

Thank you so much,

Kara

Kara A. Briggs
Architectural Historian
Tax Credit Program Manager
21 The Green| Dover, DE 19901
tel (302) 736-7400

website | vCard | map | email

Notice: all state employee email addresses now end in @delaware.gov

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From: SEIP, STEVEN M GS-14 USAF AMC 436 CES/CEN <steven.seip@us.af.mil>
Sent: Tuesday, November 3, 2020 4:32 PM
To: Briggs, Kara (DOS) <Kara.Briggs@delaware.gov>
Cc: JORDAN, MATTHEW W CIV USAF AMC 436 CES/CENPL <matthew.jordan.9@us.af.mil>; CALHOUN, TAMI S GS-12 USAF AMC 436 CES/CEIEC <tami.calhoun.2@us.af.mil>
Subject: RE: Environmental Assessment for the Expansion of Civil Air Terminal Flight Operations at Dover Air Force Base

Good afternoon Kara,

I did provide the following language to the contractor for the final version of the EA that will be released for public comment:

Management practices include language in local flying instructions that indicate the following:

- ATC will not normally vector a jet aircraft or turboprop aircraft with more than two engines over the Dover Capitol Area below 3,000' AGL, unless safety of flight is a factor.
  ATC instructions take precedence over noise abatement procedures.
- All aircraft avoid over flight of the following historically significant buildings: Dickinson Mansion located at N3906.085 W07526.912, approximately DOV 160/2.
  Round Barn located at N3909.067 W07527.413, approximately DOV 020/1. The Manor at Cool Springs located at N3843.2 W07514.8, approximately 5 NM southeast of Milton, DE.

These instructions are for all aircraft, military and civilian that utilize the Dover AFB airfield. Let me know if you need any additional information or do you want to see the next version before formally responding? Thanks.

Regards,
Steve

From: Briggs, Kara (DOS) <Kara.Briggs@delaware.gov>
Sent: Wednesday, October 28, 2020 9:43 AM
To: SEIP, STEVEN M GS-14 USAF AMC 436 CES/CEN <steven.seip@us.af.mil>
Subject: [Non-DoD Source] RE: Environmental Assessment for the Expansion of Civil Air Terminal Flight Operations at Dover Air Force Base

Good Morning Steve,
Its been a little while since we last communicated about the CAT at DAFB. I thought I should reach out to confirm receipt of my 10/7 email to you, and make sure there wasn't anything further you needed from me.

I hope all's well,
Kara

Kara A. Briggs
Architectural Historian
Tax Credit Program Manager
21 The Green | Dover, DE 19901
tel (302) 736-7400

website | vCard | map | email

From: Briggs, Kara (DOS)
Sent: Wednesday, October 7, 2020 11:16 AM
To: SEIP, STEVEN M GS-14 USAF AMC 436 CES/CEN <steven.seip@us.af.mil>
Subject: Environmental Assessment for the Expansion of Civil Air Terminal Flight Operations at Dover Air Force Base

Good Morning Steve,

Thank you for taking my call this morning. As we discussed, there are a few points of clarification needed so that I may complete my review of the CAT DAFB EA Final Draft (Revised Draft August 2020):

Cultural (Historic Properties/Sites) The DAFB EA noted 56 historic properties within the Area of Potential Effect (APE)/beneath the airspace. Counted among the 56 is the John Dickinson Plantation (JDP). However, JDP is a listed National Historic Landmark (NHL), a separate designation from the NRHP, and is not currently called out as such in the EA (Section 3.6.2.1,

Architectural and Archaeological Resources pgs. 3-23, 3-24). Our Office is requesting that JDP be NHL be noted and recognized as an NHL separate from (Table 3.6-1) the noted NRHP-Listed Sites within APE Boundary.

JDP is located within close proximity of the current military aircraft flight pattern; understanding that CAT will follow the same flight pattern (provided text excerpts with highlights below), our Office has concerns of increased noise particularly at/in the vicinity of JDP. Despite the studies provided, we are specifically asking if there is an anticipated rise in noise level

P6 (iii)

"Alternative 3 (Preferred Alternative): Under Alternative 3 (Preferred Alternative), The proposed increase to the maximum number of annual civilian aircraft operations from 13,500 to 25,000 would be facilitated by a fixed base operator (FBO) tenant. A fixed base operator would provide aeronautical services such as fueling, short term parking, long term parking, hangaring, tie-down and parking, catering, maintenance, US Customs services and car rental. The aircraft expected to use the services of an FBO tenant at the CAT would consist of small to medium general aviation aircraft. Based on the findings of a 2019 economic assessment, a daily average of a minimum of 70 operations per day would Environmental Assessment for the Expansion of Civil Air Terminal Flight Operations at Dover Air Force Base Revised Draft iv August 2020 necessary to financially sustain the FBO tenant at the CAT. Civilian aircraft would fly along the same flight paths used by military aircraft. All CAT operations would comply with DAFB Air Traffic Control and hours of operation. Military aircraft arriving and departing would continue to have priority of movement throughout the jointly used flying facilities (JUFF)."

P. 8 (v)

"Cultural (Historic Properties/Sites)

The proposed increased use of DAFB airspace by additional aircraft operations would cause no adverse effect to the 56 historic properties beneath the airspace. Desktop research showed there are no known National Register of Historic Places (NRHP) sites in the vicinity of the new or existing CAT taxiway construction. The incremental increase in overflights of any individual historic resource would be infrequent, short in duration, and would not diminish the characteristics that make the sites eligible for the NRHP

Lastly, our Office is requesting that 'current management plans that protect known cultural resources cultural resources' be referenced, defined or otherwise and included within the EA

Pgs 111-112 (5-7, 5-8)

"5.2.5 Cultural Resources

No direct impacts to NRHP would occur with implementation of the Proposed Action. The incremental changes in the visual and audible elements introduced by the Proposed Action would not diminish the integrity of any properties' significant historic attributes and would not alter the characteristics that qualify properties as eligible for the NRHP. The Day-Night average sound level increases between the currently approved number of CAT civil flight operations and the proposed future Proposed Action for the increase in civil flight operations do not exceed thresholds described in FAA 1050.1F. Current management plans that protect known cultural

resources would remain in effect for the duration of the Proposed Action. Compliance with Section 106 of the NHPA, including continued SHPO consultation to identify any known archaeological/historic resources, would be accomplished prior to implementation of any action at DAFB."

Again, Thank you very much for your time this morning. I look forward to hearing from you and moving forward to complete my review.

Best,
Kara

Kara A. Briggs
Architectural Historian
Tax Credit Program Manager
21 The Green| Dover, DE 19901
tel (302) 736-7400

HCA DELAWARE HISTORICAL & CULTURAL AFFAIRS
Saving Delaware History

American Alliance of Museums Accredited Museum

website | **vCard** | **map** | **email**

From: Michael Perrotta
Sent: Monday, November 9, 2020 11:36 AM
To: HV 4th Floor Conference Room
Cc: James Morton
Subject: RE: DAFB CAT EA comments

Here is the chain of emails from FAA to Matthew Jordan.
Please work this language into the EA

From: Miller, Paula (FAA) <Paula.Miller@faa.gov>
Sent: Wednesday, October 30, 2019 3:52 PM
To: Richburg, Jennifer (FAA) <jennifer.richburg@faa.gov>; JORDAN, MATTHEW W CIV USAF AMC 436 CES/CENPL <matthew.jordan.9@us.af.mil>; Hogan, Debra L (FAA) <Debra.L.Hogan@faa.gov>
Cc: Gallant, Paul (FAA) <paul.gallant@faa.gov>; Stowers, Jeremy H (FAA) <jeremy.h.stowers@faa.gov>; Rosenbloom, Scott (FAA) <scott.rosenbloom@faa.gov>
Subject: [Non-DoD Source] FW: Draft EA for Joint Use Agreement Increase in Flights at Dover AFB

Jennifer, Matt, and Deb,
After reviewing the draft EA and conferring with AJV's airspace SME (Paul Gallant), and our AF rep (Jeremy Stowers) we've determined that this proposed action will not involve any changes to special use airspace (SUA) utilization, or changes to current flight procedures. FAA's Airports Division has also indicated they have no review responsibility because their action is non-discretionary. Therefore, it appears that FAA currently has no role as a cooperating agency (as defined by the NEPA implementing regulations) on this project proposal.

As this project progresses however, and it's discovered that SUA or flight procedures may need to change as a result of the proposed action, then FAA's involvement should be revisited.

Please contact me if you have any questions or concerns.

Kind regards,
Paula Miller

Paula M. Miller, JD, EPS
ATO - Airspace Services
800 Independence Ave., SW, Rm 422
Washington, DC 20591
PH: 202-267-7378
FX: 202-267-5809
Email: paula.miller@faa.gov

Let's CONNECT

From: Brooks, Andrew (FAA) <Andrew.Brooks@faa.gov>
Sent: Tuesday, October 29, 2019 9:22 AM
To: Miller, Paula (FAA) <Paula.Miller@faa.gov>
Cc: Cuddy, Thomas (FAA) <Thomas.Cuddy@faa.gov>
Subject: RE: Draft EA for Joint Use Agreement Increase in Flights at Dover AFB

Paula,

I think I responded too soon. Actually, the nature of Airports Division action here is non-discretionary, so therefore, we don't have a NEPA hook in this one after all. If ATO/AJV feel that they have no action either, then we may be able to respond that we don't have a Federal Action and would not need to adopt the EA for any purpose. Additionally, we could adopt the EA at a later date f it turned out we did have an action that we just don't see at this point.

Apologies for the change of position on this one.

Andrew Brooks
Environmental Program Manager
Federal Aviation Administration
Eastern Regional Office
1 Aviation Plaza
Jamaica, NY 11434
Phone: 718-553-2511

From: Brooks, Andrew (FAA)
Sent: Tuesday, October 29, 2019 9:17 AM
To: Miller, Paula (FAA) <Paula.Miller@faa.gov>
Cc: Cuddy, Thomas (FAA) <Thomas.Cuddy@faa.gov>
Subject: FW: Draft EA for Joint Use Agreement Increase in Flights at Dover AFB

Paula,

Airports has a very minor action related to the proposal. I can serve as the FAA POC for the AF reps moving forward if you want to forward my contact info to them.

Thanks,

Andrew Brooks
Environmental Program Manager
Federal Aviation Administration
Eastern Regional Office
1 Aviation Plaza
Jamaica, NY 11434
Phone: 718-553-2511

From: Cuddy, Thomas (FAA) <Thomas.Cuddy@faa.gov>
Sent: Friday, October 25, 2019 1:46 PM

To: Brooks, Andrew (FAA) <Andrew.Brooks@faa.gov>
Subject: FW: Draft EA for Joint Use Agreement Increase in Flights at Dover AFB

Andrew,

Have you all been involved at all with this Air Force project in Dover Delaware? You may want to scan the attached EA and see if you have any issues.

TC

Thomas W. Cuddy
FAA Systems and Policy Analysis Division | Manager (Acting)
202.267.5869, thomas.cuddy@faa.gov

From: Miller, Paula (FAA) <Paula.Miller@faa.gov>
Sent: Friday, October 25, 2019 11:02 AM
To: Cuddy, Thomas (FAA) <Thomas.Cuddy@faa.gov>
Cc: Richburg, Jennifer (FAA) <jennifer.richburg@faa.gov>; Stowers, Jeremy H (FAA) <jeremy.h.stowers@faa.gov>; Hogan, Debra L (FAA) <Debra.L.Hogan@faa.gov>
Subject: FW: Draft EA for Joint Use Agreement Increase in Flights at Dover AFB

Hi Tom,
This Air Force EA was brought to my attention by Eastern Service Center. Would this Air Force proposed action be an EA that the Air Force would need to coordinate thru Airports as opposed to ATO? ATO has determined that, since it doesn't appear that this AF project impacts Special Use Airspace, ATO/AJV likely doesn't have a role in reviewing and adopting this AF EA. Please let me know if Airports would be involved, because the AF Reps would like to ensure appropriate coordination with the correct LOB at FAA.

Thanks,
Paula Miller

Paula M. Miller, JD, EPS
ATO – Airspace Services
800 Independence Ave., SW, Rm 422
Washington, DC 20591
PH: 202-267-7378
FX: 202-267-5809
Email: paula.miller@faa.gov

From: JORDAN, MATTHEW W CIV USAF AMC 436 CES/CENPL <matthew.jordan.9@us.af.mil>
Sent: Friday, October 25, 2019 9:35 AM
To: Miller, Paula (FAA) <Paula.Miller@faa.gov>; Hogan, Debra L (FAA) <Debra.L.Hogan@faa.gov>
Cc: Richburg, Jennifer (FAA) <jennifer.richburg@faa.gov>; Stowers, Jeremy H (FAA) <jeremy.h.stowers@faa.gov>; SEIP, STEVEN M GS-14 USAF AMC 436 CES/CEN <steven.seip@us.af.mil>
Subject: RE: Draft EA for Joint Use Agreement Increase in Flights at Dover AFB

Good morning all,

Attached is the State of Delaware funded draft EA for the new Joint Use Agreement at Dover AFB. The driver for this is the State of Delaware requesting additional flights (currently they are authorized 13,500 annually, they have requested 25,000). While there is no definitive occupant for the Civil Air Terminal at this time, they evaluated a UPS/Fed Ex type scenario where the fleet consists of B757 – 200 and B747-200 aircraft as a bigger potential to emit for air emissions and noise. The Air Force is the proponent for this action as they are using our airfield. Please let me know if I can provide further information.

V/R

Matt

Matthew Jordan
Dover Air Force Base Community Planner
436 CES/CENPL
600 Chevron Ave.
Dover AFB DE 19902
Com: 302-677-2121 DSN: 445-2121

Permit Number: MB56441A-0
Effective: 10/01/2016 Expires: 09/30/2021

Issuing Office:

Department of the Interior
U.S. FISH AND WILDLIFE SERVICE
Migratory Bird Permit Office
P.O. Box 779
Hadley, MA 01035-0779
Tel: 413-253-8643 Fax: 413-253-8424
Email: permitsR5MB@fws.gov

CHIEF, MIGRATORY BIRD PERMIT OFFICE - REGION 5

Permittee:

DOVER AIR FORCE BASE
436 CES/CD, 600 CHEVRON AVE.
DOVER AIR FORCE BASE, DE 19902-5600
U.S.A.

Name and Title of Principal Officer:
GINA M. LAVENDER - DEPUTY BASE CIVIL ENGINEER

Authority: Statutes and Regulations: 16 USC 668a; 50 CFR Part 13, 50 CFR 22.23.

Location where authorized activity may be conducted:

Dover Air Force Base Property, Dover, DE

Reporting requirements:

ANNUAL REPORT DUE **1/31**, PER STANDARD CONDITION (J) OF THIS PERMIT
REPORT FORMS CAN BE FOUND AT: <http://www.fws.gov/migratorybirds/mbpermits.html>

Conditions and Authorizations:

A. General conditions set out in Subpart B of 50 CFR 13, and specific conditions contained in Federal regulations cited above, are hereby made a part of this permit. All activities authorized herein must be carried out in accord with and for the purposes described in the application submitted. Continued validity, or renewal of this permit is subject to complete and timely compliance with all applicable conditions, including the filing of all required information and reports.

B. The validity of this permit is also conditioned upon strict observance of all applicable foreign, state, local tribal, or other federal law.

C. Valid for use by permittee named above

D. Permittee is authorized to use non-lethal scare devices and scare tactics to move or disperse bald eagles endangering human safety due to high potential of a serious bird strike to aircraft. Pyrotechnics must not be shot directly at bald eagles. Permittee must make a continued effort to reduce attraction of bald eagles to airport property.

E. This permit does not authorize the killing, injuring or capturing of any bald eagle or the destruction of any bald eagle nest.

F. This permit does not authorize the disturbance of bald eagles at active nest sites that contain eggs or young.

G. Permittee shall notify the issuing office at (413) 253-8424(fax) within 48 hours regarding any injury or death occuring to any bald eagle during project activities. Any injured bald eagle must be immediately transferred to the Tri-State Bird Rescue & Research, Newark, DE (302) 737-9543.

H. Authorized Subpermittees: Dover Air Force Base personnel. Permittee may delegate the authorities granted in this permit to employees and contractors under his supervision providing they exercise these authorities only while on official duty and within the scope of their employment. The subpermittees who have been delegated this authority may not re-delegate to other persons. The permittee remains completely responsible for all activities conducted under this permit.

I. Any person exercising authorities under this permit shall have a copy of this permit on his/her person and display it upon request to any duly authorized State or Federal Officer.

Permit Number: MB56441A-0
Effective: 10/01/2016 Expires: 09/30/2021

J. Permittee shall submit a report of activities conducted under this permit to the USFWS, Migratory Bird Permit Office, P.O. Box 779, Hadley, MA, 01035, by January 31 of each year.

The report must include:

(a) Locations of control activities affecting bald eagles. Locations shall be noted using figures, maps and by referencing a common coordinate system (e.g., latitude, universal transverse mercator system, etc.)
(b) Non-lethal scare devices and scare tactics used to move or disperse bald eagles.
(c) An estimate of the number of bald eagles affected.
(d) Methods used to reduce attraction of bald eagles to airport property.

K. You must comply with the attached Standard Conditions for Eagle Depredation Permits. **These standard conditions are a continuation of your permit conditions *and must remain with your permit.***

For suspected illegal activity, immediately contact USFWS Law Enforcement at: Dover, DE 302-697-1629

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, Maryland 21401
http://www.fws.gov/chesapeakebay

October 8 2020

Mr. Steve Seip
600 Chevron Avenue
Dover AFB, DE 19901

RE: "Not Likely to Adversely Affect" red knot determination for the alternatives described in the Draft Environmental Assessment for the Expansion of Civil Air Terminal Flight Operations at Dover Air Force Base in Dover, Delaware

Dear Mr. Seip:

The U.S. Fish and Wildlife Service (Service) has reviewed the following three documents provided to us in your email message on September 24, 2020 regarding the proposal to expand civilian air flights at the Dover Air Force Base (DAFB). The documents are as follows: Chapters 1-2 of the Draft Environmental Assessment (EA) for Expansion of Civil Air Terminal (CAT) Flight Operations at Dover Air Force Base dated May 2020; the Draft Noise Report Update for Civil Air Terminal Expansion at Dover Air Force Base, Delaware Reflecting the Proposed Regional Aircraft Scenario for a Fixed Based Operator, June 2020; and Appendix B to the Draft EA that provides the Service's Information, Planning and Consultation trust resources report, which identified endangered and threatened species, migratory birds, and refuges that may occur at or near the project. The Service has evaluated the range of alternatives described in the EA and the potential effects to the threatened red knot (*Calidris canutus rufa*). The comments provided below are in accordance with Section 7 of the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*).

The purpose of the proposed project is to increase the amount of civilian air traffic arriving and departing from DAFB. The Delaware Department of Transportation (DelDOT) in coordination with DAFB has proposed an increase in the use of the CAT by increasing the permitted number of flight operations at DAFB. The increase in flight operations will be realized through a new Joint Use Agreement (JUA) between DelDOT and the United States Air Force (USAF) and will incorporate the essential elements of all previous JUAs and related amendments into a single, long-term JUA. An additional stated purpose of this project is to improve the economic viability of the CAT by increasing the allowable number of civilian flight operations at DAFB.

The primary user of the CAT is The National Association for Stock Car Auto Racing (NASCAR), experiencing its heaviest traffic during the two annual race weekends (spring and

fall). A total of approximately 240 NASCAR-related operations occurred in 2018, comprising approximately 70 percent of the total annual operations. The remaining operations consist of charter flights. The majority, nearly 98 percent, of all civilian operations occurred during the acoustic daytime hours of 7 AM to 10 PM. In 2019, the event occurred between May 2 and May 5 (https://www.doverspeedway.com/2019-spring-weekend-schedule/). Some of the increased number of flights arriving and departing from DAFB fly over the Delaware coastline in spring when red knots are present in the Delaware Bay.

The federally threatened red knot occurs in the project vicinity during its spring migration. Each May, thousands of red knots fly directly from their wintering grounds in Brazil to forage, rest, and refuel along the shores of the Delaware Bay. They then depart for the last leg of their journey to the Arctic breeding grounds. The Delaware Bay is the largest stopover for red knots and approximately 74 percent of the global population of red knots travels through this area. Their migration is timed to coincide with the spawning season for the horseshoe crab (*Limulus polyphemus*). Horseshoe crab eggs provide a rich food source for migrating birds, and during their brief spring stay, red knots in Delaware Bay can nearly double their body weight. Their ability to gain weight at this critical stopover also determines their breeding success on the tundra.

The majority of the red knots occur in Delaware Bay from May 7 to June 7. In Delaware, they primarily occur from Bombay Hook National Wildlife Refuge to Prime Hook National Wildlife Refuge. The areas between these two Refuges also support many red knots with the highest concentrations found at Mispillion Harbor and adjacent Milford Neck Wildlife Areas owned by the State of Delaware.

We know that low-flying aircraft can disturb foraging birds (Harrington 2005, van der Kolk 2019, 2020) and repeated disturbance can prevent birds from using the best foraging areas and thus affect their ability to gain weight on this important stopover. Generally, if planes are simply crossing the shoreline and are at a high altitude, the disturbance from aircraft should be minimal. Low-flying aircraft that parallels the shoreline, such as banner planes or tourist charters would cause the greatest disturbance.

The Draft EA for this project currently provides representative flight profiles for anticipated aircraft but also acknowledges that there is variation in the location and altitude that will likely occur (Figures 4.1 to 4.8; *Revised Draft Dover CAT 2020 Update Noise Report.docx*). The representative flight profiles suggest that the lowest altitudes of planes as they cross the Delaware Bay shoreline is approximately 3000 feet (ft) as they cross the Port Mahon area and 4500 ft as they cross the Mispillion Harbor area (Figures 4.7 and 4.8; *Revised Draft Dover CAT 2020 Update Noise Report.docx).* At these altitudes, we expect minimal disturbance to red knots. However, the potential for lower altitudes exists.

The Federal Aviation Administration (FAA) Advisory Circular No: 91-36D defines National Wildlife Refuges as noise sensitive areas and recommends pilots not fly lower than 2000 ft over refuges or other noise-sensitive areas. We recommend that the entire shoreline between Bombay

Hook National Wildlife Refuge and Prime Hook National Wildlife Refuge also be considered a noise sensitive area between May 7 and June 7 and the same altitude recommendations of not flying below 2000 feet be applied. We also request that this recommendation be provided in the JUA so that all future pilots and civilian industries are aware of these concerns. If this circular and this specific language can be incorporated, we believe future impacts can be avoided and the project is not likely to adversely affect red knots.

The definition of noise sensitive areas and the voluntary practices recommended in CA No: 91-36D (https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_91-36D.pdf) are copied below:

> **DEFINITION.** For the purposes of this AC, an area is "noise-sensitive" if noise interferes with normal activities associated with the area's use. Examples of noise-sensitive areas include residential, educational, health, and religious structures and sites, and parks, recreational areas (including areas with wilderness characteristics), wildlife refuges, and cultural and historical sites where a quiet setting is a generally recognized feature or attribute.
>
> **VOLUNTARY PRACTICES.**
>
> a. Avoidance of noise-sensitive areas, if practical, is preferable to overflight at relatively low altitudes.
>
> b. Pilots operating noise producing aircraft (fixed-wing, rotary-wing and hot air balloons) over noise-sensitive areas should make every effort to fly not less than 2,000 feet above ground level (AGL), weather permitting. For the purpose of this AC, the ground level of noise-sensitive areas is defined to include the highest terrain within 2,000 feet AGL laterally of the route of flight, or the uppermost rim of a canyon or valley. The intent of the 2,000 feet AGL recommendation is to reduce potential interference with wildlife and complaints of noise disturbances caused by low flying aircraft over noise-sensitive areas.
>
> c. Departure from or arrival to an airport, climb after take-off, and descent for landing should be made so as to avoid prolonged flight at low altitudes near noise-sensitive areas.
>
> d. This advisory does not apply where it would conflict with Federal Aviation Regulations, air traffic control clearances or instructions, or where an altitude of less than 2,000 feet AGL is considered necessary by a pilot to operate safely.

No other federally proposed or listed endangered or threatened species will be affected by this proposed project. Should project plans change, or if additional information on the distribution of listed or proposed species becomes available, this determination may be reconsidered.

We appreciate the opportunity to provide information relevant to threatened and endangered fish and wildlife resources. This Endangered Species Act determination does not exempt this project from obtaining all permits and approvals that may be required by other state or Federal agencies. If you have any questions or concerns regarding this letter, please contact Cherry Keller of my Endangered Species staff at 301/887-7604 or by email at cherry_keller@fws.gov.

Sincerely,

Genevieve LaRouche
Field Supervisor

cc: Henrietta Bellman, DNREC, Delaware Division of Fish and Wildlife, Smyrna, DE

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Federal Aviation Administration (FAA) Advisory Circular No: 91-36D (https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_91-36D.pdf)

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Appendix D

Strategic Market Assessment, The Central Aviation Terminal – Dover AFB

STRATEGIC MARKET ASSESSMENT

The Central Aviation Terminal – Dover AFB

STRATEGIC PLANNING SERVICES

October 30, 2019

SECTION 1: INTRODUCTION AND GENERAL INFORMATION

Under a Joint Use Agreement (JUA) with the United States Department of Defense, the State of Delaware owns aeronautical property and infrastructure adjacent to Dover Air Force Base (DAFB). As currently configured, the site provides limited services for itinerant general aviation activity at a facility operated by Atlantic Aviation under an agreement with the Delaware River and Bay Authority (DRBA). The JUA is in the final stages of a revision which will potentially enhance the options for commercial aviation applications. The primary elements of the modification include:

a. An increase in the term of the lease from 25 to 50 Years.
b. An increase in the Annual Operational Operations Cap from 13,500 to 25,000. *Note that an operation is defined as a takeoff OR a landing*.
c. Removal of the 72-hour prior permission requirement
d. Granting DelDOT authority to approve flights that conform to the JUA
e. Provision of an easement for a second taxiway (75' width) from the north end of the Civil Air Terminal (CAT) ramp to Taxiway Bravo.

These modifications position Delaware Department of Transportation (DelDOT) and the Kent Economic Partnership, to explore growth strategies that could expand the existing Civil Air Terminal (CAT) to 33.2 acres and provide efficient access to an adjacent 200+ acre site – the Central Delaware Aviation Complex (CDAC). Accordingly, DelDOT must determine how its resources could be allocated in terms of business strategies to pursue, and how investments in aeronautical and landside development might be made. It is a core objective that Airport properties remain focused on appropriate aviation uses to preserve and grow the most synergistic long-term aeronautical functions. It is also vital that future facilities provide an efficient, safe, and secure operating environment on both the airside and landside.

The Delaware State DOT and the Kent Economic Partnership have several objectives in pursuing development:

- To create new jobs within the region
- To provide additional operating benefits for locating within the targeted development properties
- To stimulate interest in business relocation to Kent County
- To increase the ease of doing business for existing resident firms
- To provide more efficient transportation options for the region

1.1 The Region

Delaware offers a robust growth environment for local, regional, and international business and tourism. Located within driving distance of New York City, Philadelphia, Baltimore, and Washington D.C., Delaware offers quick access to over one-third of the nation's population. The appeal of conducting business in Delaware is bolstered by the absence of state and local sales taxes, low property taxes, below average construction costs, and a skilled local labor pool with four (4) colleges/universities

located within the City of Dover. These factors collectively result in an environment with significantly lower costs for land development and business operations when compared with that of surrounding metropolitan areas. The CAT is supported by the City of Dover as demonstrated by the zoning revisions to prioritize aircraft and spacecraft operations at this site and through solicitating public comment on the coordination with DAFB and the CAT in the 2019 Comprehensive Plan Survey. Kent County supports the success of the site as they remain an active stakeholder and current owner of the Kent County Aeropark parcels.

The location of the CAT site is primed for business development. This parcel offers unique features that are commonly sought by a multitude of business ventures. First and foremost, the site offers direct access to the largest runway in the State of Delaware at the DAFB, enabling access by aircraft of all sizes. Additionally, the site is straddled by roadways SR 9 to the east, and SR 1 to the west, both of which are less than 1 mile from the project area. SR 1 provides direct access to I-95 in northern Delaware for ease of access to major cities and ports. Recent business investments (totaling over $30 million in construction costs) within 2 miles of the project area further development prospects and economic prosperity in the area.

1.2 Consultant Engagement

In partnership with the Kent County Levy Court, and the State of Delaware, the Kent Economic Partnership (KEP) as part of its economic development efforts, determined that a rigorous due diligence effort should be conducted to determine the potential feasibility for civilian aviation uses at Dover AFB. As the initial step in this process, the KEP requested that a Strategic Market Assessment be conducted in order to provide guidance on the potential for introducing aviation and aviation support operations, facilities, and infrastructure. The work was undertaken with the following specific objectives in mind:

- To comply with all TSA regulations as appropriate for the safety and security of the Airport's facilities and operations;
- To premise recommendations for future direction on market analyses of the potential customer base;
- To identify compatible activities that will have a beneficial impact on overall regional job development:
- To optimize overall financial returns to the Airport while increasing the tenant and user base;
- To ensure that any future plans consider impacts of anticipated operational needs and activity levels of the entire Airport;

1.3 Scope of Services

An airport has the potential to become an important regional asset in terms of job creation and economic development. However, this potential is typically both driven and constrained by the answers to three primary questions:

1. Physical/Operational Feasibility – Are the aeronautical infrastructure, available facilities and property, operational environment, and landside access and egress compatible with the demand? This is typically the initial issue to be addressed: first because it is the most obvious and second because it can determine the range of potentially competing airports.
2. Market Feasibility – Is there sufficient demand for the airport and a specific service and/or facility? In very few instances, do airports have both a high existing demand for a service and limited competition. In the case of Dover, despite the physical travel distance and time, Philadelphia and Baltimore offer substantial and reasonable options for most commercial aviation services, reducing demand for the property on which the CAT is located.
3. Financial Feasibility - Can the demand and any appropriate physical development be met in a fiscally prudent manner? Even if there is demand for a facility or service, the question still remains as to whether it can be developed and implemented at a) a capital investment cost that is feasible, and b) at a cost that translates into a realistic rental/fee structure for tenants and users.

Because of the still undefined demand, it was important to enter into the analysis with the understanding that the effort might not identify viable near term uses and that this may result in the need to consider other options for the property.

The Assessment was structured to provide KEP and DelDOT with findings and recommendations that link regional growth and potential airport use to a logical and strategic methodology for identifying and accommodating aviation business through efficient and cost-effective allocation of its land resources. The work considered and addressed a broad spectrum of appropriate aviation uses that could be incorporated into the CAT site and tangentially at the larger, adjacent Central Delaware Aviation Complex (CDAC). The scope did not include tasks for public participation and evaluation of potential environmental impacts.

1.4 Approach

The approach to this Assessment generally reflects a broad analytic framework. While it is sufficiently rigorous to address many of the same issues prescribed by the Federal Aviation Administration (FAA) methodology for conducting a formal planning effort, this approach is more customer-oriented and pragmatic. It focused on solutions that reflect current industry trends and the needs and preferences of present and future tenants of the region and its airport facilities.

The Consultant Team worked and met with key staff of the City, Kent County, DelDOT, as well as industry stakeholders and Air Force personnel, to develop a full understanding of the unique environment at Dover AFB. The actual assessment work was structured to initially address demand for four aviation business segments:

- General Aviation (GA) – This included both propeller and jet aircraft, and considered corporate activity as well as other traditional GA functions. Such operations are typically managed by a Fixed Base Operator (FBO). (A fixed-base operator (FBO) is an organization granted the right by an airport or government entity to operate at the airport and provide aeronautical services for general aviation and corporate aircraft that include but may not be limited to activities such as fueling, hangar rentals, tie-down and parking, aircraft rental, aircraft maintenance, flight instruction, and similar services. In common practice, an FBO is the primary provider of support services to general aviation operators at a public-use airport and is located either on airport leasehold property or, in rare cases, adjacent to airport leasehold property as a "through the fence operation").
- Maintenance, Repair and Overhaul (MRO) - This looked at both broader commercial applications and GA potential.
- Air Cargo – This looked at the potential for developing a cargo facility and attracting both integrator and freighter aircraft operations.
- Aviation Training – This looked to capitalize on the proximity of the AFB and its infrastructure and the location of the Delaware State Aviation Program, Delaware Tech's Aircraft Mechanics Program.

SECTION 2: THE SITE

The CAT is in Kent County, Delaware, within the municipal boundaries of the City of Dover. The site is directly adjacent to the west side of the Dover Air Force Base (DAFB) and the east side of the Kent County Aeropark. The site has direct aeronautical access via an exclusive taxi-lane from Taxiway Bravo supporting Runway 01/19. See **Figure 1** below.

Figure 1: CAT Location

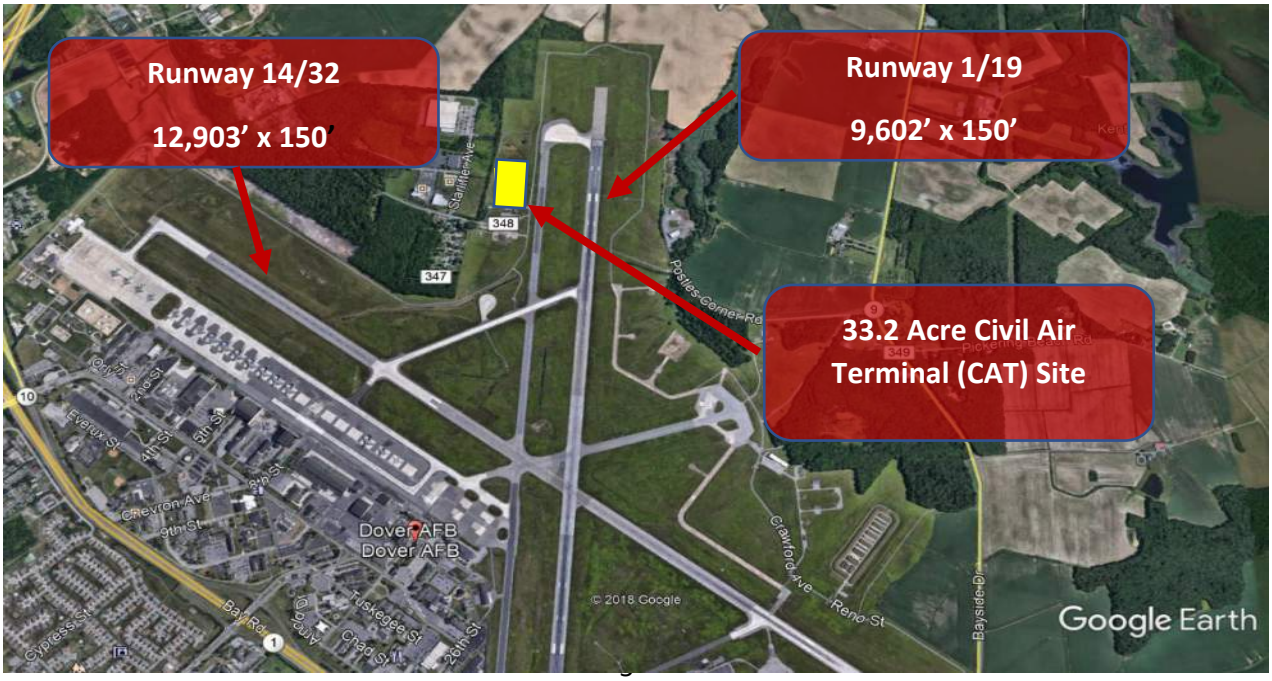


Figure 2 Expanded CAT

2.1 Access and Physical Characteristics:

Access to the CAT site is via Horsepond Road which bounds the facility to the south. Adjacent to the existing CAT site on the west, is the Kent County Aeropark which extends to Starlifter Avenue – the proposed western boundary of the project. A portion of the Aeropark is owned by Kent County Levy Court and will be included within the Project Area Lease Agreement. This will bring the total site to 33.2 acres. **(Figure 2)** A zoning classification of IPM3 (Industrial Park Manufacturing Zone-Aeropark) has been created specifically for the Kent County Aeropark, CAT, and surrounding properties to encourage aircraft and aviation related businesses.

At present, the primary use of the CAT is to service occasional civilian charter aircraft and the NASCAR race-related aircraft and passengers that come to Dover for two race weeks annually. The existing site consists of an approximately 870' by 325' aircraft parking apron, a single taxiway connection from the parking apron to DAFB Taxiway B, an approximately 1,650 square foot, single story terminal with associated parking, an outbuilding, and a 5,000-gallon fuel storage tank and dispenser.

From an airport operations perspective, there are several relevant characteristics:

- Runway 01/19 is approximately 10,000 ft by 150 ft and is primarily concrete
- Runway 14/32 is approximately 13,000 ft by 150 ft and is a mix of concrete and asphalt
- Runway 01 is supported by a Cat II ILS
- The Runway is equipped with centerline lights and lighted touchdown areas

- The Weight Bearing Capacity is PCN 150 R/B/W/T
- There is a Tower controlled by the USAF

The aeronautical infrastructure to include aircraft apron and accessing taxiways and taxi-lanes are in place, and the runway length is suitable for virtually all commercial and private aviation activity. The existing facility at the CAT is smaller than a typical FBO and is used almost exclusively for limited general aviation activity. The size, configuration, and available amenities would need substantial improvement to accommodate an operation large enough to be profitable. In addition, any expanded activity would need a second taxi-lane to provide the site with efficient access and egress to the runway system. A site review was conducted, but no physical testing of the adjacent apron was conducted. Staff advised that the concrete is stressed to accommodate Boeing 737 aircraft.

SECTION 3 COMPETING AIRPORTS

Competing airports are critical elements of the assessment for two reasons:

1. They provide a barometer of regional capacity for commercial services
2. They indicate regional capacity for the accommodation of non-commercial activity to include training and general aviation.

Airports have a responsibility to be financially self-sustaining: at the same time, the FAA indicates that airports with few exceptions, cannot operate for profit and must reinvest any generated revenue in the facilities, infrastructure, and services. These are costly to operate and maintain, and because of the magnitude of the physical elements involved, the success of the airport is usually predicated upon economies of scale and high volumes of traffic. As a result, any aviation operation must have activity levels that provide cash flows sufficient to remain viable. In instances of privately-owned operations, or a potential new operation at DAFB, profitability can be challenging in the presence of established competition.

The most fundamental consideration when looking at competing airports is the infrastructure. It is relevant for every business element of aviation activity, and the most obvious physical determinant is the length of the runway.

The accessing runway to the CAT at DAFB is approximately 10,000 feet long enabling the accommodation of virtually all commercial aircraft, including transatlantic activity. Typically, most commercial aircraft, for safety reasons, are not operated at a runway less than 7,000 feet, unless there are unusual and or mitigating circumstances. Cargo carriers, to include integrators such as FedEx and UPS, prefer runways of more than 8,000 feet. Corporate aircraft, that utilize Fixed Base Operators at General Aviation airports, need 5,000 feet for unpenalized take-offs and landings.

One of the unique elements of Delaware is that it is essentially a peninsula: geographically this can create atypical commutes for individuals or businesses seeking to use an airport. In light of this, the competitive analysis looked at non-commercial airports within 50 miles of Dover, and then overlaid those identified with

travel times of less than one hour. The result was three areas of initial focus on competing airports that considered both runway length and accessibility recognizing that access is a function of both distance and time.

1. Commercial Airports: Both Philadelphia and Baltimore offer a full range of commercial aviation services, with the facilities, infrastructure and capacity to accommodate all commercial operations. Both are less than 100 miles from Dover and are currently the primary connecting points with commercial aviation for the state of Delaware. Travel time to both is substantial with approximately 90 minutes to Philadelphia and 120 minutes to Baltimore.
2. In-State Airports: Other than the AFB, there are 10 other airports within the State of Delaware. While all of these facilities can accommodate general aviation, only two of these have runways longer 5,000 feet which would make them candidates for Corporate Aircraft operations. See **Table 1** below.

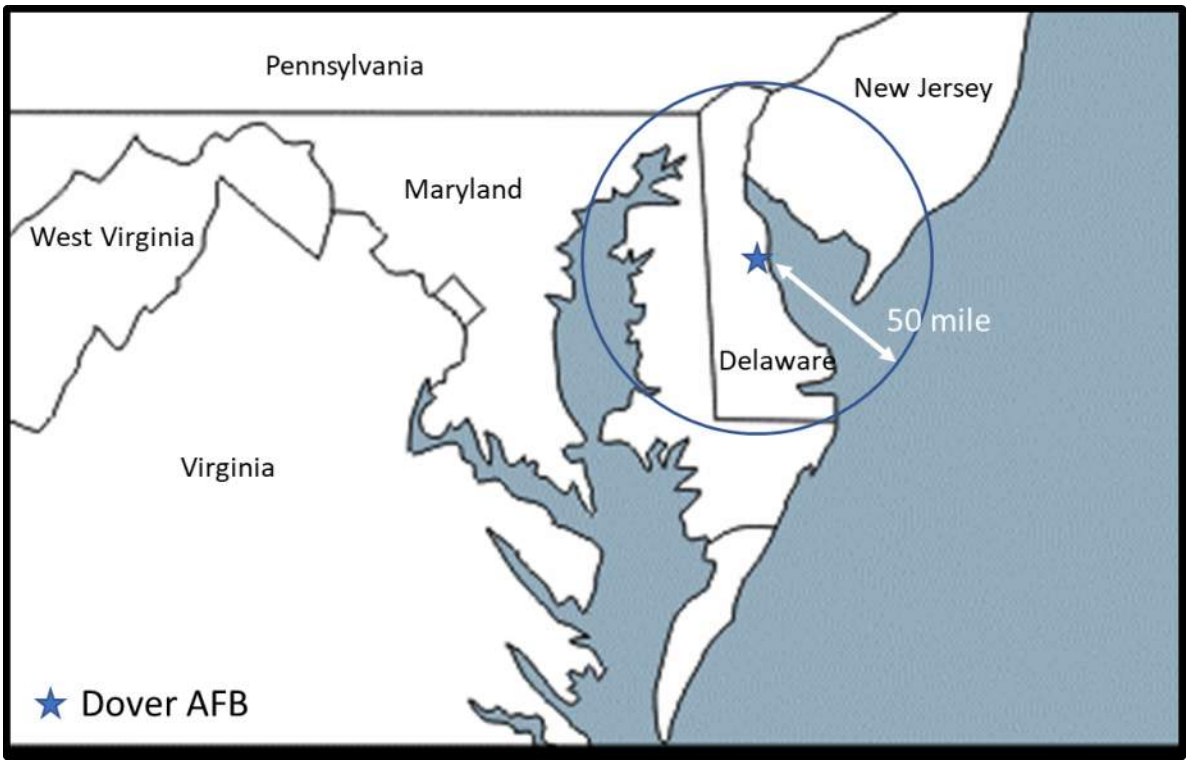
Table 1: Delaware Airports – 50 Mile Radius

DES	CITY	AIRPORT	RUNWAY	ILS
0N4	Dover	Chandelle Estates Airport	2,533 x 28	N
33N	Dover	Delaware Airpark	4,201 x 75	N
D74	Farmington	Chorman Airport	3.588 x 37	N
0N6	Felton	Albanna Aviation Airport	2,048 x 40	N
KGED	Georgetown	Delaware Coastal Airport	5,500 x 150	N
N06	Laurel	Laurel Airport	3,175 x 270	N
KEVY	Middletown	Summit Airport	4,488 x 65	N
38N	Smyrna	Smyrna Airport	2,600 x 125	N
KILG	Wilmington	New Castle Airport	7,275 x 150	**Y**
15N	Wyoming	Jenkins Airport	2,035 x 70	N

(It should be noted that Salisbury-Ocean City Wicomico Regional Airport which has a 6,400 foot runway, has limited commercial operations but is outside the 50 mile radius that was considered reasonable for in-state competition)

3. Out-of-State General Aviation Airports: While typically, out-of-state airports would not be considered as realistic competitors, there are a number that were looked at in New Jersey and Maryland that were within a 50-mile radius. This is indicated in **Figure 3** below.

Figure 3: 50 Mile Radius from Dover AFB



Within the State of Maryland there are four airports within a 50-mile radius of Dover. These are listed in **Table 2.**

Table 2: Maryland Airports – 50-Mile Radius

Code	Location/City	Airport Name	Runway Length
W29	Stevensville	Bay Bridge Airport	11/29– 2,713 ft
KESN	Easton	Easton/Newnam Field Airport	4/22—5,500 ft 15/33—4,003 ft
KCGE	Cambridge	Cambridge-Dorchester Regional Airport	16/34– 4,477 ft
MD1	Massey	Massey Aerodrome	2/20—3,000 ft

Of these, none have a runway that can accommodate commercial traffic, and only the facility in Easton has a runway in excess of 5,000 feet which can be used by corporate aircraft. The estimated driving time to Easton from Dover is 60 to 70 minutes making it a less desirable location for Dover origination or destination traffic.

Within the State of New Jersey there are nine airports within the 50-mile radius of Dover. These are listed in **Table 3**.

Table 3: New Jersey Airports – 50-Mile radius

Code	Location/City	Airport Name	Runway Length
29N	Vineland	Kroelinger Airport	10/28— 2,086 ft
28N	Vineland	Vineland-Downstown Airport	2/20— 2,251 ft 12/30– 1,800 ft
KWWD	Wildwood	Cape May County Airport	1/19– 5,252 ft 10/28—4,998 ft
KOBI	Woodbine	Woodbine Municipal Airport	1/19—3,304 ft 13/31—3,074 ft
KMIV	Millville	Millville Municipal Airport	10/28– 6,003 ft 14/32—5,058 ft
26N	Ocean City	Ocean City Municipal Airport	6/24—2,972 ft
17N	Cross Keys	Cross Keys Airport	9/27—3,500 ft
7N7	Pedricktown	Spitfire Aerodrome	7/25– 2,419 ft
C01	Williamstown	Southern Cross Airport	9/27—2,400 ft

Of these, none have a runway that can accommodate commercial traffic, and only the facilities in Wildwood (which serves Cape May) and Millville, have runways in excess of 5,000 feet which are preferred by corporate aircraft. Despite the geographic proximity, the estimated transit time from Dover to Wildwood is 150 minutes and requires a ferry crossing. The actual driving distance to Millville is 90 miles and the travel time is two hours making both airports less desirable locations for Dover origination or destination traffic.

In looking at regional airports that are potential competitors with Dover, *based solely on runway dimensions and accessibility*, there are several conclusions that can be drawn.

1. The peninsula configuration of Delaware and the location of Dover within the State are constraining factors that limit the potential market.
2. The competitors for MRO and cargo activity are essentially limited to Philadelphia and Baltimore. Niche MRO activities are also located at the New Castle Airport in Wilmington and the Delaware Coastal Airport in Georgetown.
3. There are ample competitors for general aviation activity, but it is primarily limited to in-state airports.

4. Facilities capable of accommodating corporate activity with potential origins and destinations in Dover are very limited.

SECTION 4 MARKET SEGMENTS

Understanding the relative competitive position of the CAT with other regional airports allowed the Consulting Team to narrow the analysis to a realistic geographic and operational framework in which to look at the market segments. These business elements were addressed from a very pragmatic as opposed to theoretical perspective. The analytic underpinning was not whether something is possible, but rather whether or not there is realistic demand and, if the demand exists, whether there are potential business entities that might be willing to invest.

4.1 Fixed Base Operations

One of the key sources in understanding the potential for general aviation activity is the annual report for the General Aviation Manufacturers Association (GAMA) which indicates sales by aircraft type and geographic region. General aviation aircraft are either piston engine (propeller driven) or turbine (jet engine). Within the broader general aviation category, there is a subset described as "Corporate Aviation" which includes jet aircraft and larger multi-engine piston aircraft. Based on the 2018 report:

- Over the past ten years, the sales of Corporate Aircraft have remained constant, at an increase of approximately 85% over the 1997 sales level.
- For 2018, annual sales of Piston Engine aircraft (the primary General Aviation aircraft) were 1,139. This is approximately the same number as 1997 (1,123) and down 59% from the peak year of 2007.
- The global percentage of sales for piston aircraft for North America, has fallen nearly 10% since 2007. In the same time period, the percentage sales of corporate jets are up 12%.
- The 2019 report of the Aircraft Operators and Pilots Association (AOPA) indicates that of the 50 states, only Hawaii and Rhode Island have fewer based aircraft.
- The AOPA report also cites the U.S. DOT, which in its report "The Economic Impact of Civil Aviation on the U.S. Economy" (2017), indicates that Delaware has the fewest jobs created by General Aviation.

These numbers support national anecdotal information that demand for general aviation facilities at airports is down for piston aircraft and growing for corporate aviation (private jet aircraft). It also reinforces the lack of demand on the airports in Delaware, to include no expressions of interest for the CAT facility in Dover over the past decade. It is very likely that the latter is attributable to the perception of potential challenges of operating under a Joint Use Agreement, and the need for investment in the existing facilities and infrastructure.

As the data indicate, there are ten existing airports within the State that have the ability to accommodate general aviation aircraft, but only two that have the infrastructure to handle corporate aircraft.

Activity levels at the CAT have fluctuated over the past four years, but have essentially been relatively static, with diminishing NASCAR activity attributed to the high cost of fuel at the CAT and the availability of the facilities at Wilmington. The numbers of operations and the related fuel sales are the critical elements in determining the success or failure of an FBO. The present operations cap of 13,500 annual movements, equates to approximately 38 operations a day: through the end of June 2019, *there were only 71 total operations recorded at the CAT. See* ***Table 4*** *below.*

Table 4: CAT Operations – 2016 - 2019

CAT Operations - 2016 to Present

						Spring					Fall				
Year	Jan	Feb	Mar	Apr	May	**NASCAR**	Jun	Jul	Aug	Sep	**NASCAR**	Oct	Nov	Dec	**Total**
2019	3	4	5	7	2	**42**	8								**71**
2018	4	3	0	8	4	**61**	9	8	6	3	**60**	4	8	4	**182**
2017	7	5	9	2	9	**73**	9	6	4	1	**64**	5	8	2	**204**
2016	0	0	5	3	7	**46**	8	3	7	4	**55**	8	4	3	**153**

The result of the operations activity which, on the face of the numbers in Table 4, even with the NASCAR peaks, result in very limited fuel sales - the key to the success of an FBO. **See Table 5** below which shows fuel sales over the same period as the operations. It is important to note that even small FBO's typically target annual sales in the hundreds of thousands of gallons, and larger operations in the millions, to achieve profitability.

Table 5: CAT Fueling – 2016 - 2019

CAT Fuelings - 2016 to Present

Year	Jan	Feb	Mar	Apr	May	Spring NASCAR	Jun	Jul	Aug	Sep	Fall NASCAR	Oct	Nov	Dec	Total
2019	0	0	0	0	0	**7453**	2615								10068
2018	0	0	0	0	300	**6997**	1517	0	0	1259	**12025**	3673	0	0	25771
2017	0	0	0	0	0	**11203**	0	0	0	0	**8302**	0	2546	0	22051
2016	0	0	0	0	0	**5713**	0	0	0	0	**12967**	0	0	0	18680

Previous solicitations from DelDOT for interest in the development of a full-time Fixed Base Operator at the CAT have been unsuccessful. This is attributable to several factors:

1. The provisions of the then current Joint Use Agreement limited the number of annual operations to 13,500. This constraint also by extension, limits the amount of fuel which can be sold at the CAT and its potential profits.
2. The existing lease term and the tower notification requirements of the JUA make routine operations problematic for aircraft operations.
3. There are 10 airports with GA operations within a 50-mile radius of Dover AFB. None have an indicated capacity issue and unmet demand that would warrant pursuit of an additional facility.
4. Over the past ten years, there has been an industry-wide drop in sales of general aviation piston aircraft – the primary users of regional FBOs.

In spite of these factors, there are several positives that offer some potential for development of the CAT for corporate aviation:

1. The revision to the JUA Annual Operations Cap to 25,000 allows for operations sufficient to generate financially sustaining fuel sales.
2. Other revisions to the JUA with regard to notifications to the tower and other operating provisions would enable the CAT to operate like virtually any other FBO.
3. The existing aeronautical infrastructure and instrumentation make corporate aircraft operations viable, safe, and secure.
4. The presence of regional industry and the proximity of the Capitol Complex creates the possibility of serving unmet demand.
5. The potential development of the 200 acres of land proximate to the CAT can create a symbiotic relationship that stimulates demand for corporate and other private aviation.

4.2 Training Facilities

Typically training facilities including classroom, simulation, and flight, for commercial aviation are located at corporate headquarters, hub facilities, and/or Airports with aeronautical infrastructure sufficient to accommodate actual flight training. However,

it is not unusual for training facilities for non-commercial aviation activities to be located on smaller general aviation airports. A review was conducted that included training for both fixed and rotary winged aircraft.

The physical attributes of Dover Air Force Base and the facility and infrastructure of the CAT, *without the constraints of the JUA*, would combine to form an attractive center for aviation training. The Airport is physically unconstrained and the CAT site has ample room for the development of a full range of facilities and infrastructure to conduct training and related operations. The existing runway length is more than adequate for training on a variety of aircraft types and ramp is available. As an added bonus, regional labor costs are very reasonable, so operating costs would be inexpensive.

There are two major elements of aviation training – classroom and field.

A. Field Requirements (flight training)

- A control tower on or near the airport for the required training and certification.
- A minimum runway length of 2,000 to 3,000 feet is required.
- Ramp to accommodate 10 to 30 aircraft.
- An all-weather ILS or Global Positioning System.
- The ability to operate under an exclusive fueling contract that could supplement a school's income by selling fuel to other users.

B. Classroom Requirements

- A regional population sufficient to provide a student base.
- Available and reasonably priced housing for visiting students to include extended stay hotels and/or bed and breakfast establishments.
- Avionics, maintenance and support businesses as well as the presence of supply facilities.
- Available restaurants and other commercial facilities to provide both amenities and necessities required by students.
- A building providing sufficient office and classroom space.
- Available transport and easy access.

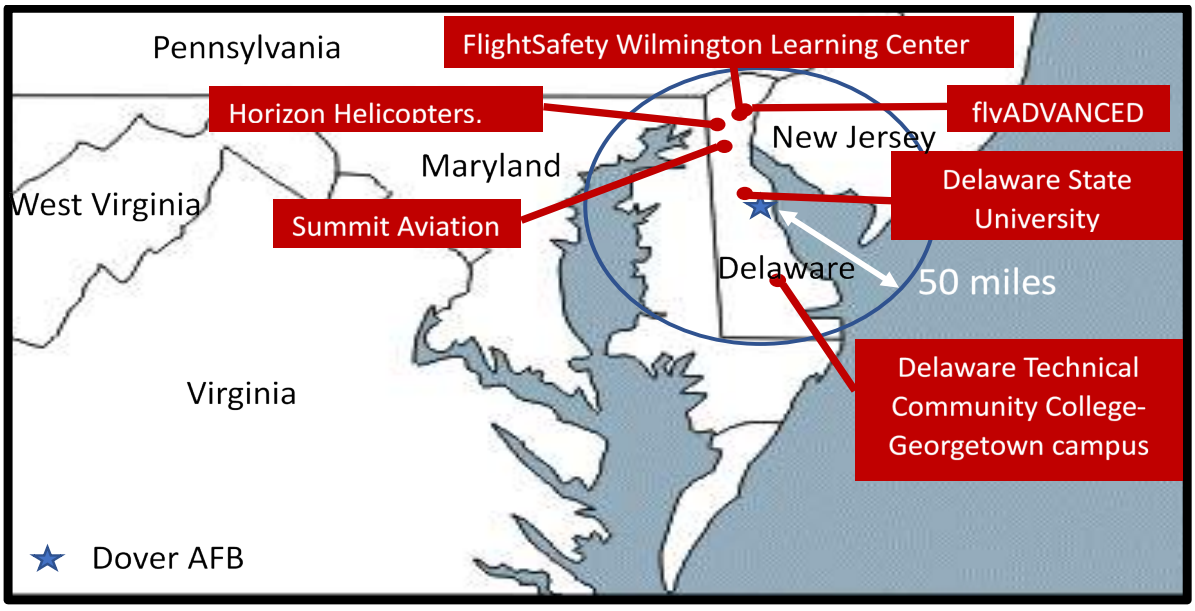
Dover specifically, and the State in general, appear to have sufficient regional amenities currently available to attract students interested in aviation. Such items as inexpensive temporary housing, restaurants, entertainment etc. are considered important to attract and retain students. The Aviation Management Program at Delaware State University, is widely-respected in the industry, and as **Table 6** indicates, there are a number of other facilities that offer a full spectrum of training in the Aviation field.

Table 6: Training Facilities

Name	Location/City	Types of Training
FlightSafety Wilmington Learning Center	New Castle, DE	Pilots and Maintenance Technicians
Summit Aviation	Middletown, DE	Maintenance and Repairment
Horizon Helicopters, Inc.	Newark, DE	Ground School, Instrument Rating and License
flyADVANCED	New Castle, DE	Ground School and Instrument Rating
Delaware State University	Dover, DE	Aviation Management Program (Bachelor of Science degree)
Delaware Technical Community College-Georgetown campus	Georgetown, DE	Aviation Maintenance Technology Program

Figure 4 indicates the location of these training facilities that are within 50 miles of Dover.

Figure 4: Training Facilities -50 Mile Radius of DAFB



The introduction of aviation training as a major function of the CAT appears problematic for several reasons:

1. Flight training is banned under the JUA
2. Without flight training, the existing Taxi-lane access and aircraft apron essentially become wasted aviation assets.
3. The current facility at the CAT would need to be removed and appropriate facilities developed.
4. There are a number of regional airports and facilities that already control market share with excellent programs and facilities.
5. The size of the regional market does not indicate relevant levels of unmet demand.

An additional, but less obvious consideration, is security. The adjacency of a civilian training facility to an active Air Force Base, can create some concerns regarding access control.

4.3 Air Cargo

4.3.1` Industry Background

Since there are no regional air cargo operations in the State, some specific context is provided to help explain some of the key characteristics. Air cargo activities at U.S. airports generally fall into three main categories:

General Air Cargo

- General air cargo is comprised of international and domestic air cargo carried in the bellies of passenger aircraft and on all-cargo freighter aircraft. This cargo is considered time-sensitive, which means that shipments are expected to be processed quickly, but not necessarily time-critical where shipments are processed for definite delivery times, typically next or second day (Air Express). General cargo is also characterized by the necessary participation and coordination of multiple logistics-sector service providers to complete shipments, including: shippers/consignees, freight forwarders, ground handlers, airlines, and Road Feeder Service (RFS) trucking companies.

Air Express

- Traditionally, air express has been defined by small packages and documents, but it is increasingly utilized for larger shipments and e-commerce. Air express is considered more time-critical in nature - guaranteeing specific, intra-day time periods for delivery. Air express differs from general air cargo in that the majority of the logistics functions are performed by integrated carriers under one brand to provide a seamless door-to-door experience. Air express carriers include FedEx, UPS, and DHL.

E-commerce

- A relatively new type of air cargo operation has recently emerged in the U.S. market that is dedicated to e-commerce shipments. Specifically, this category is currently defined by Amazon Air. While Amazon Air leases its

aircraft, which are then operated by outsourced airlines, Amazon controls the air network and schedules the aircraft. Their growth has led to substantial activity increases at non-traditional cargo airports throughout the U.S. and it now directly competes with integrated carriers in certain segments of the market.

4.3.2 Trends

Several trends and demand drivers are impacting the U.S. air cargo industry, including belly cargo utilization, e-commerce growth, expanded use of non-traditional cargo airports, and forwarder-controlled networks.

- Belly cargo utilization has become increasingly important to the overall industry as international passenger travel continues to grow, and cargo-friendly aircraft have entered many airline fleets. These aircraft including the B767, B787, A350 and the B777 not only have large belly cargo capacities, but are able to fly to non-traditional airports. Certainly, freighter aircraft will always play an important role in global air cargo operations, but belly cargo is expected to carry nearly half of the world's air cargo over the next 20 years. The fact that there are no commercial passenger operations (and the related belly cargo capacity) at DAFB, substantially limits the CAT's potential for air cargo.
- E-commerce growth has had a tremendous impact on air cargo over the past 15 years as volumes have risen and more companies have entered the market. Consumer demand for online shopping has led to a requirement of purchases being quickly delivered to individual residences and businesses; thereby necessitating new supply chains. These changing supply chains initially increased the demand for integrated express services which are now yielding market share (at least in the case of Amazon) to air services directly operated by e-commerce retailers.
- The trend towards expanded use of non-traditional cargo airports is related to both the growth of belly cargo and e-commerce. Traditionally, the vast majority of U.S. air cargo was handled by major international gateways (e.g. John F. Kennedy (JFK), Los Angeles (LAX), Chicago O'Hare (ORD), Miami (MIA), Dallas (DFW) and the integrated carrier hubs (e.g. Memphis (MEM), Louisville (SDF). However, as more airlines now serve secondary gateway airports with cargo-friendly aircraft, cargo is diversifying from an airport perspective. Amazon Air is also utilizing certain airports not previously known for frequent all-cargo operations (e.g. Lehigh Valley (ABE), Charlotte (CLT). In this manner, many U.S. airports once viewed as irrelevant to air cargo may now have a legitimate case for service.
- A final trend that relates to non-traditional cargo airports is the growth of forwarder-controlled cargo networks. Under the general cargo model, forwarders typically consolidate freight at airports that offer suitable air cargo capacity on passenger and all-cargo airlines. In the case of forwarder-

controlled networks, forwarders directly lease aircraft to serve airports of their choosing based on where they are seeing shipper demand. Two such operations are being conducted in the U.S. by Panalpina at Huntsville International Airport and by Senator International at Greenville-Spartanburg International Airport. These forwarders identified key "anchor tenant" air cargo customers who were better served by their local, non-traditional cargo airports rather than by trucking cargo to other gateway airports in the region.

4.3.3 Competitive Environment

Because air cargo can travel in a variety of ways between origin and destination and often does not utilize the closest airport, the competitive environment for air cargo is truly on a national scale. For instance, a shipment from Los Angeles to Frankfurt (FRA) could use a nonstop flight between LAX and FRA. Alternatively, the same shipment could be trucked from Los Angeles to New York and then use a nonstop flight between JFK and FRA. Of course, there are many other routings and combinations of flights and trucking services that could be employed.

In the case of the CAT and DAFB, a review of the competing airports for air cargo in the immediate region includes: PHL, BWI, IAD, EWR and JFK. Tab**le 7** summarizes some key characteristics for each airport as well as their distances from DAFB.

Table 7: Cargo Airport Distances

Code	Airport Name	Key Air Cargo Services	Distance from DAFB
PHL	Philadelphia Int'l Airport	UPS hub, FedEx and multiple international widebody passenger flights	Miles: 73 Drive time: 1:06
BWI	Baltimore/Washington Int'l Airport	Amazon Air, UPS & FedEx	Miles: 89 Drive time: 1:41
IAD	Washington Dulles Int'l Airport	UPS & FedEx and multiple international widebody passenger flights	Miles: 130 Drive time: 2:15
EWR	Newark Liberty Int'l Airport	FedEx hub, UPS and multiple international widebody passenger flights	Miles: 158 Drive time: 2:20
JFK	JFK Int'l Airport	UPS & FedEx, multiple international widebody all-cargo and passenger flights	Miles: 182 Drive time: 2:48

4.3.4 CAT / DAFB Outlook

In the past, several air cargo related opportunities at the CAT have been identified, assessed and pursued. These included potential for a South American flower import operation, an e-commerce operation and a repositioning operation for commercial

cargo carriers flying under contract to the U.S. Department of Defense at DAFB. Unfortunately, none of these opportunities materialized into actual air cargo operations at the CAT.

From a competitive positioning standpoint, the CAT and DAFB do not currently appear to provide a significant advantage. DAFB is very close to integrated carrier hubs at PHL and EWR for air express shipments and is less than 2 hours from BWI when considering possible Amazon e-commerce flights. Further, DAFB is in relatively close proximity to JFK - one largest air cargo centers in the world and an airport that attracts air freight from all across the country. Because of their existing international passenger and cargo flights, each of the competing airports in the DAFB region also have U.S. Customs and Border Protection (CBP) presence required for air cargo imports and exports. The CAT's lack of CBP presence presents an obstacle to near-term international cargo operations.

The CAT and DAFB are also challenged geographically in that their location in the middle of the Delmarva Peninsula prevents potentially more efficient surface transportation networks and omnidirectional market access. While links to the interstate highway system are possible via Route 1, the access is not direct and the I-95 corridor is approximately 45 minutes to the north. This location and access present real impediments to time-sensitive, efficient truck movements that are critical to successful air cargo operations.

Finally, and perhaps most importantly, Dover and the surrounding region does not currently have a large air cargo demand profile. There are no large manufacturers of air-eligible cargo commodities and the population base is not of a size that warrants direct air service from integrated carriers or general air cargo operators. While Amazon has a number of warehouses and fulfillment centers in northern Delaware, it has not indicated any commitments with respect to the CAT and DAFB. Without a large "anchor tenant" customer providing demand for air cargo services and without a sizable local population, the CAT and DAFB lack key ingredients that would attract and sustain air cargo operations in the near term. Any such service can be and is currently provided by existing commercial airports outside the State

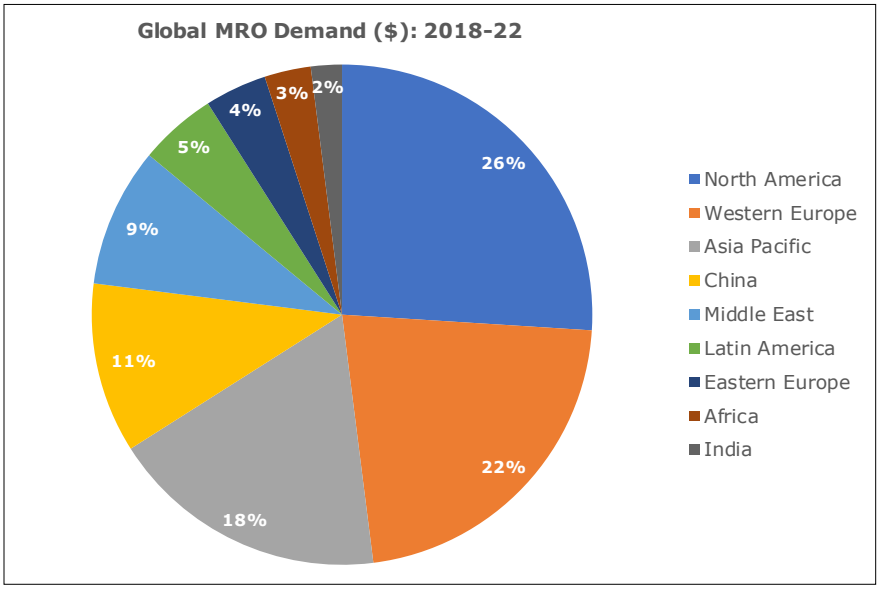
4.4 Maintenance, Repair, and Overhaul (MRO)

4.4.1 Industry Background

The aviation Maintenance, Repair, and Overhaul (MRO) industry is primarily related to the aftermarket servicing of airframes, engines and other critical components of aircraft. Aircraft and their power plants require servicing at regular intervals to maintain a safe and efficient flying environment. MRO has traditionally been performed by airlines and third-party companies that are independent of the aircraft Original Equipment Manufacturers (OEMs), such as Airbus, Boeing, and Embraer. Many large MROs exist in geographic areas that are convenient to airline networks and where there are labor and other cost advantages.

Demand for MRO services is largely driven by aircraft fleet size, type, and age. Accordingly, geographic demand for MRO services is distributed in areas with the highest amounts of aviation activity – namely North America, Western Europe, Asia-Pacific, China and the Middle East. See **Figure 5** below. North America is the largest single region for MRO demand – accounting for 26% of the global market. The MRO market in North America alone is projected to represent $125 billion over the next five years.

Figure 5: Global MRO Demand



Source: 2018 Commercial Aviation Fleet & MRO Forecast, Aviation Week Network.

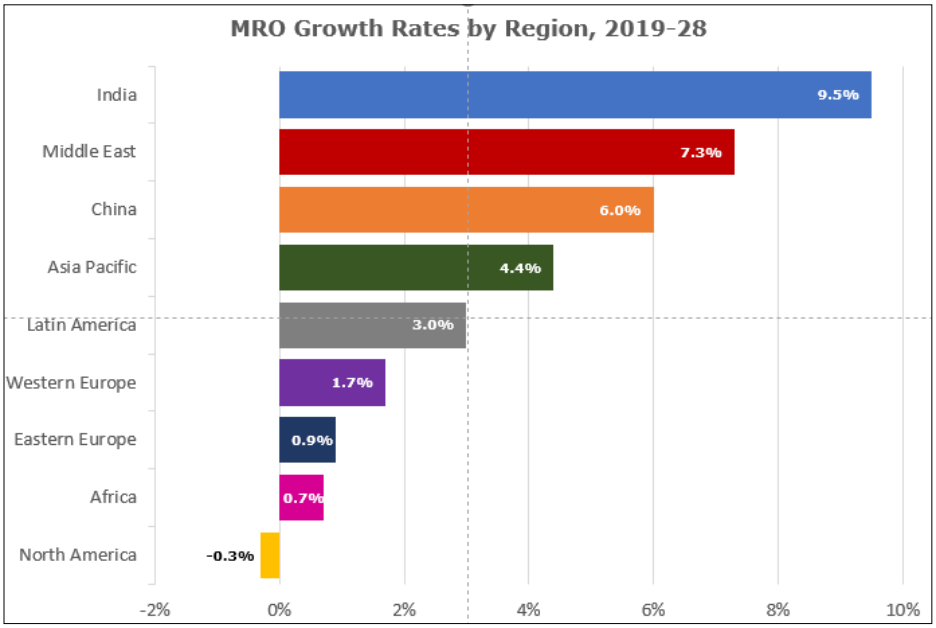
4.4.2 Trends

Several trends are shaping the future of the North American and global MRO industry, including:

- New aircraft materials (e.g. composites, titanium) increasingly being used by Original Equipment Manufacturers (OEMs) have lowered maintenance requirements and have, therefore, decreased overall MRO demand for certain aircraft types;
- High rates of fleet replacements in North America has led to lower MRO spend by airlines as newer aircraft experience "maintenance honeymoons";
- OEMs are entering the aftermarket business, leading to consolidation and a larger scale of operation which challenges smaller, independent MRO service providers; and
- Labor shortages in the maintenance technician field have challenged growth and expansion by existing MRO operators.

From a forward-looking perspective, it is particularly noteworthy that while North America is the largest region for MRO demand, as indicated in **Figure 6** below, *it is also the region with the lowest rate of forecasted growth over the next 10 years.*

Figure 6: MRO Growth Rates



Source: Aviation Week 2019 Commercial Fleet & MRO Forecast.

4.4.3 Competitive Environment

As with air cargo, competition in the MRO sector is on a national or even global scale due to the ability of airplanes to get virtually anywhere for servicing. In this manner, local or regional economics mean little as the competitive spectrum is geographically so broad. So, effectively, an MRO shop in Florida can compete directly with an MRO shop in Delaware – in terms of capabilities, costs and quality. Further, because MRO activities involve skilled labor and generate high tax revenues from sales, the industry is attractive to economic development groups nationwide. This, in turn, makes financial and other incentives a necessary part of the process to compete for MRO relocations and expansions. The competition for MRO operators is especially fierce amongst non-commercial U.S. airports as they understand the limits of General Aviation in terms of revenue and growth and MRO is commonly identified as an area of prime opportunity.

In Delaware, high-profile MRO operators are based at the Wilmington Airport (ILG) and at the Delaware Coastal Airport (GED) in Georgetown. At ILG, Dassault Aircraft Services is part of the service center network supporting Dassault Falcons in North, Central and South America. At GED, ALOFT AeroArchitects specializes in the installation of auxiliary fuel systems for Boeing aircraft as well as aircraft interiors for VIP aircraft customers.

4.4.4 CAT / DAFB Outlook

With successful MROs already established in the State of Delaware, there may be potential bring additional MRO operations to the CAT. In the past, ALOFT investigated expansion of its operations at the CAT because the long DAFB runways would allow

servicing of larger aircraft otherwise unable to utilize Georgetown's shorter runway. Ultimately, ALOFT decided against the expansion at DAFB due to the costs and inefficiencies related to a split operation.

Currently, the CAT does not appear to offer a natural competitive advantage versus any other U.S. airport for an MRO operator. Even the aircraft mechanics coming out of the DAFB would require major re-training to operate on commercial or private aircraft that can be wholly different from the military aircraft they are accustomed to servicing. Finally, it is likely that a large and sustained investment would be required to develop the CAT's brand amongst MRO operators to be considered as a viable alternative even as the North American MRO industry enters a long period of declining growth.

4.5 Customs

Currently, there is only a very limited need for Customs at the CAT. In the event, there is an aircraft arrival that requires Customs assistance, the AFB is contacted. Two Customs officers that are assigned there are available for coverage on a limited basis. They have the capability to process U.S. and Canadian citizens on site. Given the existing activity levels, there are no issues on clearance.

If there were to be increased activity at the CAT, the likelihood is that the new operator would be required to enter into a Reimbursement Service Program agreement along with a Memorandum of Understanding, that would provide for staffing costs recovery. The operational and financial requirements become more complex in the event there is a need to process and clear Foreign Nationals at the CAT. In that event, the indication from Customs and Border Patrol (CBP) is that they would require a dedicated office with secure communication lines. Details would need to be clarified between CBP and the potential new user.

SECTION 5: CONCLUSIONS

The realities of operating in the aviation industry make the creation or expansion of a business element challenging for both airports and their operating partners. Success depends on traffic volumes and cost control – both critical elements of achieving economies of scale. In assessing the viability of the CAT for a realistic opportunity, the Consulting Team looked at three facets of market assessment from a strategic perspective:

1. The existing physical capacity to include aeronautical and landside infrastructure, in place that will accommodate the proposed business element.
2. The levels of unmet demand that exists for the business element, and the ability/capacity of existing potential competitors to meet that demand.
3. The financial cost necessary to accommodate unmet demand in the facility to be developed.

These facets were examined from both a local/regional perspective, and the strategic dynamics that drive the markets on an industry-wide basis. Our conclusions are summarized below.

5.1 General

- Geography works against a number of uses. The fact that Delaware is a peninsula creates travel time challenges and constrains access for a State that in 2018 had a population of less than 1,000,000 (971,000).

- Dover is a seat of State Government and home to a number of large corporations

- The size of the population makes it difficult to create the economies of scale necessary to establish a financially viable operation for a number of aviation business elements.

- The proximity of two large commercial airports in Baltimore and Philadelphia create competitive challenges in that both offer substantial existing business and physical infrastructure typically critical to aviation functions.

- Existing airports within the State of Delaware offer facilities for general aviation and training that are not at capacity and are within a driving time and distance of Dover that positions them well competitively. .

- The general aviation market is static with the only real growth in corporate aircraft.

- Modification of the JUA increases the potential for civilian use: however, the Operations Cap still presents a potential challenge to multiple uses for the site.

5.2 Fixed Base Operator

- There are ten regional airports in Delaware within 50 miles of Dover that provide ample facilities for piston engine aircraft. There are an additional 13 airports in New Jersey and Maryland within that radius, but geography and travel time make the out of state airports non-competitive.

- The aeronautical infrastructure and landside access to the CAT make it an acceptable site for the development of a full size FBO with corporate (jet aircraft) capacity.

- The Operations Cap allows for 70 operations per day which, if the focus of the facility were corporate aircraft, could be sufficient to sustain the facility financially (assuming appropriate demand).

- The existing facility at the CAT is sufficient for limited piston engine activity, but would require a substantial upgrade to handle corporate aircraft on a regular basis.

- With anticipated business development, and as a seat of government, Dover offers potential demand for corporate aircraft activity.

5.3 Training

- The JUA prohibits flight training for civilians. This minimizes the value of proximity to the AFB and the availability of the infrastructure and navigation aids.

- There are established training facilities for both classroom and flight training available within a reasonable proximity to Dover. There is no indication of unmet demand for the classroom training.

- Given the size of the potential market within the State, any new facility, to be successful, would need to target out of state participation which would require capital investment in both the training facilities and regional hospitality assets.

5.4 Air Cargo

- The geographic positioning and the size of the regional population create challenges for achieving the economies of scale necessary to achieving profitability in an air cargo operation.

- The proximity of two large commercial operations in Philadelphia and Baltimore (as well as other airports in New York and Washington) further limit cargo service to Delaware which can essentially be served by truck.

- The cost of needed cargo facilities, equipment, and infrastructure would be difficult to recover without substantial cargo activity.

- The success of an air cargo operation depends on achieving substantial load factors on both inbound and outbound flights. The volumes of air cargo appropriate products generated in the region are problematic for sustaining a profitable balanced operation.

- The probability of an integrator (FedEx or UPS) or e-commerce giant like Amazon establishing a base of operations is very unlikely for all the reasons above.

- The commercial activity at Philadelphia and Baltimore accommodate most of the State's passenger needs, providing substantial belly cargo capacity for Delaware's inbound and outbound requirements.

5.5 Maintenance, Repair, and Overhaul

- Growth in North American MRO activity has slowed substantially.

- New facilities typically are developed at carrier hubs or high-volume airports. Exceptions may occur when carriers or third parties can capitalize on a location that offers low labor costs, existing infrastructure, and a moderate climate that helps contain operating costs when hangar bay doors are open.

- The aeronautical infrastructure of the AFB can accommodate virtually any size aircraft requiring maintenance, however, the existing apron at the CAT would need refurbishment to support larger aircraft.

- The costs of apron improvements and the construction of an appropriate facility at the CAT would provide cost recovery challenges to any operator in the absence of high levels of activity.

- Carriers typically will not fly an empty aircraft to a maintenance site for a routine issue. The deterrent is the "ferry cost"- the expense of a pilot, fuel, and landing fees to fly the aircraft to and from the MRO facility.

- In Delaware, established MRO operators are already based at the Wilmington Airport (ILG) and at the Delaware Coastal Airport (GED) in Georgetown, which presents a substantial market disadvantage to the introduction of any new service in the State.

5.6 Recommendation

The objective of this assessment was to determine whether there is merit for the State DOT to actively pursue expanded aviation operations for the CAT given the modifications to the JUA. In considering options for the site, a number of evaluative criteria were considered. These included:

- Military and regional support
- Industry and North American trends
- The competitive environment
- Geographic positioning
- Potential economies of scale
- Cost of infrastructure
- Cost of facilities
- Available labor
- Market demand

Applying these considerations to the aviation business segments (as discussed above), indicated that the strategic and operational feasibility for training, general aviation, and larger commercial uses (air cargo and MRO), is at best limited for the long-term and a virtual non-starter for the near term.

The assessment does indicate that there is potential for an FBO focused on corporate aviation activity. There are a number of reasons why this is a possibility that should be pursued.

- The JUA modifications create potential for an FBO capable of accommodating jet aircraft.
- The aeronautical infrastructure, navigation aids, and available capacity at the AFB are superior for this type of operation when compared to other facilities in the State.
- Existing businesses and events, targeted growth in Kent County to include the development of property adjacent to the CAT, and the proximity of the State's seat of government, represent generators of demand.
- At the same time, improved corporate access can provide a stimulus for future business development and/or relocation.
- The Air Force has indicated their support of a civilian operation and a willingness to be flexible in negotiating any inherent fee structures.
- The DAFB currently handles large civilian aircraft that carry military equipment and material. There is precedent for such aircraft and their crews to be handled at non-military facilities which offers additional opportunity for a sophisticated FBO at the CAT.
- Negotiations for the JUA include assumptions of the more severe environmental impacts of cargo operations. A corporate FBO would have lesser impacts on noise, carbon emissions, and regional truck traffic.

We noted that a previous solicitation process for an FBO, was unproductive due in part, to the then-existing restrictions of the JUA and in part to a generic distribution list of recipients. **Based on the changes to the Agreement, and the considerations identified in the Assessment, we believe that there is merit in DelDOT reinitiating the FBO option, and recommend that the most efficient *initial* approach to marketing the CAT, would be through a formal solicitation process**. This would provide the entire regional community, as well as appropriate national chains, with the opportunity.

The SPS team is prepared to assist DelDot and Kent County in this effort moving forward.

Appendix E

Air Installation Compatible Use Zone Study Update (2010)

Air Installation Compatible Use Zone Study Update

Dover Air Force Base
Delaware

AUGUST 2010

AIR INSTALLATION COMPATIBLE USE ZONE STUDY UPDATE

DOVER AIR FORCE BASE, DELAWARE

PREPARED BY

PARSONS

CONTRACT NO. FA8903-08-D-8778
TASK ORDER 0054

AUGUST 2010

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ACRONYMS AND ABBREVIATIONS

436 AW	436th Airlift Wing
AEOZ	Airport Environs Overlay Zone
AFB	Air Force Base
AFI	Air Force Instruction
AGL	above ground level
AICUZ	Air Installation Compatible Use Zone
APZ	Accident Potential Zone
AS	Airlift Squadron
CZ	Clear Zone
dB	decibel
DNL	Day-Night Average A-Weighted Sound Level
DoD	Department of Defense
EIR	Economic Impact Region
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
INM	Integrated Noise Model
NLR	Noise Level Reduction
SR	State Route
the Base	Dover Air Force Base
UFC	Unified Facilities Criteria
USEPA	U.S. Environmental Protection Agency

SECTION 1
PURPOSE AND NEED

1.1 INTRODUCTION

This study is an update of the 1999 Dover Air Force Base (AFB), Delaware Air Installation Compatible Use Zone (AICUZ) Study. The update presents and documents changes to the AICUZ study resulting from completion of the basing of C-17 aircraft at Dover AFB (the Base), which resulted in increasing C-17 operations and decreasing the number of C-5 aircraft, as well as other aircraft operations changes at the Base. This AICUZ Study reaffirms Air Force policy of assisting local, regional, state, and federal officials in the areas surrounding Dover AFB by promoting compatible development within the AICUZ area of influence, and protecting Air Force operational capability from the effects of land use that is incompatible with aircraft operations. Specifically, the study documents changes in aircraft operations since the last study and provides noise contours and compatible use guidelines for land areas surrounding Dover AFB-. This information is provided to assist local communities and to serve as a tool for future planning and zoning activities. Changes that have occurred since the 1999 Dover AFB AICUZ Study or are projected to occur are to:

- Base and operate 12 C-17 aircraft at Dover AFB;
- Reduce the number of C-5 aircraft based at Dover AFB from 32 to 18.
- Add, eliminate, and modify aircraft flight tracks to correspond to flying operations changes; and
- Make technical improvements to the NOISEMAP computer modeling program.

1.2 PURPOSE AND NEED

The purpose of the long-standing AICUZ program is to promote compatible land development in areas subject to aircraft noise and accident potential. As the City of Dover and Kent County prepare and modify land use development plans, recommendations from this updated AICUZ Study should be included in the planning process to prevent incompatible land use that could compromise the ability of Dover AFB to fulfill its mission. Accident potential and aircraft noise should be major considerations in the planning process.

Air Force AICUZ guidelines reflect land use recommendations for the Clear Zones (CZ), Accident Potential Zones (APZ) I and II, and four noise zones exposed to noise levels at or above 65 decibels (dB) Day-Night Average A-Weighted Sound Level (DNL). These guidelines were established based on studies prepared and sponsored by several federal agencies, including the United States Department of Housing and Urban Development, United States Environmental Protection Agency (USEPA), United States Air Force, and state agencies. The guidelines recommend land uses that are compatible with airfield operations while allowing maximum beneficial use of adjacent properties. The Air Force has no desire to recommend land use regulations that render property economically useless. It does, however, have an obligation to the inhabitants of the Dover AFB area of influence and the citizens of the United States to point out ways to protect the public investment in the installation and the people living in areas adjacent to the Base. The AICUZ area of influence

includes the area within the DNL of 65 dBA and greater noise exposure area as well as the area within the CZs and APZs.

1.3 PROCESS, PROCEDURE, AND NOISE METRICS

Preparation and presentation of this update to Dover AFB's AICUZ Study is part of the continuing Air Force participation in the local planning process. Guidance for the Air Force AICUZ program is contained in Air Force Instruction (AFI) 32-7063, *Air Installation Compatible Use Zone Program*, which implements Department of Defense (DoD) Instruction 4165.57, *Air Installations Compatible Use Zones*.

As local communities prepare land use plans and zoning ordinances, the Air Force recognizes it has the responsibility to provide input on its activities relating to the community. This study is presented in the spirit of cooperation and assistance by Dover AFB to aid in the land use planning process around the Base. Noise contours depicted on the AICUZ maps in this study are based on the September of 2008 to September of 2009 levels of flying activity.

Aircraft operational data used in this study were collected at Dover AFB in September 2008 and validated as well as updated in October 2009. The noise contours created for this AICUZ Study were based on the most current operations data at the time this study was conducted.

The AICUZ program uses the latest technology to define noise levels in areas near Air Force installations with a flying mission. An analysis of Dover AFB's flying operations was performed, including types of aircraft, flight patterns utilized, variations in altitude, power settings, number of operations, and hours of operations. After verification for accuracy, the data were input into the NOISEMAP Version 7.352 computer modeling program and the DNL metric was used to define the noise zones for Dover AFB. The noise contours for Dover AFB were plotted on an area map and overlaid with the CZ and APZ areas for the airfield.

1.4 COMPUTERIZED NOISE EXPOSURE MODELS

The Air Force developed the NOISEMAP computer program to describe noise impacts created by aircraft operations. NOISEMAP is one of two United States Environmental Protection Agency (USEPA)-approved computer programs; the other is the Integrated Noise Model (INM) used by the Federal Aviation Administration (FAA) for noise analysis at civil airports. The NOISEMAP and INM programs are similar; however, INM does not contain noise data for all military aircraft.

NOISEMAP is a suite of computer programs and components developed by the Air Force to predict noise exposure in the vicinity of an airfield due to aircraft flight, maintenance, and ground run-up operations. The components of NOISEMAP are:

- BASEOPS - the input module for NOISEMAP and is used to enter detailed aircraft flight track and profile as well as ground maintenance operational data.
- NOISEFILE - a comprehensive database of measured military and civil aircraft noise data. Aircraft operational information is matched with the noise measurements in the NOISEFILE after the detailed aircraft flight and ground maintenance operational data has been entered into BASEOPS.

- NMAP - the computational module in NOISEMAP. NMAP takes BASEOPS input and uses the NOISEFILE database to calculate the noise levels generated by aircraft events at specified grid points in the airbase vicinity. The output of NMAP is a series of georeferenced data points, specific grid point locations, and corresponding noise levels.
- NMPLOT - the program for viewing and editing the sets of georeferenced data points. NMPLOT plots the NMAP output in a noise contour grid that can be exported as files to be used in mapping programs for analyzing the noise impacts.

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SECTION 2
INSTALLATION DESCRIPTION

2.1 DESCRIPTION OF DOVER AIR FORCE BASE

Dover AFB is located in Kent County in central Delaware, southeast of the City of Dover, the capital of Delaware. The Base is situated on approximately 3,900 acres of land. Figure 2.1 shows Dover AFB location map. Access to the Base from the north is via U.S. 13, U.S. 113, and by the State Route (SR)-1 Bypass. U.S. 113 and SR-1 provide access from the south and SR-9 flanks the east side of the Base. From the west, SR-10 provides direct access to the Base via a north gate. Dover AFB has two active runways, 01/19 and 14/32.

2.2 MISSION

The 436th Airlift Wing (436 AW) is the host unit at Dover AFB and reports to the Air Mobility Command, headquartered at Scott AFB, Illinois. The vision of the wing is to "Continue to be America's preeminent expeditionary airlift team." During wartime, 436 AW is responsible for deployment and resupply of the major combat units of the United States. The Wing also provides administrative, logistical, and medical support to 436 AW units, tenant agencies, as well as retirees and their families who live in the Dover community. The organizational structure of 436 AW consists primarily of a Wing Headquarters, Maintenance Group, Medical Group, Operations Group, and Mission Support Group.

Major tenant units at the Base include the 512th Airlift Wing (Air Force Reserve Command), Air Force Office of Special Investigations, the Army and Air Force Exchange Service, Defense Commissary Agency, Air Force Mortuary Affairs Operations Center, and Detachment 3 of the 373rd Training Squadron. The 436th Operations Group is home to the wing's primary flying units, the 3rd and 9th Airlift Squadrons (AS). Flying squadrons in the 512th AW include the 326 AS and 709 AS.

2.3 ECONOMIC IMPACT

The Economic Impact Region (EIR) for Dover AFB is the geographic area subject to significant base-generated economic impacts, and is defined as the area within a 50-mile radius of the Base. This area includes the Delaware counties of Kent, Sussex, and New Castle, the City of Dover, and the Towns of Frederica, Little Creek, and Magnolia. The area most immediately impacted is Kent County and the City of Dover.

2.3.1 Local Economic Characteristics

As shown in Table 2.1, Kent County had a population of over 126,000 in 2000. The City of Dover, with a 2008 population of 35,811, an increase of nearly 12 percent from the 2000 population, constitutes approximately 25 percent of Kent County's total population.

The Delaware Population Consortium projects that Kent County's population will increase to over 159,000 by 2010, 169,433 by 2015, and 178,257 by 2020. This increase represents a faster rate than the State of Delaware as a whole, remaining at about 3 percent per decade

Table 2.1 Historic and Projected Population

Area	1990	2000	2010 projection	2020 projection
Dover	27,529	32,043	37,479	38,635
Kent County	110,993	126,697	159,722	178,257

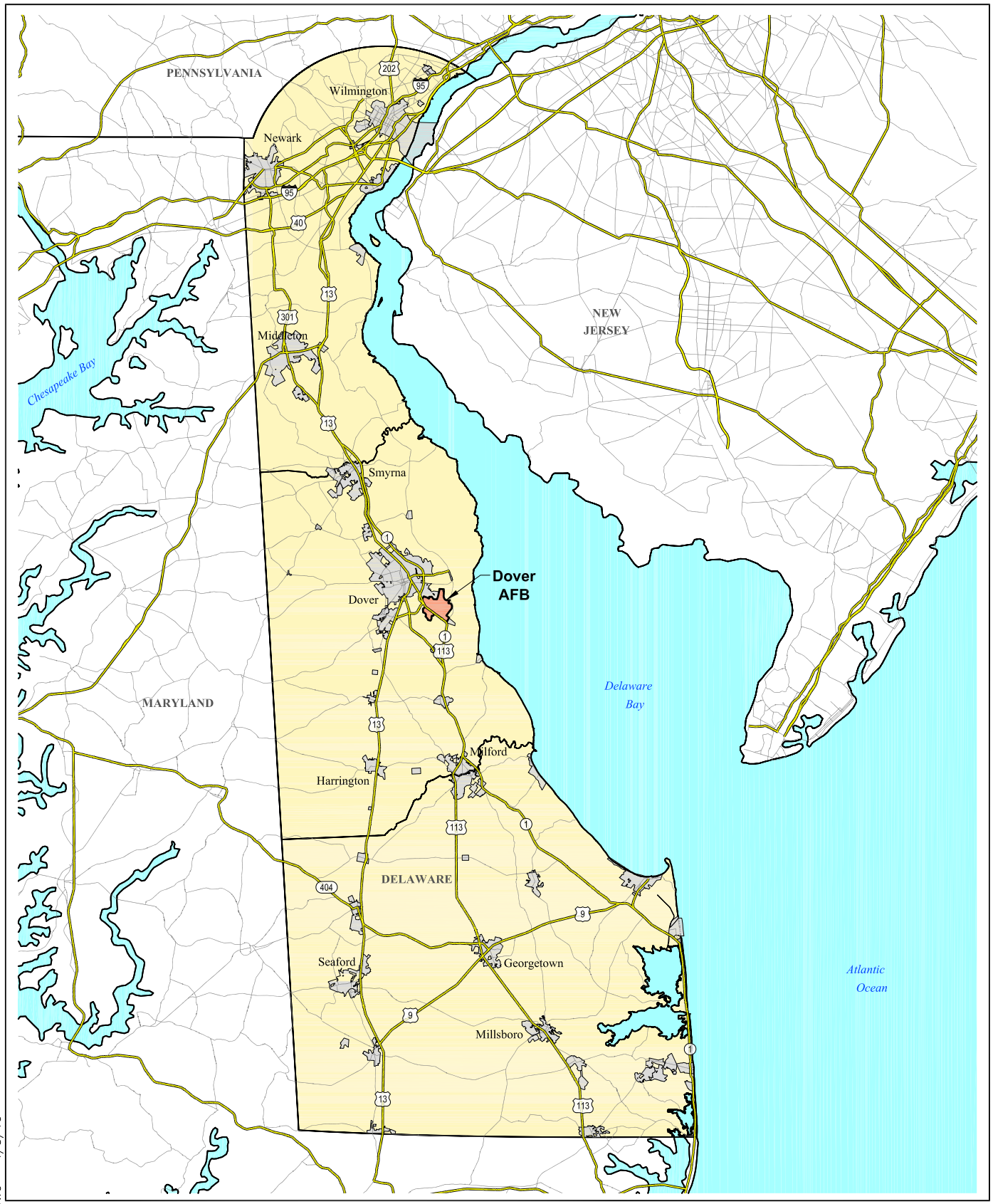
Source: US Census Bureau, 2000; City of Dover Comprehensive Plan, 2008; the Delaware Population Consortium, 2009

In 2009, employment in Kent County was estimated to be nearly 63,000 persons. The county's unemployment rate typically ranges between four and five percent. Professional, Educational, Health, Leisure, and Hospitality Services employ the largest percentage of workers, with nearly 22,000 employees (35% of total). Table 2.2 presents the Kent County non-farm employment, by employment sector.

Table 2.2 Kent County Non-farm Employment Estimates, Dec-09

Sector	Employees
Construction, Mining, Natural Resources	2,500
Manufacturing	3,300
Trade, Transportation & Utilities	13,100
Information	700
Finance Insurance and Real Estate	2,100
Services	21,700
Government	19,300
Total	**62,700**

Source: Delaware Department of Labor & U.S. Department of Labor, Bureau of Labor Statistics



743528 DOV10-AICUZ-LOC.DWG 4/5/10

Dover AFB Location Map

Figure 2.1

2.3.2 Base Impact

The geographic area subject to significant Base-generated economic impacts is defined as the area within a 50-mile radius of Dover AFB. As of the fiscal year 2010, Dover AFB employed 7,175 military personnel and civilians (Table 2.3). The annual payroll of the installation is $340.5 million (Table 2.4).

As a result of payroll expenditures, annual expenses, and the estimated value of indirect jobs in the local area, Dover AFB has an estimated total economic impact on the region of more than $528.8 million. The majority of this economic impact is due to the payroll and contracts provided by the Base.

Table 2.3 Personnel by Classification

Classification	Total
Active Duty Military	**5,483**
Military Dependents	3,652
Appropriated Fund Civilian	1,105
Non-Appropriated Fund Civilian	587
Total Dependents and Civilian Personnel	**5,344**
Total	**10,827**

Source: Dover AFB FY09 Economic Impact Statement

Table 2.4 Annual Payroll and Expenditures ($M)

Category	($M)
Total Annual Military Payroll	249.6
Total Annual APF and NAF Civilian Payroll	90.9
Subtotal Payroll	**340.5**
Annual Expenses for Construction Services and Procurement	96.0
Total	**436.5**

Source: Dover AFB FY09 Economic Impact Statement

SECTION 3
AIRCRAFT OPERATIONS

3.1 INTRODUCTION

It is necessary to fully evaluate the exact nature of flying activities to describe the relationship between aircraft operations and land use at and around the Base airfield. The October 2009 inventories of Base aircraft operations included where aircraft fly, how high they fly, how many times they fly over a given area, and the time of day they fly.

Section 3.2 discusses aircraft operations at Dover AFB; Section 3.3 discusses runway and flight track utilization for all operations by aircraft type; Section 3.4 describes aircraft maintenance activity; Section 3.5 discusses aircraft flight profiles; and Section 3.6 presents climatological data.

3.2 AIRCRAFT OPERATIONS

It is estimated that about 35,500 annual aircraft operations occur at Dover AFB. An aircraft operation is defined as one takeoff/departure, one approach/landing, or half a closed pattern. A closed pattern consists of two portions, a takeoff/departure and an approach/landing, *i.e.,* two operations. A sortie is a single military aircraft flight from the initial takeoff through the termination landing. The minimum number of aircraft operations for one sortie is two operations, one takeoff (departure), and one landing (approach).

Table 3.1 summarizes the average annual day aircraft operations for Dover AFB based on information provided by Base staff, flying organization, and air traffic control personnel. Aircraft types operating at the Base consist primarily of military aircraft. In addition to the Dover AFB based C-5 and C-17 aircraft, numerous types of transient military and civil air carrier aircraft conduct operations at the Base. Operations of the transient military and civilian aircraft types were combined based on similar characteristics (*e.g.*, number and type of engines, size of aircraft, airspeed, *etc*.). The table reflects a total of approximately 121 average annual day aircraft operations at Dover AFB. Approximately 26 percent of the total daily aircraft flight operations occur at night (10:00 p.m.-7:00 a.m.).

Although the number of military and civil aircraft operations at an installation usually varies from day to day, NOISEMAP requires input of the specific numbers of daily flight and aircraft maintenance engine runup operations. The Air Force does not follow the FAA's use of the "average annual day" in which annual operations are averaged over an entire 365-day year. Neither does the Air Force use the "worst-case day" since it typically does not represent the typical noise exposure. Instead, the Air Force uses the "average busy day" concept in which annual operations for an aircraft type are averaged over the number of flying days per year by that aircraft type.

Table 3.1 Average Busy Day Aircraft Operations at Dover AFB

Category/ Aircraft Type	Daily Arrival/ Departure Operations	Daily Closed Pattern Operations	Total Daily Operations
Dover AFB Based Aircraft			
C-17	4.10	32.50	36.60
C-5	3.70	44.97	48.66
Aero Club	0.86	13.28	14.14
Subtotal	*8.66*	*90.74*	*99.40*
Transient Military Aicraft			
C-17	1.93	0.00	1.93
C-5	3.11	0.00	3.11
F-18	0.06	0.00	0.06
A-10	0.09	0.00	0.09
T-1	0.03	0.00	0.03
T-38	0.23	0.00	0.23
F-16	0.13	0.00	0.13
KC-135	0.53	0.00	0.53
C-21	0.53	0.00	0.53
P-3	0.03	0.00	0.03
UH-60	1.02	0.00	1.02
UH-1	0.43	0.00	0.43
Subtotal	*8.12*	*0.00*	*8.12*
Civilian Aircraft			
B-747	7.33	0.00	7.33
DC-10	0.36	0.00	0.36
Cessna	1.51	0.00	1.51
Falcon 20	3.55	0.00	3.55
MD-11	0.33	0.00	0.33
B-737	0.13	0.00	0.13
Subtotal	*13.21*	*0.00*	*13.21*
Total	**29.99**	**90.74**	**120.73**

Note: An operation is one arrival/departure or one takeoff/landing; One closed pattern consists of two operations, one takeoff and one landing.

3.3 RUNWAY AND FLIGHT TRACK UTILIZATION

The Base has two runways. Runway 01/19 is oriented 010°–190°, is 9,600 feet long and 200 feet wide, and has 1,000-foot long overruns at each end. Runway 14/32 is oriented 140°–320°, is 12,900 feet long and is 150 feet wide, and has a 150-foot long overrun at the northwest end and a 1,000-foot long overrun at the southeast end. The airfield elevation is 28 feet above mean sea level. Overhead traffic patterns accomplished by fighter and trainer type aircraft are flown at an altitude of approximately 2,500 feet above ground level (AGL). Rectangular patterns for large, heavy aircraft are accomplished about 1,800 feet AGL. Light aircraft such as Aero Club aircraft fly patterns at approximately 700 feet AGL. Radar patterns are flown about 3,000 feet AGL.

A hangar off the northwest end of Runway 14/32 affects the operations on the runway; the location of the hangar reduces the length of runway available for landing on Runway 14 and takeoff on Runway 32. The runway threshold on the northwest end of Runway 14/32 is displaced 4,248 feet to the southeast to assure proper clearance between landing aircraft and the hangar. With this adjustment, approximately 8,652 feet of runway are available for landing on Runway 14. Landings on Runway 14 are restricted to helicopters and Dover AFB Aero Club aircraft. However, Runway 14 may be used by other aircraft during closure of Runway 01/19 and when crosswind and runway conditions prevent aircraft from landing on Runway 01/19.

For Runway 32 departures, the threshold is displaced 2,830 feet from the northwest end, leaving 10,070 feet for takeoff. Aircraft departing on Runway 32 turn to a heading of 360 degrees after takeoff to avoid the hangar.

Aircraft arrival and departure flight tracks at Dover AFB are influenced by other airports within the area. The Chandele Estates Airport is 5 miles north; Johnson's Airport is 4 miles south; the Henderson Aviation Airport is 8 miles southwest; the Jenkins Airport is 5 miles west; the Delaware Airpark is 8 miles northwest; and the Smyrna Airport is 11 miles northwest. The location and proximity of these airports relative to Dover AFB require that arriving and departing aircraft be routed to avoid conflict. Likewise, regional aircraft routings are developed, to the maximum extent practicable, to establish common tracks that serve the arrival and departure "flow" for all the airports within the area.

To reduce aircraft noise in the areas surrounding Dover AFB, the Base has established noise abatement procedures advising pilots to avoid overflying beach towns. Additionally, pilots should not overfly the Town of Little Creek nor housing units to the maximum extent possible. To reduce noise to the northwest of the airfield, aircraft taking off on Runway 32 will turn to the north (360º) when reaching 400 feet AGL, use radar vectors for departure, and delay flap retraction until 2,000 feet AGL or reaching pattern altitude. Missed approaches for Runway 32 are executed prior to the approach end of the runway by turning to a heading of 360º. Landing on Runway 14 is restricted to helicopters and Dover AFB Aero Club aircraft; however, the runway may be used for aircraft emergency landings or during excessive wind conditions.

Aircraft operating at Dover AFB use the following flight patterns:

- Departures on Runways 01 and 19 proceed straight-out, Runway 14 departures turn slightly right after the end of the runway, and departures from Runway 32 turn to a heading of 360º (except for the spiral up departure, which climbs to altitude before proceeding to the northwest);
- Straight-in approaches;
- Overhead landing patterns;
- Radar closed patterns;
- Tactical C-17 arrivals, departures, and closed patterns in which the aircraft spirals up and down above the airfield; and
- Overhead and rectangular closed patterns.

Flight patterns specific to Dover AFB result from several considerations, including:

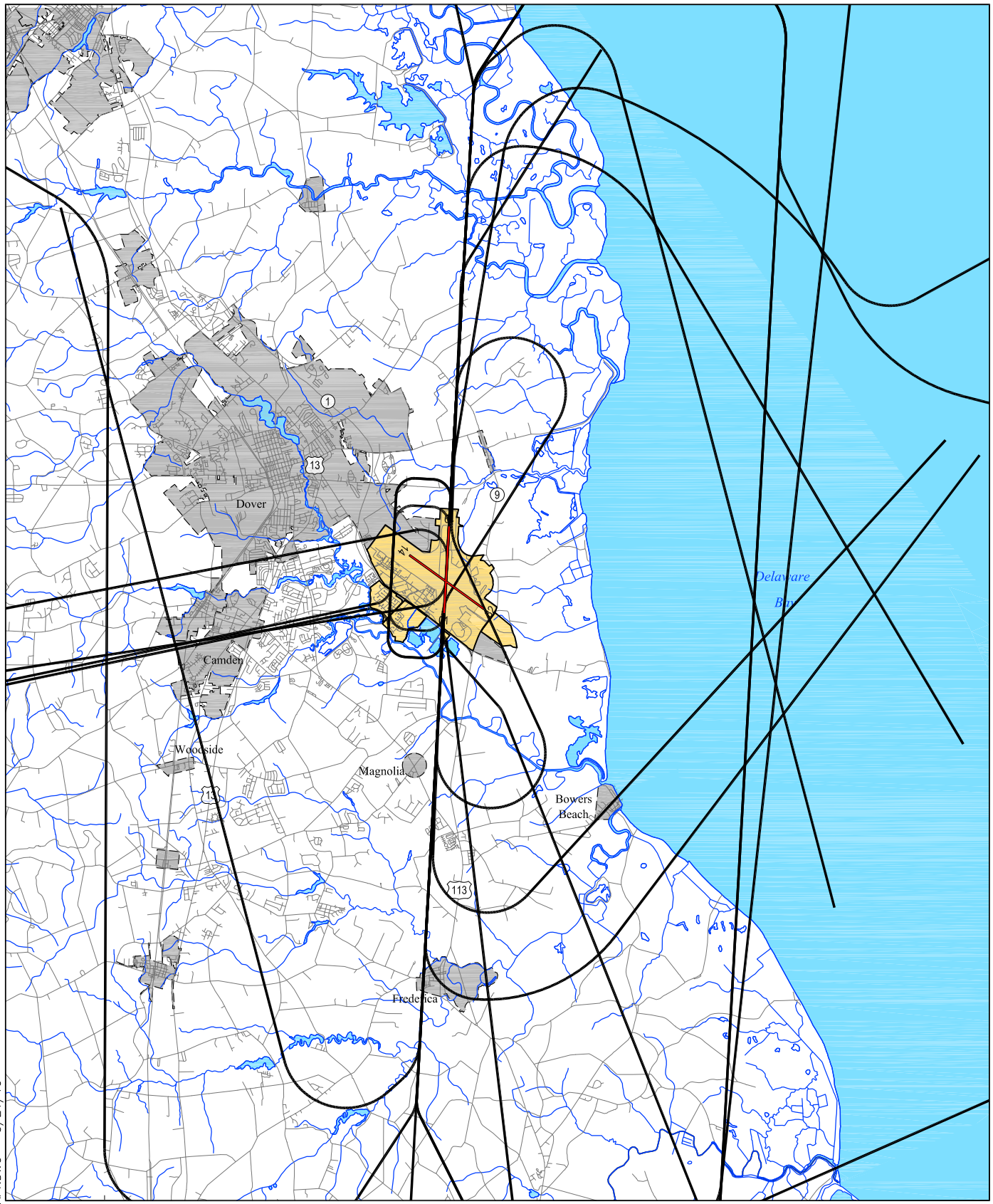
- Takeoff patterns routed to avoid noise-sensitive areas, such as the City of Dover, as much as possible;
- Criteria governing the speed, rate of climb, and turning radius for each type of aircraft;
- Efforts to control and schedule missions to keep noise levels low, especially at night; and
- Coordination with the FAA to minimize conflict with civil aircraft operations.

Planning for the areas surrounding an airfield considers three primary aircraft operational/land-use determinants: (1) aircraft accident potential to land users; (2) aircraft noise; and (3) hazards to operations from land uses (*e.g.*, height of structures). Each of these concerns is addressed in conjunction with mission requirements and safe aircraft operations to determine the optimum flight track for each aircraft type. The flight tracks depicted in Figures 3.1 through 3.6 are the result of such planning and depict the representative flight tracks used for noise modeling. Following are the percents of use for the four runways: Runway 01, 53 percent; Runway 19, 30 percent; Runway 14, 5 percent; and Runway 32, 12 percent.

3.4 AIRCRAFT MAINTENANCE RUNUP OPERATIONS

To the maximum extent possible, aircraft maintenance engine runup locations have been established in areas to minimize noise for people on Base, as well as for those in the surrounding communities. Aircraft maintenance engine runup operations are accomplished by based flying units and their associated maintenance functions.

Average annual day aircraft maintenance runup operations were calculated similarly to flight operations described in Section 3.1. Weekly, monthly, or annual estimates of runups provided by Dover AFB aircraft maintenance personnel were divided by the typical number of days runups were performed over the respective period.



Dover Air Force Base 2010 AICUZ

LEGEND

- Flight Track
- Runway
- Roadway
- Dover AFB
- Municipal Boundary

N

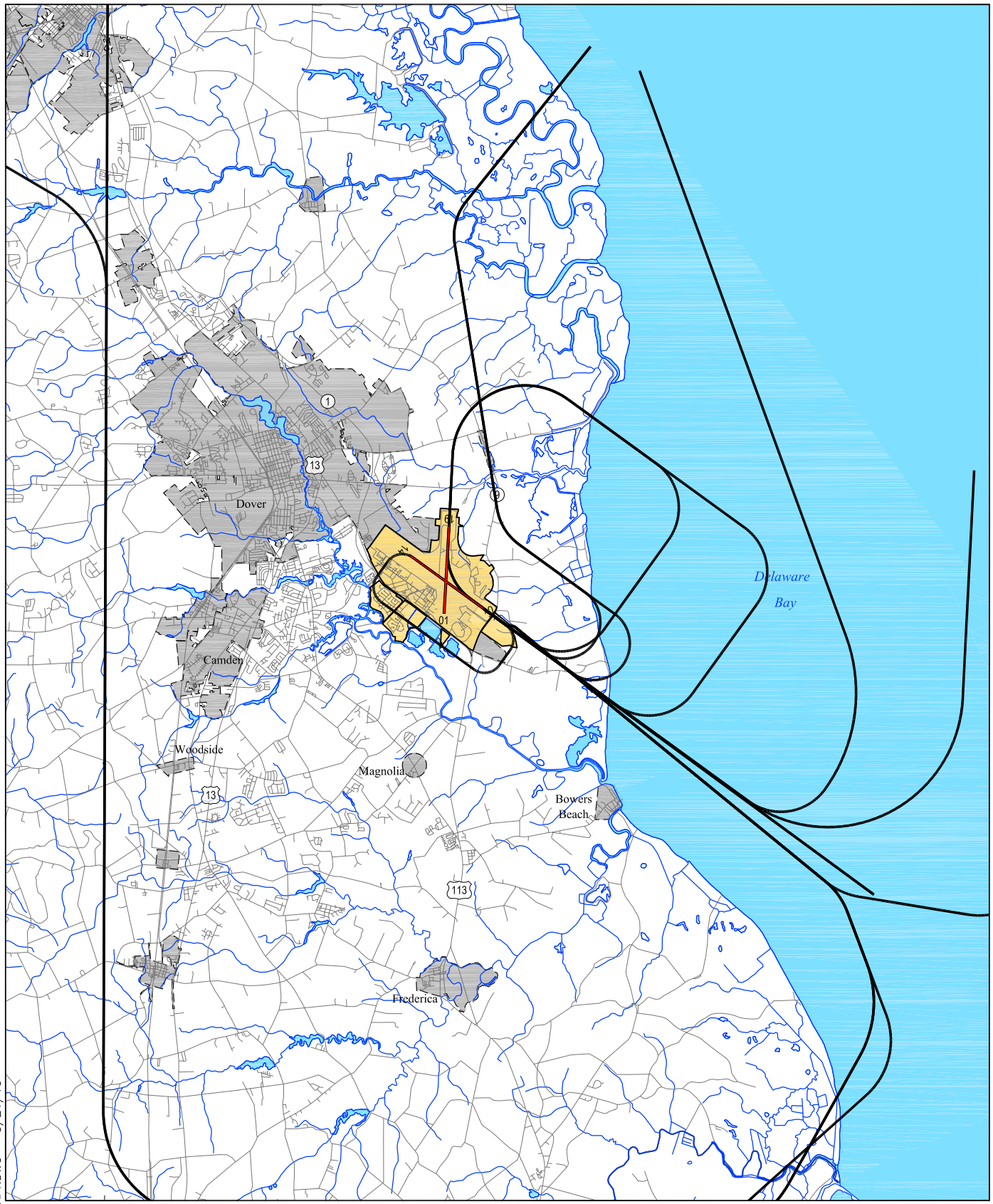
0 15,000

Feet

Arrival Flight Tracks Runway 01/19

Figure 3.1

747076 DOV10-AICUZ-0119AFT.DWG 5/21/10



Dover Air Force Base 2010 AICUZ

LEGEND

- Flight Track
- Runway
- Roadway
- Dover AFB
- Municipal Boundary

N

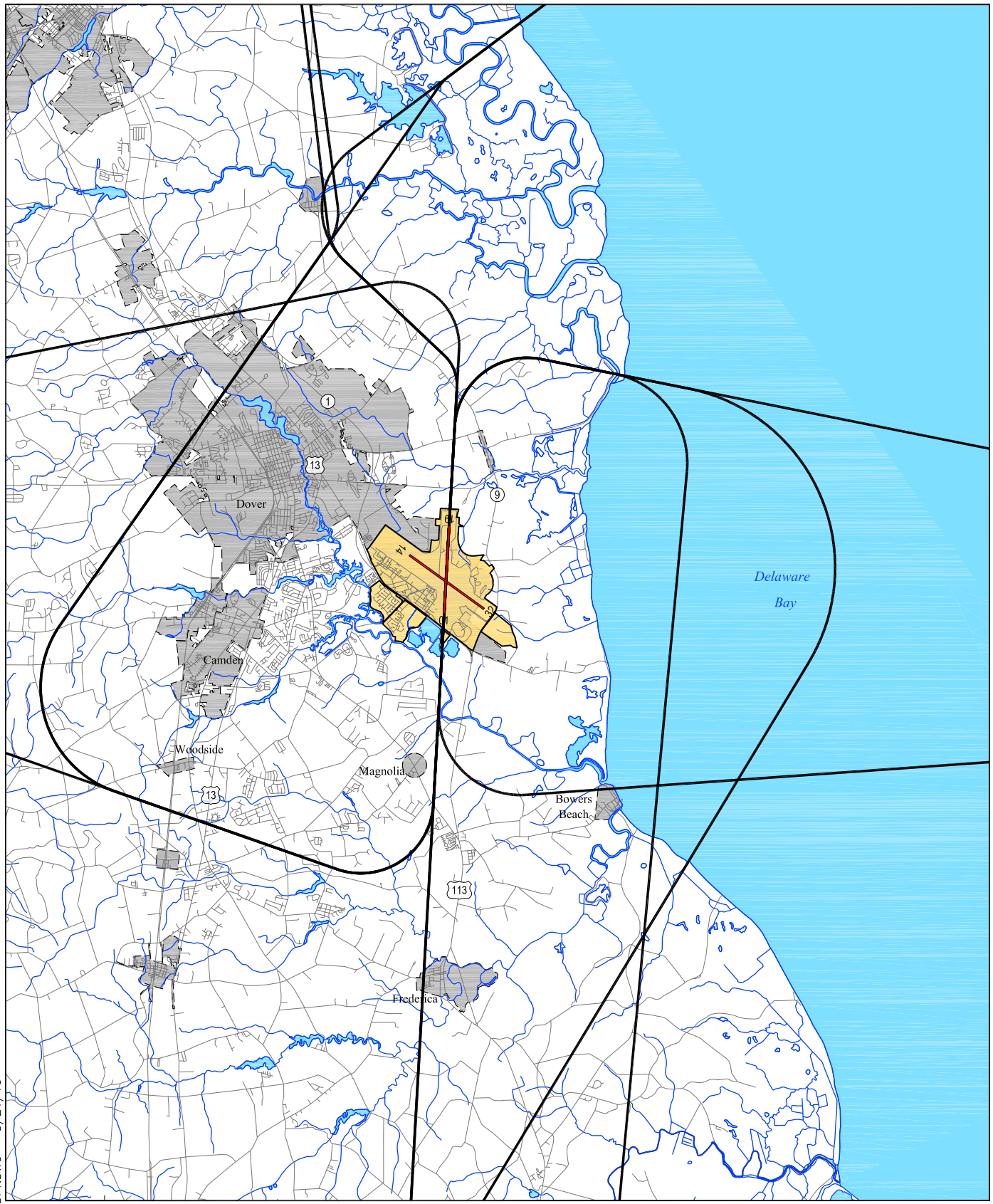
0 15,000

Feet

Arrival Flight Tracks Runway 14/32

Figure 3.2

747076 DOV10-AICUZ-1432AFT.DWG 5/21/10



Dover Air Force Base 2010 AICUZ

LEGEND

- Flight Track
- Runway
- Roadway
- Dover AFB
- Municipal Boundary

N

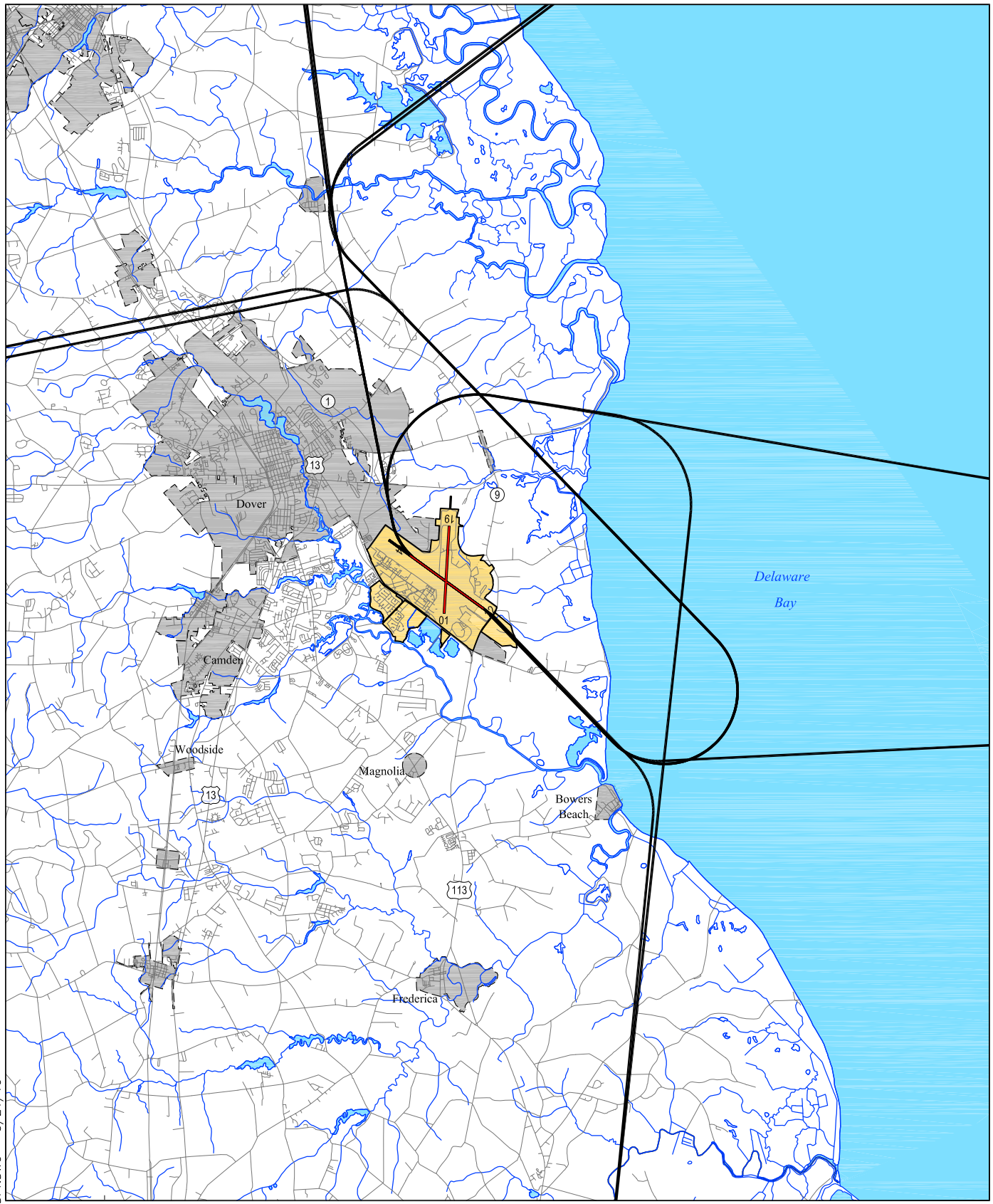
0 15,000

Feet

Departure Flight Tracks Runway 01/19

Figure 3.3

747076 DOV10-AICUZ-0119DFT.DWG 5/21/10



Dover Air Force Base 2010 AICUZ

LEGEND

- Flight Track
- Runway
- Roadway
- Dover AFB
- Municipal Boundary

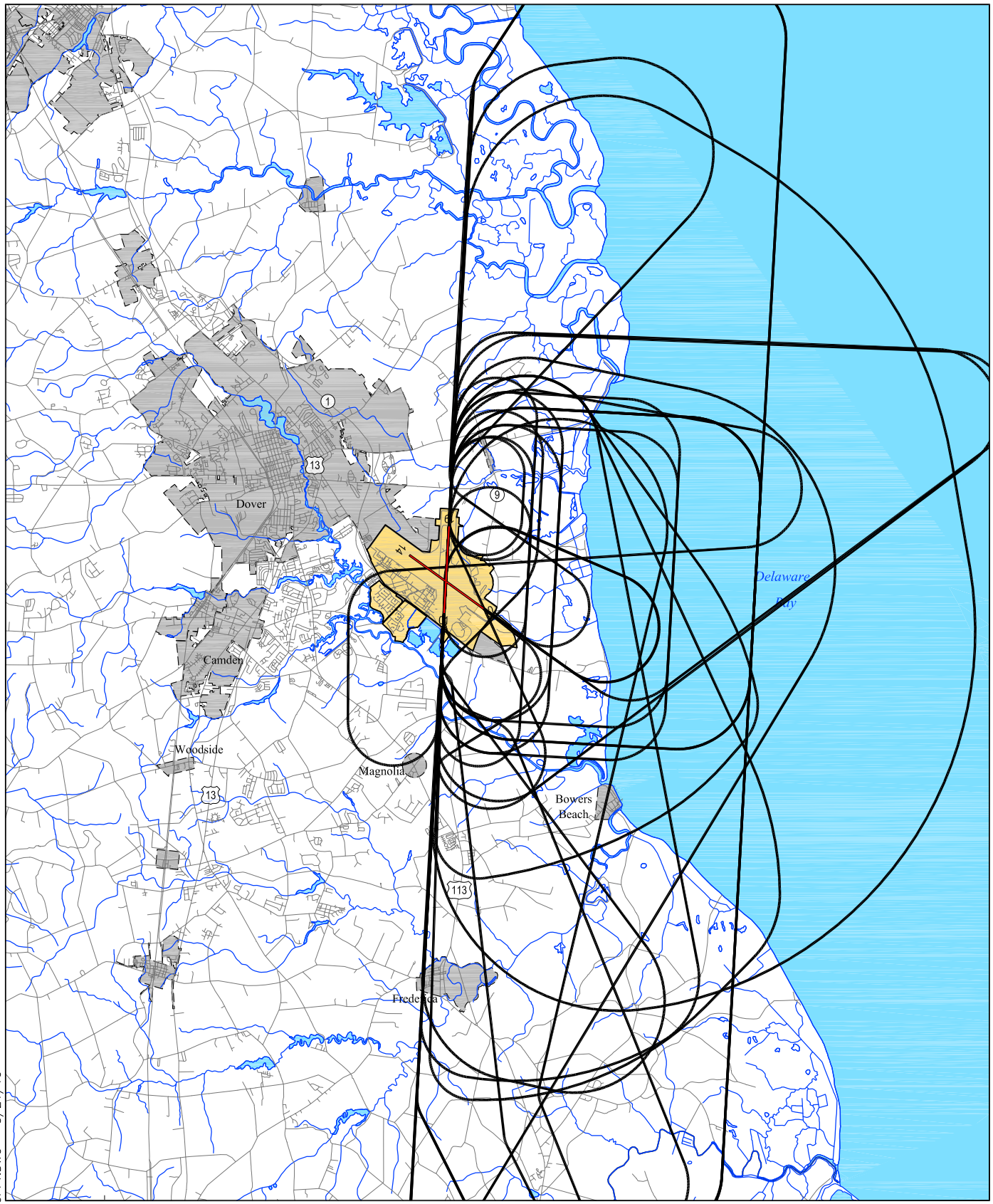
N

0 15,000 Feet

Departure Flight Tracks Runway 14/32

Figure 3.4

747076 DOV10-AICUZ-1432DFT.DWG 5/21/10



Dover Air Force Base 2010 AICUZ

LEGEND

- Flight Track
- Runway
- Roadway
- Dover AFB
- Municipal Boundary

N

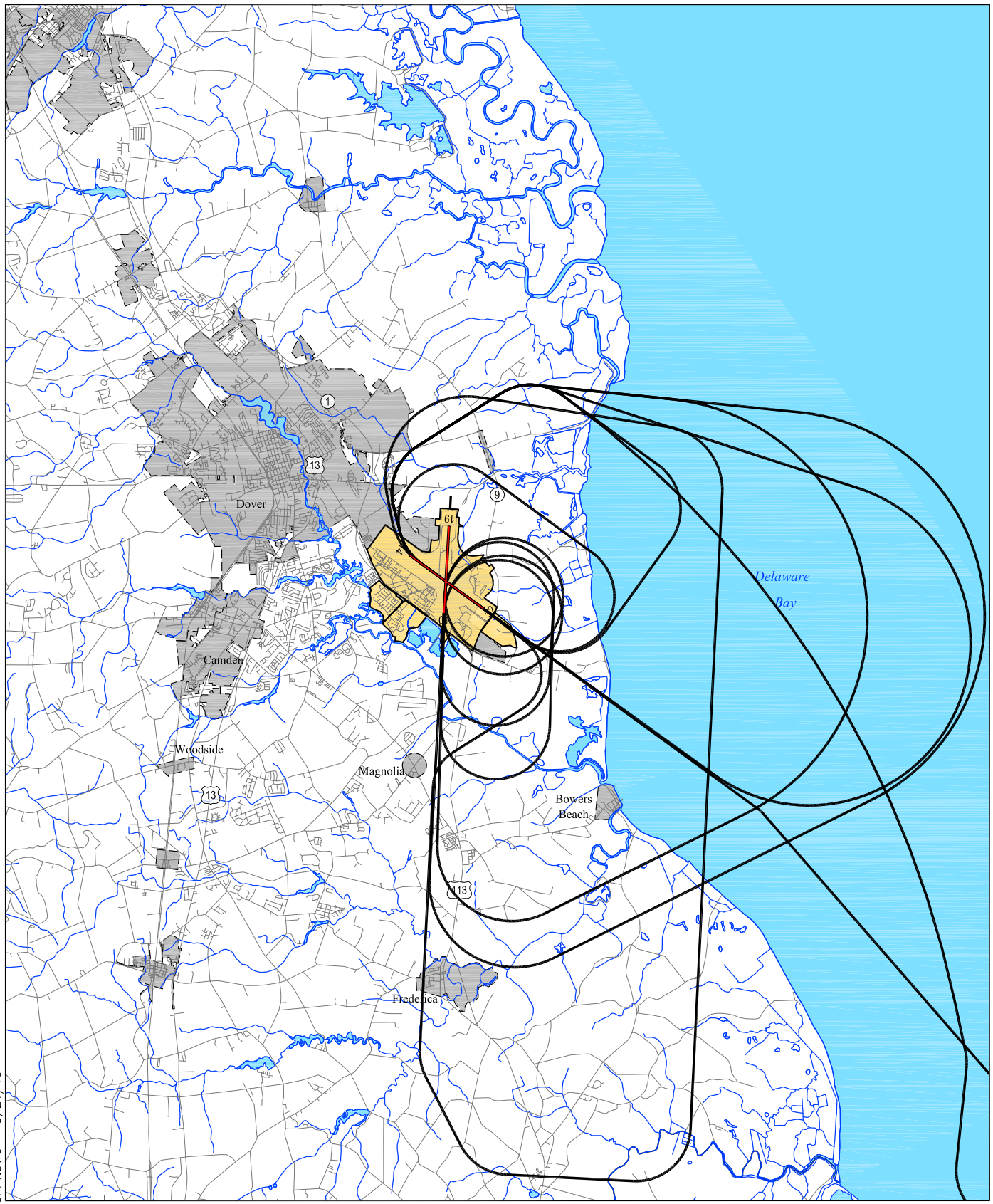
0 15,000

Feet

Closed Pattern Flight Tracks - Runway 01/19

Figure 3.5

747076 DOV10-AICUZ-0119CPFT.DWG 5/21/10



Dover Air Force Base 2010 AICUZ

LEGEND

- Flight Track
- Runway
- Roadway
- Dover AFB
- Municipal Boundary

N

0 15,000

Feet

Closed Pattern Flight Tracks - Runway 14/32

Figure 3.6

747076 DOV10-AICUZ-1432CPFT.DWG 5/21/10

3.5 AIRCRAFT FLIGHT PROFILES

For purposes of this AICUZ Study, aircraft "flight profiles" denote the aircraft power settings, altitudes above runway level, and airspeeds along each flight track. Aircraft flight profiles for C-5 and C-17 aircraft were obtained from Dover AFB personnel. Generic flight profiles from the BASEOPS database were used to model operations for the other military aircraft types. Noise data from the NOISEFILE database were used to model operations for all aircraft types.

3.6 CLIMATOLOGICAL DATA

Weather conditions, measured by temperature and relative humidity, are an important factor in the propagation of noise. Temperature and relative humidity affect sound absorption. The average temperature and humidity for each month of the year are input into BASEOPS, which then calculates the sound absorption coefficient for each month. Ranking the twelve monthly sound absorption coefficients from smallest to largest, BASEOPS chooses the sixth smallest sound absorption coefficient to represent the typical weather conditions at the installation. The month with the sixth smallest sound absorption coefficient for Dover AFB is the month with the average monthly temperature of 36 degrees Fahrenheit and 66 percent relative humidity.

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SECTION 4
EFFECTS OF AIRCRAFT OPERATIONS

4.1 INTRODUCTION

This section has two purposes. The first is to describe the imaginary surfaces associated with obstructions to air navigation, noise exposure, CZs, and APZs. The second is to present applicable land-use compatibility guidelines and the Air Force's participation in the land-use planning process.

4.2 RUNWAY AIRSPACE IMAGINARY SURFACES

Obstructions to air navigation are considered to be:

- Natural objects or man-made structures that protrude above the planes or imaginary surfaces, and/or;
- Man-made objects that extend more than 500 feet AGL at the site of the structure.

4.2.1 Explanation of Terms

The following elevation, runway length, and dimensional criteria apply:

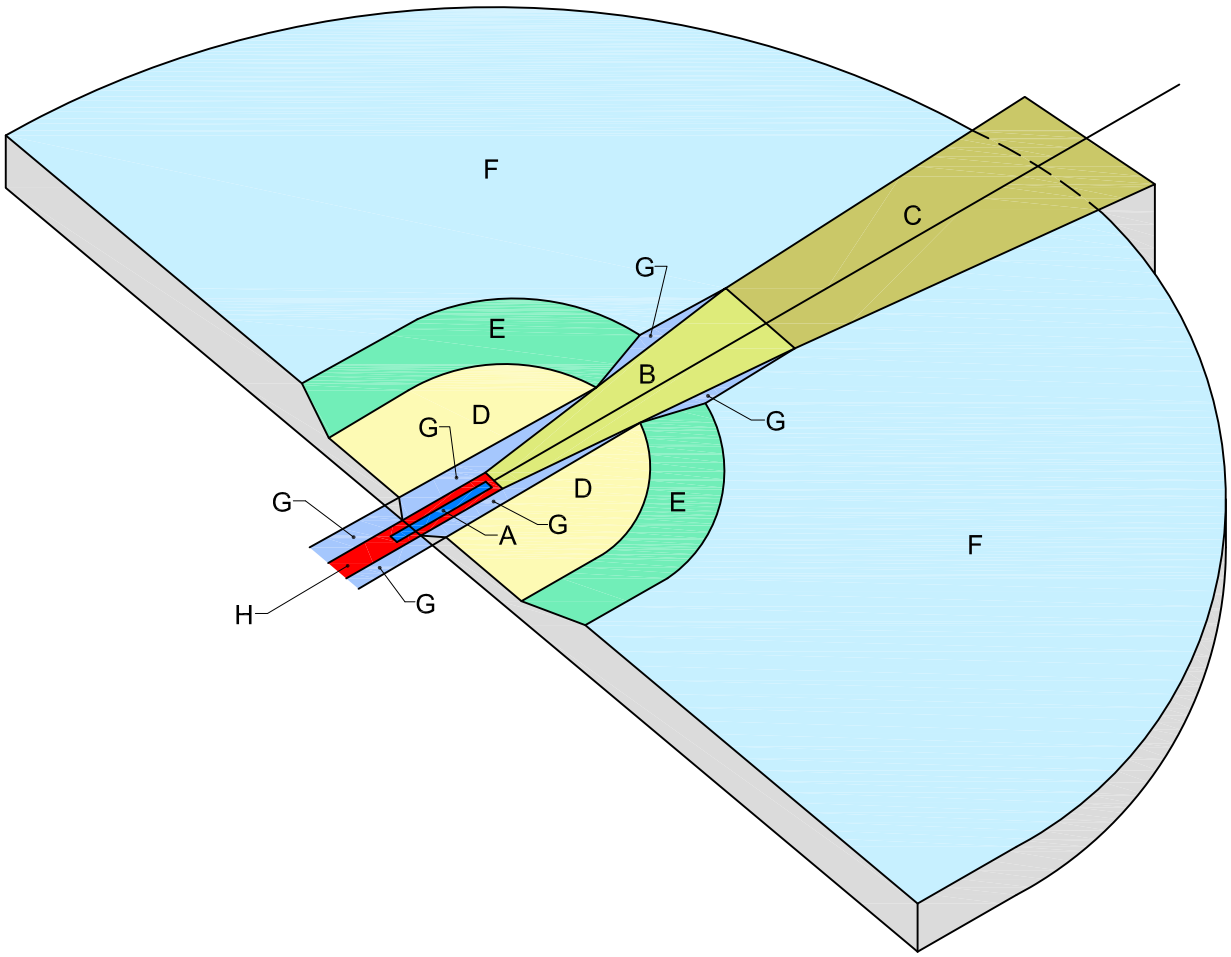
- Controlling Elevation—whenever surfaces or planes within the obstruction criteria overlap, the controlling (or governing) elevation becomes that of the lowest surface or plane.
- Runway Length—Dover AFB has two runways. Runway 01/19 is 9,600 feet long and Runway 14/32 is 12,900 feet long. Both runways are Class B runways designed and built for sustained aircraft landings and take-offs.
- Established Airfield Elevation—The established elevation for the Dover AFB airfield is 28 feet above mean sea level.
- Dimensions—All dimensions are measured horizontally unless otherwise noted.

4.2.2 Runway Airspace Imaginary Surfaces

Runway airspace imaginary surfaces, in graphical form, are the result of the application of obstruction height criteria to Dover AFB. Imaginary surfaces are surfaces in space around airfields in relation to runways. The surfaces are designed to define the obstacle-free airspace at and around the airfield. Refer to Unified Facilities Criteria (UFC) 3-260-01, *Airfield and Heliport Planning and Design* (2008), for a more complete description of runway airspace imaginary surfaces for Class B runways. Figure 4.1 depicts the runway airspace imaginary surfaces for the Dover AFB Class B runways. Air Force obstruction criteria in UFC 3-260-01 are based on those contained in Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace*, Subpart C. The following paragraphs contain definitions of the runway airspace imaginary surfaces for Air Force Class B runways:

- Primary Surface—An imaginary surface symmetrically centered on the runway, extending 200 feet beyond each runway end, which defines the limits of the obstruction clearance requirements in the vicinity of the landing area. The width of the primary surface is 2,000 feet, or 1,000 feet on each side of the runway centerline.

- Clear Zone Surface—An obstruction-free surface (except for features essential for aircraft operations) on the ground symmetrically centered on the extended runway centerline beginning at the end of the runway and extending outward 3,000 feet. The CZ width is 3,000 feet (1,500 feet to either side of runway centerline).
- Accident Potential Zone Surfaces—APZ I begins at the outer end of the CZ and is 5,000 feet long and 3,000 feet wide. APZ II begins at the outer end of APZ I and is 7,000 feet long and 3,000 feet wide.
- Approach-Departure Clearance Surface—This imaginary surface is symmetrically centered on the extended runway centerline, beginning as an inclined plane (glide angle) 200 feet beyond each end of the primary surface, and extending for 50,000 feet. The slope of the approach-departure clearance surface is 50:1 until it reaches an elevation of 500 feet above the established airfield elevation. It then continues horizontally at this elevation to a point 50,000 feet from the starting point. The width of this surface at the runway end is 2,000 feet, flaring uniformly to a width of 16,000 feet at the end point.
- Inner Horizontal Surface—This imaginary surface is an oval plane at a height of 150 feet above the established airfield elevation. The inner boundary intersects with the approach-departure clearance surface and the transitional surface. The outer boundary is formed by scribing arcs with a radius 7,500 feet from the centerline of each runway end and interconnecting these arcs with tangents.
- Conical Surface—This is an inclined imaginary surface extending outward and upward from the outer periphery of the inner horizontal surface for a horizontal distance of 7,000 feet to a height of 500 feet above the established airfield elevation. The slope of the conical surface is 20:1. The conical surface connects the inner and outer horizontal surfaces.
- Outer Horizontal Surface—This imaginary surface is located 500 feet above the established airfield elevation and extends outward from the outer periphery of the conical surface for a horizontal distance of 30,000 feet.
- Transitional Surface—This imaginary surface extends outward and upward at right angles to the runway centerline and extended runway centerline at a slope of 7:1. The transitional surface connects the primary and the approach-departure clearance surfaces to the inner horizontal, the conical, and the outer horizontal surfaces.



Note:
The outer edge of the outer horizontal surfaces (F) extends to 44,500 feet from the runway centerline.

LEGEND

- A Primary Surface
- B Approach-Departure Clearance Surface (50:1 Slope Ratio)
- C Approach-Departure Clearance Surface (Horizontal)
- D Inner Horizontal Surface (45.72m [150'] Elevation)
- E Conical Surface (20:1 Slope Ratio)
- F Outer Horizontal Surface (152.40m [500'] Elevation)
- G Transitional Surface (7:1 Slope Ratio)
- H Runway

Class B Air Force Runway Airspace Imaginary Surfaces

Figure 4.1

747076 DOV10-AICUZ-IMSURF.DWG 6/8/10

4.3 RESTRICTED AND/OR PROHIBITED LAND USES

The land areas outlined by these criteria should be regulated to prevent uses that might otherwise be hazardous to aircraft operations. The following uses should be restricted and/or prohibited for runways:

- Releases into the air of any substance that would impair visibility or otherwise interfere with the operation of aircraft (e.g., steam, dust, or smoke);
- Light emissions, either direct or indirect (reflective), that would interfere with pilot vision;
- Electrical emissions that would interfere with aircraft communications systems or navigational equipment;
- Uses that would attract birds or waterfowl, including but not limited to, operation of sanitary landfills, waste transfer facilities, maintenance of feeding stations, sand and gravel dredging operations, storm water retention ponds, created wetland areas, or the growing of certain vegetation; and
- Structures within 10 feet of aircraft approach-departure and/or transitional surfaces.

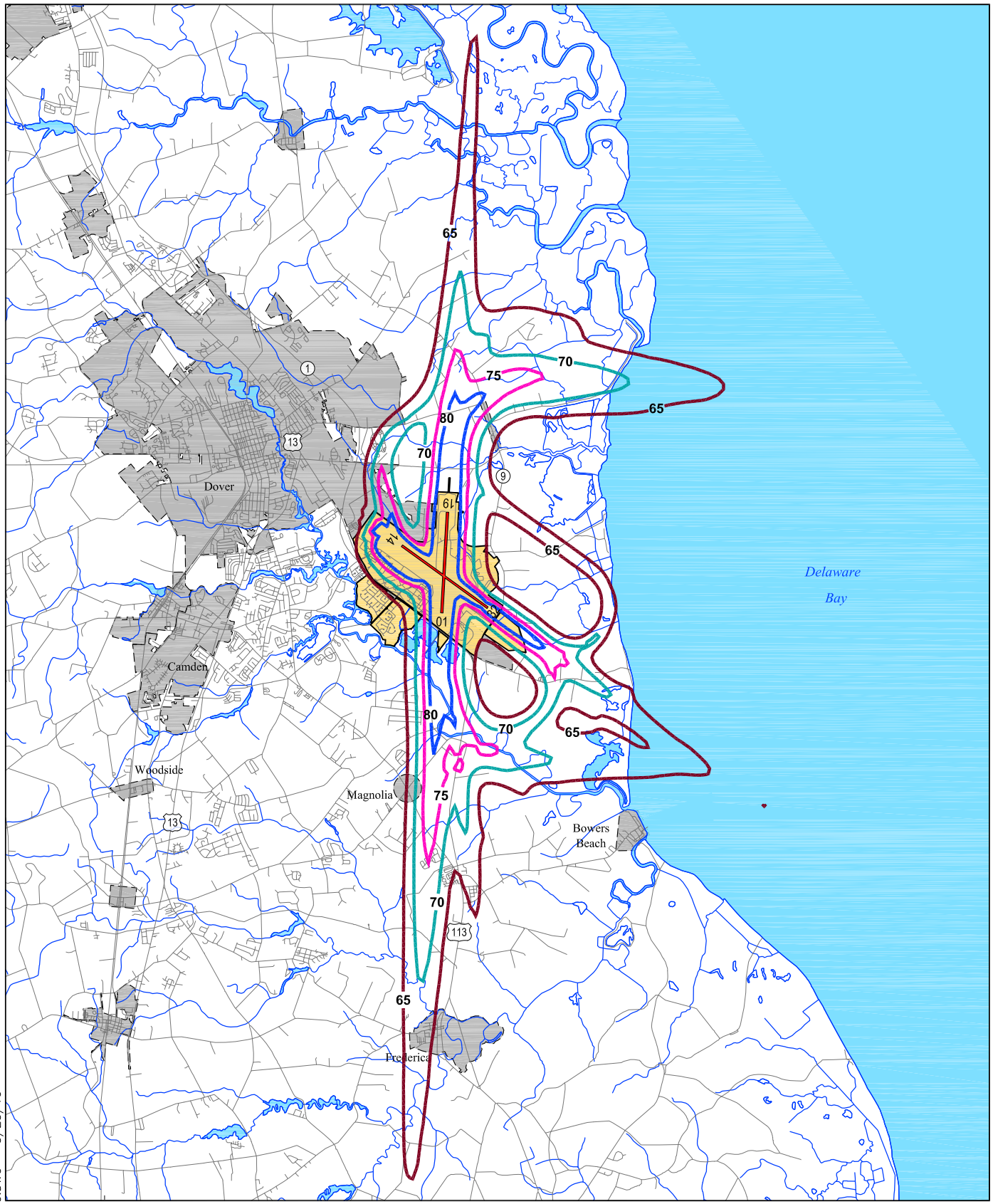
4.4 NOISE EXPOSURE

NOISEMAP Version 7.352 was used to calculate and plot the DNL noise contours based on the average busy day aircraft operations data collected and updated in 2008 and 2009 and described in Sections 3.1 through 3.6. Figure 4.2 shows the DNL noise contours plotted in 5 dB increments, ranging from DNL of 65 dBA to above 80 dBA.

Different sounds have different frequency content. When describing sound and its effect on a human population, A-weighted (dB) sound levels are typically used to account for the response of the human ear. The term "A-weighted" refers to a filtering of the sound signal to emphasize frequencies in the middle of the audible spectrum and to de-emphasize low and high frequencies in a manner corresponding to the way the human ear perceives sound. This filtering network has been established by the American National Standards Institute. The A-weighted noise level has been found to correlate well with people's judgments of noisiness of different sounds and has been in use for many years as a measure of community noise.

Table 4.1 shows the off-Base noise exposure within the DNL 65 dBA and greater noise exposure area for aircraft operations at Dover AFB in terms of acreage and estimated affected population. DNL is the measure of the total noise environment. DNL averages the sum of all aircraft noise producing events over a 24-hour period, with a 10 dB upward adjustment added to the nighttime events (between 10:00 p.m. and 7:00 a.m.).

The population data used in preparing this estimate was obtained from the United States Census Bureau 2000 census. To estimate affected population, it was assumed that population was equally distributed within a census tract area. Using this assumption, the total acreage and population in each census tract surrounding Dover AFB were collected and assessed. Using the noise contour information, the number of acres of land in each noise zone (i.e., DNL of 65-69 dBA, 70-74 dBA, 75-79 dBA, and 80 dBA and greater) was divided by the number of acres of land in each census tract to determine what portion of the census tract was contained within each noise zone.



Dover Air Force Base 2010 AICUZ

LEGEND

- 65 dBA Contour
- 70 dBA Contour
- 75 dBA Contour
- 80 dBA Contour
- Runway
- Roadway
- Dover AFB
- Municipal Boundary

N

0 13,000

Feet

2010 DNL Noise Contours

Figure 4.2

747076 DOV10-AICUZ-ABDNC.DWG 3/25/10

To determine population, the population total in each block-group was then multiplied by this ratio to estimate affected population. Because of the limited land area within the 80 dBA zone, a visual count of structures was conducted. The general population density per household was then applied to determine the estimated population within the 80 dBA zone.

Table 4.1 Area and Population Within DNL 65 dBA and Greater Noise Exposure Area (Off-Base Only)

DNL Noise Zone	2010 Study	1999 Study
65–69 dBA	11,252	1,952
70–74 dBA	5,032	610
75–79 dBA	2,076	171
80+ dBA	961	51
Total	**19,321**	2,784

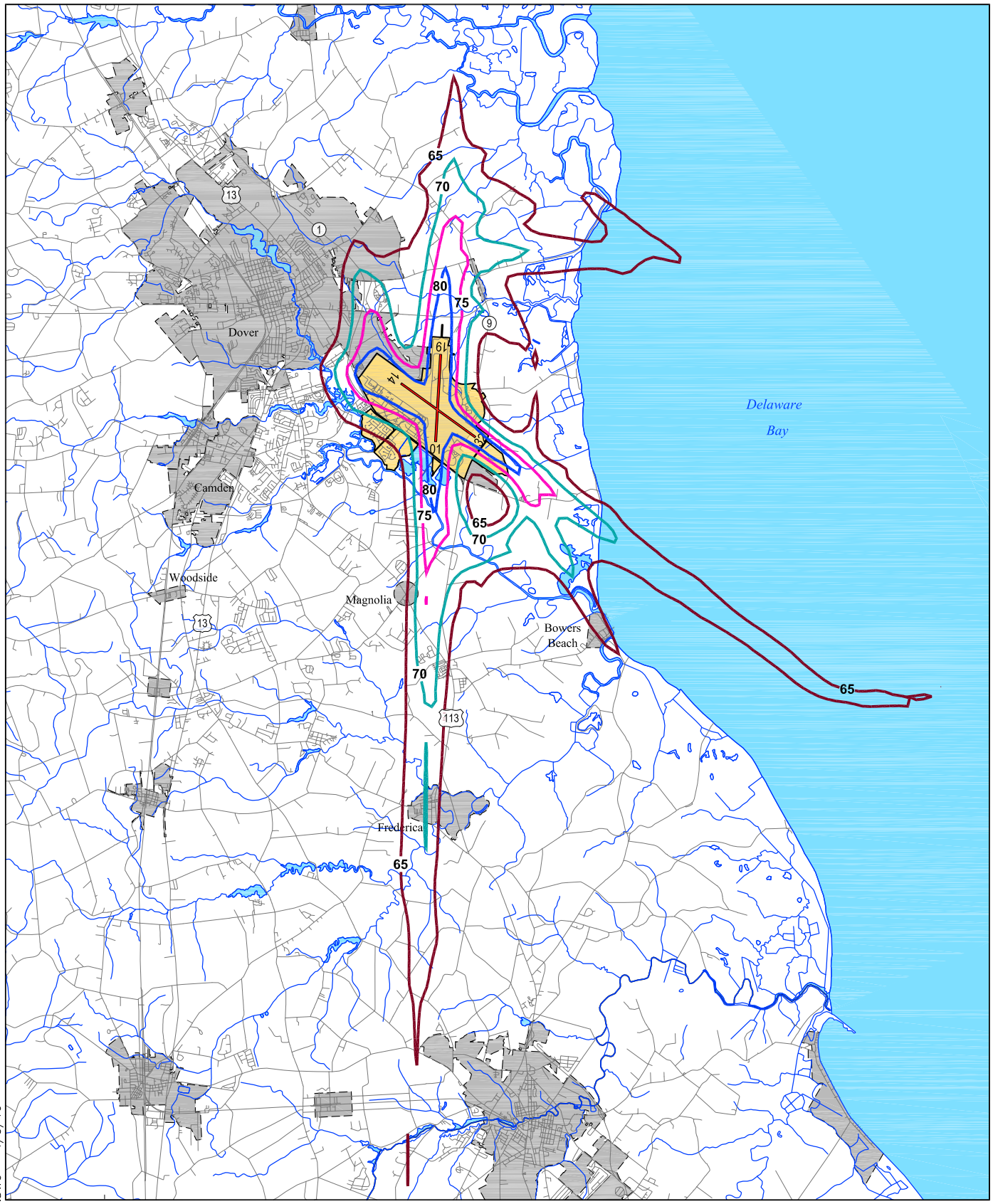
From Table 4.1, a total of 19,321 acres and 2,784 persons are expected to be in the off-Base area within the DNL 65 dBA and greater noise exposure area. The largest affected population is anticipated to be within the DNL 65–69 dBA noise zone. This area is estimated to contain 11,252 acres in off-Base land area (approximately 58% of the total) and an estimated population of 1,952 persons (70% of the total) based on the calculated population densities for the area.

4.5 COMPARISON WITH 1999 AICUZ STUDY

Noise contours presented in this study differ in both shape and extent from the noise contours in the 1999 AICUZ Study. Figure 4.3 depicts the 1999 AICUZ Study contours, and Figure 4.4 compares the 2010 and 1999 contours. The overall exposure for this AICUZ Study is about 4,456 acres less than the 1999 AICUZ Study. Table 4.2 lists the total noise exposure for the four noise zones in each study. The decrease in noise exposure is attributed to the reduction in airfield operations at the Base by the noisier C-5 aircraft.

Table 4.2 Total Acres Within the 2010 and 1999 AICUZ Study Noise Zones (Off-Base and On-Base)

	Acres	
DNL Noise Zone	**2010 Study**	**1999 Study**
65–69 dBA	11,779	15,462
70–74 dBA	5,528	6,262
75–79 dBA	2,513	2,572
80+ dBA	2,258	2,238
Total	**22,078**	**26,534**



Dover Air Force Base 2010 AICUZ

LEGEND

- 65 dBA Contour
- 70 dBA Contour
- 75 dBA Contour
- 80 dBA Contour
- Runway
- Roadway
- Dover AFB
- Municipal Boundary

N

0 15,000

Feet

1999 DNL Noise Contours

Figure 4.3

4.6 CLEAR ZONES AND ACCIDENT POTENTIAL ZONES FOR RUNWAYS

The purpose of this section is to describe the basis for CZs and APZs and apply the zones to the Dover AFB runways.

4.6.1 Basis for Clear Zones and Accident Potential Zones

Areas around airports are exposed to the possibility of aircraft accidents even with well-maintained aircraft and highly trained aircrews. Despite stringent maintenance requirements and countless hours of training, past history makes it clear that accidents may occur.

The risk of people on the ground being killed or injured by aircraft accidents is small. However, an aircraft accident is a high-consequence event and, when a crash does occur, the result is often catastrophic. Because of this, the Air Force does not attempt to base its safety standards on accident probabilities. Instead it approaches this safety issue from a land-use-planning perspective. Designation of safety zones around the airfield and restriction of incompatible land uses can reduce the public's exposure to safety hazards.

The AICUZ program includes three safety zones: the CZ, APZ I, and APZ II. These zones were developed from analysis of over 800 major Air Force accidents that occurred within 10 miles of an Air Force installation between 1968 and 1995. Figure B-3 in Appendix B summarizes the location of these accidents.

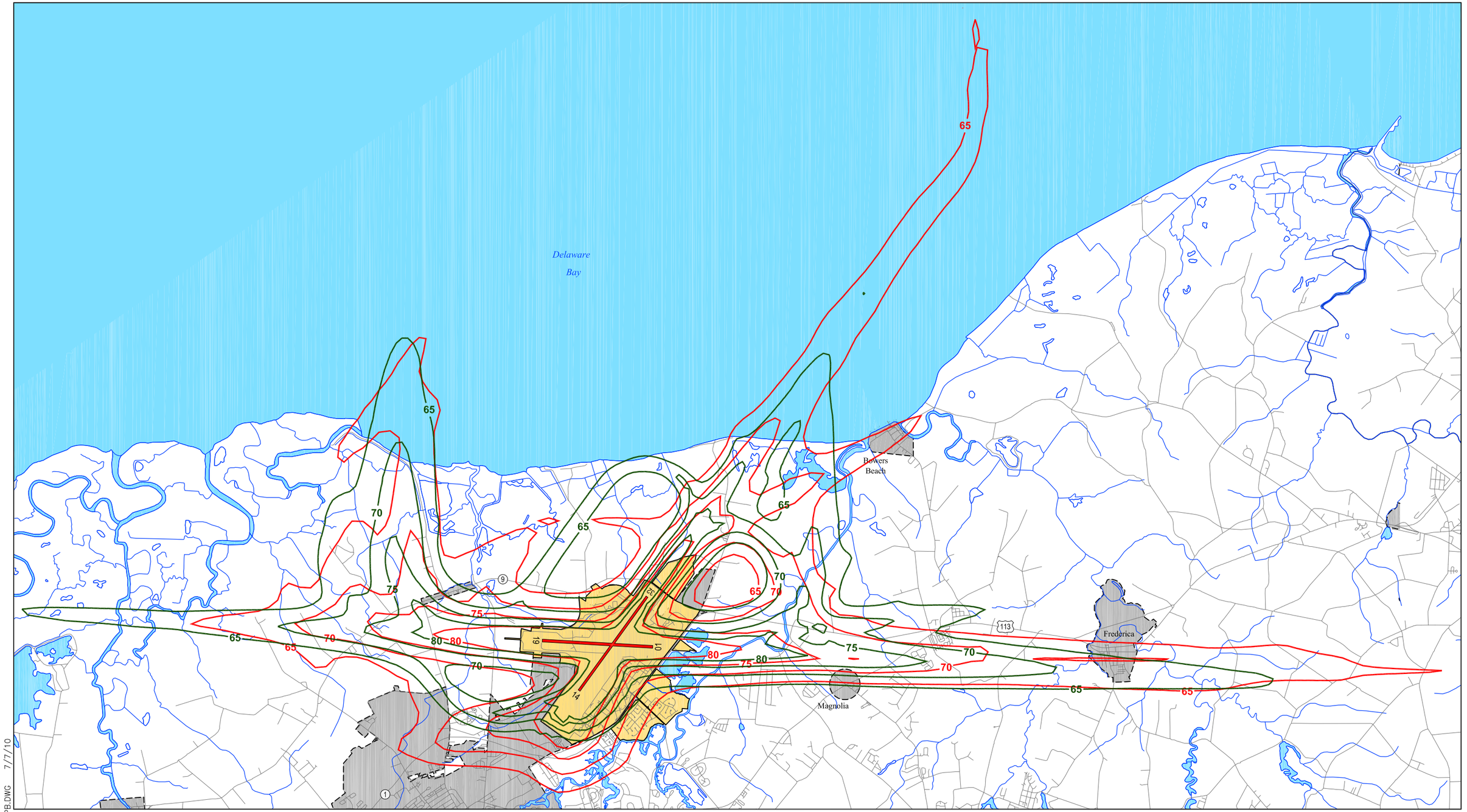
The CZ has the highest accident potential of the three zones, as 27 percent of accidents studied occurred in this area. Due to the relatively high accident potential, the Air Force adopted a policy of acquiring real estate interests in the CZ through purchase or easement when feasible.

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

4.6.2 Clear Zones and Accident Potential Zones for Runways 01/19 and 14/32

Figure 4.5 depicts the CZs and APZs for Runways 01/19 and 14/32 at Dover AFB.

Each end of Runway 01/19 and 14/32 at Dover AFB has a 3,000 foot by 3,000 foot CZ and two APZs. Accident potential on or adjacent to the runway or within the CZ is so high that the necessary land use restrictions would prohibit reasonable economic use of land. As stated previously, it is Air Force policy to request that Congress authorize and appropriate funds to purchase the real property interests in this area to prevent incompatible land uses.



Dover Air Force Base 2010 AICUZ

LEGEND

- 1999 Noise Contour
- 2010 Noise Contour
- Runway
- Roadway
- Dover AFB
- Municipal Boundary

N

0 8,000 Feet

Comparison of 2010 and 1999 DNL Noise Contours

Figure 4.4

747076 DOV10-AICUZ-COMPB.DWG 7/7/10

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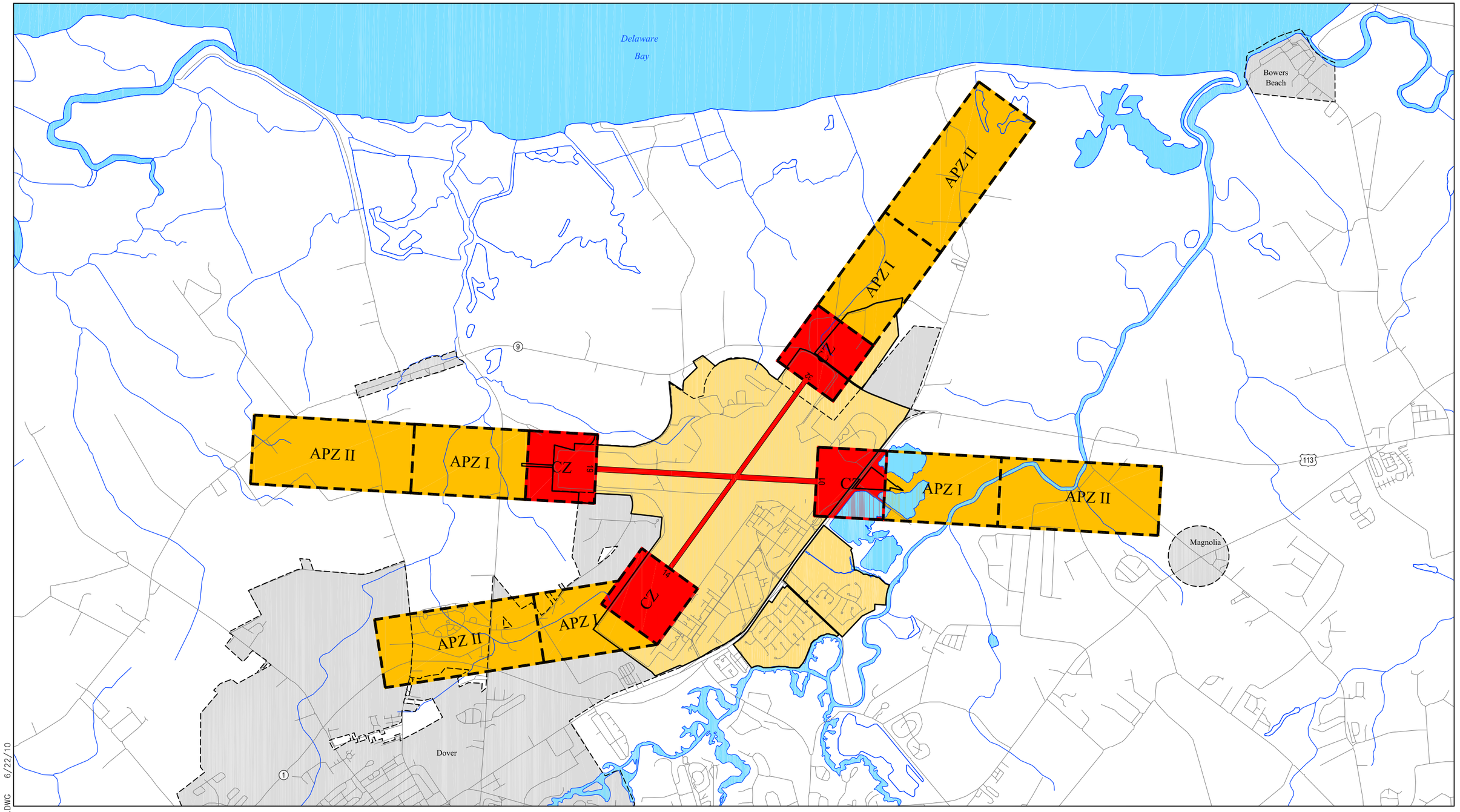

Dover Air Force Base 2010 AICUZ

LEGEND

- CZ — Clear Zone
- APZ — Accident Potential Zone
- Dover AFB
- Municipal Boundary
- Runway
- Roadway

N

0 4,000 Feet

Clear Zones and Accident Potential Zones

Figure 4.5

747076 DOV10-AICUZ-CZB.DWG 6/22/10

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Accident Potential Zone I is less critical than the CZ, but still possesses a significant risk factor. This 3,000 by 5,000 feet area has land use compatibility guidelines that are sufficiently flexible to allow reasonable economic use of the land, such as industrial/manufacturing, transportation, communication/utilities, wholesale trade, open space, recreation, and agriculture. However, uses that concentrate people in small areas are not acceptable.

Accident Potential Zone II is less critical than APZ I, but still possesses potential for accidents. Accident potential zone II, also 3,000 feet wide, is 7,000 feet long extending to 15,000 feet from the runway threshold. Acceptable uses include those of APZ I, as well as low density single family residential and those personal and business services and commercial/retail trade uses of low intensity or scale of operation. High density functions such as multi-story buildings, places of assembly (*e.g.*, theaters, churches, schools, restaurants, *etc*.), and high density office uses are not considered appropriate.

Accident Potential Zones I and II at the northwestern end of Runway 14/32 are aligned to reflect the departure and arrival flight track adjustments resulting from the operations restrictions mentioned in Section 3.3 related to the hangar located off the northwestern end of the runway. Figure 4.5 depicts the adjusted APZs. The dimensions of APZs I and II at the northwestern end of Runway 14/32 are the same as those described in the two previous paragraphs.

High people densities should be limited to the maximum extent possible in APZ II. The optimum density recommended for residential usage (where it does not conflict with noise criteria) in APZ II is one dwelling per acre. For most nonresidential usage, buildings should be limited to one story and the lot coverage should not exceed 20 percent.

4.6.3 Land Use Compatibility Guidelines for Runways

Introduction

The DoD developed the AICUZ program for military airfields. Using this program at its installations, the DoD works to protect aircraft operational capabilities and to assist local government officials in protecting and promoting the public's health, safety, and quality of life. The goal is to promote compatible land-use development around military airfields by providing information on aircraft noise exposure and accident potential.

AICUZ reports describe three basic types of constraints that affect, or result from, flight operations. The first constraint involves areas that the FAA and the DoD identified for height limitations (see Section 4.2).

The second constraint involves noise zones based on the DNL metric and the DoD NOISEMAP methodology. Using the NOISEMAP program, which is similar to FAA's INM, the Air Force produces noise contours showing the noise levels generated by aircraft operations. The AICUZ report contains noise contours plotted in 5 dB increments, ranging from DNL 65 dBA to 80+ dBA.

The third constraint involves CZs and APZs based on statistical analysis of past DoD aircraft accidents. DoD analysis has determined that areas immediately beyond the ends of runways and along the approach and departure flight paths have greater potential for aircraft accidents. Figure 4.5 shows CZs and APZs.

Land-Use Compatibility Guidelines for Runways

Each AICUZ Study contains land-use guidelines. Table 4.3 identifies land uses and possible noise exposure and accident potential combinations for Dover AFB. These noise guidelines are essentially the same as those published by the Federal Interagency Committee on Urban Noise in the June 1980 publication, *Guidelines for Considering Noise in Land-Use Planning and Control.* The U.S. Department of Transportation publication, *Standard Land Use Coding Manual (SLUCM),* has been used to identify and code land-use activities. The designations are a combination of criteria listed in the Legend and Notes at the end of the table. For example, Y^1 means land use and related structures are compatible without restriction at a suggested maximum density of 1-2 dwelling units per acre, possibly increased under a Planned Unit Development where lot coverage is less than 20 percent.

4.7 PARTICIPATION IN THE PLANNING PROCESS

The Air Force provides the AICUZ Study to local communities to assist them in preparing their local land use plans. This section discusses how the base participates in the community planning process. Section 6.3 addresses the role played by the local community in enhancing compatible land use.

Airspace obstructions, construction in the APZs, residential development, and the construction of other noise-sensitive uses near the base are of great concern to Dover AFB. The Air Force is very interested in minimizing increases in incompatible usage and in encouraging voluntary conversion of non-compatible usage to compatible usage. Applying the categories for compatible land use described in Table 4.3, the Base evaluates the impact aircraft operations have on surrounding properties and the effect new development or changes in land use might have on Dover AFB operational capabilities.

In addition to working with local governing entities and planning professionals, the 436 AMW Public Affairs Office works to address concerns expressed by community neighbors.

Dover AFB conducts active outreach to the community by meeting with various community groups and speaking with individuals as needed. The Dover AFB Civil Engineer and Public Affairs Offices work together providing public meetings and informational workshops to disseminate information about base operations, forecasts, plans, and mitigation strategies.

The Base Community Planner has been designated as the official liaison with the local community on all planning matters. This office is prepared to participate in the continuing discussion of zoning and other land use matters as they may affect, or may be affected by, Dover AFB.

Table 4.3 Land Use Compatibility Guidelines

Land Use		Accident Potential Zones			Noise Zones in DNL dBA			
SLUCM No.	Name	Clear Zone	APZ I	APZ II	65-69	70-74	75-79	80+
10	**Residential**							
11	Household units							
11.11	Single units; detached	N	N	Y[1]	A[11]	B[11]	N	N
11.12	Single units; semidetached	N	N	N	A[11]	B[11]	N	N
11.13	Single units; attached row	N	N	N	A[11]	B[11]	N	N
11.21	Two units; side-by-side	N	N	N	A[11]	B[11]	N	N
11.22	Two units; one above the other	N	N	N	A[11]	B[11]	N	N
11.31	Apartments; walk up	N	N	N	A[11]	B[11]	N	N
11.32	Apartments; elevator	N	N	N	A[11]	B[11]	N	N
12	Group quarters	N	N	N	A[11]	B[11]	N	N
13	Residential hotels	N	N	N	A[11]	B[11]	N	N
14	Mobile home parks or courts	N	N	N	N	N	N	N
15	Transient lodgings	N	N	N	A[11]	B[11]	C[11]	N
16	Other residential	N	N	N[1]	A[11]	B[11]	N	N
20	**Manufacturing**							
21	Food & kindred products; manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
22	Textile mill products; manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
23	Apparel and other finished products made from fabrics, leather, and similar materials; manufacturing	N	N	N[2]	Y	Y[12]	Y[13]	Y[14]
24	Lumber and wood products (except furniture); manufacturing	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
25	Furniture and fixtures; manufacturing	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
26	Paper & allied products; manufacturing	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
27	Printing, publishing, and allied industries	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
28	Chemicals and allied products; manufacturing	N	N	N[2]	Y	Y[12]	Y[13]	Y[14]
29	Petroleum refining and related industries	N	N	Y	Y	Y[12]	Y[13]	Y[14]
30	**Manufacturing**							
31	Rubber and misc. plastic products, manufacturing	N	N[2]	N[2]	Y	Y[12]	Y[13]	Y[14]
32	Stone, clay and glass products manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
33	Primary metal industries	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
34	Fabricated metal products; manufacturing	N	N[2]	Y	Y	Y[12]	Y[13]	Y[14]
35	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks manufacturing	N	N	N[2]	Y	A	B	N
39	Miscellaneous manufacturing	N	Y[2]	Y[2]	Y	Y[12]	Y[13]	Y[14]
40	**Transportation, Communications and Utilities**							
41	Railroad, rapid rail transit and street railroad transportation	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]
42	Motor vehicle transportation	N[3]	Y	Y	Y	Y[12]	Y[13]	Y[14]
43	Aircraft transportation	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]
44	Marine craft transportation	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]
45	Highway & street right-of-way	N[3]	Y	Y	Y	Y[12]	Y[13]	Y[14]
46	Automobile parking	N[3]	Y[4]	Y	Y	Y[12]	Y[13]	Y[14]
47	Communications	N[3]	Y[4]	Y	Y	A[15]	B[15]	N
48	Utilities	N[3]	Y[4]	Y	Y	Y	Y[12]	Y[13]
49	Other transportation communications and utilities	N[3]	Y[4]	Y	Y	A[15]	B[15]	N

LEGEND

SLUCM - Standard Land Use Coding Manual, U.S. Department of Transportation.

Y - (Yes) - Land use and related structures are compatible without restriction.

N - (N) - Land use and related structures are not compatible and should be prohibited.

Y[x] - (yes with restrictions) - Land use and related structures generally compatible; see notes 1-21.

N[x] - (no with exceptions) - See notes 1-21.

NLR - (Noise Level Reduction) - NLR (outdoor to indoor) to be achieved through incorporation of noise attenuation measures into the design and construction of the structures.

A, B, or C - Land use and related structures generally compatible; measures to achieve NLR of A (DNL 25 dB), B (DNL 30 dB), or C (DNL 35 dB) need to be incorporated into the design and construction of structures.

A[*], B[*], and C[*] - Land use generally compatible with NLR. However, measures to achieve an overall noise level reduction do not necessarily solve noise difficulties and additional evaluation is warranted. See appropriate footnotes.

***** - The designation of these uses as "compatible" in this zone reflects individual federal agency and program consideration of general cost and feasibility factors, as well as past community experiences and program objectives. Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider.

NOTES

1. Suggested maximum density of 1-2 dwelling units per acre possibly increased under a Planned Unit Development where maximum lot coverage is less than 20 percent.
2. Within each land use category, uses exist where further definition may be needed due to the variation of densities in people and structures. Shopping malls and shopping centers are considered incompatible in any accident potential zone (CZ, APZ I, or APZ II).
3. The placing of structures, buildings, or aboveground utility lines in the clear zone is subject to severe restrictions. In a majority of the clear zones, these items are prohibited. See AFI 32-7063 and UFC 3-260-01 for specific guidance.
4. No passenger terminals and no major aboveground transmission lines in APZ I.
5. Factors to be considered: labor intensity, structural coverage, explosive characteristics, and air pollution.
6. Low-intensity office uses only. Meeting places, auditoriums, etc., are not recommended.
7. Excludes chapels.
8. Facilities must be low intensity.
9. Clubhouse not recommended.
10. Areas for gatherings of people are not recommended.

11A. Although local conditions may require residential use, it is discouraged in DNL 65-69 dB and strongly discouraged in DNL 70-74 dB. An evaluation should be conducted prior to approvals, indicating a demonstrated community need for residential use would not be met if development were prohibited in these zones, and there are no viable alternative locations.

11B. Where the community determines the residential uses must be allowed, measures to achieve outdoor to indoor NLR for DNL 65-69 dB and DNL 70-74 dB should be incorporated into building codes and considered in individual approvals.

11C. NLR criteria will not eliminate outdoor noise problems. However, building location and site planning, and design and use of berms and barriers can help mitigate outdoor exposure, particularly from near ground level sources. Measures that reduce outdoor noise should be used whenever practical in preference to measures which only protect interior spaces.

12. Measures to achieve the same NLR as required for facilities in the DNL 65-69 dB range 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.
13. Measures to achieve the same NLR as required for facilities in the DNL 70-74 dB range 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.
14. Measures to achieve the same NLR as required for facilities in the DNL 75-79 dB range 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.
15. If noise sensitive, use indicated NLR; if not, the use is compatible.
16. No buildings.
17. Land use is compatible provided special sound reinforcement systems are installed.
18. Residential buildings require the same NLR required for facilities in the DNL 65-69 dB range.
19. Residential buildings require the same NLR required for facilities in the DNL 70-74 dB range.
20. Residential buildings are not permitted.
21. Land use is not recommended. If the community decides the use is necessary, personnel should wear hearing protection devices.

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Table 4.3 Land Use Compatibility Guidelines (continued)

Land Use		Accident Potential Zones			Noise Zones in DNL dBA			
SLUCM No.	**Name**	**Clear Zone**	**APZ I**	**APZ II**	**65-69**	**70-74**	**75-79**	**80+**
50	**Trade**							
51	Wholesale trade	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
52	Retail trade-building materials, hardware and farm equipment	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
53	Retail trade-general merchandise	N	N[2]	Y[2]	Y	A	B	N
54	Retail trade-food	N	N[2]	Y[2]	Y	A	B	N
55	Retail trade-automotive, marine craft, aircraft and accessories	N	Y[2]	Y[2]	Y	A	B	N
56	Retail trade-apparel and accessories	N	N[2]	Y[2]	Y	A	B	N
57	Retail trade-furniture, home furnishings and equipment	N	N[2]	Y[2]	Y	A	B	N
58	Retail trade-eating and drinking establishments	N	N	N[2]	Y	A	B	N
59	Other retail trade	N	N[2]	Y[2]	Y	A	B	N
60	**Services**							
61	Finance, insurance and real estate services	N	N	Y[6]	Y	A	B	N
62	Personal services	N	N	Y[6]	Y	A	B	N
62.4	Cemeteries	N	Y[7]	Y[7]	Y	Y[12]	Y[13]	Y[14,21]
63	Business services	N	Y[8]	Y[8]	Y	A	B	N
64	Repair services	N	Y[2]	Y	Y	Y[12]	Y[13]	Y[14]
65	Professional services	N	N	Y[6]	Y	A	B	N
65.1	Hospitals, nursing homes	N	N	N	A*	B*	N	N
65.1	Other medical facilities	N	N	N	Y	A	B	N
66	Contract construction services	N	Y[6]	Y	Y	A	B	N
67	Governmental services	N	N	Y[6]	Y*	A*	B*	N
68	Educational services	N	N	N	A*	B*	N	N
69	Miscellaneous services	N	N[2]	Y[2]	Y	A	B	N
70	**Cultural, Entertainment and Recreational**							
71	Cultural activities (including churches)	N	N	N[2]	A*	B*	N	N
71.2	Nature exhibits	N	Y[2]	Y	Y*	N	N	N
72	Public assembly	N	N	N	Y	N	N	N
72.1	Auditoriums, concert halls	N	N	N	A	B	N	N
72.11	Outdoor music shell, amphitheaters	N	N	N	N	N	N	N
72.2	Outdoor sports arenas, spectator sports	N	N	N	Y[17]	Y[17]	N	N
73	Amusements	N	N	Y[8]	Y	Y	N	N
74	Recreational activities (including golf courses, riding stables, water recreation)	N	Y[8,9,10]	Y	Y*	A*	B*	N
75	Resorts and group camps	N	N	N	Y*	Y*	N	N
76	Parks	N	Y[8]	Y[8]	Y*	Y*	N	N
79	Other cultural, entertainment and recreation	N	Y[9]	Y[9]	Y*	Y*	N	N
80	**Resources Production and Extraction**							
81	Agriculture (except livestock)	Y[16]	Y	Y	Y[18]	Y[19]	Y[20]	Y[20,21]
81.5 to 81.7	Livestock farming and animal breeding	N	Y	Y	Y[18]	Y[19]	Y[20]	Y[20,21]
82	Agricultural related activities	N	Y[5]	Y	Y[18]	Y[19]	N	N
83	Forestry activities and related services	N[5]	Y	Y	Y[18]	Y[19]	Y[20]	Y[20,21]
84	Fishing activities and related services	N[5]	Y[5]	Y	Y	Y	Y	Y
85	Mining activities and related services	N	Y[5]	Y	Y	Y	Y	Y
89	Other resources production and extraction	N	Y[5]	Y	Y	Y	Y	Y

LEGEND

SLUCM - Standard Land Use Coding Manual, U.S. Department of Transportation.

Y - (Yes) - Land use and related structures are compatible without restriction.

N - (N) - Land use and related structures are not compatible and should be prohibited.

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A, B, or C - Land use and related structures generally compatible; measures to achieve NLR of A (DNL 25 dB), B (DNL 30 dB), or C (DNL 35 dB) need to be incorporated into the design and construction of structures.

A*, B*, and C* - Land use generally compatible with NLR. However, measures to achieve an overall noise level reduction do not necessarily solve noise difficulties and additional evaluation is warranted. See appropriate footnotes.

***** - The designation of these uses as "compatible" in this zone reflects individual federal agency and program consideration of general cost and feasibility factors, as well as past community experiences and program objectives. Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider.

NOTES

1. Suggested maximum density of 1-2 dwelling units per acre possibly increased under a Planned Unit Development where maximum lot coverage is less than 20 percent.
2. Within each land use category, uses exist where further definition may be needed due to the variation of densities in people and structures. Shopping malls and shopping centers are considered incompatible in any accident potential zone (CZ, APZ I, or APZ II).
3. The placing of structures, buildings, or aboveground utility lines in the clear zone is subject to severe restrictions. In a majority of the clear zones, these items are prohibited. See AFI 32-7063 and UFC 3-260-01 for specific guidance.
4. No passenger terminals and no major aboveground transmission lines in APZ I.
5. Factors to be considered: labor intensity, structural coverage, explosive characteristics, and air pollution.
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7. Excludes chapels.
8. Facilities must be low intensity.
9. Clubhouse not recommended.
10. Areas for gatherings of people are not recommended.

11A. Although local conditions may require residential use, it is discouraged in DNL 65-69 dB and strongly discouraged in DNL 70-74 dB. An evaluation should be conducted prior to approvals, indicating a demonstrated community need for residential use would not be met if development were prohibited in these zones, and there are no viable alternative locations.

11B. Where the community determines the residential uses must be allowed, measures to achieve outdoor to indoor NLR for DNL 65-69 dB and DNL 70-74 dB should be incorporated into building codes and considered in individual approvals.

11C. NLR criteria will not eliminate outdoor noise problems. However, building location and site planning, and design and use of berms and barriers can help mitigate outdoor exposure, particularly from near ground level sources. Measures that reduce outdoor noise should be used whenever practical in preference to measures which only protect interior spaces.

12. Measures to achieve the same NLR as required for facilities in the DNL 65-69 dB range 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.
13. Measures to achieve the same NLR as required for facilities in the DNL 70-74 dB range 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.
14. Measures to achieve the same NLR as required for facilities in the DNL 75-79 dB range 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.
15. If noise sensitive, use indicated NLR; if not, the use is compatible.
16. No buildings.
17. Land use is compatible provided special sound reinforcement systems are installed.
18. Residential buildings require the same NLR required for facilities in the DNL 65-69 dB range.
19. Residential buildings require the same NLR required for facilities in the DNL 70-74 dB range.
20. Residential buildings are not permitted.
21. Land use is not recommended. If the community decides the use is necessary, personnel should wear hearing protection devices.

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SECTION 5
LAND USE ANALYSIS

5.1 INTRODUCTION

Land use planning and control is a dynamic, rather than static process. The specific characteristics of land use determinants will always reflect, to some degree, the changing conditions of the economic, social, and physical environment of a community, as well as changing public concern. The planning process accommodates this fluidity in which decisions are normally not based on boundary lines, but rather on more generalized area designations.

Dover AFB was originally established in a relatively undeveloped area in Kent County, Delaware. In recent years, however, development increased northwest of the Base, particularly in the City of Dover, in residential areas west of the Base, and southwest in the vicinity of the Town of Magnolia.

Improvements in computer technology have enabled the Air Force to more precisely display its flight tracks and noise contours for land use planning purposes. These technical improvements reveal the extent of the Dover AFB region of influence into the counties and surrounding nearby cities and towns.

For the purpose of this study, existing and future land uses on the figures in this section are generalized into one of the following six categories:

Residential: Includes all types of residential activity, such as single and multi-family residences and mobile homes, at a density greater than one dwelling unit per acre.

Commercial: Includes offices, retail, restaurants, and other types of commercial establishments.

Industrial: Includes manufacturing, warehousing, and other similar uses.

Public/Quasi-Public: Includes publicly owned lands and/or land to which the public has access, including military reservations and training grounds, public buildings, schools, churches, cemeteries, and hospitals.

Recreational: Includes land areas designated for recreational activity, including parks, wilderness areas and reservations, conservation areas, and areas designated for trails, hikes, camping, etc.

Open/Agricultural/Low Density: Includes undeveloped land areas, agricultural areas, grazing lands, and areas with residential activity at densities less than or equal to one dwelling unit per acre.

5.2 EXISTING LAND USE

Existing land uses in the vicinity of Dover AFB are shown in Figure 5.1. As previously described, Dover AFB is located in central Kent County, southeast of the City of Dover. The installation's airfield activities primarily impact areas to the northwest and south; these areas include the City of Dover and unincorporated portions of Kent County. Existing land use adjacent to the Base is primarily a mix of commercial, residential, and open space. Smaller

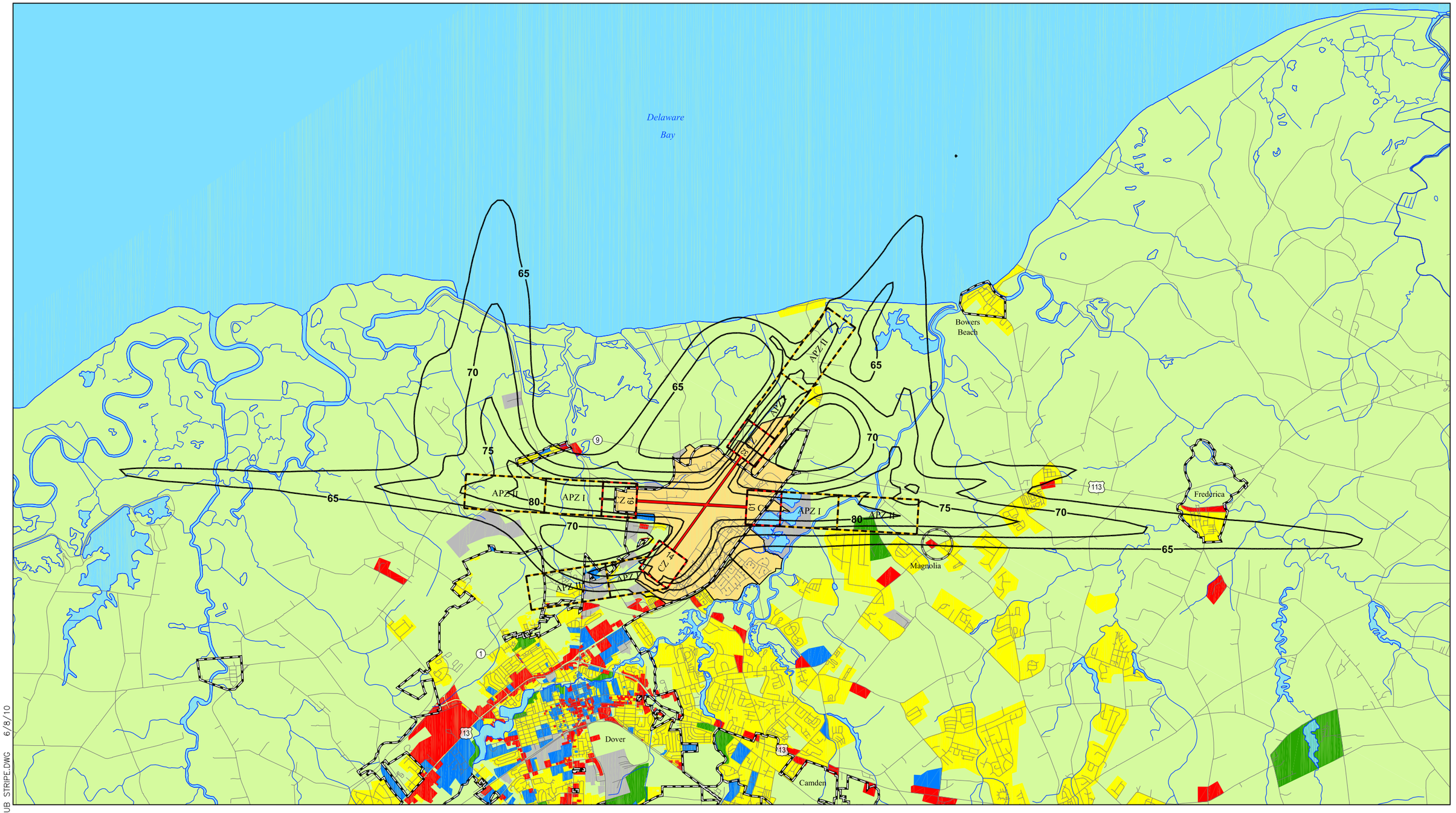
areas of industrial and public uses are interspersed throughout the area. Moderate density residential is prevalent in the City of Dover, with pockets of low-density rural residential scattered throughout unincorporated Kent County. Land to the northeast, east, and south of the Base is largely undeveloped, agricultural, or conservation areas, with pockets of residential use within the municipalities of Camden, Magnolia, Frederica, Little Creek, and Bowers Beach.

Land within the City of Dover comprises a mixture of uses, with suburban residential and commercial uses prevalent. The downtown business district, in the vicinity of Governors Avenue and Division Street, consists of a mix of uses, including public, commercial, and residential. Several residential subdivisions are interspersed among land uses in Dover, northwest of the Base. Commercial land uses are primarily located along major arterial roadways and within the traditional downtown business district. Dover Downs and several commercial mall developments dominate the northern Dupont Highway corridor, with strip commercial buildings common from the Base to Dover Downs. Public land uses are extensive throughout the City of Dover, including the State Capitol, Bayhealth Medical Center, Wesley College, Delaware State University, Delaware Technical and Community College, and the Wilmington University. Delaware State University is located directly to the west of Dover Downs, across Dupont Highway. The Delaware Technical and Community College is located adjacent to the university.

Major industrial land uses lie along the Norfolk Southern railroad line adjoining Dover AFB. Numerous vacant developable tracts of land are distributed fairly evenly throughout the city limits. The land areas east of SR-1 within the City of Dover have remained predominantly agricultural.

The areas south and southeast of the Base are less developed, with small clusters of developed areas within the municipalities of Camden, Magnolia, Frederica, Little Creek, and Bowers Beach. Several recently constructed residential subdivisions exist south of the Base. Many of these developments contain larger lots that are less than one dwelling unit per acre. A sand and gravel operation that includes water and dredging activities is classified as industrial and is located directly south of the Base.

Figure 5.1 presents the existing land uses for the area that surrounds Dover AFB and within the DNL 65 dBA and greater noise exposure area.



Dover Air Force Base 2010 AICUZ

LEGEND

- Dover AFB
- Residential
- Commercial
- Industrial
- Public/Quasi-Public
- Recreational
- Open/Agriculture/Low Density
- Municipal Boundary
- DNL Contours
- Runway
- Roadway
- Accident Potential Zone
- Clear Zone

N

0 8,000 Feet

Generalized Existing Land Use

Figure 5.1

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Table 5.1 summarizes the acreage by land use category exposed to noise levels of DNL 65 dBA and greater. Note that these acreages represent only the area outside the Dover AFB boundaries.

Table 5.1 Generalized Existing Land Use Within DNL 65 dBA and Greater Noise Exposure Area (Off-Base)

Category	Acreage
Residential	729
Commercial	20
Industrial	738
Public/Quasi-public	43
Recreational	70
Open/Agricultural/Low Density	17,721
Total	**19,321**

The analysis also includes land use within the Dover AFB CZs and APZs. Inclusion of the CZs and APZs in the evaluation shows 51 acres of residential land within the Dover AFB CZs and APZs. Table 5.2 reflects the land use (outside the Dover AFB boundaries) within the Dover AFB CZs and APZs.

Table 5.2 Generalized Existing Land Use Within the Dover AFB Clear Zones and Accident Potential Zones (Off-Base)

Category	Acreage
Residential	51
Commercial	3
Industrial	385
Public/Quasi-public	17
Recreational/Open/Agricultural/ Low Density	2,914
Total	**3,370**

5.3 CURRENT ZONING

Figure 5.2 overlays the 2010 noise contours and APZs on a map displaying the current zoning in the vicinity of Dover AFB. The zoning classifications identified on Figure 5.2 have been generalized for AICUZ planning purposes. As described in the preceding existing land use section, the area of influence includes the City of Dover, unincorporated portions of Kent County, and several small municipalities to the south/southwest of the Base. Kent County has jurisdiction over land in the unincorporated areas of the county, and the municipalities have jurisdiction over land use within their respective municipal boundaries. Zoning within the AICUZ area of influence generally reflects existing land use patterns.

Kent County and the City of Dover both recently completed comprehensive plan updates, with the county plan adopted in October 2008 and the City of Dover plan adopted by the City Council in February 2009. Both plans include goals and recommendations to protect Dover AFB from encroachment that may impact mission operations. The City's plan includes a goal to, "Create a favorable and compatible environment for Dover Air Force Base through a resolute commitment to provide all reasonable planning accommodations to protect the Base." Kent County's plan includes a policy recommendation to, "Continue the positive working relationship between the County and the Dover Air Force Base and maintain zoning requirements that protect the Base from incompatible land uses."

Also, Kent County and the City of Dover both adopted an Airport Environs Overlay Zone (AEOZ), creating a specific overlay zone with regulations to address sound attenuation from noise resulting from the Base and its operations. Kent County adopted an amendment to subdivision regulations requiring that for any new subdivision within the AICUZ environs, a note must be placed on the plat indicating the property is located "in the vicinity of aircraft operations…which may result in high noise disturbances or the potential for an aircraft accident." Additionally, Kent County and the City adopted zoning ordinances that require sound attenuating materials to be used in new construction within Dover AFB AICUZ noise contours. The City of Dover also enacted restrictions on building heights around the Base.

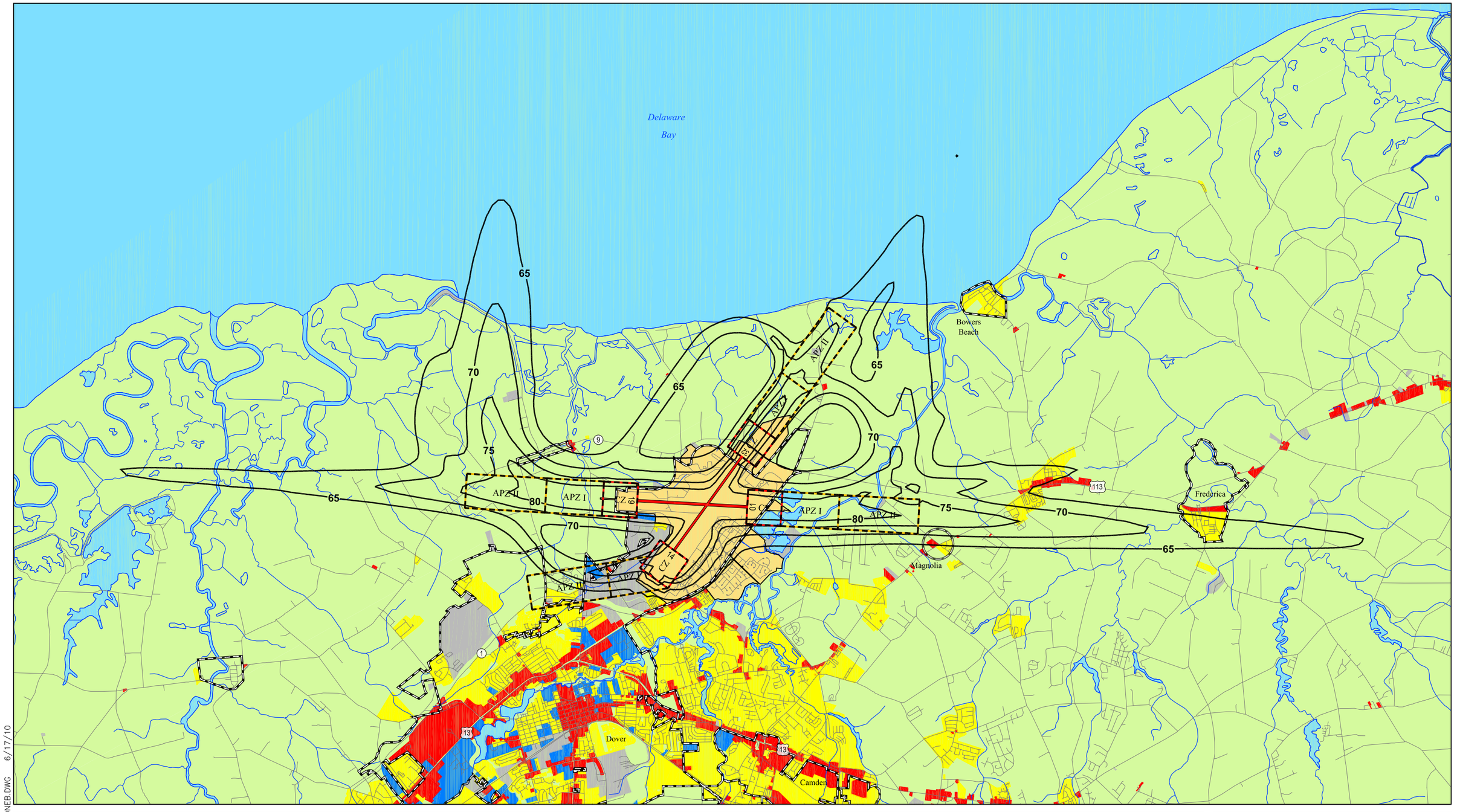
Clearly, local jurisdictions recognize the importance of maintaining the capability of Dover AFB by protecting it from urban encroachment and have developed a strong working relationship with Dover AFB in matters of development planning. Kent County and the City of Dover have taken steps to incorporate the mission of Dover AFB by adopting land use plans and zoning controls that limit encroachment into the flight paths and operations of the airfield. Continued maintenance of the land use and zoning restrictions currently in place will ensure the viability of Dover AFB while helping to provide valuable information to the owners and potential owners of impacted properties.

Analysis of the current zoning maps for these jurisdictions was performed to determine the acreage of each zoning designation within the DNL 65 dBA and greater noise area. For this analysis, zoning designations were generalized into residential, commercial, industrial, public/quasi-public, and recreational/open/agricultural/low density categories. Figure 5.2 shows the results of the compilation, and Table 5.3 provides a breakdown of the generalized zoning (areas outside Dover AFB only and outside CZs and APZs) within the DNL 65 dBA and greater noise area.

Table 5.3 Generalized Zoning Within DNL 65 dBA and Greater Noise Exposure Area (Off-Base outside CZs and APZs)

Category	Acreage
Residential	367
Commercial	39
Industrial	319
Public/Quasi-public	27
Recreational/Open/Agricultural/Low Density	15,501
Total	**16,253**

Source: *Dover Zoning Map and Kent County Zoning Map*



Dover Air Force Base 2010 AICUZ

LEGEND

- Dover AFB
- Residential
- Commercial
- Industrial
- Public/Quasi-Public
- Recreational
- Open/Agriculture/Low Density
- Municipal Boundary
- DNL Contours
- Runway
- Roadway
- Accident Potential Zone
- Clear Zone

N

0 8,000 Feet

Generalized Zoning

Figure 5.2

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A similar analysis was performed to determine the acreage of each generalized zoning category within the Dover AFB CZs and APZs and is shown on Table 5.4.

Table 5.4 Generalized Zoning Within the Dover AFB Clear Zones and Accident Potential Zones (Off-Base)

Category	Acreage
Residential	75
Commercial	10
Industrial	369
Public/Quasi-public	27
Recreational/Open/Agricultural/Low Density	2,889
Total	**3,370**

Source: *Dover Zoning Map and Kent County Zoning Map*

5.4 FUTURE LAND USE

Figure 5.3 shows generalized future land use predicted for the Dover AFB environs based on local zoning maps, comprehensive plans, and local development proposals. Kent County and the City of Dover are expected to continue to develop at a moderate pace over the next several years.

Kent County created a Growth Overlay Zone in 1996 (modified in 2002), which is the County's primary growth management strategy. The zone serves to encourage more intense development and infrastructure investment in and around existing developed areas. The County has experienced significant residential development in the past several years, with commercial and industrial development primarily occurring in municipalities. Growth in the Dover AFB vicinity is expected to focus on expansion of developed areas to the south of the Base and within the Growth Overlay Zone. As discussed in Subsection 5.3, for those areas within AICUZ noise zones and where the local government has granted development approval, new residences are required to have sound attenuation installed.

The City of Dover maintains an official policy of considering SR-1 an urban boundary by keeping the lands east of SR-1 for agricultural uses. Consequently, a significant amount of the City is expected to remain predominately agricultural. Commercial and public/quasi public uses have dominated new development within the City of Dover in recent years, with moderate amounts of residential development primarily in the western portion of the City. North and west of the Base, future development is expected to predominantly consist of infill development along U.S. 113 and Alternate U.S. 13. Moderate industrial development is occurring north of the Base and is anticipated to continue in the future.

The Delaware Agricultural Lands Preservation Act, signed into law on July 8, 1991, established a long term program for preserving agricultural lands within the State. Kent County has subsequently taken proactive steps to promote agricultural preservation, including the adoption of a number of policies designed to promote the continued existence of farmland within the county. The law has been a contributing factor in encouraging farmers adjacent to

the Base to join the preservation program. The acquisition of farmland development rights will further serve to ensure incompatible development does not occur close to the Base.

The land use planning and zoning enacted by Kent County and the City of Dover ensure that significant land use incompatibilities in the Dover environs will be avoided in the future. The positive relationship among the Base and local jurisdictions and planning agencies will continue to minimize the expansion of undeveloped areas surrounding the Base.

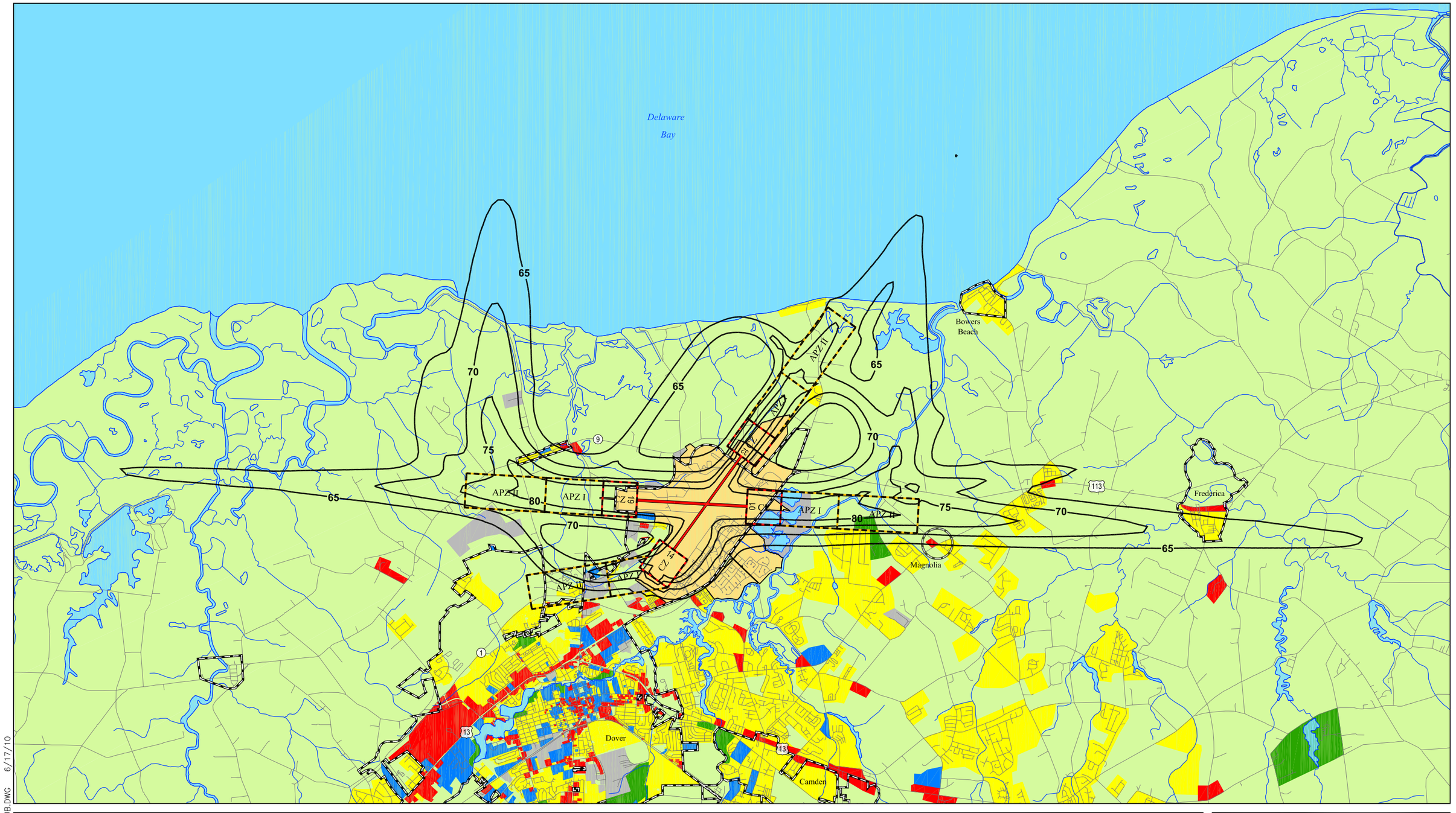
5.5 INCOMPATIBLE LAND USES

Table 5.5 shows land use compatibility as it is applied to existing land use within the Dover AFB area of influence. For a land use area to be considered compatible, it must meet criteria for its category for both noise and accident potential as shown in Table 5.5. The compatibility guidelines shown in Table 5.5 were combined with the existing land use data presented on Figure 5.1 to determine land use compatibility associated with aircraft operations at Dover AFB. Results of this analysis are shown numerically in Table 5.5, and graphically on Figure 5.4. There are land uses to the north and south of Dover AFB that are considered to be incompatible with Base operations.

Table 5.5 Incompatible Land Use for Runways 01/19 and 14/32 at Dover AFB

	Acreage Within CZs and APZs			Acreage Within Noise Zones, Not Included in CZs and APZs				
Category	**CLEAR ZONE**	**APZ I**	**APZ II**	**65-69**	**70-74**	**75-79**	**80+**	**Total**
Residential	0	9	12	460	216	21	0	**718**
Commercial	0	0	•	•	•	•	0	**0**
Industrial	69	•	•	•	•	•	•	**69**
Public/Quasi-public	0	0	17	•	0	11	8	**36**
Recreation/Open/ Agricultural/Low Density	•	•	•	•	•	•	•	**0**
Total	**69**	**9**	**29**	**460**	**216**	**32**	**8**	**823**

• *Represents compatible land use*



Dover Air Force Base 2010 AICUZ

LEGEND

- Dover AFB
- Residential
- Commercial
- Industrial
- Public/Quasi-Public
- Recreational
- Open/Agriculture/Low Density
- Municipal Boundary
- DNL Contours
- Runway
- Roadway
- Accident Potential Zone
- Clear Zone

N

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Generalized Future Land Use

Figure 5.3

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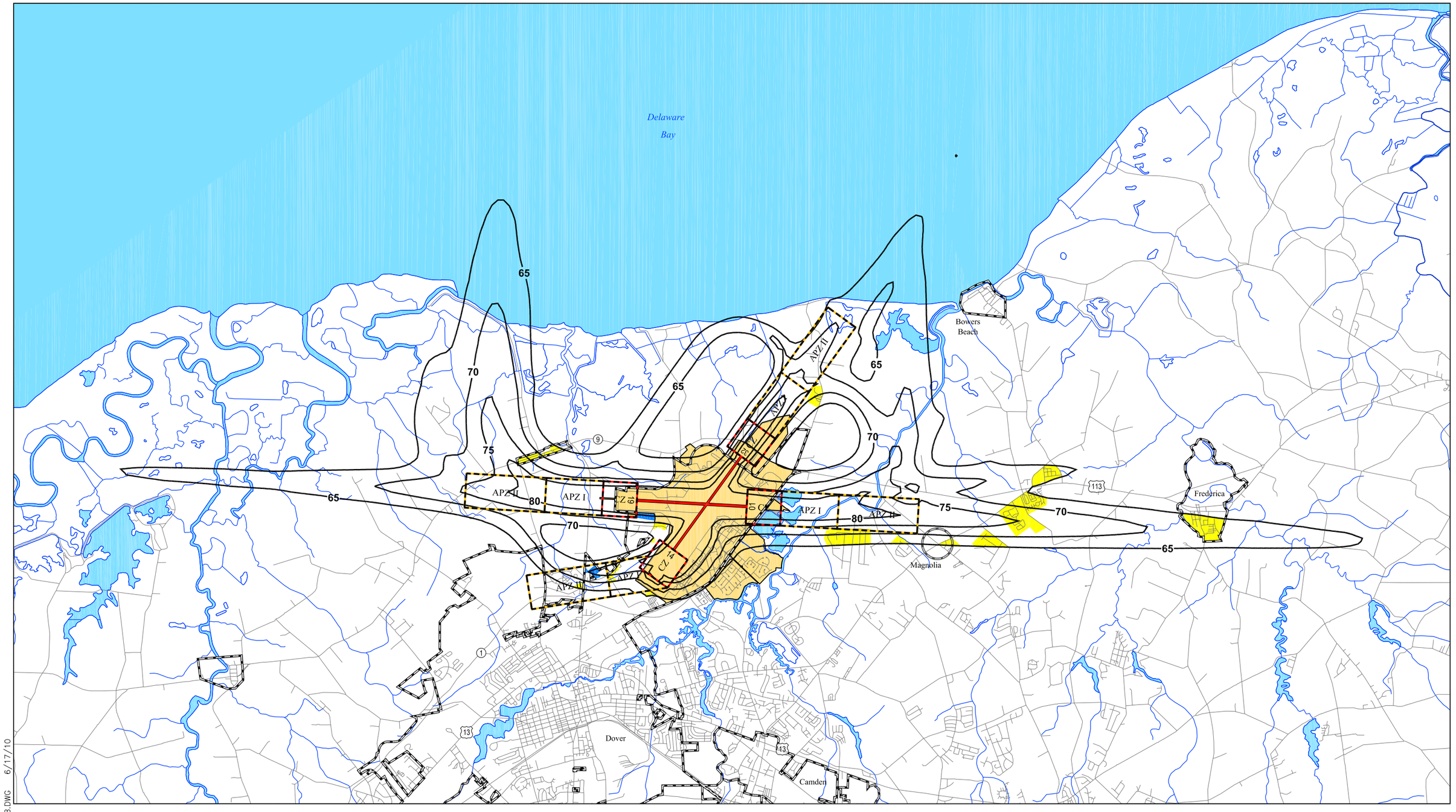

Dover Air Force Base 2010 AICUZ

LEGEND

- Dover AFB
- Residential
- Industrial
- Public/Quasi-Public
- Municipal Boundary
- DNL Contours
- Runway
- Roadway
- Accident Potential Zone
- Clear Zone

N

0 8,000 Feet

Incompatible Land Use

Figure 5.4

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5.5.1 Runways 01 and 19 Clear Zones and Accident Potential Zones

Runway 01 Clear Zone (South of the Airfield)

Dover AFB owns approximately 130 acres of the Runway 01 CZ. This discussion applies to that portion of the CZ outside the Base boundary (approximately 76 acres). Any land use other than vacant or limited agricultural use is incompatible with the safety criteria established for a CZ. A sand and gravel operation (industrial) is located south of the Base and although a majority of the land within the CZ is water, the activity is considered incompatible with CZ criteria.

Runway 01 Accident Potential Zone I (South of the Airfield)

Only industrial and recreational/open land uses are compatible with the safety criteria established for APZ I. Although there are no incompatible land uses associated with the Runway 01 APZ I, the sand and gravel operation located there represents a safety concern since birds are attracted to the water body (Bird Aircraft Strike Hazard potential).

Runway 01 Accident Potential Zone II (South of the Airfield)

Any land use other than public is compatible with the safety criteria established for APZ II, as long as residential development is limited to a maximum density of one dwelling unit per acre. There are no incompatible land uses associated with the Runway 01 APZ II.

Runway 19 Clear Zone (North of the Airfield)

Dover AFB owns approximately 96 acres of the Runway 19 CZ. This discussion applies to that portion of the CZ outside of the Base boundary (approximately 110 acres). Any land uses other than vacant are incompatible with the safety criteria established for a CZ. There are no incompatible land uses associated with the Runway 19 CZ.

Runway 19 Accident Potential Zone I (North of the Airfield)

In general, industrial, recreational, vacant, and agricultural/open land uses are compatible with the safety criteria established for APZ I. Compatibility of commercial uses within APZ I is dependent on densities and intensity of uses. There are no incompatible land uses associated with the Runway 19 APZ I.

Runway 19 Accident Potential Zone II (North of the Airfield)

Most categories of land use are compatible with the safety criteria established for APZ II with the exception of public/quasi-public and some densities of residential. If residential densities are greater than one dwelling unit per acre, these land uses would be incompatible. There are no incompatible land uses associated with the Runway 19 APZ II.

5.5.2 Runways 14 and 32 Clear Zones and Accident Potential Zones

Runway 14 Clear Zone (Northwest of the Airfield)

Dover AFB owns approximately 182 acres of the Runway 14 CZ. This discussion applies to that portion of the CZ that occurs outside of the Base boundary (approximately 24 acres). Any land uses other than vacant is incompatible with the safety criteria established for a CZ. There are no incompatible land uses associated with the Runway 14 CZ.

Runway 14 Accident Potential Zone I (Northwest of the Airfield)

Accident Potential Zone I for Runway 14 turns to a northerly direction to follow prevalent flight patterns and overlays portions of incorporated areas of the City of Dover. In general, industrial, recreational, vacant, and agricultural/open land uses are compatible with the safety criteria established for APZ I. Compatibility of commercial uses within APZ I is dependent on densities and intensity of uses. A small area of incompatible existing residential development exists along Horsepond Road and Lafferty Lane.

Runway 14 Accident Potential Zone II (Northwest of the Airfield)

Most categories of land use are compatible with the safety criteria established for APZ II with the exception of public/quasi-public and some densities of residential. If residential densities are greater than one dwelling unit per acre, these land uses would be incompatible. The APZ II includes areas of public, commercial, industrial, and residential uses. Incompatible land uses include small areas of residential and public (health center).

Runway 32 Clear Zone (Southeast of the Airfield)

Dover AFB owns approximately 143 acres of the Runway 32 CZ. This discussion applies to that portion of the CZ outside the Base boundary (approximately 63 acres). Any land use other than vacant or limited agricultural use is incompatible with the safety criteria established for a CZ. There are no incompatible land uses associated with the Runway 32 CZ.

Runway 32 Accident Potential Zone I (Southeast of the Airfield)

Only industrial and recreational/open land uses are compatible with the safety criteria established for APZ I. There are no incompatible land uses associated with the Runway 32 APZ I.

Runway 32 Accident Potential Zone II (Southeast of the Airfield)

Any land use other than public is compatible with the safety criteria established for APZ II, as long as residential development is limited to a maximum density of one dwelling unit per acre. There are no incompatible land uses associated with the Runway 32 APZ II.

5.6 NOISE ZONES

At noise levels between DNL 65-69 dB, the only incompatible land use type is residential without noise level reduction (NLR) materials. Residential uses exist within the DNL 65-69 dB noise contours northwest of the Base adjacent to the Runway 14 end and to the south of the Base in the vicinity of U.S. 113, including a portion of the Town of Frederica. A small portion of residential development exists in the 65-69 dB noise contours along Fox Road north of the Runway 14 end. One area of residential development falls within both the DNL 65-69 dB and DNL 70-74 dB noise contours southeast of the Base adjacent to Kitts Hummock Road. Residential uses also exist in the DNL 70-74 dB and DNL 75-79 dB noise contours along Horsepond Road and Lafferty Lane.

Incompatible residential areas exist within the DNL 70-74 dB noise contours near James Road, between the ends of Runways 14 and 19. The majority of these residential areas were constructed prior to adoption of noise compatible zoning regulations and are assumed to be incompatible. More recently constructed homes south of the Base may have had NLR measures incorporated into their construction and would be considered compatible. Additionally, two small areas of public land north of the airfield are within the DNL 75-79 dB and DNL 80+ dB noise contours and are considered incompatible.

5.7 AIR INSTALLATION COMPATIBLE USE ZONE STUDY UPDATES

AICUZ noise contours describe the noise characteristics of a specific operational environment and, as such, will change if a significant operational change is made. An AICUZ Study should be evaluated for an update if the noise exposure map changes by DNL 2 dB or more in noise sensitive areas from the noise contour map in the last publicly released AICUZ Study. With this in mind, this AICUZ Study updates the 1999 AICUZ Study and provides flight track, APZ and noise zone information in this report, which reflects the most accurate picture of the Base's aircraft activities as of December 2009.

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SECTION 6
IMPLEMENTATION

6.1 INTRODUCTION

Implementation of the AICUZ Study must be a joint effort between the Air Force and adjacent communities. The role of the Air Force is to minimize impact on the local communities by Dover AFB aircraft operations. The role of the communities is to ensure that development in the surrounding area is compatible with accepted planning and development principles and practices.

6.2 AIR FORCE RESPONSIBILITIES

In general, the Air Force perceives its AICUZ responsibilities as encompassing the areas of flying safety, noise abatement, and participation in the land use planning process.

Well-maintained aircraft and well-trained aircrews do a great deal to assure that aircraft accidents are avoided. Despite the best aircrew training and aircraft maintenance intentions, history clearly shows that accidents do occur. It is imperative flights be routed over sparsely populated areas as regularly as possible to reduce the exposure of lives and property to a potential accident.

Commanders are required by Air Force policy to periodically review existing traffic patterns, instrument approaches, weather minima, and operating practices, and evaluate these factors in relationship to populated areas and other local situations. This requirement is a direct result and expression of Air Force policy that all AICUZ plans must include an analysis of flying and flying-related activities designed to reduce and control the effects of such operations on surrounding land areas. Noise is generated from aircraft both in the air and on the ground. In an effort to reduce the noise effects of Dover AFB operations on surrounding communities, the Base routes flight tracks to avoid populated areas.

Preparation and presentation of this Dover AFB AICUZ Study is one phase of continuing Air Force participation in the local planning process. It is recognized that as the local community updates its land use plans, the Air Force must be ready to provide additional input when needed.

It is also recognized that the AICUZ program is an ongoing activity even after compatible development plans are adopted and implemented. Dover AFB personnel are prepared to participate in the continuing discussion of zoning and other land use matters as they may affect, or may be affected by the Base. Base personnel are also available to provide information, criteria, and guidelines to state, regional, and local planning bodies, civic associations, and similar groups.

Participation in land-use planning can take many forms. The simplest of these is straightforward, consistent two-way discussion and information sharing with both professionals and neighbors. Copies of the AICUZ Study, including maps, will be provided to regional planning departments and zoning administrators. Through this communication process, the Base reviews applications for development or changed use of properties within

the noise impact and safety areas, as well as other nearby parcels. The Base coordinates closely with surrounding communities and counties on zoning and land-use issues.

6.3 LOCAL COMMUNITY RESPONSIBILITIES

Residents in the area surrounding Dover AFB and Base personnel have a long history of working together for mutual benefit of the area around the airfield. Local jurisdictions have taken a proactive approach to incorporating land use regulations into local plans and ordinances that consider Dover AFB flying operations when considering development proposals. Adoption of the following recommendations will strengthen this relationship, increase the health and safety of the public, and help protect the integrity of the Dover AFB flying mission:

- Continue to incorporate AICUZ policies and guidelines into the comprehensive plans of Kent County and the City of Dover. Continue to use overlay maps of the AICUZ noise contours and Air Force Land Use Compatibility Guidelines to evaluate existing and future land use proposals.
- Review the boundaries of the AEOZ and update if necessary to coincide with the updated noise contours produced in this study.
- Kent County and the City of Dover should continue to enforce the sound attenuation requirements for new buildings located within DNL of 65 dBA, 70 dBA, 75 dBA, and/or 80 dBA noise areas.
- Continue to review and modify existing zoning ordinances and subdivision regulations if needed to support the compatible land uses outlined in this study.
- Develop a working group representing city, county, and base planners to address AICUZ concerns and major development proposals that could affect airfield operations.
- Continue to inform Dover AFB of planning and zoning actions that have the potential to affect Base operations.

APPENDIX A

THE AICUZ CONCEPT, PROGRAM, METHODOLOGY, AND POLICIES

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THE AICUZ CONCEPT, PROGRAM, METHODOLOGY, AND POLICIES

A.1 Concept

Federal legislation, national sentiment, and other external forces that directly affect the Air Force mission, serve to increase the role of the Air Force in environmental and planning issues. Problems of airfield encroachment from incompatible land uses surrounding installations, as well as air and water pollution and socioeconomic impact, require continued and intensified Air Force involvement. The nature of these problems dictates direct Air Force participation in comprehensive community and land use planning. Effective, coordinated planning that bridges the gap between the federal government and the community requires establishment of good working relationships with local citizens, local planning officials, and state and federal officials. This depends on creating an atmosphere of mutual trust and helpfulness. The AICUZ concept was developed in an effort to:

- protect local citizens from noise exposure and accident potential associated with flying activities; and
- prevent degradation of the capability of the Air Force to achieve its mission by promoting compatible land use planning.

The land use guidelines developed herein are a composite of a number of other land use compatibility studies that have been refined to fit the Dover AFB aviation environment.

A.2 Program

Installation commanders establish and maintain active programs to promote the maximum feasible land use compatibility between air installations and neighboring communities. The program requires that all appropriate government bodies and citizens be fully informed whenever AICUZ or other planning matters affecting the installation are under consideration. This includes positive and continuous programs designed to:

- provide information, criteria, and guidelines to federal, state, regional, as well as local planning bodies, civic associations, and similar groups;
- inform such groups of the requirements of the flying activity, noise exposure, aircraft accident potential, and AICUZ plans;
- describe the noise reduction measures being used; and
- ensure that all reasonable, economical, and practical measures are taken to reduce or control the impact of noise-producing activities. These measures include such considerations as proper location of engine test facilities, provision of sound suppressors where necessary, and adjustment of flight patterns and/or techniques to minimize the noise impact on populated areas. This must be done without jeopardizing safety or operational effectiveness.

A.3 Methodology

The AICUZ consists of land areas upon which certain land uses may obstruct the airspace or otherwise be hazardous to aircraft operations, and land areas that are exposed to the health, safety, or welfare hazards of aircraft operations. The AICUZ includes:

- Accident Potential Zones (APZ) and Clear Zones (CZ) based on past Air Force aircraft accidents and installation operational data (see Appendix B);
- Noise zones produced by the computerized DNL modeling of the noise created by aircraft flight and maintenance operations (see Appendix C); and
- The area designated by the FAA and the Air Force for purposes of height limitations in the approach and departure zones of the base (see Section 4 of the Study).

The APZ, CZ, and noise zones are the basic building blocks for land use planning with AICUZ data. Compatible land uses are specified for these zones, and recommendations on building materials and standards to reduce interior noise levels inside structures are provided in Section A.7.

As part of the AICUZ Program, the only real property acquisition for which the Air Force has requested and received Congressional authorization, and for which the installation and major commands request appropriation, are the areas designated as the CZ. Dover AFB does not own all property in the CZs. Compatible land use controls for the remaining airfield area of influence should be accomplished through the community land use planning processes.

A.4 AICUZ Land Use Development Policies

The basis for any effective land use control system is development of, and subsequent adherence to, policies that serve as the standard by which all land use planning and control actions are evaluated. Dover AFB recommends the following policies be considered for incorporation into the comprehensive plans of agencies in the vicinity of the Base's area of influence:

A.4.1 Policy 1

To promote the public health, safety, peace, comfort, convenience, and general welfare of the inhabitants in the airfield area of influence, it is necessary to:

- guide, control, and regulate future growth and development;
- promote orderly and appropriate use of land;
- protect the character and stability of existing land uses;
- prevent destruction or impairment of the airfield and the public investment therein;
- enhance the quality of living in the areas affected; and
- protect the general economic welfare by restricting incompatible land use.

A.4.2 Policy 2

In furtherance of Policy 1, it is appropriate to:

- establish guidelines of land use compatibility;

- restrict or prohibit incompatible land use;
- prevent establishment of any land use that would unreasonably endanger aircraft operations and continued use of the airfield;
- incorporate the AICUZ concept into community land use plans, modifying them when necessary; and
- adopt appropriate ordinances to implement airfield area of influence land use plans.

A.4.3 Policy 3

Within the boundaries of the AICUZ, certain land uses are inherently incompatible. Those not in the public interest and must be restricted or prohibited, are land uses that:

- release into the air any substance, such as steam, dust, or smoke that would impair visibility or otherwise interfere with the operation of aircraft;
- produce light emissions, either direct or indirect (reflective), that would interfere with pilot vision;
- produce electrical emissions that would interfere with aircraft communication systems or navigation equipment;
- attract birds or waterfowl, such as operation of sanitary landfills, maintenance or feeding stations, or growth of certain vegetation; and
- provide for structures within 10 feet of aircraft approach-departure and/or transitional surfaces.

A.4.4 Policy 4

Certain noise levels of varying duration and frequency create hazards to both physical and mental health. A limited, though definite, danger to life exists in certain areas adjacent to airfields. Where these conditions are sufficiently severe, it is not consistent with public health, safety, and welfare to allow the following land uses:

- residential;
- retail business;
- office buildings;
- public buildings (schools, churches, etc.); and
- recreation buildings and structures.

A.4.5 Policy 5

Land areas below takeoff and final approach flight paths are exposed to significant danger of aircraft accidents. The density of development and intensity of use must be limited in such areas.

A.4.6 Policy 6

Different land uses have different sensitivities to noise. Standards of land use acceptability should be adopted, based on these noise sensitivities. In addition, a system of Noise Level Reduction Guidelines (Appendix C) for new construction should be implemented to permit certain uses where they would otherwise be prohibited.

A.4.7 Policy 7

Land use planning and zoning in the airfield area of influence cannot be based solely on aircraft-generated effects. Allocation of land used within the AICUZ should be further refined by consideration of:

- physiographic factors;
- climate and hydrology;
- vegetation;
- surface geology;
- soil characteristics;
- intrinsic land use capabilities and constraints;
- existing land use;
- land ownership patterns and values;
- economic and social demands;
- cost and availability of public utilities, transportation, and community facilities; and
- other noise sources.

A.5 Basic Land Use Compatibility

Research on aircraft accident potential, noise, and land use compatibility is ongoing at a number of federal and other agencies. These and all other compatibility guidelines must not be considered inflexible standards. They are the framework within which land use compatibility questions can be addressed and resolved. In each case, full consideration must be given to local conditions such as:

- previous community experience with aircraft accidents and noise;
- local building construction and development practices;
- existing noise environment due to other urban or transportation noise sources;
- time periods of aircraft operations and land use activities;
- specific site analysis; and
- noise buffers, including topography.

These basic guidelines cannot resolve all land use compatibility questions, but they do offer a reasonable framework within which to work.

A.6 Accident Potential

Each end of Runways 01/19 and 12/30 at Dover AFB has a 3,000-foot by 3,000-foot CZ and two APZs (Section 5). Accident potential on or adjacent to the runway or within CZ is so high that the necessary land use restrictions would prohibit reasonable economic use of land. As stated previously, it is Air Force policy to request Congress to authorize and appropriate funds for the necessary real property interests in this area to prevent incompatible land uses.

Accident Potential Zone I is less critical than the CZ, but still possesses a significant risk factor. This 3,000-foot by 5,000-foot area has land use compatibility guidelines sufficiently flexible to allow reasonable economic use of the land, such as industrial/manufacturing, transportation, communication/utilities, wholesale trade, open space, recreation, and agriculture. However, uses that concentrate people are not acceptable.

Accident Potential Zone II is less critical than APZ I, but still possesses potential for accidents. Accident potential zone II, also 3,000 feet wide, is 7,000 feet long extending to 15,000 feet from the runway threshold. Acceptable uses include those of APZ I, as well as low density single family residential and those personal and business services and commercial/retail trade uses of low intensity or scale of operation. High-density functions such as multistory buildings, places of assembly (theaters, churches, schools, restaurants, *etc*.), and high density office uses are not considered appropriate.

High density populations should be limited to the maximum extent possible. The optimum density recommended for residential usage (where it does not conflict with noise criteria) in APZ II is one dwelling per acre. For most nonresidential usage, buildings should be limited to one story, and the lot coverage should not exceed 20 percent.

Land use guidelines for the two APZs are based on a hazard index system that compares the relationship of accident occurrence for five areas:

- on or adjacent to the runway;
- within the CZ;
- in APZ I;
- in APZ II; and
- in all other areas within a 10 nautical mile radius of the runway.

Accident potential on or adjacent to the runway or within the CZ is so high that few uses are acceptable. The risk outside APZ I and APZ II, but within the 10 nautical mile radius area, is significant, but is acceptable if sound engineering and planning practices are followed.

Land use guidelines for APZs I and II have been developed. The main objective has been to restrict all people-intensive uses because there is greater risk in these areas. The basic guidelines aim at prevention of uses that:

- have high density residential characteristics;
- have high labor intensity;
- involve above-ground explosives, fire, toxic, corrosive, or other hazardous characteristics;
- promote population concentrations;
- involve utilities and services required for area-wide population, where disruption would have an adverse impact (telephone, gas, etc.);
- concentrate people who are unable to respond to emergency situations, such as children, elderly, handicapped, etc.; and
- pose hazards to aircraft operations.

There is no question that these guidelines are relative. Ideally, there should be no people-intensive uses in either of these APZs. The free market and private property systems prevent this where there is a demand for land development. To go beyond these guidelines, substantially increases risk by placing more people in areas where there may ultimately be an aircraft accident.

A.7 Noise

Nearly all studies analyzing aircraft noise and residential compatibility recommend no residential uses in noise zones above DNL 75 dB. Usually, no restrictions are recommended below noise zone DNL 65 dB. There is currently no consensus between DNL 65-74 dB. These areas may not qualify for federal mortgage insurance in residential categories according to United States Department of Housing and Urban Development (HUD) Regulation 24 CFR 51B. In many cases, HUD approval requires noise attenuation measures, the Regional Administrator's concurrence, and an Environmental Impact Statement. The United States Department of Veterans Affairs also has airfield noise and accident restrictions that apply to its home loan guarantee program. Whenever possible, residential land use should be located below DNL 65 dB according to Air Force land use recommendations. Residential buildings within the DNL 65-70 dB noise contours should contain noise level reduction in accordance with the Air Force land use compatibility guidelines in the AICUZ Study, Table 4.3.

Most industrial/manufacturing uses are compatible in the airfield area of influence. Exceptions are uses such as research or scientific activities that require lower noise levels. Noise attenuation measures are recommended for portions of buildings devoted to office use, receiving the public, or where the normal background noise level is low.

The transportation, communications, and utilities categories have a high noise level compatibility because they generally are not people-intensive. When people use land for these purposes, the duration is generally very short. Where buildings are required for these uses, additional evaluation is warranted.

The commercial/retail trade and personal and business services categories are compatible without restriction up to DNL 70 dB; however, they are generally incompatible above DNL 80 dB. Between DNLs 70-79 dB, noise level reduction measures should be included in the design and construction of buildings.

The nature of most uses in the public and quasi-public services category requires a quieter environment, and attempts should be made to locate these uses below DNL 65 dB (an Air Force land use recommendation), or else provide adequate noise level reduction.

Although recreational use has often been recommended as compatible with high noise levels, recent research has resulted in a more conservative view. Above DNL 75 dB, noise becomes a factor that limits the ability to enjoy such uses. Where the requirement to hear is a function of the use (*e.g.*, music shell, *etc*.), compatibility is limited. Buildings associated with golf courses and similar uses should be noise attenuated.

With the exception of forestry activities and livestock farming, uses in the resources production, extraction, and open space category are compatible almost without restrictions.

APPENDIX B
CLEAR ZONES AND ACCIDENT POTENTIAL ZONES

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CLEAR ZONES AND ACCIDENT POTENTIAL ZONES

B.1 Guidelines For Accident Potential

Areas around airports are exposed to the possibility of aircraft accidents even with well-maintained aircraft and highly trained aircrews. Despite stringent maintenance requirements and countless hours of training, history makes it clear that accidents do happen.

When the AICUZ Program began, there were no current comprehensive studies on accident potential. To support the program, the Air Force completed a study of Air Force aircraft accidents that occurred between 1968 and 1972 within 10 nautical miles of airfields. The study of 369 accidents revealed that 75 percent of aircraft accidents occurred on or adjacent to the runway (1,000 feet to each side of the runway centerline) and in a corridor 3,000 feet (1,500 feet either side of the runway centerline) wide, extending from the runway threshold along the extended runway centerline for a distance of 15,000 feet. The Air Force updated these studies and this information is presented later in this section.

The CZ, APZ I, and APZ II were established based on crash patterns. The CZ starts at the end of the runway and extends outward 3,000 feet. It has the highest accident potential of the three zones. The Air Force adopted a policy of acquiring property rights to areas designated as CZs because of the high accident potential. APZ I extends from the CZ an additional 5,000 feet. It includes an area of reduced accident potential. APZ II extends from APZ I an additional 7,000 feet in an area of further reduced accident potential.

Research in accident potential conducted by the Air Force was the first significant effort in this subject area since 1952 when the President's Airport Commission published "The Airport and Its Neighbors," better known as the "Doolittle Report." The recommendations of this earlier report were influential in the formulation of the APZ concept.

The risk to people on the ground being killed or injured by aircraft accidents is small. However, an aircraft accident is a high consequence event, and when a crash does occur, the result is often catastrophic. Because of this, the Air Force does not attempt to base its safety standards on accident probabilities. Instead, the Air Force approaches this safety issue from a land use planning perspective.

B.2 Guidelines For Accident Potential

Military aircraft accidents differ from commercial air carrier and general aviation accidents because of the variety of aircraft used, the type of missions, and the number of training flights. In 1973, the Air Force performed a service-wide aircraft accident hazard study to identify land near airfields with significant accident potential. Accidents studied occurred within 10 nautical miles of airfields.

The study reviewed 369 major Air Force accidents during 1968-1972, and found that 61 percent of those accidents were related to landing operations, and 39 percent were takeoff related. It also found that 70 percent occurred in daylight, and that fighter and training aircraft accounted for 80 percent of the accidents.

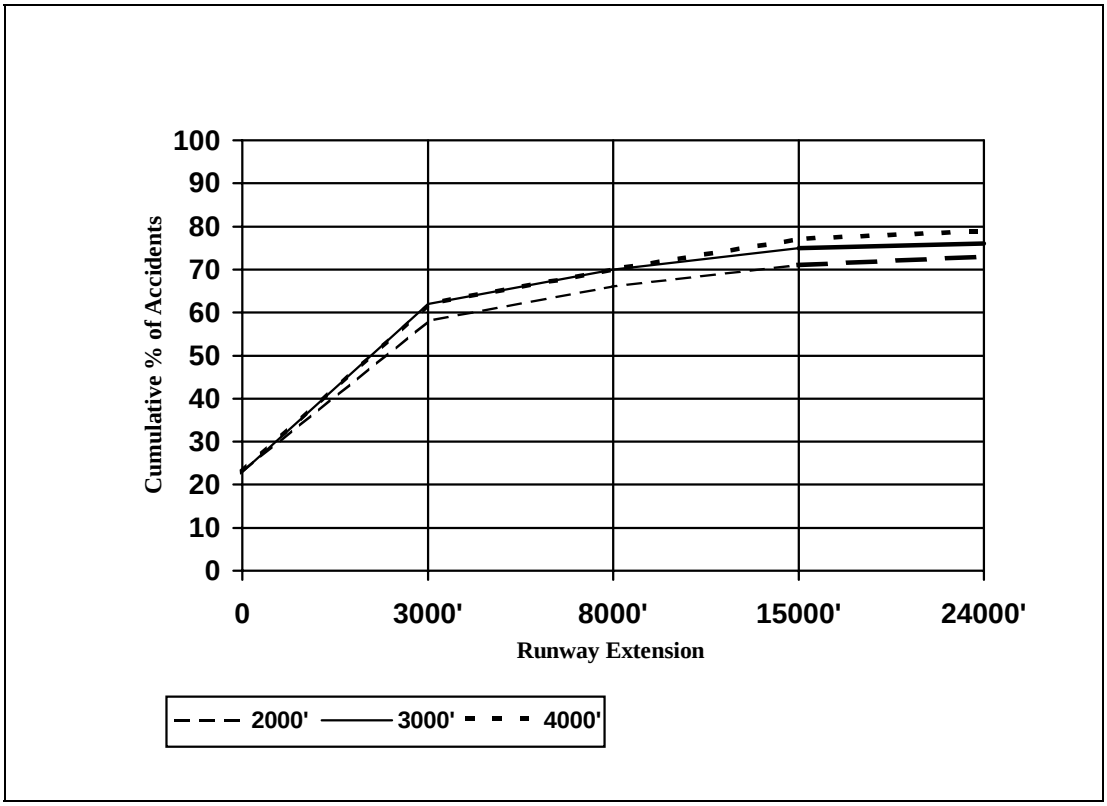
Because the purpose of the study was to identify accident hazards, the study plotted each of the 369 accidents in relation to the airfield. This plotting found that the accidents clustered along the runway and its extended centerline. To further refine this clustering, a tabulation was prepared that described the cumulative frequency of accidents as a function of distance from the runway centerline along the extended centerline. This analysis was done for widths of 2,000, 3,000, and 4,000 total feet. Table B.1 reflects the location analysis.

Table B.1 Location Analysis

	Width of Runway Extension (feet)		
Length From Both Ends of Runway (feet)	**2,000**	**3,000**	**4,000**
Percent of Accidents			
On or Adjacent to Runway (1,000 feet to each side of runway centerline)	23	23	23
0 to 3,000	35	39	39
3,000 to 8,000	8	8	8
8,000 to 15,000	5	5	7
Cumulative Percent of Accidents			
On or Adjacent to Runway (1,000 feet to each side of runway centerline)	23	23	23
0 to 3,000	58	62	62
3,000 to 8,000	66	70	70
8,000 to 15,000	71	75	77

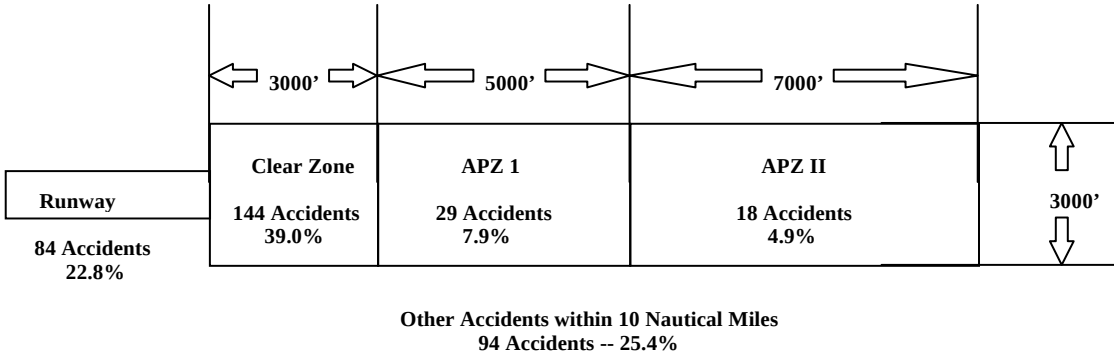
Figure B.1 indicates that the cumulative number of accidents rises rapidly from the end of the runway to 3,000 feet, rises more gradually to 8,000 feet, then continues at about the same rate of increase to 15,000 feet, where it levels off rapidly. The location analysis also indicates 3,000 feet as the optimum runway extension width and the width that includes the maximum percentage of accidents in the smallest area.

Figure B.1 Distribution of Air Force Aircraft Accidents (369 Accidents - 1968 - 1972)



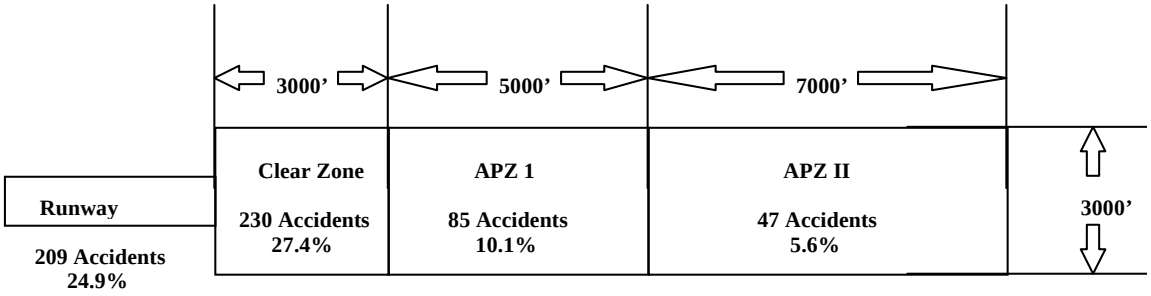
Using the optimum runway extension width, 3,000 feet, and the cumulative distribution of accidents from the end of the runway, zones were established that minimized the land area included and maximized the percentage of accidents included. The zone dimensions and accident statistics for the 1968-1972 study are shown in Figure B.2.

Figure B.2 Air Force Aircraft Accident Data (369 Accidents - 1968 - 1972)



The original study was updated to include accidents through September 1995. This updated study includes 838 accidents during the 1968-1995 period. Using the optimum runway extension width of 3,000 feet, the accident statistics of the updated study are shown in Figure B.3.

Figure B.3 Air Force Aircraft Accident Data (838 Accidents - 1968 - 1995)



Other Accidents within 10 Nautical Miles
267 Accidents -- 31.9%

Using the designated zones and accident data, it is possible to calculate a ratio of percentage of accidents to percentage of area size. These ratios indicate the CZ, with the smallest area size and the highest number of accidents, has the highest ratio, followed by the runway and adjacent area, APZ I, and then APZ II. Table B.2 reflects these data.

Table B.2 Accident to Area Ratio

Ratio of Percentage of Accidents to Percentage of Area

(Air Force Accident Data 1968 - 1995)

	Area[1] (Acres)	Number[2] Accident	Accident Per Acre	Percent of Total Area	Percent of Total Accidents	Ratio:[3] % Accidents to % Area
Runway Area	487	209	1 Per 2.3 acres	0.183	24.9	136
Clear Zone	413	230	1 Per 1.8 acres	0.155	27.4	177
APZ I	689	85	1 Per 8.1 acres	0.258	10.1	39
APZ II	964	47	1 Per 20.5 acres	0.362	5.6	16
Other Area	264,053	267	1 Per 989 acres	99.042	31.9	0.3

1 Area includes land within 10 nautical miles of runway.

2 Total number of accidents is 838 (through 1995).

3 Percent total accidents divided by percent total area.

Additional accident data for 1986 through July 1995 has been analyzed. Specific location data for some of the 1986-1995 accidents was not available and these were not included in the analysis. Table B.3 compares the 1968-1985 data with the data through July 1995.

Table B.3 Additional Accident Data

	1968-1985		1968-1995	
ZONE	Accidents	% of Total	Accidents	% of Total
On-Runway	197	27.1	209	24.9
Clear Zone	210	28.8	230	27.4
APZ I	57	7.8	85	10.1
APZ II	36	5.0	47	5.7
Other (Within 10 nautical miles)	228	31.3	267	31.9
Total	728	100.0	838	100.0

Analysis shows that the cumulative changes evident in accident location through July 1995 reconfirm the dimensions of the CZs and APZs.

B.3 Definable Debris Impact Areas

The Air Force also determined which accidents had definable debris impact areas, and in what phase of flight the accident occurred. Overall, 75 percent of the accidents had definable debris impact areas, although they varied in size by type of accident. The Air Force used weighted averages of impact areas, for accidents occurring only in the approach and departure phase, to determine the following average impact areas:

Average Impact Areas for Approach and Departure Accidents

Overall Average Impact Area	5.06 acres
Fighter, Trainer, and Misc. Aircraft	2.73 acres
Heavy Bomber and Tanker Aircraft	8.73 acres

B.4 Findings

Designation of safety zones around the airfield and restriction of incompatible land uses can reduce the public's exposure to safety hazards.

Air Force accident studies have found that aircraft accidents near Air Force installations occurred in the following patterns:

- 61% were related to landing operations.
- 39% were related to takeoff operations.
- 70% occurred in daylight.
- 80% were related to fighter and training aircraft operations.
- 25% occurred on the runway or within an area extending 1,000 feet out from each side of the runway.

- 27% occurred in an area extending from the end of the runway to 3,000 feet along the extended centerline and 3,000 feet wide, centered on the extended centerline.
- 15% occurred in an area between 3,000 and 15,000 feet along the extended runway centerline and 3,000 feet wide, centered on the extended centerline.

Air Force aircraft accident statistics found 75% of aircraft accidents resulted in definable impact areas. The size of the impact areas were:

- 5.06 acres overall average.
- 2.73 acres for fighters and trainers.
- 8.73 acres for heavy bombers and tankers.

APPENDIX C
NOISE AND NOISE LEVEL REDUCTION GUIDELINES

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NOISE AND NOISE LEVEL REDUCTION GUIDELINES

C.1 General

Noise, often defined as unwanted sound, is one of the most common environmental issues associated with aircraft operations. Of course, aircraft are not the only sources of noise in an urban or suburban surrounding, where noise from interstate and local roadway traffic, rail, industrial, and neighborhood sources also intrude on the everyday quality of life. Nevertheless, aircraft are readily identifiable to those affected by their noise and are typically singled out for special attention and criticism. Consequently, aircraft noise problems often dominate analyses of environmental impacts.

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.*, aircraft noise) depends largely on the listener's current activity, past experience, and attitude toward the source of that sound. It is often true that one person's music is another person's noise.

The measurement and human perception of sound involves two basic physical characteristics - intensity and frequency. Intensity is a measure of the acoustic energy of the sound vibrations and is expressed in terms of sound pressure. The higher the sound pressure, the more energy carried by the sound and the louder the perception of that sound. The second important physical characteristic is sound frequency, that 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 loudest sounds, which can be detected comfortably by the human ear, have intensities that are a trillion times larger than those of sounds that can be detected at the lower end of the spectrum. Because of this vast range, any attempt to represent the intensity of sound using a linear scale becomes very unwieldy. As a result, a logarithmic unit known as the decibel (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 and eventually pain at still higher levels.

Because of the logarithmic nature of the decibel unit, sound levels cannot be added or subtracted directly 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. Thus, for example:

60 dB + 60 dB = 63 dB, and

80 dB + 80 dB = 83 dB.

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 dB + 70.0 dB = 70.4 dB.

Because the addition of sound levels behaves differently than that of ordinary numbers, such an addition is often referred to as "decibel addition" or "energy addition." The latter term arises from the fact that what is really happening when decibel values are added is each decibel value is first converted to its corresponding acoustic energy, then the energies are added using the normal rules of addition, and finally the total energy is converted to its decibel equivalent.

An important facet of decibel addition arises later when the concept of time-average sound levels is introduced to explain Day-Night Average A-Weighted Sound Level (DNL). Because of the logarithmic units, the louder levels that occur during the averaging period dominate the time-average sound levels. As a simple example, consider a sound level that is 100 dB and lasts for 30 seconds, followed by a sound level of 50 dB that also lasts for 30 seconds. The time-average sound level over the total 60-second period is 97 dB, not 75 dB.

Sound frequency is measured in terms of cycles per second (cps), or hertz (Hz), which is the preferred scientific 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 are not heard equally well by the human ear, which is most sensitive to frequencies in the 1000 to 4000 Hz range. In measuring community noise, this frequency dependence is taken into account by adjusting the sound levels of the very high and low frequencies to approximate the human ear's lower sensitivity to those frequencies. This is called "A-weighting" and is commonly used in measurements of community environmental noise.

Sound levels measured using A-weighting are most properly called A-weighted sound levels while sound levels measured without any frequency weighting are most properly called sound levels. However, since most environmental impact analysis documents deal only with A-weighted sound levels, the adjective "A-weighted" is often omitted, and A-weighted sound levels are referred to simply as sound levels. In some instances it will be indicated that the sound levels have been A-weighted by using the abbreviation dBA or dB(A), rather than the abbreviation dB, for decibel. As long as the use of A-weighting is understood to be used, there is no difference implied by the terms "sound level" and "A-weighted sound level" or by the units dB, dBA, and dB(A).

In this document and most AICUZ documents, all sound levels are A-weighted sound levels and the adjective "A-weighted" has been omitted and dB is used for the decibel units.

Sound levels do not represent instantaneous measurements but rather averages over short periods. Two measurement time periods are most commonly used - one second and one-eighth of a second. Most environmental noise studies use slow response measurements, and the adjective "slow response" is usually omitted. It is easy to understand why the proper descriptor "slow response A-weighted sound level" is usually shortened to "sound level" in environmental impact analysis documents.

C.2 Noise Metrics

A "metric" is defined as something "of, involving, or used in measurement." In environmental noise analyses, a metric refers to the unit or quantity that quantitatively measures the effect of noise on the environment. Noise studies have typically involved a

confusing proliferation of noise metrics as individual researchers have attempted to understand and represent the effects of noise. As a result, past literature describing environmental noise abatement has included many different metrics.

Various federal agencies involved in environmental noise mitigation agree on common metrics for environmental impact analysis documents, and both the Department of Defense (DoD) and the FAA specified those that should be used for federal aviation noise assessments. These metrics are as follows.

C.2.1 Maximum Sound Level

The highest A-weighted sound level measured during a single event in which the sound level changes value as time goes on (*e.g.*, an aircraft overflight) is called the maximum A-weighted sound level or maximum sound level, for short. It is usually abbreviated by $L_{max,}$ or L_{Amax}.

C.2.2 Sound Exposure Level

Individual time-varying noise events have two main characteristics - a sound level which changes throughout the event and a period of time during which the event is heard. Although the maximum sound level, described above, provides some measure of the intrusiveness of the event, it alone does not completely describe the total event. The period of time during which the sound is heard is also significant. The Sound Exposure Level (abbreviated SEL or L_{AE}) combines both of these characteristics into a single metric.

Sound Exposure Level is a logarithmic measure of the total acoustic energy transmitted to the listener during the event. Mathematically, it represents the sound level of the constant sound that would, in one second, generate the same acoustic energy as did the actual time-varying noise event. Since aircraft overflights usually last longer than one second, the SEL of an overflight is usually greater than the L_{max} of the overflight.

Note that sound exposure level is a composite metric that represents both the intensity of a sound level of the constant sound and its duration. It does not directly represent the sound level heard at any given time, but rather provides a measure of the net impact of the entire acoustic event. It is well-established in the scientific community that SEL measures this impact much more reliably than just the L_{max}.

Because the SEL and the L_{max} are both A-weighted sound levels expressed in decibels, there is sometimes confusion between the two, so the specific metric used should be clearly stated.

C.2.3 Day-Night Average Sound Level

Time-average sound levels are measurements of sound levels that are averaged over a specified length of time. These levels provide a measure of the average sound energy during the measurement period.

For the evaluation of community noise effects, and particularly aircraft noise effects, the DNL (mathematically represented as L_{dn}) is used. DNL averages aircraft sound levels at a location over a complete 24-hour period, with a 10-dB adjustment added to those noise events that take place between 10:00 p.m. and 7:00 a.m. (local time). This 10-dB "penalty" represents the added intrusiveness of sounds that occur during normal sleeping hours, both

because of the increased sensitivity to noise during those hours and because ambient sound levels during nighttime are typically about 10 dB lower than during daytime hours.

DNL does not represent the sound level heard at any particular time. DNL provides a single measure of overall noise impact, but does not provide specific information on the number of noise events or the individual sound levels that occur during the day. For example, a DNL of 65 dB could result from a very few noisy events, or a large number of quieter events.

Scientific studies and social surveys conducted to evaluate community annoyance to all types of environmental noise have found the DNL to be the best measure to predict annoyance. Its use is endorsed by the scientific community (See References C.1 through C-5 at the end of this section).

There is a remarkable consistency in the results of attitudinal surveys about aircraft noise conducted in different countries to find the percentages of groups of people who express various degrees of annoyance when exposed to different levels of DNL.

Reference C.6 was published in 1978. A more recent study has reaffirmed this relationship (Reference C.7). 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. The correlation coefficients for the annoyance of individuals are relatively low; however, 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. Nevertheless, findings substantiate that community annoyance to aircraft noise can be predicted quite reliably using DNL.

This relation between community annoyance and DNL has been confirmed, even for infrequent aircraft noise events. Reference C.8 reported the reactions of individuals in a community to daily helicopter overflights correlated quite well with the daily time-average sound levels over this range of numbers of daily noise events.

The use of DNL has been criticized as not accurately representing community annoyance and land-use compatibility with aircraft noise. Much of that criticism stems from a lack of understanding of the basis for the measurement or calculation of DNL. One frequent criticism is based on the principle that people inherently react more to single noise events and not as much to “meaningless” time-average sound levels.

In fact, a time-average noise metric, such as DNL, takes into account both the noise levels of all individual events which occur during a 24-hour period and the number of times those events occur. As described briefly above, the logarithmic nature of the decibel unit causes the noise levels of the loudest events to control the 24-hour average.

As a simple example of this characteristic, consider a case in which only one aircraft overflight occurs in daytime during a 24-hour period, creating a sound level of 100 dB for 30 seconds. During the remaining 23 hours, 59 minutes, and 30 seconds of the day, the ambient sound level is 50 dB. The DNL for this 24-hour period is 65.5 dB. Assume, as a second example, that 10 such 30-second overflights occur in daytime hours during the next 24-hour period, with the same ambient sound level of 50 dB during the remaining 23 hours and 55 minutes of the day. The DNL for this 24-hour period is 75.4 dB. Clearly, the

averaging of noise over a 24-hour period does not ignore the louder single events and tends to emphasize both the sound levels and number of those events. This is the basic concept of a time-average sound metric, and specifically the DNL.

C.3 Noise Effects

C.3.1 Hearing Loss

Noise-induced hearing loss is probably the best-defined of the potential effects of human exposure to excessive noise. Federal workplace standards for protection from hearing loss allow a time-average level of 90 dB over an 8-hour work period, or 85 dB averaged over a 16-hour period. An outdoor DNL of 75 dBA is considered the threshold above which the risk of hearing loss should be evaluated. Following guidelines recommended by the Committee on Hearing, Bioacoustics, and Biomechanics of the National Research Council, the average change in the threshold of hearing for people exposed to DNL equal to or greater than 75 dBA was evaluated. Results indicated that an average of 1 dBA hearing loss could be expected for people exposed to DNL equal to or greater than 75 dBA. For the most sensitive 10 percent of the exposed population, the maximum anticipated hearing loss would be 4 dBA. These hearing loss projections must be considered conservative as the calculations are based on an average daily outdoor exposure of 16 hours (7:00 a.m. to 10:00 p.m.) over a 40-year period. Since it is unlikely that airport neighbors will remain outside their homes 16 hours per day for extended periods of time, there is little possibility of hearing loss below a DNL of 75 dB, and this level is extremely conservative.

C.3.2 Nonauditory Health Effects

Nonauditory health effects of long-term noise exposure, where noise may act as a risk factor, have never 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 Institute of Health Conference on Noise and Hearing Loss, held on 22-24 January 1990 in Washington, D.C.

> "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). At the recent (1988) International Congress 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, one comes to the conclusion 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." (Reference C.9; parenthetical wording added for clarification.)

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 (UCLA) researchers apparently found a relationship 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 (Reference C.10). Nevertheless, three other UCLA professors analyzed those same data and found no relationship between noise exposure and mortality rates (Reference C.11).

In summary, there is no scientific basis for a claim that potential health effects exist for aircraft DNL below 75 dB.

C.3.3 Annoyance

The primary effect of aircraft noise on exposed communities is one of annoyance. Noise annoyance is defined by the U.S. Environmental Protection Agency (USEPA) as any negative subjective reaction on the part of an individual or group (Reference C.3). As noted in the discussion of DNL above, community annoyance is best predicted by that metric.

It is often suggested that a lower DNL, such as 60 or 55 dB, be adopted as the threshold of community noise annoyance for airport environmental analysis documents. While there is no technical reason why a lower level cannot be measured or calculated for comparison purposes, a DNL of 65 dB:

- provides a valid basis for comparing and assessing community noise effects;
- represents a noise exposure level which is normally dominated by aircraft noise and not other community or nearby highway noise sources; and
- reflects the FAA's threshold for grant-in-aid funding of airport noise mitigation projects.
- United States Department of Housing and Urban Development also establishes a DNL standard of 65 dB for eligibility for federally guaranteed home loans.

C.3.4 Speech Interference

Speech interference associated with aircraft noise is a primary cause of annoyance to individuals on the ground. 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 also important in classrooms, offices, and industrial settings and can cause fatigue and vocal strain in those who attempt to communicate over the noise. Research has shown that "whenever intrusive noise exceeds approximately 60 dB indoors, there will be interference with speech communication" (Reference C.5). A steady A-weighted background sound level of 60 dB will produce 93 percent intelligibility; that of 70 dB will produce 66 percent intelligibility; and that of 75 dB will produce 2 percent intelligibility (Figure D-1 in Reference C.3).

C.3.5 Sleep Interference

Sleep interference may be measured in either of two ways. "Arousal" represents actual awakening from sleep, while a change in "sleep stage" represents a shift from one of four sleep stages to another stage of lighter sleep without actual awakening. In general, arousal requires a somewhat louder noise level than does a change in sleep stage.

A recent analysis sponsored by the Air Force summarized 21 published studies concerning the effects of noise on sleep (Reference C.14). The analysis concluded that a lack of reliable studies in homes, combined with large differences among the results from the various laboratory studies and the limited in-home studies, did not permit development of an acceptable accurate assessment procedure. The noise events used in the laboratory studies and in contrived in-home studies were presented at much higher rates of occurrence than would normally be experienced in the home. None of the laboratory studies was of sufficiently long duration to determine any effects of habituation, such as those that would occur under normal community conditions.

Nevertheless, some guidance is available in judging sleep interference. The U.S. EPA identified an indoor DNL of 45 dB as necessary to protect against sleep interference (Reference C.3). Assuming a very conservative structural noise insulation of 20 dB for typical dwelling units, this corresponds to an outdoor DNL of 65 dB as minimizing sleep interference.

The Federal Interagency Committee on Noise (Reference C.5) reviewed the sleep disturbance issue and presented an Air Force-developed sleep disturbance dose-response prediction curve, which is based on data from Reference C.14, as an interim tool for analysis of potential sleep disturbance. This interim curve shows that for an indoor SEL of 65 dB, approximately 15 percent or less of those exposed should be awakened.

C.3.6 Noise Effects on Domestic Animals and Wildlife

Animal species differ greatly in their responses to noise. Each species has adapted, physically and behaviorally, to fill its ecological role in nature, and its hearing ability usually reflects that role. Animals rely on their 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. Secondary effects may include nonauditory effects similar to those exhibited by humans - stress, hypertension, and other nervous disorders. Tertiary effects may include interference with mating and resultant population declines.

Many scientific studies are available regarding the effects of noise on wildlife and some anecdotal reports of wildlife "flight due to noise." Few of these studies or reports include any reliable measures of the actual noise levels involved.

In the absence of definitive data on the effect of noise on animals, the Committee on Hearing, Bioacoustics, and Biomechanics proposed that protective noise criteria for animals be taken to be the same as for humans (Reference C.16).

C.3.7 Effects of Noise-Induced Vibration on Structures and Humans

The sound from an aircraft overflight travels from the exterior to the interior of the house in one of two ways: through the solid structural elements and directly through the air. The

sound transmission starts with noise impinging on the wall exterior. Some of this sound energy will be reflected away and some will make the wall vibrate. The vibrating wall radiates sound into the airspace, which in turn sets the interior finish surface vibrating, with some of the energy lost in the airspace. This surface then radiates sound into the dwelling interior. Vibrational energy also bypasses the air cavity by traveling through the studs and edge connections.

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 pressure impinging on the structure is normally sufficient to determine the possibility of damage. In general, at sound levels above 130 dB, there is the possibility of structural damage. While certain frequencies (such as 30 Hz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than 1 second above a sound level of 130 dB are potentially damaging to structural components (Reference C.17).

In terms of average peak particle velocity of wall or ceiling vibration, the thresholds for structural damage (Reference C.20) are:

- 0.1 in/sec—threshold of risk of damage to sensitive structures (e.g., ancient monuments); and
- 0.4 – 0.5 in/sec—threshold of risk of damage to normal dwellings (e.g., houses with plaster ceilings and walls).

Noise-induced structural vibration may also cause annoyance to dwelling occupants because of induced secondary vibrations, or "rattle," of objects within the dwelling - hanging pictures, dishes, plaques, and bric-a-brac. Loose window panes may also vibrate noticeably when exposed to high levels of aircraft noise, causing homeowners to fear breakage. In general, such noise-induced vibrations occur at sound levels above those considered normally compatible with residential land use. Thus, assessments of noise exposure levels for compatible land use should also be protective of noise-induced secondary vibrations.

In the assessment of vibrations on humans, the following factors determine if a person will perceive and possibly react to building vibrations:

- Type of excitation: steady state, intermittent, or impulsive vibration;
- Frequency of the excitation. ISO 2631-2 (Reference C.18) recommends a frequency range of 1 to 80 Hz for the assessment of vibration on humans;
- Orientation of the body with respect to the vibration;
- The use of the occupied space; and
- Time of day.

C.3.8 Noise Effects on Terrain

It has been suggested that noise levels associated with low-flying aircraft may affect the terrain under the flight path by disturbing fragile soil or snow structures, especially in mountainous areas, causing landslides or avalanches. There are no known instances of such effects, and it is considered improbable that such effects will result from routine, subsonic aircraft operations.

C.3.9 Noise Effects on Historical and Archaeological Sites

Because of the potential for increased fragility of structural components of historical buildings and other historical sites, aircraft noise may affect such sites more severely than newer, modern structures. Again, there are few scientific studies of such effects to provide guidance for their assessment.

One study involved the measurements of sound levels and structural vibration levels in a superbly restored plantation house, originally built in 1795, and now situated approximately 1,500 feet from the centerline at the departure end of Runway 19L at Washington Dulles International Airport. These measurements were made in connection with the proposed scheduled operation of the supersonic Concorde airplane at Dulles (Reference C.19). There was a special concern for the building's windows, since roughly half of the 324 panes were original. No instances of structural damage were found. Interestingly, despite the high levels of noise during Concorde takeoffs, the induced structural vibration levels were actually less than those induced by touring groups and vacuum cleaning.

As noted above for the noise effects of noise-induced vibrations of normal structures, assessments of noise exposure levels for normally compatible land uses should also be protective of historic and archaeological sites.

C.4 Noise Level Reduction Guidelines

A study that provides in-depth, state-of-the-art noise level reduction guidelines was prepared for the Naval Facilities Engineering Command in April 2005. The title of the document is *Guidelines for the Sound Insulation of Residences Exposed to Aircraft Operations* (Reference C.21).

C.5 References

C.1. "Sound Level Descriptors for Determination of Compatible Land Use," American National Standards Institute Standard ANSI S3.23-1980.

C.2. "Quantities and Procedures for Description and Measurement of Environmental Sound, Part 1," American National Standards Institute Standard ANSI S12.9-1988.

C.3. "Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare With an Adequate Margin of Safety," U.S. Environmental Protection Agency Report 550/9-74-004, March 1972.

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C.17. Von Gierke, H.E., and W.D. Ward, "Criteria for Noise and Vibration Exposure," Handbook of Acoustical Measurements and Noise Control, Third Edition, 1991.

C.18. "Evaluation of Human Exposure to Whole-Body Vibration - Part 2: Continuous and Shock-Induced Vibration in Buildings (1 to 80 Hz)", International Organization for Standardization, Standards 2631-2, February 1989.

C.19. Wesler, J.E., "Concorde Operations at Dulles International Airport," NOISEEXPO '77, Chicago, IL, March 1977.

C.20 American Association of State Highway and Transportation Officials (AASHTO), "Standard Recommended Practice for Evaluation of Transportation-related Earthborn Vibration," Washington, DC, 1990.

C.21 *Guidelines for the Sound Insulation of Residences Exposed to Aircraft Operations*. Department of the Navy, Naval Facilities Engineering Command, April 2005.

Appendix F

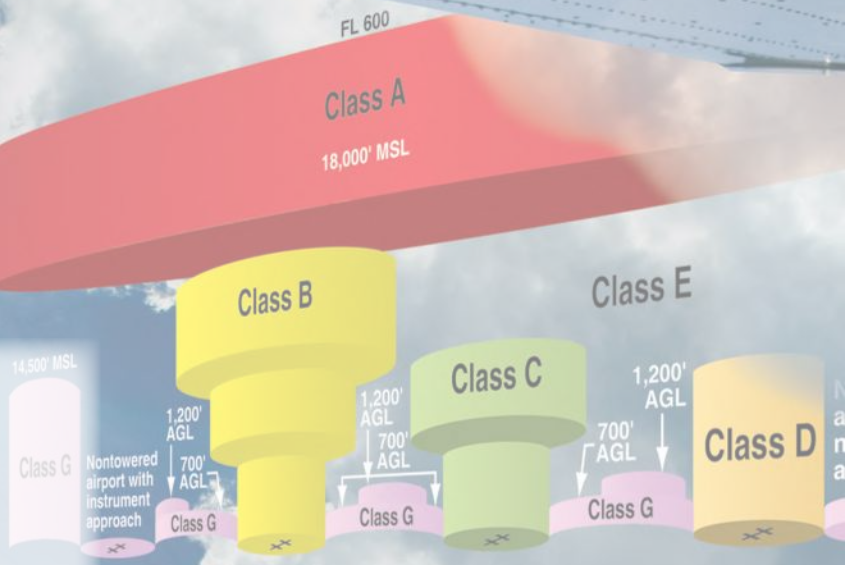
FAA Airspace Classifications

Chapter 15

Airspace

Introduction

The two categories of airspace are: regulatory and nonregulatory. Within these two categories, there are four types: controlled, uncontrolled, special use, and other airspace. The categories and types of airspace are dictated by the complexity or density of aircraft movements, nature of the operations conducted within the airspace, the level of safety required, and national and public interest. *Figure 15-1* presents a profile view of the dimensions of various classes of airspace. Also, there are excerpts from sectional charts that are discussed in Chapter 16, Navigation, that are used to illustrate how airspace is depicted.



Basic VFR Weather Minimums

Airspace			Flight Visibility	Distance from Clouds
Class A			Not applicable	Not applicable
Class B			3 statute miles	Clear of clouds
Class C			3 statute miles	1,000 feet above 500 feet below 2,000 feet horizontal
Class D			3 statute miles	1,000 feet above 500 feet below 2,000 feet horizontal
Class E	At or above 10,000 feet MSL		5 statute miles	1,000 feet above 1,000 feet below 1 statute mile horizontal
	Less than 10,000 feet MSL		3 statute miles	1,000 feet above 500 feet below 2,000 feet horizontal
Class G	1,200 feet or less above the surface (regardless of MSL altitude).	Day, except as provided in section 91.155(b)	1 statute mile	Clear of clouds
		Night, except as provided in section 91.155(b)	3 statute miles	1,000 feet above 500 feet below 2,000 feet horizontal
	More than 1,200 feet above the surface but less than 10,000 feet MSL	Day	1 statute mile	1,000 feet above 500 feet below 2,000 feet horizontal
		Night	3 statute miles	1,000 feet above 500 feet below 2,000 feet horizontal
	More than 1,200 feet above the surface and at or above 10,000 feet MSL		5 statute miles	1,000 feet above 1,000 feet below 1 statute mile horizontal

Class Airspace	Entry Requirements	Equipment	Minimum Pilot Cert
Class A	ATC clearance	IFR equipped	Instrument rating
Class B	ATC clearance	Two-way radio, transponder with altitude reporting capability	Private—(However, recreational pilot other than the pr seeking private if regulatory re
Class C	Two-way radio communications prior to entry	Two-way radio, transponder with altitude reporting capability	No specific
Class D	Two-way radio communications prior to entry	Two-way radio	No spec
Class E	None for VFR	No specific requirement	No
Class G	None	No specific requirement	

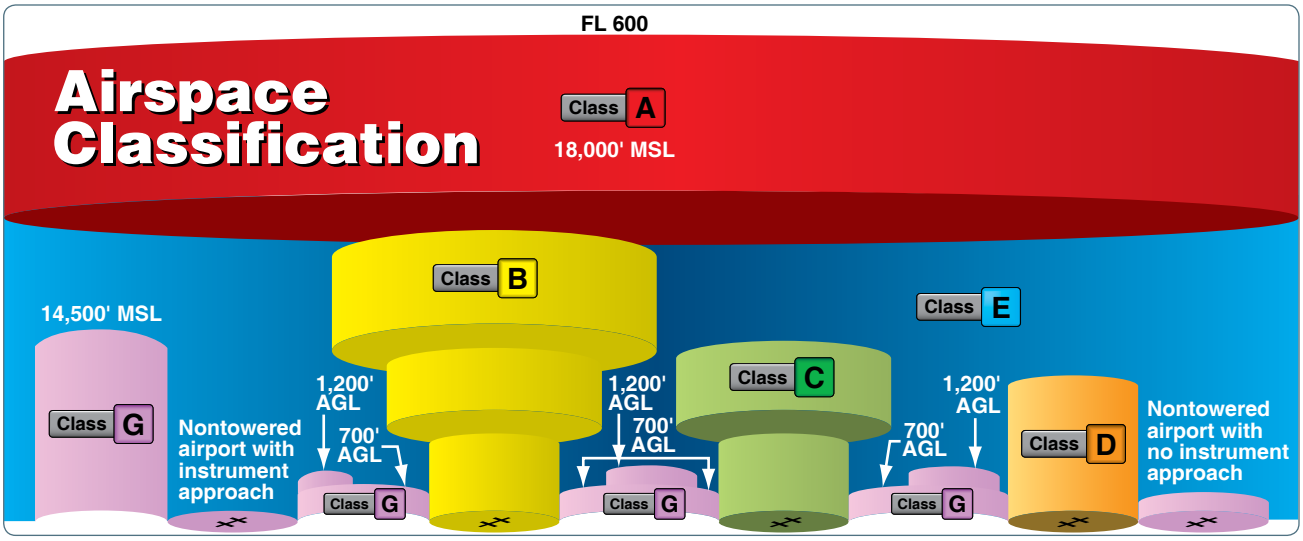


Figure 15-1. *Airspace profile.*

Controlled Airspace

Controlled airspace is a generic term that covers the different classifications of airspace and defined dimensions within which air traffic control (ATC) service is provided in accordance with the airspace classification. Controlled airspace consists of:

- Class A
- Class B
- Class C
- Class D
- Class E

Class A Airspace

Class A airspace is generally the airspace from 18,000 feet mean sea level (MSL) up to and including flight level (FL) 600, including the airspace overlying the waters within 12 nautical miles (NM) of the coast of the 48 contiguous states and Alaska. Unless otherwise authorized, all operation in Class A airspace is conducted under instrument flight rules (IFR).

Class B Airspace

Class B airspace is generally airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports in terms of airport operations or passenger enplanements. The configuration of each Class B airspace area is individually tailored, consists of a surface area and two or more layers (some Class B airspace areas resemble upside-down wedding cakes), and is designed to contain all published instrument procedures once an aircraft enters the airspace. ATC clearance is required for all aircraft to operate in the area, and all aircraft that are so cleared receive separation services within the airspace.

Class C Airspace

Class C airspace is generally airspace from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower, are serviced by a radar approach control, and have a certain number of IFR operations or passenger enplanements. Although the configuration of each Class C area is individually tailored, the airspace usually consists of a surface area with a five NM radius, an outer circle with a ten NM radius that extends from 1,200 feet to 4,000 feet above the airport elevation. Each aircraft must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter must maintain those communications while within the airspace.

Class D Airspace

Class D airspace is generally airspace from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and, when instrument procedures are published, the airspace is normally designed to contain the procedures. Arrival extensions for instrument approach procedures (IAPs) may be Class D or Class E airspace. Unless otherwise authorized, each aircraft must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while in the airspace.

Class E Airspace

Class E airspace is the controlled airspace not classified as Class A, B, C, or D airspace. A large amount of the airspace over the United States is designated as Class E airspace.

This provides sufficient airspace for the safe control and separation of aircraft during IFR operations. Chapter 3 of the Aeronautical Information Manual (AIM) explains the various types of Class E airspace.

Sectional and other charts depict all locations of Class E airspace with bases below 14,500 feet MSL. In areas where charts do not depict a class E base, class E begins at 14,500 feet MSL.

In most areas, the Class E airspace base is 1,200 feet AGL. In many other areas, the Class E airspace base is either the surface or 700 feet AGL. Some Class E airspace begins at an MSL altitude depicted on the charts, instead of an AGL altitude.

Class E airspace typically extends up to, but not including, 18,000 feet MSL (the lower limit of Class A airspace). All airspace above FL 600 is Class E airspace.

Uncontrolled Airspace

Class G Airspace

Uncontrolled airspace or Class G airspace is the portion of the airspace that has not been designated as Class A, B, C, D, or E. It is therefore designated uncontrolled airspace. Class G airspace extends from the surface to the base of the overlying Class E airspace. Although ATC has no authority or responsibility to control air traffic, pilots should remember there are visual flight rules (VFR) minimums that apply to Class G airspace.

Special Use Airspace

Special use airspace or special area of operation (SAO) is the designation for airspace in which certain activities must be confined, or where limitations may be imposed on aircraft operations that are not part of those activities. Certain special use airspace areas can create limitations on the mixed use of airspace. The special use airspace depicted on instrument charts includes the area name or number, effective altitude, time and weather conditions of operation, the controlling agency, and the chart panel location. On National Aeronautical Charting Group (NACG) en route charts, this information is available on one of the end panels. Special use airspace usually consists of:

- Prohibited areas
- Restricted areas
- Warning areas
- Military operation areas (MOAs)
- Alert areas
- Controlled firing areas (CFAs)

Prohibited Areas

Prohibited areas contain airspace of defined dimensions within which the flight of aircraft is prohibited. Such areas are established for security or other reasons associated with the national welfare. These areas are published in the Federal Register and are depicted on aeronautical charts. The area is charted as a "P" followed by a number (e.g., P-40). Examples of prohibited areas include Camp David and the National Mall in Washington, D.C., where the White House and the Congressional buildings are located. *[Figure 15-2]*

Restricted Areas

Restricted areas are areas where operations are hazardous to nonparticipating aircraft and contain airspace within which the flight of aircraft, while not wholly prohibited, is subject to restrictions. Activities within these areas must be confined because of their nature, or limitations may be imposed upon aircraft operations that are not a part of those activities, or both. Restricted areas denote the existence of unusual, often invisible, hazards to aircraft (e.g., artillery firing, aerial gunnery, or guided missiles). IFR flights may be authorized to transit the airspace and are routed accordingly. Penetration of restricted areas without authorization from the using or controlling agency may be extremely hazardous to the aircraft and its occupants. ATC facilities apply the following procedures when aircraft are operating on an IFR clearance (including those cleared by ATC to maintain VFR on top) via a route that lies within joint-use restricted airspace:

1. If the restricted area is not active and has been released to the Federal Aviation Administration (FAA), the ATC facility allows the aircraft to operate in the restricted airspace without issuing specific clearance for it to do so.
2. If the restricted area is active and has not been released to the FAA, the ATC facility issues a clearance that ensures the aircraft avoids the restricted airspace.

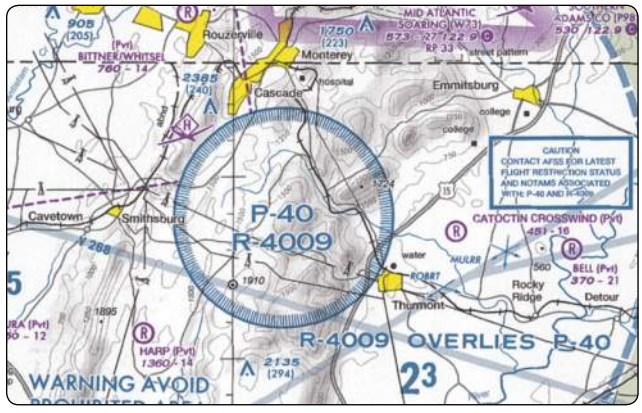


Figure 15-2. *An example of a prohibited area, P-40 around Camp David.*

Restricted areas are charted with an "R" followed by a number (e.g., R-4401) and are depicted on the en route chart appropriate for use at the altitude or FL being flown. *[Figure 15-3]* Restricted area information can be obtained on the back of the chart.

Warning Areas

Warning areas are similar in nature to restricted areas; however, the United States government does not have sole jurisdiction over the airspace. A warning area is airspace of defined dimensions, extending from 3 NM outward from the coast of the United States, containing activity that may be hazardous to nonparticipating aircraft. The purpose of such areas is to warn nonparticipating 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). *[Figure 15-4]*

Military Operation Areas (MOAs)

MOAs consist of airspace with defined vertical and lateral limits established for the purpose of separating certain military training activities from IFR traffic. Whenever an MOA is being used, nonparticipating IFR traffic may be cleared through an MOA if IFR separation can be provided by ATC. Otherwise, ATC reroutes or restricts nonparticipating IFR traffic. MOAs are depicted on sectional, VFR terminal area, and en route low altitude charts and are not numbered (e.g., "Camden Ridge MOA"). *[Figure 15-5]* However, the MOA is also further defined on the back of the sectional charts with times of operation, altitudes affected, and the controlling agency.

Alert Areas

Alert areas are depicted on aeronautical charts with an "A" followed by a number (e.g., A-211) to inform nonparticipating pilots of areas that may contain a high volume of pilot training or an unusual type of aerial activity. Pilots should exercise caution in alert areas. All activity within an alert area shall be conducted in accordance with regulations, without waiver, and pilots of participating aircraft, as well as pilots transiting the area, shall be equally responsible for collision avoidance. *[Figure 15-6]*

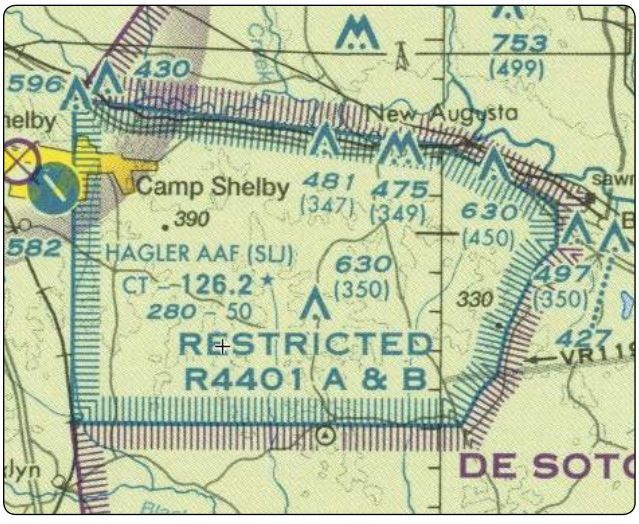


Figure 15-3. *Restricted areas on a sectional chart.*

Figure 15-4. *Requirements for airspace operations.*

Controlled Firing Areas (CFAs)

CFAs contain activities that, if not conducted in a controlled environment, could be hazardous to nonparticipating aircraft. The difference between CFAs and other special use airspace is that activities must be suspended when a spotter aircraft, radar, or ground lookout position indicates an aircraft might be approaching the area. There is no need to chart CFAs since they do not cause a nonparticipating aircraft to change its flight path.

Other Airspace Areas

"Other airspace areas" is a general term referring to the majority of the remaining airspace. It includes:

- Local airport advisory (LAA)
- Military training route (MTR)
- Temporary flight restriction (TFR)
- Parachute jump aircraft operations
- Published VFR routes
- Terminal radar service area (TRSA)
- National security area (NSA)
- Air Defense Identification Zones (ADIZ) land and water based and need for Defense VFR (DVFR) flight plan to operate VFR in this airspace
- Intercept Procedures and use of 121.5 for communication if not on ATC already

Figure 15-5. *Camden Ridge MOA is an example of a military operations area.*

Figure 15-6. *Alert area (A-211).*

- Flight Restricted Zones (FRZ) in vicinity of Capitol and White House
- Special Awareness Training required by 14 CFR 91.161 for pilots to operate VFR within 60 NM of the Washington, DC VOR/DME
- Wildlife Areas/Wilderness Areas/National Parks and request to operate above 2,000 AGL
- National Oceanic and Atmospheric Administration (NOAA) Marine Areas off the coast with requirement to operate above 2,000 AGL
- Tethered Balloons for observation and weather recordings that extend on cables up to 60,000

Local Airport Advisory (LAA)

An advisory service provided by Flight Service Station (FSS) facilities, which are located on the landing airport, using a discrete ground-to-air frequency or the tower frequency when the tower is closed. LAA services include local airport advisories, automated weather reporting with voice broadcasting, and a continuous Automated Surface Observing System (ASOS)/Automated Weather Observing Station (AWOS) data display, other continuous direct reading instruments, or manual observations available to the specialist.

Military Training Routes (MTRs)

MTRs are routes used by military aircraft to maintain proficiency in tactical flying. These routes are usually established below 10,000 feet MSL for operations at speeds in excess of 250 knots. Some route segments may be defined at higher altitudes for purposes of route continuity. Routes are identified as IFR (IR), and VFR (VR), followed by a number. *[Figure 15-7]* MTRs with no segment above 1,500 feet AGL are identified by four number characters (e.g., IR1206, VR1207). MTRs that include one or more segments above 1,500 feet AGL are identified by three number characters (e.g., IR206, VR207). IFR low altitude en route charts depict all IR routes and all VR routes that accommodate operations above 1,500 feet AGL. IR routes are conducted in accordance with IFR regardless of weather conditions. VFR sectional charts depict military training activities, such as IR, VR, MOA, restricted area, warning area, and alert area information.

Figure 15-7. *Military training route (MTR) chart symbols.*

Temporary Flight Restrictions (TFR)

A flight data center (FDC) Notice to Airmen (NOTAM) is issued to designate a TFR. The NOTAM begins with the phrase "FLIGHT RESTRICTIONS" followed by the location of the temporary restriction, effective time period, area defined in statute miles, and altitudes affected. The NOTAM also contains the FAA coordination facility and telephone number, the reason for the restriction, and any other information deemed appropriate. The pilot should check the NOTAMs as part of flight planning.

Some of the purposes for establishing a TFR are:

- Protect persons and property in the air or on the surface from an existing or imminent hazard.
- Provide a safe environment for the operation of disaster relief aircraft.
- Prevent an unsafe congestion of sightseeing aircraft above an incident or event, that may generate a high degree of public interest.
- Protect declared national disasters for humanitarian reasons in the State of Hawaii.
- Protect the President, Vice President, or other public figures.
- Provide a safe environment for space agency operations.

Since the events of September 11, 2001, the use of TFRs has become much more common. There have been a number of incidents of aircraft incursions into TFRs that have resulted in pilots undergoing security investigations and certificate suspensions. It is a pilot's responsibility to be aware of TFRs in their proposed area of flight. One way to check is to visit the FAA website, www.tfr.faa.gov, and verify that there is not a TFR in the area.

Parachute Jump Aircraft Operations

Parachute jump aircraft operations are published in the Chart Supplement U.S. (formerly Airport/Facility Directory). Sites that are used frequently are depicted on sectional charts.

Published VFR Routes

Published VFR routes are for transitioning around, under, or through some complex airspace. Terms such as VFR flyway, VFR corridor, Class B airspace VFR transition route, and terminal area VFR route have been applied to such routes.

These routes are generally found on VFR terminal area planning charts.

Terminal Radar Service Areas (TRSAs)

TRSAs are areas where participating pilots can receive additional radar services. The purpose of the service is to provide separation between all IFR operations and participating VFR aircraft.

The primary airport(s) within the TRSA become(s) Class D airspace. The remaining portion of the TRSA overlies other controlled airspace, which is normally Class E airspace beginning at 700 or 1,200 feet and established to transition to/from the en route/terminal environment. TRSAs are depicted on VFR sectional charts and terminal area charts with a solid black line and altitudes for each segment. The Class D portion is charted with a blue segmented line. Participation in TRSA services is voluntary; however, pilots operating under VFR are encouraged to contact the radar approach control and take advantage of TRSA service.

National Security Areas (NSAs)

NSAs consist of airspace of defined vertical and lateral dimensions established at locations where there is a requirement for increased security and safety of ground facilities. Flight in NSAs may be temporarily prohibited by regulation under the provisions of Title 14 of the Code of Federal Regulations (14 CFR) part 99, and prohibitions are disseminated via NOTAM. Pilots are requested to voluntarily avoid flying through these depicted areas.

Air Traffic Control and the National Airspace System

The primary purpose of the ATC system is to prevent a collision between aircraft operating in the system and to organize and expedite the flow of traffic. In addition to its primary function, the ATC system has the capability to provide (with certain limitations) additional services. The ability to provide additional services is limited by many factors, such as the volume of traffic, frequency congestion, quality of radar, controller workload, higher priority duties, and the pure physical inability to scan and detect those situations that fall in this category. It is recognized that these services cannot be provided in cases in which the provision of services is precluded by the above factors.

Consistent with the aforementioned conditions, controllers shall provide additional service procedures to the extent permitted by higher priority duties and other circumstances. The provision of additional services is not optional on the part of the controller, but rather is required when the work situation permits. Provide ATC service in accordance with the procedures and minima in this order except when:

1. A deviation is necessary to conform to ICAO Documents, National Rules of the Air, or special agreements where the United States provides ATC service in airspace outside the country and its possessions
2. Other procedures/minima are prescribed in a letter of agreement, FAA directive, or a military document
3. A deviation is necessary to assist an aircraft when an emergency has been declared

Coordinating the Use of Airspace

ATC is responsible for ensuring that the necessary coordination has been accomplished before allowing an aircraft under their control to enter another controller's area of jurisdiction.

Before issuing control instructions directly or relaying through another source to an aircraft that is within another controller's area of jurisdiction that will change that aircraft's heading, route, speed, or altitude, ATC ensures that coordination has been accomplished with each of the controllers listed below whose area of jurisdiction is affected by those instructions unless otherwise specified by a letter of agreement or a facility directive:

1. The controller within whose area of jurisdiction the control instructions are issued
2. The controller receiving the transfer of control
3. Any intervening controller(s) through whose area of jurisdiction the aircraft will pass

If ATC issues control instructions to an aircraft through a source other than another controller (e.g., Aeronautical Radio, Incorporated (ARINC), FSS, another pilot), they ensure that the necessary coordination has been accomplished with any controllers listed above, whose area of jurisdiction is affected by those instructions unless otherwise specified by a letter of agreement or a facility directive.

Operating in the Various Types of Airspace

It is important that pilots be familiar with the operational requirements for each of the various types or classes of airspace. Subsequent sections cover each class in sufficient detail to facilitate understanding regarding weather, type of pilot certificate held, and equipment required.

Basic VFR Weather Minimums

No pilot may operate an aircraft under basic VFR when the flight visibility is less, or at a distance from clouds that is less, than that prescribed for the corresponding altitude and class of airspace. *[Figure 15-8]* Except as provided in 14 CFR part 91, section 91.157, "Special VFR Weather Minimums,"

Basic VFR Weather Minimums				
Airspace			Flight Visibility	Distance from Clouds
Class A			Not applicable	Not applicable
Class B			3 statute miles	Clear of clouds
Class C			3 statute miles	1,000 feet above 500 feet below 2,000 feet horizontal
Class D			3 statute miles	1,000 feet above 500 feet below 2,000 feet horizontal
Class E	At or above 10,000 feet MSL		5 statute miles	1,000 feet above 1,000 feet below 1 statute mile horizontal
	Less than 10,000 feet MSL		3 statute miles	1,000 feet above 500 feet below 2,000 feet horizontal
Class G	1,200 feet or less above the surface (regardless of MSL altitude).	Day, except as provided in section 91.155(b)	1 statute mile	Clear of clouds
		Night, except as provided in section 91.155(b)	3 statute miles	1,000 feet above 500 feet below 2,000 feet horizontal
	More than 1,200 feet above the surface but less than 10,000 feet MSL.	Day	1 statute mile	1,000 feet above 500 feet below 2,000 feet horizontal
		Night	3 statute miles	1,000 feet above 500 feet below 2,000 feet horizontal
	More than 1,200 feet above the surface and at or above 10,000 feet MSL.		5 statute miles	1,000 feet above 1,000 feet below 1 statute mile horizontal

Figure 15-8. *Visual flight rule weather minimums.*

no person may operate an aircraft beneath the ceiling under VFR within the lateral boundaries of controlled airspace designated to the surface for an airport when the ceiling is less than 1,000 feet. Additional information can be found in 14 CFR part 91, section 91.155(c).

Operating Rules and Pilot/Equipment Requirements

The safety of flight is a top priority of all pilots and the responsibilities associated with operating an aircraft should always be taken seriously. The air traffic system maintains a high degree of safety and efficiency with strict regulatory oversight of the FAA. Pilots fly in accordance with regulations that have served the United States well, as evidenced by the fact that the country has the safest aviation system in the world.

All aircraft operating in today's National Airspace System (NAS) has complied with the CFR governing its certification and maintenance; all pilots operating today have completed rigorous pilot certification training and testing. Of equal importance is the proper execution of preflight planning, aeronautical decision-making (ADM) and risk management. ADM involves a systematic approach to risk assessment and stress management in aviation, illustrates how personal attitudes can influence decision-making, and how those attitudes can be modified to enhance safety in the flight deck. More detailed information regarding ADM and risk mitigation can be found in Chapter 2, "Aeronautical Decision-Making."

Pilots also comply with very strict FAA general operating and flight rules as outlined in the CFR, including the FAA's important "see and avoid" mandate. These regulations provide the historical foundation of the FAA regulations governing the aviation system and the individual classes of airspace. *Figure 15-9* lists the operational and equipment requirements for these various classes of airspace. It is helpful to refer to this figure as the specific classes are discussed in greater detail.

Class A

Pilots operating an aircraft in Class A airspace must conduct that operation under IFR and only under an ATC clearance received prior to entering the airspace. Unless otherwise authorized by ATC, each aircraft operating in Class A airspace must be equipped with a two-way radio capable of communicating with ATC on a frequency assigned by ATC. Unless otherwise authorized by ATC, all aircraft within Class A airspace must be equipped with the appropriate transponder equipment meeting all applicable specifications found in 14 CFR part 91, section 91.215. Additionally, beginning January 1, 2020, aircraft operating in the Class A airspace described in 14 CFR part 91, section 91.225, must have ADS-B Out equipment installed, which meets the performance requirements of 14 CFR part 91, section 91.227.

Class B

All pilots operating an aircraft within a Class B airspace area must receive an ATC clearance from the ATC facility having jurisdiction for that area. The pilot in command (PIC) may not take off or land an aircraft at an airport within a Class B airspace unless he or she has met one of the following requirements:

1. A private pilot certificate
2. A recreational pilot certificate and all requirements contained within 14 CFR part 61, section 61.101(d), or the requirements for a student pilot seeking a recreational pilot certificate in 14 CFR part 61, section 61.94.
3. A sport pilot certificate and all requirements contained within 14 CFR part 61, section 61.325, or the requirements for a student pilot seeking a recreational pilot certificate in 14 CFR part 61, section 61.94, or the aircraft is operated by a student pilot who has met the requirements of 14 CFR part 61, sections 61.94 and 61.95, as applicable.

Unless otherwise authorized by ATC, all aircraft within Class B airspace must be equipped with the applicable operating transponder and automatic altitude reporting equipment specified in 14 CFR part 91, section 91.215(a) and an operable two-way radio capable of communications with ATC on appropriate frequencies for that Class B airspace area. Additionally, beginning January 1, 2020, aircraft operating in the Class B airspace described in 14 CFR part 91, section 91.225, must have ADS-B Out equipment installed, which meets the performance requirements of 14 CFR part 91, section 91.227.

Class C

For the purpose of this section, the primary airport is the airport for which the Class C airspace area is designated. A satellite airport is any other airport within the Class C airspace area. No pilot may take off or land an aircraft at a satellite airport within a Class C airspace area except in compliance with FAA arrival and departure traffic patterns.

Two-way radio communications must be established and maintained with the ATC facility providing air traffic services

Class Airspace	Entry Requirements	Equipment*	Minimum Pilot Certificate
Class A	ATC clearance	IFR equipped	Instrument rating
Class B	ATC clearance	Two-way radio, transponder with altitude reporting capability	Private—(However, a student or recreational pilot may operate at other than the primary airport if seeking private pilot certification and if regulatory requirements are met.)
Class C	Two-way radio communications prior to entry	Two-way radio, transponder with altitude reporting capability	No specific requirement
Class D	Two-way radio communications prior to entry	Two-way radio	No specific requirement
Class E	None for VFR	No specific requirement	No specific requirement
Class G	None	No specific requirement	No specific requirement

*Beginning January 1, 2020, ADS-B Out equipment may be required in accordance with 14 CFR part 91, section 91.225.

Figure 15-9. *Requirements for airspace operations.*

prior to entering the airspace and thereafter maintained while within the airspace.

A pilot departing from the primary airport or satellite airport with an operating control tower must establish and maintain two-way radio communications with the control tower, and thereafter as instructed by ATC while operating in the Class C airspace area. If departing from a satellite airport without an operating control tower, the pilot must establish and maintain two-way radio communications with the ATC facility having jurisdiction over the Class C airspace area as soon as practicable after departing.

Unless otherwise authorized by the ATC having jurisdiction over the Class C airspace area, all aircraft within Class C airspace must be equipped with the appropriate transponder equipment meeting all applicable specifications found in 14 CFR part 91, section 91.215. Additionally, beginning January 1, 2020, aircraft operating in the Class C airspace described in 14 CFR part 91, section 91.225, must have ADS-B Out equipment installed, which meets the performance requirements of 14 CFR part 91, section 91.227.

Class D

No pilot may take off or land an aircraft at a satellite airport within a Class D airspace area except in compliance with FAA arrival and departure traffic patterns. A pilot departing from the primary airport or satellite airport with an operating control tower must establish and maintain two-way radio communications with the control tower, and thereafter as instructed by ATC while operating in the Class D airspace area. If departing from a satellite airport without an operating control tower, the pilot must establish and maintain two-way radio communications with the ATC facility having jurisdiction over the Class D airspace area as soon as practicable after departing.

Two-way radio communications must be established and maintained with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintained while within the airspace.

If the aircraft radio fails in flight under IFR, the pilot should continue the flight by the route assigned in the last ATC clearance received; or, if being radar vectored, by the direct route from the point of radio failure to the fix, route, or airway specified in the vector clearance. In the absence of an assigned route, the pilot should continue by the route that ATC advised may be expected in a further clearance; or, if a route had not been advised, by the route filed in the flight plan.

If the aircraft radio fails in flight under VFR, the PIC may operate that aircraft and land if weather conditions are at or above basic VFR weather minimums, visual contact with the tower is maintained, and a clearance to land is received.

Class E

Unless otherwise required by 14 CFR part 93 or unless otherwise authorized or required by the ATC facility having jurisdiction over the Class E airspace area, each pilot operating an aircraft on or in the vicinity of an airport in a Class E airspace area must comply with the requirements of Class G airspace. Each pilot must also comply with any traffic patterns established for that airport in 14 CFR part 93.

Unless otherwise authorized or required by ATC, no person may operate an aircraft to, from, through, or on an airport having an operational control tower unless two-way radio communications are maintained between that aircraft and the control tower. Communications must be established within four nautical miles from the airport, up to and including 2,500 feet AGL. However, if the aircraft radio fails in flight, the PIC may operate that aircraft and land if weather conditions are at or above basic VFR weather minimums, visual contact with the tower is maintained, and a clearance to land is received.

If the aircraft radio fails in flight under IFR, the pilot should continue the flight by the route assigned in the last ATC clearance received; or, if being radar vectored, by the direct route from the point of radio failure to the fix, route, or airway specified in the vector clearance. In the absence of an assigned route, the pilot should continue by the route that ATC advised may be expected in a further clearance; or, if a route had not been advised, by the route filed in the flight plan. Additionally, beginning January 1, 2020, aircraft operating in the Class E airspace described in 14 CFR part 91, section 91.225, must have ADS-B Out equipment installed, which meets the performance requirements of 14 CFR part 91, section 91.227.

Class G

When approaching to land at an airport without an operating control tower in Class G airspace:

1. Each pilot of an airplane must make all turns of that airplane to the left unless the airport displays approved light signals or visual markings indicating that turns should be made to the right, in which case the pilot must make all turns to the right.
2. Each pilot of a helicopter or a powered parachute must avoid the flow of fixed-wing aircraft.

Unless otherwise authorized or required by ATC, no person may operate an aircraft to, from, through, or on an airport having an operational control tower unless two-way radio communications are maintained between that aircraft and the control tower. Communications must be established within four nautical miles from the airport, up to and including 2,500 feet AGL. However, if the aircraft radio fails in flight, the PIC may operate that aircraft and land if weather conditions are at or above basic VFR weather minimums, visual contact with the tower is maintained, and a clearance to land is received.

If the aircraft radio fails in flight under IFR, the pilot should continue the flight by the route assigned in the last ATC clearance received; or, if being radar vectored, by the direct route from the point of radio failure to the fix, route, or airway specified in the vector clearance. In the absence of an assigned route, the pilot should continue by the route that ATC advised may be expected in a further clearance; or, if a route had not been advised, by the route filed in the flight plan.

Uncontrolled Airspace

It is possible for some airports within Class G airspace to have a control tower (Lake City, FL, for example). Be sure to check the Chart Supplement U.S. (formerly Airport/Facility Directory) to be familiar with the airport and associated airspace prior to flight.

Ultralight Vehicles

No person may operate an ultralight vehicle within Class A, Class B, Class C, or Class D airspace or within the lateral boundaries of the surface area of Class E airspace designated for an airport unless that person has prior authorization from the ATC facility having jurisdiction over that airspace. (See 14 CFR part 103.)

Unmanned Free Balloons

Unless otherwise authorized by ATC, no person may operate an unmanned free balloon below 2,000 feet above the surface within the lateral boundaries of Class B, Class C, Class D, or Class E airspace designated for an airport. (See 14 CFR part 101.)

Unmanned Aircraft Systems

Regulations regarding unmanned aircraft systems (UAS) are currently being developed and are expected to be published by summer 2016 as 14 CFR part 107.

Parachute Jumps

No person may make a parachute jump, and no PIC may allow a parachute jump to be made from an aircraft, in or into Class A, Class B, Class C, or Class D airspace without, or in violation of, the terms of an ATC authorization issued by the ATC facility having jurisdiction over the airspace. (See 14 CFR part 105.)

Chapter Summary

This chapter introduces the various classifications of airspace and provides information on the requirements to operate in such airspace. For further information, consult the AIM and 14 CFR parts 71, 73, and 91.

Appendix G

Final Noise Report for DAFB (2020)

FINAL

Noise Report Update for Civil Air Terminal Expansion at Dover Air Force Base, Delaware Reflecting the Proposed Regional Aircraft Scenario for a Fixed-Base Operator

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August 2020

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ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AICUZ	Air Installation Compatible Use Zone
ANSI	American National Standards Institute
ASA	Acoustical Society of America
dB	Decibel(s)
dBA	A-weighted decibel(s)
CAT	Civil Air Terminal
DelDOT	Delaware Department of Transportation
DNL	day-night average sound level
EA	Environmental Assessment
FAA	Federal Aviation Administration
HVAC	heating, ventilation, and air conditioning
Hz	hertz
LBS	pounds
L_{max}	maximum sound level
NC	core engine speed
NF	fan speed
RPM	revolutions per minute
SEL	sound exposure level
UPS	United Parcel Service

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SECTION 1. OVERVIEW

1.1 OBJECTIVE

This study supports an environmental assessment of increased Civil Air Terminal (CAT) operations at Dover Air Force Base (AFB). The objective is to determine whether significant environmental impacts would result from implementation of the Proposed Action. Because the future user(s) of the proposed CAT are not known at this time, a hypothetical use scenario was developed based on operations at other airports in the region. The operational scenario modeled in this Noise Report reflects updates made in 2020, and differs from a previous CAT Noise Report published in 2019. If actual CAT user(s) turn out to be substantively different from the modeled operations, then supplemental environmental noise impacts analysis could be appropriate.

1.2 SCENARIOS MODELED

Three scenarios were developed to describe ongoing and potential future operations at Dover AFB:

- **Current.** The 'Current' scenario reflects baseline operations and noise conditions. The scenario includes flight and static engine run operations by both military and civilian aircraft as documented in the 2016 Final Environmental Assessment (EA) for Flight Operations at Dover AFB. It includes approximately 44,000 military/transient aircraft operations per year. The aircraft operations that are included in the 'Current' scenario are also included unchanged in the 'Approved' and 'Future' scenarios described below.
- **Approved.** This scenario reflects total civilian operations increasing to 13,500 per year, which is the number of operations approved under the current Joint Use Agreement. This scenario corresponds to Alternative 1 - No-Build, as described in the Draft Civil Air Terminal EA.
- **Future.** The aircraft type mix and corresponding number of aircraft per type reflects the implementation of a new Joint Use Agreement that would permit 25,000 civilian aircraft operations per year. Under this scenario, CAT operations would scale up such that the total annual civilian operations would equal 25,000. This scenario corresponds to Alternative 3, as described in the Draft Civil Air Terminal EA, and listed in Table 2.1 within this report.

1.3 NOISE CONCEPTS

Noise is considered unwanted sound that interferes with normal activities or otherwise diminishes the quality of the environment. Responses to noise vary widely according to the characteristics of the sound source, the time of day, the distance between the noise source and the person hearing the sound, and the sensitivity and expectations of the person hearing the sound. This section will discuss noise as it relates to human health and welfare, as well as the potential for noise to affect structures.

Sound intensity varies widely (e.g., from a soft whisper to a jet engine), and it is measured on a logarithmic scale to accommodate this wide range. The logarithm is a mathematical tool used to simplify dealing with very large and very small numbers. For example, the logarithm of the number 1,000,000 is 6, and the logarithm of the number 0.000001 is −6.

The frequency (or pitch) of sound is measured in cycles per second, or hertz (Hz). This measurement reflects the number of times per second the air vibrates from the acoustic energy. Low-frequency sounds are heard as rumbles or roars, and high-frequency sounds are heard as screeches.

The communication of sound intensity is refined to account for frequency through the use of "A-weighting." The normal human ear can detect sounds that range in frequency from approximately 20 to 20,000 Hz. However, not all sounds in this range are heard equally well. Therefore, through internal electronic circuitry, some sound meters are calibrated to emphasize frequencies in the 1,000 to 4,000 Hz range and de-emphasize sound energy in other frequencies. The human ear is most sensitive to frequencies in this range, and sounds measured with these instruments are termed "A-weighted." For purposes of this document, decibel (dB) levels provided are A-weighted and provided in A-weighted decibels (dBA) unless otherwise noted. Examples of typical dBA of common sounds are shown on Figure 1-1.

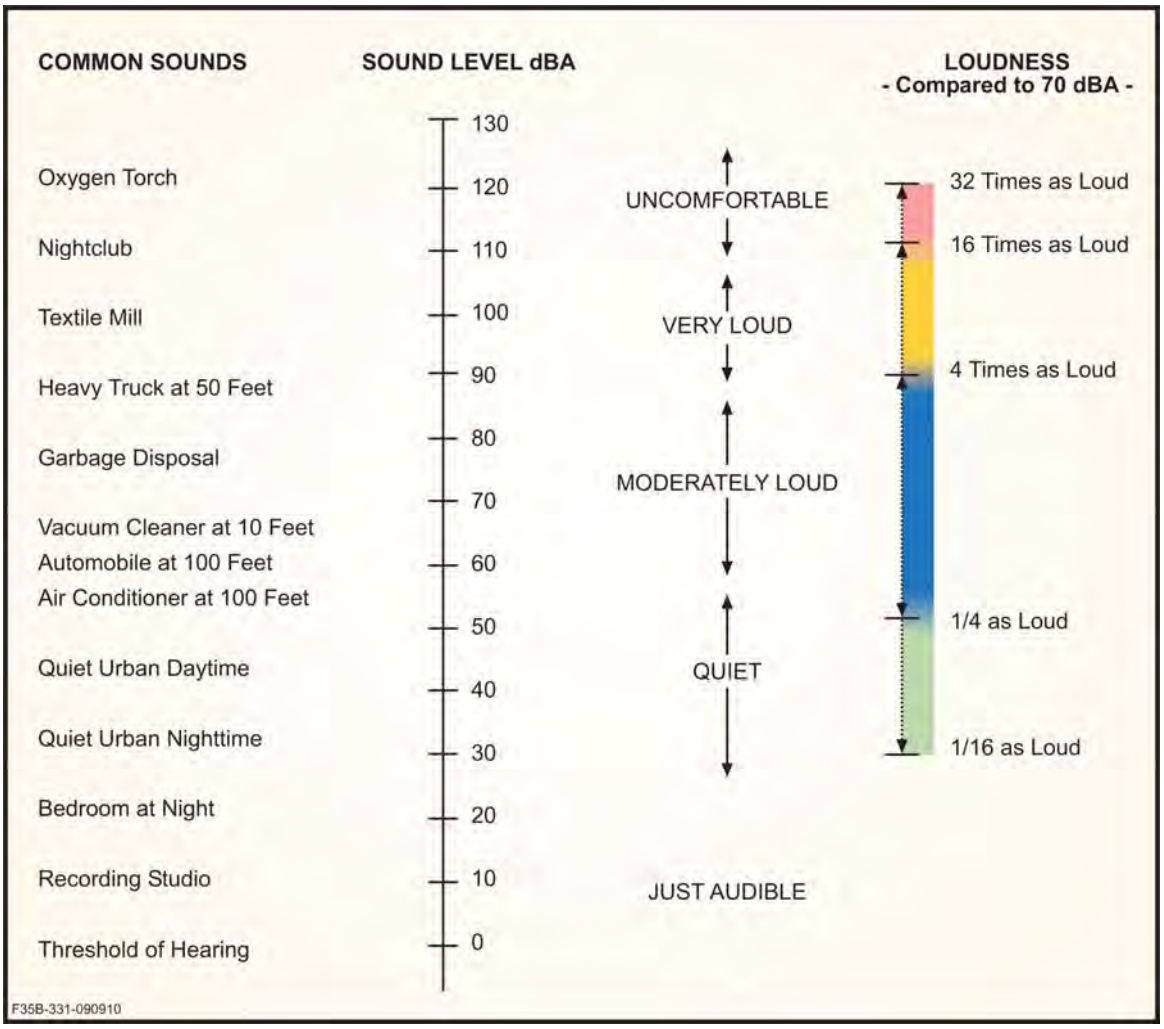

Figure 1-1. Typical A-Weighted Levels of Common Sounds

The word "metric" is used to describe a standard of measurement. As used in environmental noise analysis, there are many different types of noise metrics. Each metric has a different physical meaning and was developed by researchers attempting to represent a particular set of noise effects. The metrics supporting the assessment of noise from aircraft operations and other activities evaluated in this document are the maximum sound level (L_{max}), sound exposure level (SEL), and day-night average sound level (DNL).

Maximum Sound Level (L_{max}). The L_{max} is the highest sound level measured during a noise event which is typically logged in 1/8-second intervals during aircraft noise level measurements. In many

situations, noise levels vary over time for one reason or another. In the case of an aircraft overflight, the noise level varies as the aircraft moves closer to or farther away from the observer on the ground. L_{max} is a useful metric for judging a noise event's interference with conversation and other common activities.

Sound Exposure Level (SEL). The SEL compresses the total sound energy of an overflight event into a single second reflecting both the intensity and duration of the noise event. For noise events lasting more than one second, the SEL will be higher than the L_{max}.

Day-Night Average Sound Level (DNL). The DNL metric sums individual A-weighted noise events and averages the acoustic energy over a 24-hour period. Thus, it is a composite metric that considers the maximum noise levels, the duration of the events, the number of events that occur, and the time of day during which they occur. This metric adds 10 dB to those events that occur between 10:00 P.M. and 7:00 A.M. to account for the increased intrusiveness of noise events that occur at night when ambient noise levels are normally lower than during the daytime.

Ignoring the acoustic nighttime penalty, DNL may be thought of as the continuous or cumulative A-weighted sound level that would be present if all of the variations in sound level over the given time period were smoothed out so as to contain the same total sound energy. It is fully recognized that the DNL metric does not provide specific information on the number of noise events or the specific individual sound levels that occur. For example, a DNL of 65 dB could result from a few very noisy events or a large number of quieter events.

Although it does not represent the sound level heard at any one particular time, DNL does accurately represent the total sound exposure at a location. Social surveys have found the DNL metric to be the best predictor of community annoyance resulting from transportation noise. Its use is endorsed by the scientific community and several governmental agencies (U.S. Environmental Protection Agency, 1974; Federal Interagency Committee on Urban Noise, 1980; Federal Interagency Committee on Noise, 1992).

1.4 NOISE LEVEL CALCULATION METHOD

The computer program NoiseMap, version 7.3, was used to calculate noise levels under the three scenarios described in Section 1.2. This model accepts inputs related to aircraft flight paths, altitudes, engine power settings, and airspeeds as well as inputs related to static engine runs conducted on the ground. The model references a database, known as NoiseFile, containing measured flyover and static engine run noise levels measured for various aircraft types in several configurations. Several factors, including atmospheric conditions, terrain, and ground impedance, are considered in the calculation of noise levels received at various points of interest.

Computer noise modeling allows informed decision-making without actually exposing people to the noise associated with the proposed action. The alternative to noise modeling would be to begin the action in question - potentially requiring construction and other preparatory actions - and then conduct field measurements of noise levels to assess impacts. If impacts were found to be excessive, then all of the preparatory actions that had been taken would need to be reversed, very likely at great expense.

Computer aircraft noise modeling to assess community impacts has been being conducted since the 1970s, and the capabilities of the noise models have increased in the intervening years. Most relevant is Noisemap's ability to calculate a wider variety of supplemental metrics (i.e., characterizations of noise level other than the primary metric DNL). Supplemental metrics provide a more complete

picture of noise levels than is provided by DNL alone. In this document, results are compared between the three operational scenarios for sleep disturbance and speech interference.

As mentioned in Section 1.1, the objective of this study is to provide a conservative estimate of possible impacts. Four aircraft were selected to represent aircraft types that would be expected to use the CAT. The number of operations conducted at several other airports in the region by various aircraft types was considered in developing the aircraft operations mix scenario.

The details of the modeled CAT operations scenario were developed in coordination with the Delaware Department of Transportation (DelDOT). Noise modeling parameters were sent for review by the Air Force Civil Engineer Center/CZN and review was completed on April 20, 2020. The approved modeling parameters include frequency of operations (Section 2 of this Noise Report), flight paths (Section 3), flight profiles (Section 4), and static engine runs (Section 5). The effects of atmospheric conditions and terrain were also considered in the noise modeling (Section 6). Noise modeling results are described in Section 7 of this Noise Report.

1.5 NOISE IMPACTS ASSESSMENT METHOD

The most common impact associated with exposure to elevated noise levels is public annoyance. Annoyance due to aircraft noise can be predicted based on the noise metric DNL (Schultz, 1978; Finegold, 1994). When subjected to DNL of 65 dB, approximately 12 percent of persons exposed will be "highly annoyed" by the noise. At levels below 55 dB, the percentage of annoyance is correspondingly lower (less than 3 percent). The percentage of people annoyed by noise never drops to zero (some people are always annoyed), but at levels below 55 dB, noise is reduced enough to be essentially negligible. Based on numerous sociological surveys and recommendations of Federal interagency councils, the most common benchmark referred to is 65 dB DNL. This threshold is often used to determine residential land use compatibility around airports, highways, or other transportation corridors.

The U.S. Air Force considers "significance" of noise impacts in the context of the National Environmental Policy Act in terms of context and intensity, and has not defined uniformly applicable significance thresholds. The Federal Aviation Administration (FAA), on the other hand, defines a threshold for "significant" noise impacts in FAA Order 1050.1F as any increase relative to the No Action Alternative in noise level at a noise-sensitive areas that is exposed to greater than or equal to 65 dB DNL of greater than 1.5 dB DNL. The FAA also establishes thresholds for "reportable" impacts if a noise sensitive area experiences a 3 dB increase and the end-state is between 60 and 65 dB DNL or if a noise sensitive area experiences a 5 dB increase and the end-state is between 45 and 60 dB DNL. If "reportable" impacts would be associated with a proposed action, other factors must be considered in determining whether a significant impact would occur.

The likelihood of sleep disturbance by aircraft noise depends on a host of situational factors, including depth of sleep, previous exposure to aircraft noise, familiarity with the surroundings, and the physiological and psychological condition of the sleeper. In 1997, the Federal Interagency Committee on Aircraft Noise published a revised relationship between SEL and sleep disturbance (U.S. Air Force Research Laboratory, 1997). This relationship, which predicts the maximum percentage of people awakened by sounds that are new to an area, predicts that about 16 percent of sleepers would be disturbed by a 96 dB SEL noise event. A typical residential structure provides approximately 15 dB outdoor-to-indoor noise level reduction with windows open and 25 dB reduction with windows closed. An overflight generating 96 dB SEL outdoors could generate roughly 76 dB SEL indoors and would be expected to result in 8 percent of sleepers being awakened. The percentage of sleepers disturbed decreases substantially for persons accustomed to

aircraft noise. In this report, the percentage of people awakened by aircraft noise at least once per night was estimated using the calculation method described in American National Standards Institute (ANSI)/Acoustical Society of America (ASA) Standard 12.9-2008 (Part 6).

Indoor speech interference from flight operations can be annoying to the public. For this analysis, the recommended conservative indoor noise threshold of 50 dBA is used to indicate flight events, which have the potential to interfere, at least momentarily, with speech. The average number of events per hour exceeding 50 dB during 7:00 A.M. to 10:00 P.M. was calculated under each scenario for a person outdoors, indoors with windows open, and indoors with windows closed. When windows are open, the noise reduction from the outside of the house to inside is 15 dB (this depends on house construction and is an average). When windows are closed, the noise reduction from the outside of the house to the inside is 25 dB (this depends on the windows type and is an average for newer construction homes). Thus, to calculate the number of events above 50 dBA indoors with windows open, a 65 dBA threshold is applied (50 dBA plus house reduction of 15 dBA). To calculate the number of events above 50 dBA indoors with windows closed, a 75 dBA threshold is applied (50 dBA plus house and windows reduction of 25 dBA).

A DNL of 75 dB is a threshold above which impacts other than annoyance may occur. While it is well below levels known to damage hearing (Occupational Safety and Health Administration, 1983) it is also a level above which non-auditory health effects cannot be categorically discounted.

Structural impacts caused by subsonic noise are possible only under extreme circumstances (Sutherland, 1989). Normally, the most sensitive components of a structure to airborne noise are the windows and, infrequently, the plastered walls and ceilings. While certain frequencies (such as 30 Hz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than 1 second above a sound level of 130 dB (un-weighted) are potentially damaging to structural components (Committee on Hearing, Bioacoustics and Biomechanics, 1977).

For the purposes of this Noise Report, noise impacts would be considered potentially significant if the FAA thresholds described above were exceeded. The degree of change in probabilities of sleep disturbance and speech interference were also considered in assessment of impacts significance.

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SECTION 2. FREQUENCY OF OPERATIONS

As discussed in Section 1, the Approved, and Future scenarios include 13,500, and 25,000 annual CAT operations, respectively. Table 2-2 lists the number of operations conducted by each aircraft type and percent of operations conducted during acoustic night (10:00 P.M. to 7:00 A.M.) under the Future scenario. The Approved scenario is scaled down relative to the Future scenario in proportion to the number of CAT operations (i.e., 13,500 rather than 25,000). The modeled percentages of CAT operations during acoustic night were based on the operations of similar transient aircraft types as recorded in baseline noise modeling data.

Table 2-1. Operations Per Year (Future Scenario) and Percent of Operations During Acoustic Night (10:00 P.M. to 7:00 A.M.)

Aircraft Types in Aircraft Mix Scenario	Aircraft Type Used in Modeling	Operations Per Year	Departure	Arrival
Boeing 737-300/700 and McDonnell Douglass M80	Boeing 737-300	4,500	50%	35%
Bombardier CL-600/601 Challenger and Dassault Falcon	Bombardier CL-601	11,431	25%	16%
Cessna 500 Citation	Cessna 500 Citation	4,625	22%	11%
Beechcraft 300/350 King Air and Beechcraft 58 Baron	C-12 (Beechcraft KingAir modified for military use)	4,444	22%	11%

Runway usage and flight paths for CAT aircraft, which are listed in Table 2-2 for departures and in Table 2-3 for arrival operations, were based on noise modeling data used in the 2010 Dover Air Installation Compatible Use Zone (AICUZ) study (USAF, 2010). The AICUZ report itself only lists consolidated runway usage percent, and so runway usage values specific to each operation type were taken directly from the AICUZ noise modeling input files. Runway usage was assumed to be limited to Runway 01/19 during acoustic night per direction from DelDOT. Runway 32 is rarely used for departures and Runway 14 is rarely used for approaches because several noise-sensitive land uses (including the state capitol) are located west of the airfield and usage of these runways requires low-altitude overflight of these noise-sensitive land uses. Because the origin and destination of CAT aircraft are not known, an equal percentage of total operations was assigned to flight paths to/from each cardinal direction. CAT aircraft are not expected to fly second approaches to the airfield, and therefore none were modeled.

Table 2-2. Departure Operations Runway and Flight Path Usage

Runway	Percent Usage During Day	Percent Usage During Night	Flight Path Description	Percent
1	35	50	Sea Isle	25
			North via DQO	25
			South or West via SBY (East side)	25
			Toward ENO then turn toward Baltimore	25
14	30	0	Sea Isle	25
			North via DQO	25
			South or West via SBY (East side)	25
			Toward ENO then turn toward Baltimore	25
19	35	50	Sea Isle	25
			North via DQO	25
			South or West via SBY (East side)	25
			Toward ENO then turn toward Baltimore	25
32	0	0	Runway 32 departures rare due to flight restrictions	N/A

Key: N/A – not applicable

Table 2-3. Arrival Operations Runway and Flight Path Usage

Runway Used	Percent During Day	Percent During Night	Flight Path Description	Percent
1	40	57	Instrument approach from South or West	25
			Instrument approach from Sea Isle	25
			Instrument approach from North (East)	25
			Instrument approach from North (West)	25
14	0	0	Arrivals to Runway 14 are rare due to flight restrictions	N/A
19	30	43	Instrument approach from North	25
			Instrument approach from Sea Isle	25
			Instrument approach from South (East)	25
			Instrument approach from South (West)	25
32	30	0	Instrument approach from South	25
			Instrument approach from East	25
			Instrument approach from North	25
			Instrument approach from West	25

Key = N/A – not applicable

SECTION 3. REPRESENTATIVE FLIGHT PATHS

The flight tracks illustrated in this section are flown by military pilots currently operating at Dover AFB. They were developed based on published flying procedures and input from pilots, air traffic control, and other operational points of contact. Members of the operational community updated and validated the tracks as part of analysis supporting the 2016 EA for Flight Operations. The CAT flying operations at Dover AFB would be expected to follow flight paths that are similar to or the same as the flight paths used currently. Flight paths were selected that transit to/from each cardinal direction. Figure 3-1 shows modeled departure flight paths and Figure 3-2 shows modeled approach flight paths from and to each runway. In both maps, color-coding is used to associate each track with a particular runway. All of the approaches modeled are instrument approaches because transient aircrews can be expected to prefer the procedural certainty of instrument approaches to visual approaches. All flight tracks used in noise modeling are representative of actual flight paths, which vary from one flight to the next due to winds and weather, pilot preference, guidance from air traffic control, and other factors.

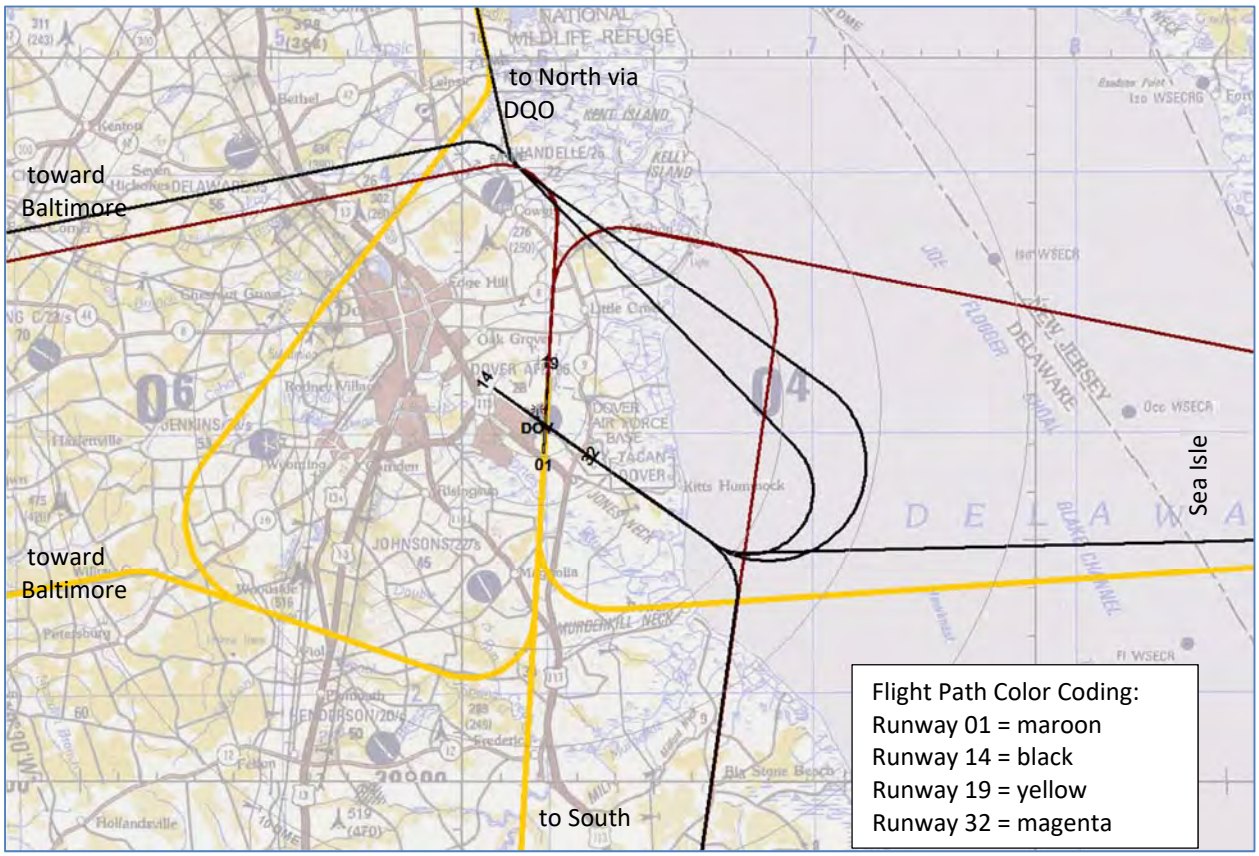

Figure 3-1. Representative Departure Flight Paths

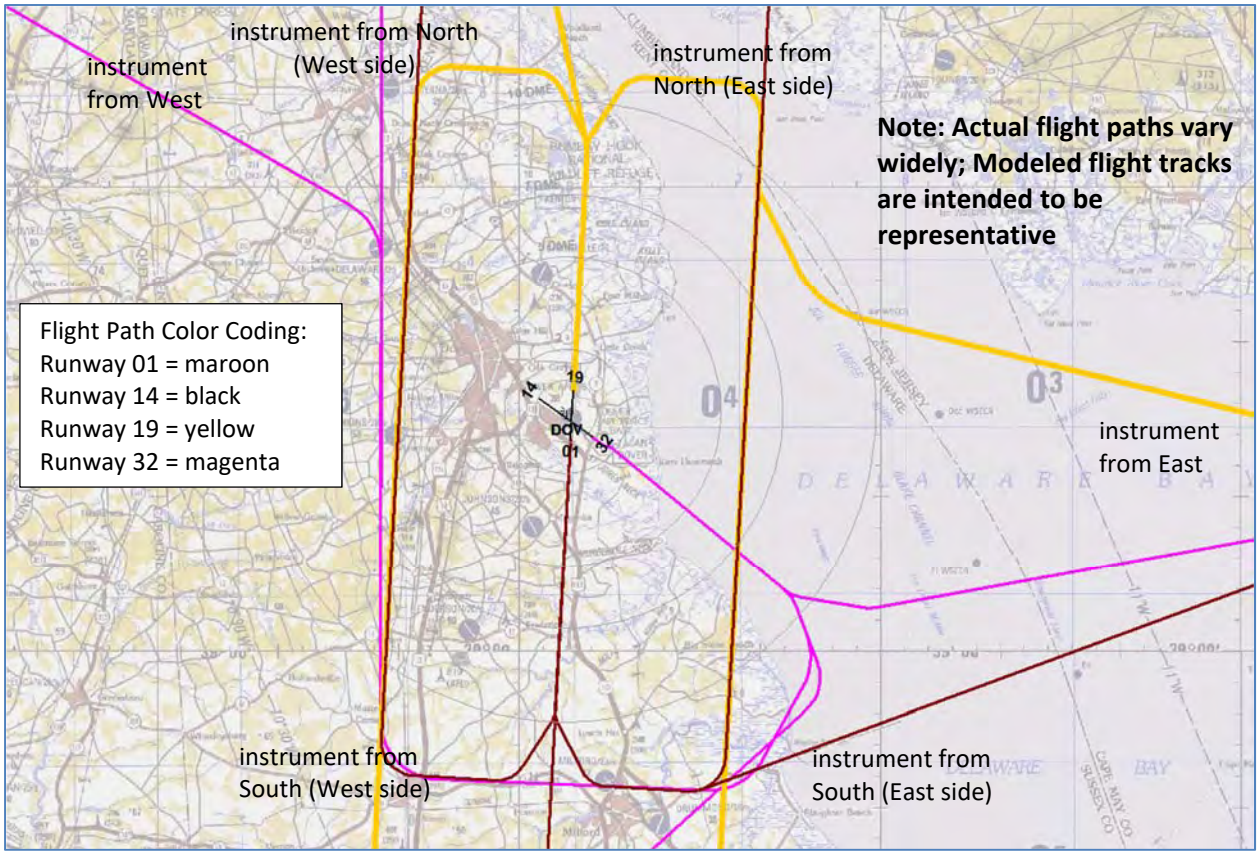

Figure 3-2. Representative Approach Flight Paths

SECTION 4. REPRESENTATIVE FLIGHT PROFILES

Representative Boeing 737-300 altitude, engine power, and airspeed profiles for departures and approaches are shown on Figure 4-1 and Figure 4-2, respectively. Equivalent representative profiles are shown for CL-601, Cessna 500, and Beechcraft KingAir aircraft in Figure 4-3 through 4-8. Because actual profiles vary from one flight to the next depending on factors such as aircraft load, atmospheric conditions (e.g., winds, temperature, humidity, etc.), air traffic control guidance, and pilot preference, all modeled flight paths are 'representative.' Flight profiles for the representative aircraft were based on profiles for the same aircraft type as recorded during previous noise modeling efforts at other installations.

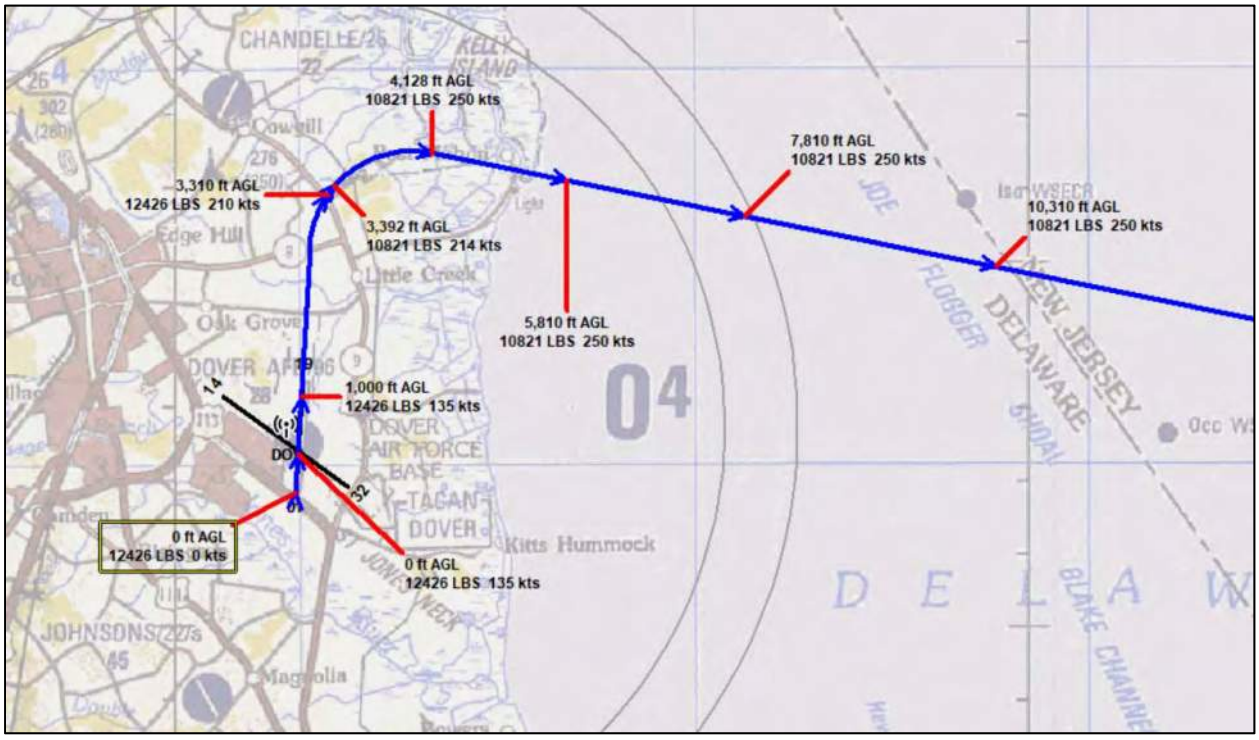

Figure 4-1. Representative Boeing 737-300 Departure Altitude / Engine Power / Airspeed Profiles

Figure 4-2. Representative Boeing 737-300 Approach Altitude / Engine Power / Airspeed Profiles

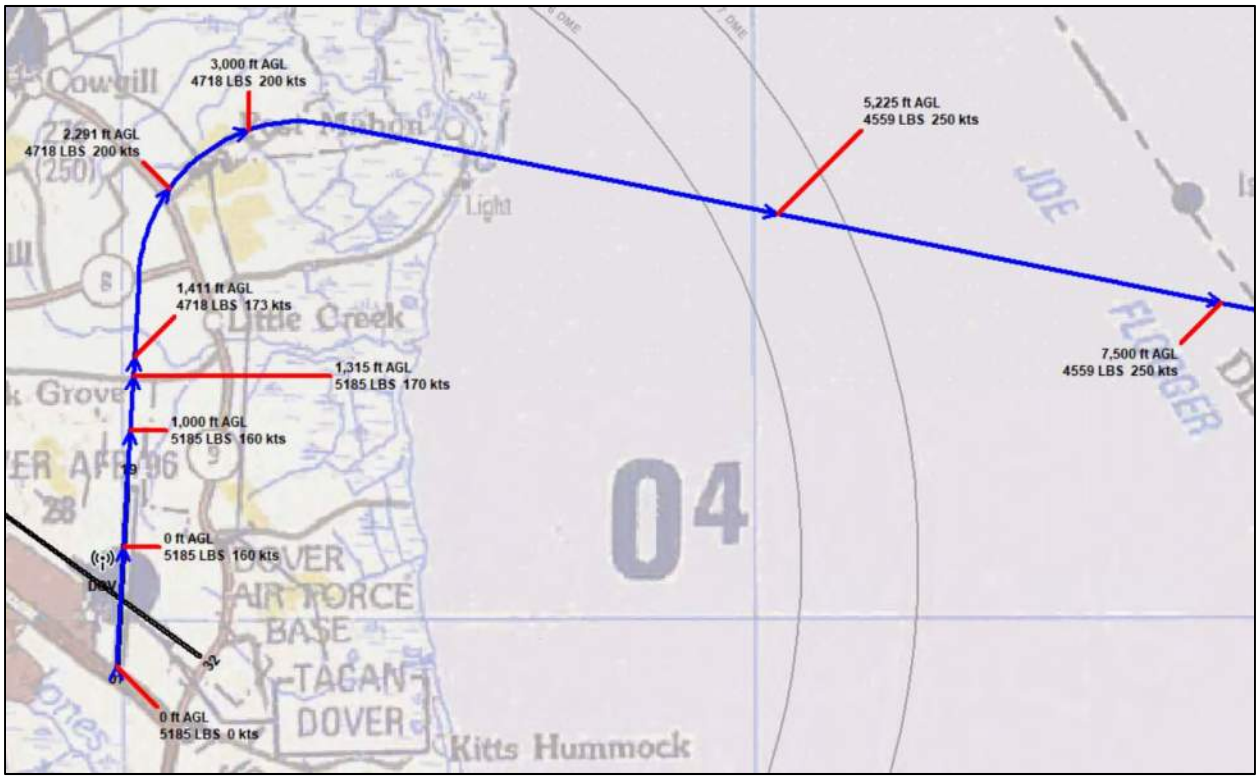

Figure 4-3. Representative CL-601 Departure Altitude / Engine Power / Airspeed Profiles

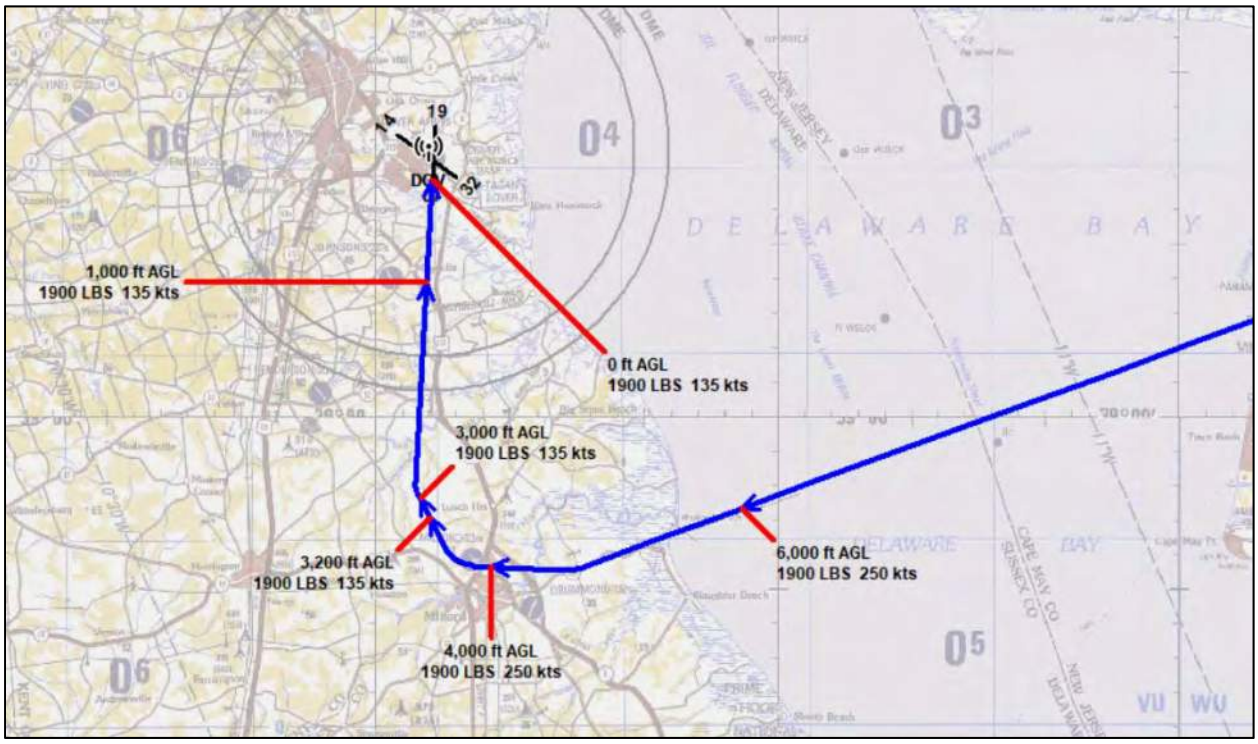

Figure 4-4. Representative CL-601 Approach Altitude / Engine Power / Airspeed Profiles

Figure 4-5. Representative Cessna 500 Departure Altitude / Engine Power / Airspeed Profiles

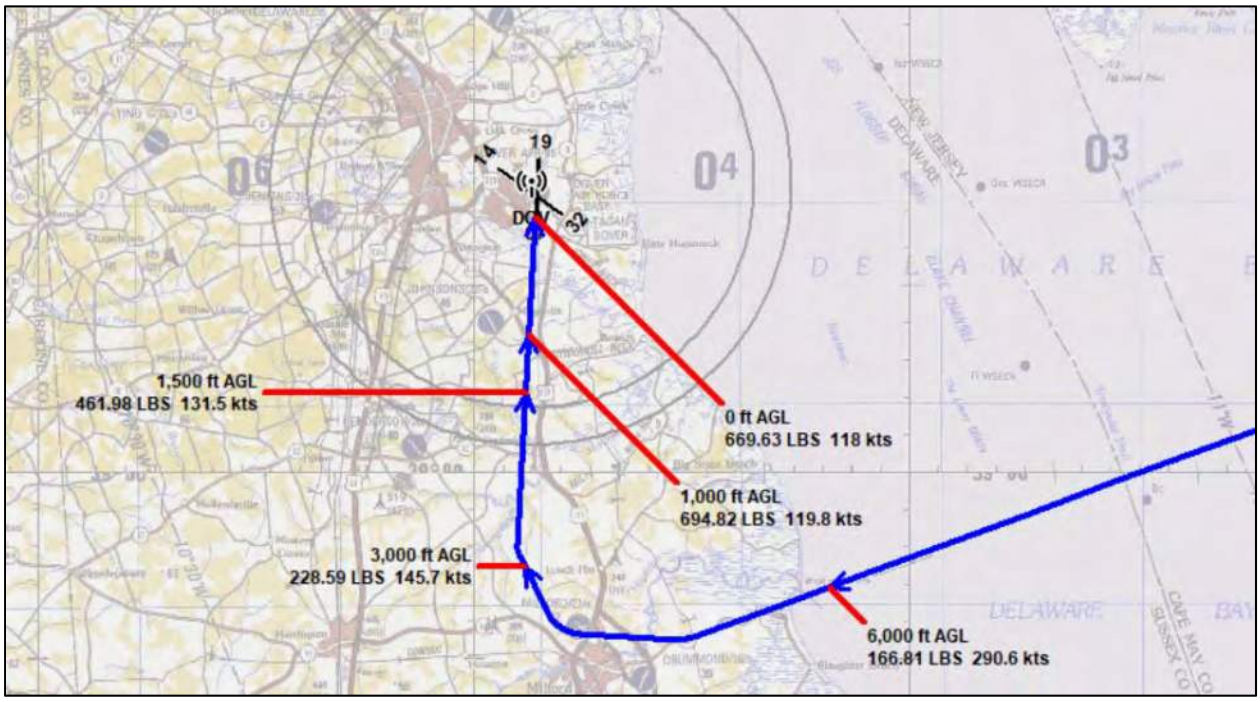

Figure 4-6. Representative Cessna 500 Approach Altitude / Engine Power / Airspeed Profiles

Figure 4-7. Representative Beechcraft KingAir Departure Altitude / Engine Power / Airspeed Profiles

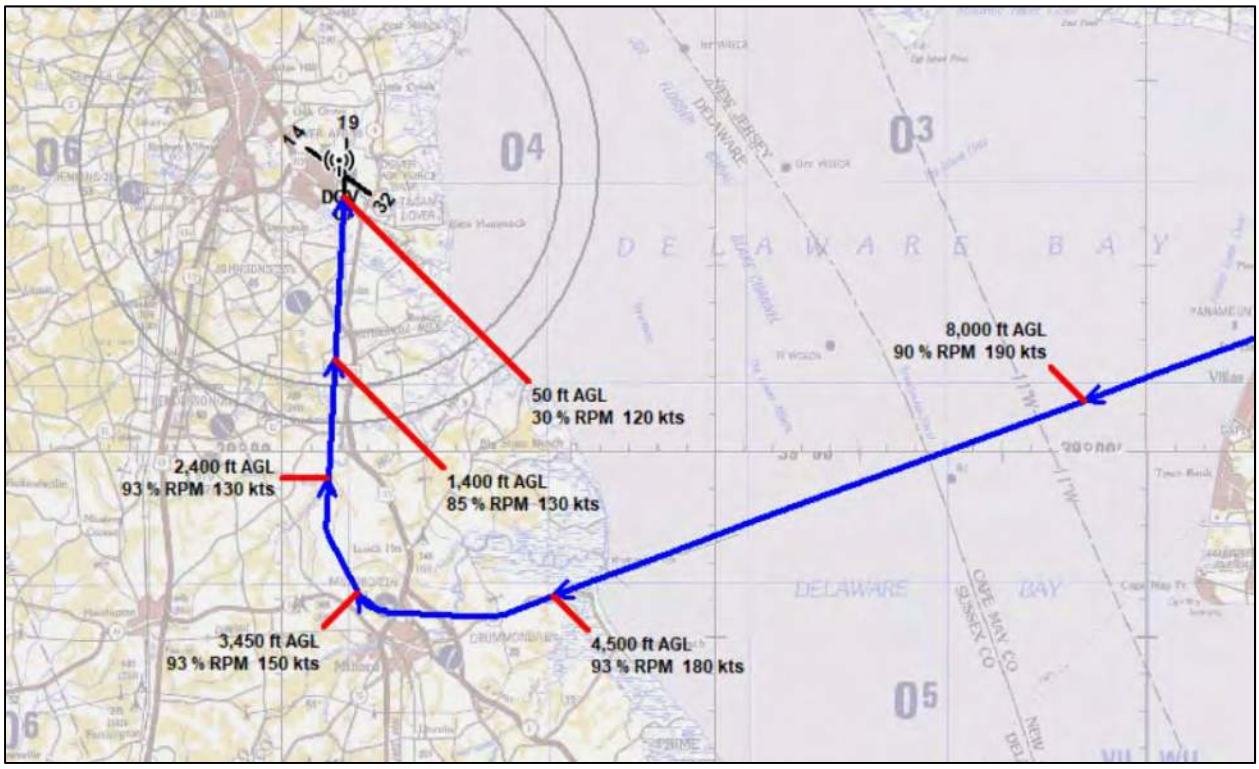

Figure 4-8. Representative Beechcraft KingAir Approach Altitude / Engine Power / Airspeed Profiles

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SECTION 5. STATIC ENGINE RUNS

A static engine run scenario was developed in coordination with DELDOT. Representative locations (see Table 4-1 and Figure 5-1) identify locations where CAT aircraft might park and their orientation (i.e., aircraft noise orientation in degrees from magnetic north). All representative CAT static engine runs were modeled as occurring on the existing CAT apron. As has been mentioned previously, if actual development and/or aircraft operations deviate substantially from modeling parameters, noise impacts could also differ and supplemental analysis may be appropriate. It is worth noting that noise and air emissions static engine run modeling parameters reflect differing degrees of conservatism in representing the hypothetical CAT operations. Noise modeling was conducted using static engine counts provided by DELDOT, as noted previously, while air emissions modeling was conducted reflecting a lower engine testing ops tempo typical for commercial/civilian aircraft based on input from Air Force Civil Engineering Center subject matter experts.

Table 5-1. Representative Static Engine Run Locations

Description	Identification Number	Latitude	Longitude	Orientation (Nose Orientation in Degrees Magnetic)
Civil Air Terminal 1	CAT 1	39° 8'32.17"N	75°28'2.12"W	285
Civil Air Terminal 2	CAT 2	39° 8'29.85"N	75°28'2.15"W	285
Civil Air Terminal 3	CAT 3	39° 8'27.79"N	75°28'2.27"W	285

Figure 5-1. Representative CAT Static Engine Run Locations

As shown in Table 5-2, low-power static engine runs are modeled as occurring prior to each departure (warmup) and following each landing (cooldown) for a total of 3 minutes per sortie. Maintenance-driven static engine runs (1,000 low-power and 750 high-power runs annually) were also modeled and were evenly split between the representative CAT static locations. Most maintenance activity is conducted during daytime hours to minimize noise concerns and for worker convenience, and CAT maintenance activity between 10:00 P.M. and 7:00 A.M. was modeled as being rare. Because the aircraft types selected to represent possible CAT operations were not available in the Noisemap 'static01' database, the aircraft type in the database with the next higher overall thrust was selected for use in static engine run noise modeling. The B-737-300, CL-601, Cessna 500, and Beechcraft KingAir aircraft were represented by the C-17, C-20, T-1, and C-12 aircraft, respectively.

1

Table 5-2. CAT Static Engine Run Profiles

Rep. Aircraft Type	Run Description	Engine Runs Per Year (Future Scenario)	Run Locations	Engine Power			Number of Engines	Duration (minutes)	% Runs During 2200-0700L
				Description	Setting	Units			
Boeing 737-300/700 and McDonnell Douglass M80	Engine run-up before taxi	2250	split among 3 rep. spots	Idle	77	%NC	1	3	50
	Low-Power Runs	180	split among 3 rep. spots	Idle	77	%NC	1	10	0
	High-Power Runs	135	split among 3 rep. spots	Idle	77	%NC	1	10	0
				Mid	92	%NC	1	16	
				Full	95	%NC	1	4	
Bombardier CL-600/601 Challenger and Dassault Falcon	Engine run-up before taxi	5716	split among 3 rep. spots	Idle	500	LBS	1	3	25
	Low-Power Runs	457	split among 3 rep. spots	Idle	500	LBS	1	10	0
	High-Power Runs	343	split among 3 rep. spots	Idle	500	LBS	1	10	0
				Mid	2000	LBS	1	16	
				Full	11400	LBS	1	4	
Cessna 500 Citation	Engine run-up before taxi	2313	split among 3 rep. spots	Idle	31	%NF	1	3	22
	Low-Power Runs	185	split among 3 rep. spots	Idle	31	%NF	1	10	0
	High-Power Runs	139	split among 3 rep. spots	Idle	31	%NF	1	10	0
				Mid	70	%NF	1	16	
				Full	99	%NF	1	4	

Table 5-2. CAT Static Engine Run Profiles (Continued)

Rep. Aircraft Type	Run Description	Engine Runs Per Year (Future Scenario)	Run Locations	Engine Power			Number of Engines	Duration (minutes)	% Runs During 2200-0700L
				Description	Setting	Units			
Beechcraft 300/350 King Air and Beechcraft 58 Baron	Engine run-up before taxi	2222	split among 3 rep. spots	Idle	60	%RPM	1	3	22
	Low-Power Runs	178	split among 3 rep. spots	Idle	60	%RPM	1	10	0
	High-Power Runs	133	split among 3 rep. spots	Idle	60	%RPM	1	10	0
				Mid	70	%RPM	1	16	
				Full	100	%RPM	1	4	

Key: CAT: Civil Air Terminal; LBS = pounds of thrust; NC = core engine speed; NF = fan speed; RPM = revolutions per minute

SECTION 6. ATMOSPHERIC CONDITIONS AND TERRAIN

The effects of atmospheric conditions and terrain were also considered in the noise modeling. Local weather conditions (e.g., temperature, relative humidity, and air pressure) influence how quickly sound is absorbed by the atmosphere as it travels outward from its source. The month with median acoustic atmospheric conditions was February, with an average 36 degrees Fahrenheit, 66 percent relative humidity, and air pressure of 29.9212 inches of mercury (Table 6-1).

Table 6-1. Average Atmospheric Conditions by Month

Month	Temperature	Humidity	Pressure[a]
January	34	68	29.9212
February	36	66	29.9212
March	44	65	29.9212
April	54	65	29.9212
May	63	70	29.9212
June	72	71	29.9212
July	77	72	29.9212
August	75	73	29.9212
September	69	73	29.9212
October	58	70	29.9212
November	48	69	29.9212
December	38	68	29.9212

Note: [a]Atmospheric pressure used in noise modeling is presented for completeness, but in accordance with standard practice, a default value of the average sea level pressure is used.

Terrain effects on noise include the effects of terrain elevation (e.g., hills, valleys) and terrain impedance (i.e., the amount of sound energy absorbed by the surface). Surface elevation data were obtained from the U.S. Geological Survey and were modeled on a 250-foot grid.

In the current version of NoiseMap, ground impedance can take one of two possible values: acoustically hard or acoustically soft. Following standard procedures, all water areas were treated as being acoustically hard and all solid ground (including asphalt, concrete, and vegetation-covered ground) was treated as being acoustically soft. The impedance values for acoustically hard and acoustically soft surfaces are 100,000 and 225 kilopascal seconds per square meter, respectively. Ground impedance data were derived from elevation data and were modeled on a 250-foot grid.

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SECTION 7. RESULTS

7.1 AIRCRAFT NOISE

Noise levels resulting from the three scenarios are shown on Figure 7-1 (Current Scenario), Figure 7-2 (Approved Scenario), (Future Scenario), Figure 7-4 (Approved and Future Scenarios [Northern]), and Figure 7-5 (Approved and Future Scenarios [Southern]) as contours in 5-dB intervals ranging from 65 to 85 dBA DNL. Because hypothetical CAT operations would be expected to follow the same flight paths currently used by aircraft, changes in noise contour and extent would primarily occur on and near the extended runway centerlines in areas already exposed to frequent overflight noise. However, static engine runs are expected to be conducted in areas not currently used for static engine runs. Noise contours resulting from the Approved and Future scenarios expand to include areas on and near the CAT parking apron (located northwest of the intersection of Runway 01 and Runway 19).

Table 7-1 lists the number of acres affected by each contour interval under each scenario. Under the Future scenario, the total number of acres affected by DNL greater than 65 dBA would increase relative to the Approved scenario by 61 acres from 4,200 to 4,261 acres.

Table 7-1. Acres Affected by DNL of 65 dB or Greater Resulting from Each Scenario

Contour Interval (dBA DNL)	Current Scenario	Approved Scenario	Future Scenario	Change from Approved
65-69	2,393	2,420	2,461	41
70-74	1,028	1,046	1,055	9
75-79	536	552	560	8
80-84	173	176	179	3
>=85	6	6	6	0
Total	4,136	4,200	4,261	61

Key: dB = decibel; dBA = A-weighted decibel(s); DNL = day-night average sound level

Several representative points of interest were identified for more in-depth noise analysis (see Figure 1-1 for locations). The locations studied include residences (e.g., residence #1), towns (e.g., Little Creek), historic sites (e.g., Dickinson Mansion), and commercial centers (e.g., Target store). Each type of location has its own set of sensitivities that might not be shared by other types of locations. For example, historic sites, such as the Dickinson Mansion, are used primarily during the day, and are particularly sensitive to loud events that could interfere with speech. Residences are sensitive to daytime events that could interfere with speech and are also sensitive to nighttime noise that could disrupt sleep. For the purposes of this Noise Report, all noise metrics are presented for all representative points of interest. Even though the Target store is not a location where people sleep, sleep disturbance results for the Target store are useful as a proxy for nearby residences where people do sleep.

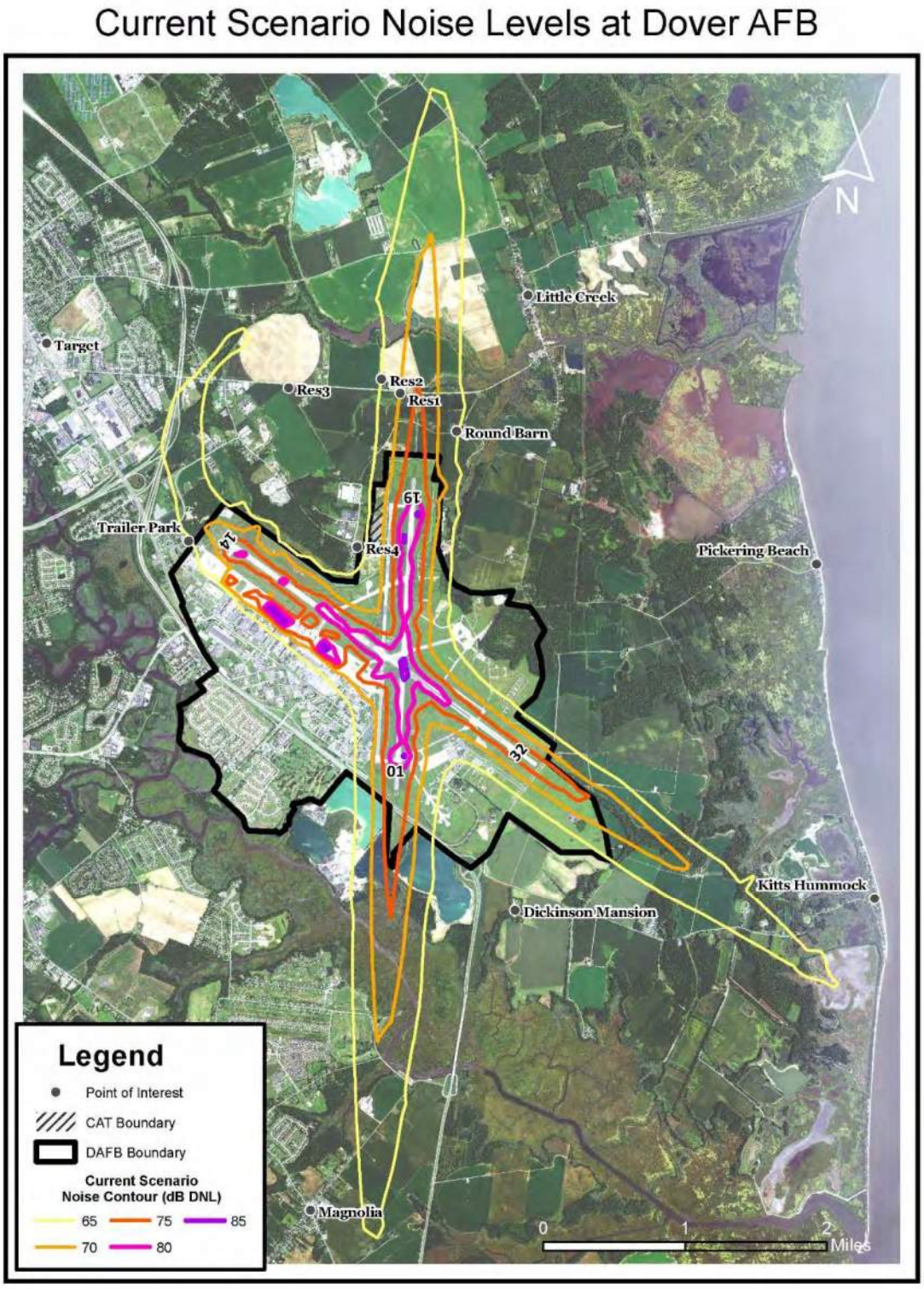

Figure 7-1. DNL Contours Under Current Scenario

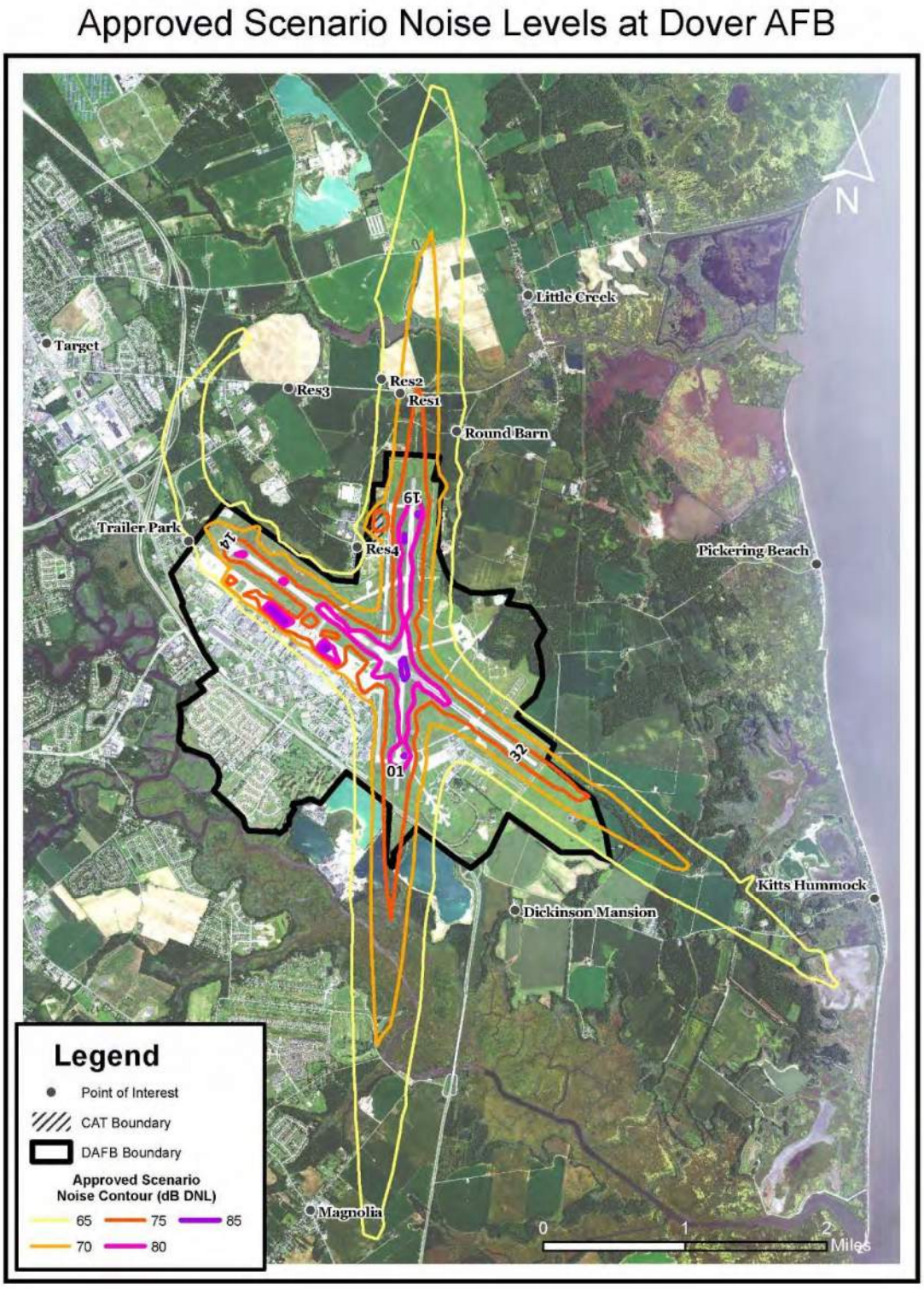

Figure 7-2. DNL Contours Under Approved Scenario

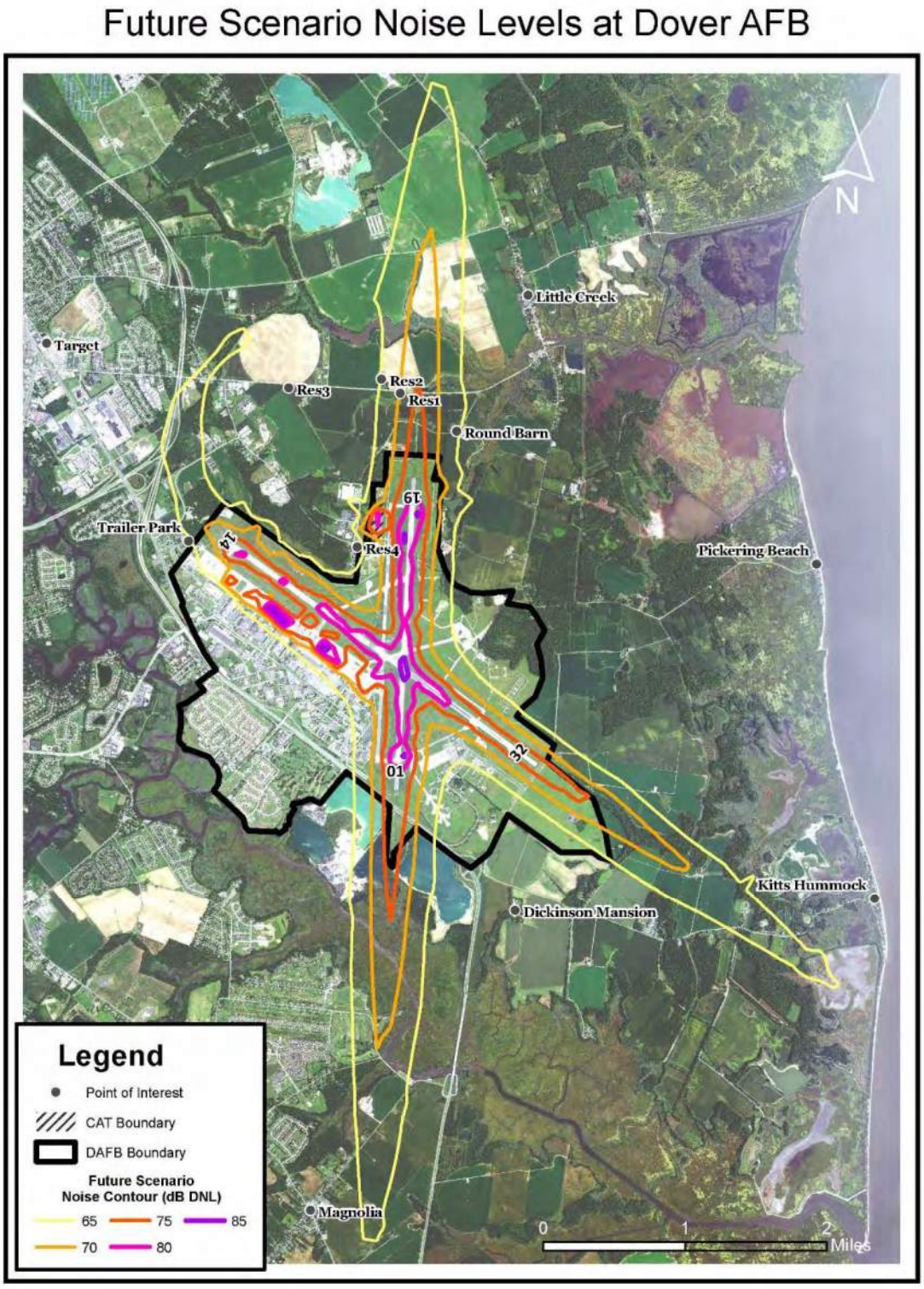

Figure 7-3. DNL Contours Under Future Scenario

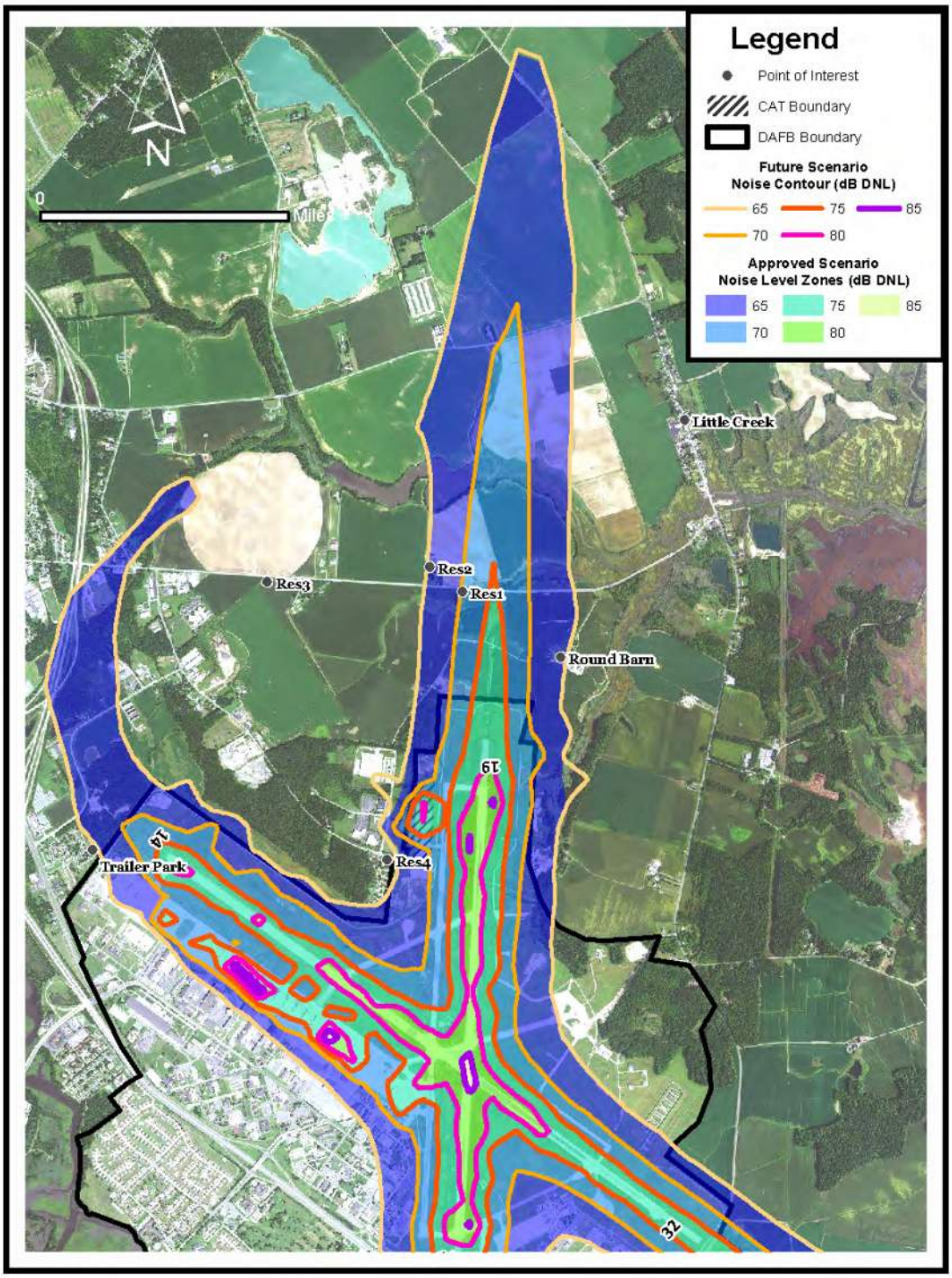

Figure 7-4. DNL Contours Comparing Approved, and Future Scenarios (Northern)

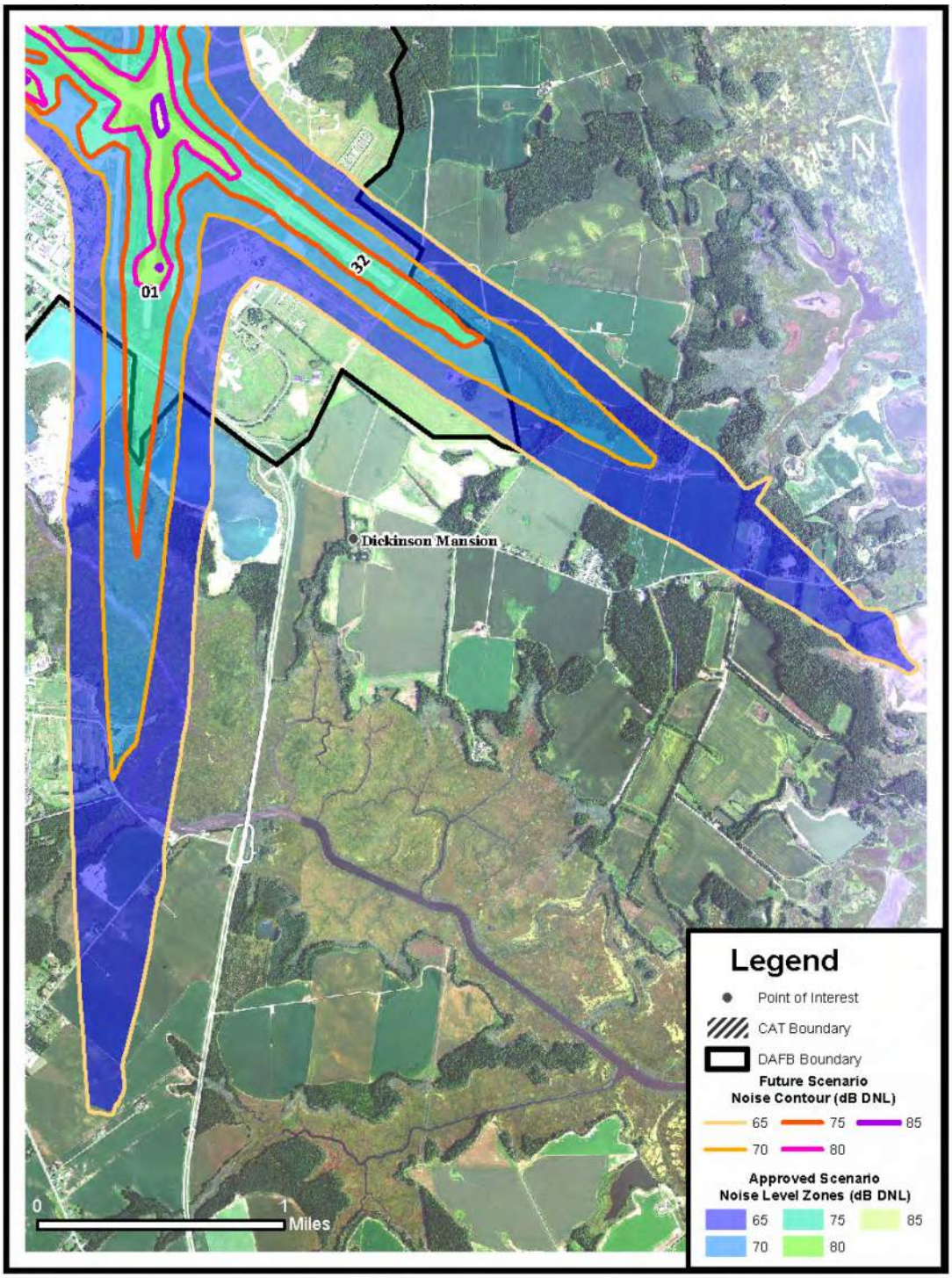

Figure 7-5. DNL Contours Comparing Approved and Future Scenarios (Southern)

DNL at the representative points of interest under each scenario are listed in Table 7-2. Increases in DNL between the Approved and Future scenario do not exceed thresholds described in FAA 1050.1F under any scenario.

Table 7-2. DNL at Points of Interest Under Each Scenario

Representative Points of Interest	Current Scenario	Approved Scenario	Future Scenario	Change from Approved	Exceed FAA thresholds
Bowers Beach	50.2	50.3	50.4	0.1	No
Dickinson Mansion	57.0	57.1	57.2	0.1	No
Kitts Hummock	54.5	54.6	54.6	0.0	No
Little Creek	57.2	57.3	57.5	0.2	No
Magnolia	57.1	57.3	57.5	0.2	No
Pickering Beach	53.2	53.2	53.3	0.1	No
Residence 1 (Res1)	70.0	70.1	70.2	0.1	No
Residence 2 (Res2)	65.0	65.2	65.3	0.1	No
Residence 3 (Res3)	58.1	58.2	58.3	0.1	No
Residence 4 (Res4)	63.5	63.8	64.1	0.3	No
Round Barn	65.4	65.5	65.6	0.1	No
Target (Store)	48.4	48.4	48.5	0.1	No
Trailer Park 1	64.3	64.3	64.3	0.0	No

The operational scenario modeled includes a large fraction of overall CAT aircraft operations being conducted during acoustic night – and these late-night operations could result in an increased potential for sleep disturbance. The probability of being awakened at least once per night by aircraft noise was estimated using the method prescribed by ANSI/ASA S12.9-2008/Part 6. Probabilities were calculated with windows open, reflecting a 15 dBA attenuation provided by the structure, and with windows closed, reflecting a 25 dBA structural attenuation. As shown in Table 7-3, the probability of awakening would increase relative to the Approved scenario by as much as 5 percent under the 'Future' scenario with windows open and by as much as 3 percent under the 'Future' scenario with windows closed. Awakenings could result in an increased likelihood of annoyance and disruption of quality sleep can result in increased tiredness during the day for affected people. The ongoing military mission at Dover AFB currently involves late-night operations. Therefore, most of the people living near the base currently experience nighttime aircraft noise.

Table 7-3. Minimum Probability (Percentage) of Being Awakened per Night by Aircraft Noise Resulting from Each Scenario

Representative Points of Interest	Current Scenario		Approved Scenario		Future Scenario		Change Relative to Approved Under Future	
	Windows Open	Windows Closed	Windows Open	Windows Closed	Windows Open	Windows Closed	Windows Open	Windows Closed
Bowers Beach	7	2	8	2	8	2	0	0
Dickinson Mansion	13	8	17	9	20	10	3	1
Kitts Hummock	11	6	11	6	11	6	0	0
Little Creek	13	8	17	9	20	10	3	1
Magnolia	9	5	13	6	17	7	4	1
Pickering Beach	10	4	10	4	10	4	0	0

Table 7-3. Minimum Probability (Percentage) of Being Awakened per Night by Aircraft Noise Resulting from Each Scenario (Continued)

Representative Points of Interest	Current Scenario		Approved Scenario		Future Scenario		Change Relative to Approved Under Future	
	Windows Open	Windows Closed	Windows Open	Windows Closed	Windows Open	Windows Closed	Windows Open	Windows Closed
Residence 1 (Res1)	19	12	25	16	30	19	5	3
Residence 2 (Res2)	17	11	22	14	27	17	5	3
Residence 3 (Res3)	13	8	17	9	20	10	3	1
Residence 4 (Res4)	18	12	24	14	29	17	5	3
Round Barn	17	11	23	14	28	17	5	3
Target (Store)	8	3	8	3	8	3	0	0
Trailer Park 1	14	8	16	8	18	8	2	0

Notes: Percentage probability of being awakened at least once per night by aircraft noise was estimated using the method prescribed by ANSI/ASA S12.9-2008/Part 6. Probabilities were calculated with windows open, reflecting a 15-dBA attenuation provided by the structure, and with windows closed reflecting a 25-dBA structural attenuation.

Table 7-4 lists the number of events per average daytime hour (i.e., 7:00 A.M. to 10:00 P.M.) that have some potential to disrupt speech (i.e., background sound level exceeds 50 dBA L_{max}). This assessment assumes that voices are not raised when background noise levels increase thereby allowing conversation to continue. Values are presented for people outdoors where no structure is present to block noise, indoors with windows open, and indoors with windows closed. Typical residential structures provide 15 dB noise level reduction with windows open and 25 dB noise level reduction with windows closed. At most of the locations evaluated, the number of events per hour with potential to interfere with speech would not measurably increase. Under the 'Future' scenario, the number of events with potential to interfere with speech would increase relative to the Approved scenario by as much as 1.2 events per hour for people outdoors at Residences #1-4.

Table 7-4. Events With the Potential to Interfere With Speech Resulting from Each Scenario

Representative Points of Interest	Current Scenario			Approved Scenario			Future Scenario			Change Relative to Approved Under Future		
	Outdoor	Open	Closed	Outdoor	Open	Closed	Outdoor	Open	Closed	Outdoor	Open	Closed
Bowers Beach	0.9	0.4	0.0	1.4	0.4	0.0	1.8	0.4	0.0	+0.4	+0	+0
Dickinson Mansion	1.8	0.8	0.1	3.0	0.8	0.1	4.0	0.8	0.1	+1	+0	+0
Kitts Hummock	1.3	0.6	0.2	2.0	0.7	0.2	2.5	0.7	0.2	+0.6	+0	+0
Little Creek	1.6	1.0	0.5	2.3	1.0	0.5	3.0	1.1	0.5	+0.6	+0	+0
Magnolia	1.1	0.5	0.1	1.8	0.7	0.1	2.4	0.8	0.1	+0.6	+0.1	+0
Pickering Beach	1.5	0.5	0.2	1.6	0.5	0.2	1.7	0.5	0.2	+0.1	+0	+0
Residence 1 (Res1)	2.2	1.4	1.2	3.4	2.0	1.5	4.5	2.5	1.7	+1	+0.5	+0.2

Table 7.4. Events With the Potential to Interfere With Speech Resulting from Each Scenario (Continued)

Representative Points of Interest	Current Scenario			Approved Scenario			Future Scenario			Change Relative to Approved Under Future		
	Outdoor	Open	Closed	Outdoor	Open	Closed	Outdoor	Open	Closed	Outdoor	Open	Closed
Residence 2 (Res2)	2.2	1.4	1.1	3.4	1.9	1.1	4.4	2.4	1.2	+1	+0.5	+0
Residence 3 (Res3)	2.1	1.2	0.4	3.1	1.2	0.4	3.9	1.2	0.4	+0.8	+0	+0
Residence 4 (Res4)	2.3	1.7	1.2	3.8	2.3	1.3	5.0	3.0	1.3	+1.2	+0.7	+0
Round Barn	2.1	1.4	0.9	3.3	2.0	0.9	4.4	2.5	0.9	+1	+0.5	+0
Target (Store)	1.3	0.5	0.0	1.3	0.5	0.0	1.3	0.5	0.0	+0	+0	+0
Trailer Park 1	2.0	1.1	0.5	3.0	1.1	0.5	3.8	1.1	0.5	+0.8	+0	+0

7.2 CONSTRUCTION NOISE

Construction activities generate noise that is localized (i.e., limited to the area immediately surrounding the construction site) and temporary (i.e., lasting only for the duration of the construction project). CAT infrastructure expansion would require the use of several types of heavy equipment potentially including the types listed in Table 7-5. Table 7-5 shows maximum noise levels generated by each type of equipment at a reference distance of 50 feet and an overall noise level on a hypothetical day when all equipment types simultaneously operate. Equipment noise levels were calculated in the Federal Highway Administration's Roadway Construction Noise Model (Federal Highway Administration, 2006).

Table 7-5. Typical Construction Equipment Noise Levels

Equipment Type	Noise Level (dBA L_{max})	
	At 50 feet	At 550 feet
Backhoe	78	57
Dozer	82	61
Concrete Mixer Truck	79	58
Dump Truck	77	56
Roller	80	59
TOTAL	83	61

Source: Roadway Construction Noise Model
Key: dBA = A-weighted decibels; Lmax = maximum sound level

The closest noise-sensitive locations to the proposed CAT are several residences that are located approximately 550 feet south of the CAT facility. At this distance, the overall L_{max} generated at the construction site would be 61 and the DNL would also be 61. Heavy-duty trucks carrying equipment and materials to and from the construction site would use Route 438, and would pass within approximately 50 feet of the residences. At this distance, heavy trucks generate an L_{max} of approximately 77 dBA. Truck trips would be expected to be relatively infrequent, occurring

primarily at the beginning and end of the construction project. Construction and transportation noise could be considered annoying at these closest residences. This noise could temporarily interfere with activities that involve listening (e.g., conversation or watching television) at times when particularly loud activities are under way. The proposed construction would occur in the context of frequent military aircraft operations noise generating approximately 64 dB DNL. The combined noise level, including both temporary construction noise and ongoing aircraft noise would be approximately 65 dB DNL. Construction activity would be expected to be limited to normal working hours (7:00 A.M. to 5:00 P.M.). As mentioned previously, the noise would be temporary lasting only the duration of the project. Construction workers would use hearing protection when necessary in accordance with applicable laws and regulations. As discussed in Section 1.1, future noise analysis may be required depending on future tenants of the CAT.

7.3 NON-AIRCRAFT DAY-TO-DAY OPERATIONS NOISE

Day-to-day operations of the expanded CAT could include increased vehicular traffic (e.g., delivery trucks) and equipment noise (e.g., forklifts; heating, ventilation, and air conditioning [HVAC]). The nature of the noise would be dependent on the user(s) of the expanded CAT. For example, a cargo operation with extensive nighttime activities would probably involve frequent truck traffic that could also occur at night. If heavy trucks were used for transport as part of the CAT operations, noise levels generated by the trucks would be similar to levels stated for dump trucks in Section 7.2. Truck traffic could be considered annoying to people living along frequently travelled routes. As discussed in Section 1.1, future noise analysis may be required depending on future tenants of the CAT.

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SECTION 8. REFERENCES

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Appendix H

Final Air Quality Report for DAFB (2020)

FINAL

Air Quality Analysis for Civil Air Terminal Expansion at Dover Air Force Base, Delaware Reflecting the Proposed Regional Aircraft Scenario for a Fixed Based Operator

Prepared For:

Century Engineering, Inc.

10710 Gilroy Road

Hunt Valley, MD 21031

August 2020

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LIST OF TABLES

ATTACHMENTS:

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ACRONYMS AND ABBREVIATIONS

ACAM	Air Conformity Applicability Model
AFB	Air Force Base
AGE	aerospace ground equipment
CAT	Civil Air Terminal
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e (mt)	carbon dioxide equivalent in metric tons
DNREC	Delaware Department of Natural Resources and Environmental Control
GHG	greenhouse gas
HAPs	hazardous air pollutants
LTO	landing and take-off
NA	not applicable
NAAQS	National Ambient Air Quality Standards
NO	nitric oxide
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
O_3	ozone
$PM_{2.5}$	particulate matter less than or equal to 2.5 micrometers in diameter
PM_{10}	particulate matter less than or equal to 10 micrometers in diameter
PSD	Prevention of Significant Deterioration
SO_2	sulfur dioxide
TIM	Time in Mode
USAF	United States Air Force
USEPA	U.S. Environmental Protection Agency
VOCs	volatile organic compounds

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SECTION 1. OVERVIEW

The proposed Civil Air Terminal (CAT) Expansion project would increase civilian aircraft operations and use of the CAT and would increase air emissions at Dover Air Force Base (AFB). The following section describes the air quality affected environment and estimations of impacts due to proposed construction on Dover AFB property and increase in civilian aircraft operations.

SECTION 2. AFFECTED ENVIRONMENT

Air quality in a given location is defined by the size and topography of an air basin; the air emissions that occur within and outside of the air basin; local and regional meteorological influences; and the resulting types and concentrations of pollutants in the atmosphere. The significance of a pollutant concentration often is determined by comparing its concentration to an appropriate national or state ambient air quality standard. These standards represent the allowable atmospheric concentrations at which the public health and welfare are protected and include a reasonable margin of safety to protect the more sensitive individuals in the population. The U.S. Environmental Protection Agency (USEPA) establishes the National Ambient Air Quality Standards (NAAQS) to regulate the following criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than or equal to 10 micrometers in diameter (PM_{10}), particulate matter less than or equal to 2.5 micrometers in diameter ($PM_{2.5}$), and lead. Ozone is not directly emitted, but forms in the atmosphere by photochemical reactions between primary emissions of nitrogen oxides (NO_x), which includes both nitric oxide (NO) and NO_2, and reactive volatile organic compounds (VOCs).

The Delaware Department of Natural Resources and Environmental Control (DNREC) Division of Air Quality is responsible for enforcing air pollution regulations in Delaware. The DNREC implements the NAAQS and additional state ambient air quality standards for purposes of regulating air quality within Delaware.

Air emissions resulting from the proposed increase in civilian flight operations at Dover AFB primarily would affect air quality within the surrounding Kent County region. The USEPA designates all areas of the United States in terms of having air quality better (attainment) or worse (nonattainment) than the NAAQS. An area is in attainment of a NAAQS if its pollutant concentration remains below the standard value, as defined by annual to tri-annual metrics. Former nonattainment areas that have attained a NAAQS are designated as maintenance areas. Currently, Kent County is designated by the USEPA as in attainment of the NAAQS for all pollutants (USEPA, 2019).

Historically, Kent County did not attain the 1997 ozone standard. The USEPA subsequently revoked the 1997 ozone standard and replaced it with the 2008 ozone standard and Kent County attained that standard. Recent court decisions have labeled such a region as an "orphan area." Since the USEPA has no current guidance on whether the USEPA General Conformity Rule applies to these areas, the U.S. Air Force takes the conservative approach and treats these areas as if they were nonattainment/maintenance areas (Century Engineering, 2019). Therefore, the air quality analysis includes an evaluation to determine whether the Proposed Action is subject to the requirements of the General Conformity Rule.

In addition to criteria pollutants, implementation of the Proposed Action also would emit greenhouse gas (GHG) emissions as a result of fossil fuel combustion. Therefore, the analysis also presents estimates of potential GHG emissions generated by the Proposed Action in terms of

carbon dioxide (CO_2), as about 99 percent of the total global warming potential of all pollutants emitted from the combustion of gasoline, diesel, or aviation fuels is in the form of CO_2.

SECTION 3. ENVIRONMENTAL CONSEQUENCES

The air quality analysis estimated annual emissions that would result from construction and operation of the proposed CAT Expansion at Dover AFB. Attachment 1 of this report presents the calculations used to estimate air pollutant emissions from proposed construction and operational sources.

Potential impacts to air quality are evaluated with respect to the extent, context, and intensity of the impact in relation to relevant regulations, guidelines, and scientific documentation. This requires that the significance of an action be analyzed in respect to the setting of the action and severity of the impact. In the context of criteria pollutants for which the project region is in attainment of a NAAQS, the analysis compared the annual net increase in emissions estimated for Proposed Action to the USEPA Prevention of Significant Deterioration (PSD) Regulation permitting threshold of 250 tons per year as an initial indicator of significance of potential impacts to air quality. The PSD permitting threshold represents the level of potential new attainment pollutant emissions below which a new or existing stationary source may acceptably emit without triggering the requirement to obtain a permit. Thus, if the intensity of any net emissions increase for the Proposed Action is below 250 tons per year of an attainment pollutant, the indication is the air quality impacts for that pollutant would be insignificant. In the case of criteria pollutants for which the project region does not attain a NAAQS, the analysis compared the net increase in annual emissions to the applicable conformity *de minimis* thresholds.

It is important to note that the proposed indicator thresholds only provide a clue to the potential impacts to air quality. If projected emissions exceeded an indicator threshold, further analysis was conducted to determine whether impacts were significant. In such cases, if emissions (1) do not contribute to an exceedance of an ambient air quality standard or (2) conform to the approved State Implementation Plan, then impacts would not be significant.

The Dover AFB project region within Kent County currently attains all of the NAAQS. However, the analysis conservatively treats the region as an ozone nonattainment/maintenance area. Therefore, the air quality analysis used the USEPA General Conformity Rule *de minimis* thresholds of 100 tons per year of NO_x, 50 tons per year of VOCs, and the PSD threshold of 250 tons per year for all other criteria pollutants as indicators of the significance of projected air quality impacts within the Dover AFB project region.

3.1 CONSTRUCTION

The increase in flight operations from the CAT Expansion would require construction of a 75-foot wide taxiway and widening of the existing taxiway to 75 feet, both connecting Runway 1/19 to the existing 6.5-acre CAT ramp. Air quality impacts resulting from the proposed construction activities would occur from (1) combustive emissions due to the use of fossil fuel-powered trucks and nonroad equipment and (2) fugitive dust emissions (PM_{10}/$PM_{2.5}$) from the operation of equipment on exposed soil.

Construction activity data were developed to estimate construction equipment usages and areas of disturbed ground due to the proposed construction activities. These data were used as inputs to estimate air emissions from proposed construction activities. Factors needed to derive construction source emission rates were obtained from the *Compilation of Air Pollutant Emission Factors*, AP-42, Volume I (USEPA, 1995) for fugitive dust and the USEPA MOVES2014b model (USEPA,

2018) for on-road trucks and nonroad equipment. The analysis assumed the use of standard construction practices, which would reduce fugitive dust emissions generated from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels. The air quality analysis assumed that all proposed construction activities would occur in year 2022.

Table 1 presents estimates of emissions from the construction activities for the CAT taxiway at Dover AFB. These data show that even if total construction emissions occurred in one year, the construction emissions would be well below the annual indicator thresholds. Therefore, construction emissions associated with the proposed CAT taxiway would not result in significant air quality impacts.

Table 1. Total Construction Emissions from the CAT Taxiway - Dover AFB

Construction Activity	Air Pollutant Emissions (tons)						
	VOCs	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e (mt)
Taxiway Site Preparation	0.002	0.01	0.03	0.00	0.06	0.01	12
Taxiway Paving	0.001	0.004	0.01	0.00	0.02	0.0003	5
Total Emissions	**0.003**	**0.01**	**0.04**	**0.0001**	**0.08**	**0.01**	**17**
Annual Indicator Threshold	**50**	**250**	**100**	**250**	**250**	**250**	**NA**
Exceed Threshold	**No**	**No**	**No**	**No**	**No**	**No**	**NA**

Note: Calculated values and totals have been rounded; therefore, sum total may not match the totals row.
Key: CO_2e (mt) = carbon dioxide equivalent in metric tons; NA = not applicable

3.2 OPERATIONS

The proposed CAT Expansion at Dover AFB primarily would generate air emissions from (1) commercial and private aircraft operations, (2) commercial and private aircraft engine maintenance and testing, and (3) usage of aerospace ground equipment (AGE). To estimate emissions from proposed aircraft operations and AGE, the analysis employed the U.S. Air Force Air Conformity Applicability Model (ACAM) version 5.0.16b (Solutio Environmental, Inc. 2020). The analysis incorporated an aggressive approach, assuming that the project would reach full "Future" operations and resulting emissions in year 2025, incorporating all required infrastructure improvements.

Some of the specifics of the air quality analysis include the following:

- The analysis considered a range of cargo, passenger, and private aircraft types and sizes that feasibly would operate under the proposed CAT Expansion. The aircraft fleet chosen for analysis included (1) Type 1 - Boeing 737-300/700 and McDonnell Douglas M80, (2) Type 2 - Bombardier CL-600/601 Challenger and Dissault Falcon, (3) Type 3 - Cessna 500 Citation, and (4) Type 4 - Beechcraft 300/350 King Air.
- Military aircraft surrogates were used for the civilian aircraft chosen for analysis to match military aircraft in the ACAM database (Century Engineering, 2020).
- Aircraft engine Time in Mode (TIM) values for a landing and take-off (LTO) cycle were obtained for civilian aircraft from Table 2-4 of the *USAF Mobile Emissions Guide* (Air Force Civil Engineer Center, 2018a).
- The analysis evaluated activities associated with a proposed maximum increase of 25,000 annual civilian fight operations, or 12,500 annual LTOs at full buildout.
- AGE usages for each project aircraft type were developed from data in Table 3-3 and Table 3-5 of the *2018 AF Mobile Source Guidelines* (Air Force Civil Engineer Center 2018b), as

ACAM AGE defaults pertain to military and not commercial/civilian aircraft. The analysis matched AGE listed for various aircraft categories in Table 3-5 to the project aircraft types and then obtained AGE usage durations for these equipment from data in Table 3-3 to develop reasonable worst-case AGE usages for each project commercial/civilian aircraft type.

- The analysis used assumptions internal to the ACAM model to estimate on-wing or static aircraft engine tests. The annual number of trim tests per aircraft were lowered from the ACAM default value of 12 to 4 to simulate more typical engine testing activities for commercial/civilian aircraft (personal communications, Austin Naranjo, Air Force Civil Engineer Center/CZTQ July 2, 2020).

The analysis of proposed aircraft operations focuses on operations that would 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. In general, aircraft emissions released above the mixing layer would not appreciably affect ground-level air quality.

Table 2 summarizes the increase in annual operational emissions that would result from the full build-out of the CAT Expansion at Dover AFB. The data in Table 2 show that proposed aircraft operations and AGE usages would result in emissions that would remain below all emission indicator thresholds. Emissions generated by the project would occur from intermittent (1) aircraft operations up to an altitude of 3,000 feet above ground level and across several square miles that make up the Dover AFB airspace and adjoining aircraft flight patterns and (2) AGE operations spread across the CAT aircraft parking ramp. These intermittent emissions would be adequately mixed through this large volume of atmosphere to the point that they would not result in substantial ground-level concentrations in any localized area. Therefore, operational emissions associated with the proposed CAT Expansion at Dover AFB would result in less than significant impacts to all air pollutant levels.

Project aircraft operations would emit hazardous air pollutants (HAPs) that could potentially impact public health. As discussed above for project criteria pollutant impacts, since proposed aircraft operations would occur intermittently over a large volume of atmosphere, they would produce minimal ambient impacts of HAPs in a localized area.

The potential effects of GHG emissions from the proposed CAT Expansion are by nature global. 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 analysis presents estimates of GHG emissions from the CAT Expansion project for use as indicators of their potential contributions to climate change effects.

Table 2. Projected Annual Emissions from Aircraft Operations – Dover AFB CAT Expansion Year 2025

Aircraft Type/Activity	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e (mt)
Type 1							
Aircraft Landing and Take-offs and Trim Tests	2.57	21.30	28.68	2.42	0.16	0.14	6,451
Aerospace Ground Equipment	2.14	11.96	13.67	2.70	1.91	1.90	1,909
Total Annual Type 1 Aircraft Emissions	**4.71**	**33.26**	**42.35**	**5.12**	**2.07**	**2.04**	**8,360**
Type 2							
Aircraft Landing and Take-offs and Trim Tests	3.24	17.02	5.98	0.81	0.15	0.08	2,242
Aerospace Ground Equipment	2.89	15.85	19.60	4.03	2.78	2.76	2,809
Total Annual Type 2 Aircraft Emissions	**6.13**	**32.87**	**25.58**	**4.84**	**2.93**	**2.84**	**5,051**
Type 3							
Aircraft Landing and Take-offs and Trim Tests	17.00	15.88	1.15	0.25	0.14	0.13	680
Aerospace Ground Equipment	0.78	3.26	6.82	1.27	0.68	0.67	885
Total Annual Type 3 Aircraft Emissions	**17.78**	**19.14**	**7.97**	**1.52**	**0.82**	**0.80**	**1,565**
Type 4							
Aircraft Landing and Take-offs and Trim Tests	6.54	8.11	0.96	0.22	0.07	0.07	591
Aerospace Ground Equipment	0.71	2.80	6.51	1.15	0.59	0.58	803
Total Annual Type 4 Aircraft Emissions	**7.25**	**10.91**	**7.47**	**1.37**	**0.66**	**0.65**	**1,394**
Total Annual CAT Expansion Emissions	**35.87**	**96.17**	**83.39**	**12.85**	**6.49**	**6.34**	**16,369**
Indicator Threshold	**50**	**250**	**100**	**250**	**250**	**250**	**NA**
Exceed Threshold	**No**	**No**	**No**	**No**	**No**	**No**	**NA**

Note: Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.
Key: CO_2e(mt) = carbon dioxide equivalent in metric tons; NA = not applicable.

3.3 MITIGATIONS

To minimize air quality impacts from the increase in civilian flight operations at Dover AFB, operators would implement the following mitigation measure:

- Mitigation Measure AQ-1: To the extent feasible, aerospace ground equipment used by project aircraft shall have engines certified to USEPA nonroad Tier 4 emission standards.

The calculation of unmitigated emission due to project AGE usages are based on equipment that have engines rated with older and less-stringent Tier 1 to Tier 3 nonroad emission standards. Therefore, implementation of the most stringent Tier 4 standards as part of Mitigation Measure AQ-1 would have the potential to produce substantial emission reductions from unmitigated AGE usages.

SECTION 4. REFERENCES

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Personal communications, Austin Naranjo, Air Force Civil Engineer Center/CZTQ. Email of July 2, 2020 to Steven Seip, USAF AMC 436 CES/CEN.

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ATTACHMENT 1

EMISSION CALCULATIONS FOR CONSTRUCTION AND OPERATION OF THE CIVIL AIR TERMINAL EXPANSION AT DOVER AIR FORCE BASE

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1	**Table 1. Emission Source Data for Construction of the Civil Air Terminal at Dover Air Force Base**								
2		Hp	Ave. Daily	Number	Hourly	Hours/	Daily	Work	Total
3	Construction Activity/Equipment Type	Rating	Load Factor	Active	Hp-Hrs	Day	Hp-Hrs	Days	Hp-Hrs
4	Taxiway Site Preparation								
5	Bulldozer - D9	405	0.43	1	174	8	1,393	4	5,573
6	Grader	180	0.41	1	74	6	443	3	1,328
7	Loader	215	0.36	2	155	6	929	5	4,644
8	Scraper	195	0.48	1	94	6	562	2	1,123
9	Vibratory Compactor - CB 355D	105	0.42	2	88	8	706	2	1,411
10	Water Truck - 5000 Gallons	175	0.38	1	67	6	399	5	1,995
11	Truck - Demo Material (1)	NA	NA	15	NA	14	208	4	833
12	Truck - Runway Base (1)	NA	NA	20	NA	19	370	1	370
13	Truck - Supplies (1)	NA	NA	40	NA	2	80	4	320
14	Fugitive Dust (2)	NA	NA	0.7	NA	8	NA	6	4.2
15	Taxiway Paving								
16	Concrete Paver	25	0.42	2	21	8	168	2	336
17	Concrete Pump Truck, 110' Boom	285	0.42	1	120	8	958	2	1,915
18	Concrete Vibrator	8	0.42	2	7	8	54	2	108
19	Water Truck - 5000 Gallons	175	0.38	1	67	6	399	2	798
20	Truck - Concrete (1)	NA	NA	15	NA	41	617	2	1,235
21	Truck - Supplies (1)	NA	NA	40	NA	3	120	3	360
22	Fugitive Dust (2)	NA	NA	0.7	NA	8	NA	2	1.4
23	Notes: (1) Number Active = miles/roundtrip, Hours/Day = daily truck trips, Daily Hp-Hrs = daily miles, and Total Hp-Hrs = total miles.								
24	(2) Number Active is acres disturbed at one time and Total Hp-Hrs is acre-days for the entire activity.								

1	**Table 2. Air Emission Factors for Construction of the Civil Air Terminal at Dover Air Force**									
2		Fuel	Emission Factors (Grams/Horsepower-Hour)							
3	Project Year/Source Type	Type	VOC	CO	NOx	SO_2	PM10	PM2.5	CO2	References
4	Year 2019									
5	Nonroad Equipment - 7-11 Hp	D	0.93	3.26	4.46	0.01	0.35	0.34	607	(1)
6	Nonroad Equipment - 26-40 Hp	D	0.19	0.72	2.87	0.00	0.11	0.11	611	(1)
7	Nonroad Equipment - 101-175 Hp	D	0.18	0.59	1.57	0.00	0.12	0.12	547	(1)
8	Nonroad Equipment - 176-300 Hp	D	0.10	0.32	1.07	0.00	0.06	0.06	539	(1)
9	Nonroad Equipment - 301-600 Hp	D	0.09	0.59	1.75	0.00	0.08	0.08	535	(1)
10	HDDV	D	0.23	1.03	3.72	0.01	0.49	0.15	1,679	(2)
11	Disturbed Ground - Fugitive Dust						27.50	2.75		(3)
12	Notes: (1) Emissions factors estimated with the use of the EPA NONROAD2008a model for Tennessee, assuming default conditions.									
13	Composite emission factors were calculated foreach Hp categoryby averagingall ofthedifferent types ofequipment wihinthe									
14	same Hp category. Model was used to produce factors for year 2022.									
15	(2) Estimated with the use of the EPA MOVES2014a model for Tennessee default conditions in year 2022.									
16	(3) Unitsin lbs/acre-dayfromsection11.2.3 ofAP-42 (USEPA1995). Emissions reducedby50% fromuncontrolled									
17	levelstosimulate implementation of best management practices (BMPs) for fugitive dust control									

	V	W	X	Y	Z	AA	AB	AC
1	Table 3. Emissions from Construction of the Civil Air Terminal at Dover Air Force.							
2		Tons						
3	Construction Activity/Equipment Type	VOC	CO	NOx	SOx	PM10	PM2.5	CO2
4	Taxiway Site Preparation							
5	Bulldozer - D9	0.00	0.00	0.01	0.00	0.00	0.00	3.29
6	Grader	0.00	0.00	0.00	0.00	0.00	0.00	0.79
7	Loader	0.00	0.00	0.01	0.00	0.00	0.00	2.76
8	Scraper	0.00	0.00	0.00	0.00	0.00	0.00	0.67
9	Vibratory Compactor - CB 355D	0.00	0.00	0.00	0.00	0.00	0.00	0.85
10	Water Truck - 5000 Gallons	0.00	0.00	0.00	0.00	0.00	0.00	1.20
11	Truck - Demo Material (1)	0.00	0.00	0.00	0.00	0.00	0.00	1.54
12	Truck - Runway Base (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.69
13	Truck - Supplies (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.59
14	Fugitive Dust (2)					0.06	0.01	
15	Subtotal	0.002	0.01	0.03	0.0001	0.06	0.01	12.38
16	Taxiway Paving							
17	Concrete Paver	0.00	0.00	0.00	0.00	0.00	0.00	0.23
18	Concrete Pump Truck, 110' Boom	0.00	0.00	0.00	0.00	0.00	0.00	1.14
19	Concrete Vibrator	0.00	0.00	0.00	0.00	0.00	0.00	0.07
20	Water Truck - 5000 Gallons	0.00	0.00	0.00	0.00	0.00	0.00	0.48
21	Truck - Concrete (1)	0.00	0.00	0.01	0.00	0.00	0.00	2.29
22	Truck - Supplies (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.67
23	Fugitive Dust (2)					0.02	0.00	
24	Subtotal	0.001	0.004	0.01	0.00004	0.02	0.003	4.87
25	Total Emissions - Tons	0.003	0.01	0.04	0.0001	0.08	0.01	17.25

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ATTACHMENT 2

AIR CONFORMITY APPLICABILITY MODEL REPORT
RECORD OF CONFORMITY ANALYSIS (ROCA)

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1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to assess the potential air quality impact/s associated with the action in accordance with the Air Force Instruction 32-7040, Air Quality Compliance And Resource Management; the Environmental Impact Analysis Process (EIAP, 32 CFR 989); and the General Conformity Rule (GCR, 40 CFR 93 Subpart B). This report provides a summary of the ACAM analysis.

a. Action Location:

Base: DOVER AFB
State: Delaware
County(s): Kent
Regulatory Area(s): Philadelphia-Wilmin-Atlantic City, PA-NJ-MD-DE

b. Action Title: Civil Air Terminal (CAT) Expansion at Dover AFB

c. Project Number/s (if applicable):

d. Projected Action Start Date: 1 / 2025

e. Action Description:

SCENARIO 4a - HIGH AGGRESSIVE

f. Point of Contact:

Name: Chris Crabtree
Title: AQ Meteorologist
Organization: Leidos
Email: crabtreec@leidos.com
Phone Number: 805-566-6422

2. Analysis: Total combined direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the "worst-case" and "steady state" (net gain/loss upon action fully implemented) emissions. General Conformity under the Clean Air Act, Section 1.76 has been evaluated for the action described above according to the requirements of 40 CFR 93, Subpart B.

Based on the analysis, the requirements of this rule are: _____applicable
__X not applicable

Conformity Analysis Summary:

2025

Pollutant	Action Emissions (ton/yr)	GENERAL CONFORMITY	
		Threshold (ton/yr)	Exceedance (Yes or No)
Philadelphia-Wilmin-Atlantic City, PA-NJ-MD-DE			
VOC	35.868	50	No
NOx	83.389	100	No
CO	96.171	250	No
SOx	12.851	250	No
PM 10	6.485	250	No
PM 2.5	6.335	250	No
Pb	0.000	N/A	N/A
NH3	0.000	N/A	N/A
CO2e	18006.1	N/A	N/A

2026 - (Steady State)

Pollutant	Action Emissions (ton/yr)	GENERAL CONFORMITY	
		Threshold (ton/yr)	Exceedance (Yes or No)
Philadelphia-Wilmin-Atlantic City, PA-NJ-MD-DE			
VOC	35.868	50	No
NOx	83.389	100	No
CO	96.171	250	No
SOx	12.851	250	No
PM 10	6.485	250	No
PM 2.5	6.335	250	No
Pb	0.000	N/A	N/A
NH3	0.000	N/A	N/A
CO2e	18006.1	N/A	N/A

None of estimated emissions associated with this action are above the conformity threshold values established at 40 CFR 93.153 (b); Therefore, the requirements of the General Conformity Rule are not applicable.

Chris Crabtree 7/30/2020

Chris Crabtree, AQ Meteorologist DATE

ATTACHMENT 3

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

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1. General Information

- Action Location
Base: DOVER AFB
State: Delaware
County(s): Kent
Regulatory Area(s): Philadelphia-Wilmin-Atlantic City, PA-NJ-MD-DE

- Action Title: Civil Air Terminal (CAT) Expansion at Dover AFB

- Project Number/s (if applicable):

- Projected Action Start Date: 1 / 2025

- Action Purpose and Need:
Expand CAT to enable an increase in civil aircraft operations

- Action Description:
SCENARIO 4a - HIGH AGGRESSIVE

- Point of Contact
Name: Chris Crabtree
Title: AQ Meteorologist
Organization: Leidos
Email: crabtreec@leidos.com
Phone Number: 805-566-6422

- Activity List:

Activity Type		Activity Title
2.	Aircraft	Boeing 737-300/700 and McDonnell Douglass M80 Operations - Scenario 4a
3.	Aircraft	Dissault Falcon and Bombardier CL-600/601 Operations - Scenario 4a
4.	Aircraft	Cessna Citation 500 Operations - Scenario 4a
5.	Aircraft	Beechcraft 350 Operations - Scenario 4a

Emission factors and air emission estimating methods come from the United States Air Force's Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and Air Emissions Guide for Air Force Transitory Sources.

2. Aircraft

2.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Kent
Regulatory Area(s): Philadelphia-Wilmin-Atlantic City, PA-NJ-MD-DE

- Activity Title: Boeing 737-300/700 and McDonnell Douglass M80 Operations - Scenario 4a

- Activity Description:
The analysis uses a C-40A as a surrogate for the Boeing 737-700 and McDonnell Douglass M80 aircraft. All aircraft flight operations are landing and take-offs (LTOs). Annual number of trim tests per aircraft lowered from the default value of 12 to 4 to better simulate commercial/civilian aircraft - per CZTQ recommendations.

- Activity Start Date
Start Month: 1
Start Year: 2025
- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	4.710669
SO_x	5.120176
NO_x	42.359158
CO	33.252408
PM 10	2.069581

Pollutant	Emissions Per Year (TONs)
PM 2.5	2.044296
Pb	0.000000
NH_3	0.000000
CO_2e	9196.0

- Activity Emissions [Flight Operations (includes Trim Test & APU) part]:

Pollutant	Emissions Per Year (TONs)
VOC	2.567675
SO_x	2.417795
NO_x	28.684613
CO	21.295995
PM 10	0.159160

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.143551
Pb	0.000000
NH_3	0.000000
CO_2e	7095.6

- Activity Emissions [Aerospace Ground Equipment (AGE) part]:

Pollutant	Emissions Per Year (TONs)
VOC	2.142994
SO_x	2.702381
NO_x	13.674545
CO	11.956413
PM 10	1.910422

Pollutant	Emissions Per Year (TONs)
PM 2.5	1.900745
Pb	0.000000
NH_3	0.000000
CO_2e	2100.4

2.2 Aircraft & Engines

2.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: C-40A
Engine Model: CFM56-7B24
Primary Function: Transport - Bomber
Aircraft has After burn: No
Number of Engines: 2

- Aircraft & Engine Surrogate
Is Aircraft & Engine a Surrogate? No
Original Aircraft Name:
Original Engine Name:

2.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Emissions Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	865.00	2.76	1.07	4.40	22.00	0.05	0.05	3234
Approach	2508.00	0.12	1.07	10.10	2.20	0.04	0.04	3234
Intermediate	7222.00	0.12	1.07	20.50	0.60	0.10	0.09	3234
Military	8754.00	0.12	1.07	25.30	0.40	0.11	0.10	3234
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3234

2.3 Flight Operations

2.3.1 Flight Operations Assumptions

- Flight Operations

Number of Aircraft:	9
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft:	2250
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft:	0
Number of Annual Trim Test(s) per Aircraft:	4

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)

Taxi/Idle Out [Idle] (mins):	19
Takeoff [Military] (mins):	0.7
Takeoff [After Burn] (mins):	0
Climb Out [Intermediate] (mins):	2.2
Approach [Approach] (mins):	4
Taxi/Idle In [Idle] (mins):	7

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner. (Exception made for F-35 where KARNES 3.2 flight profile was used)

- Trim Test

Idle (mins):	12
Approach (mins):	27
Intermediate (mins):	9
Military (mins):	12
AfterBurn (mins):	0

2.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year

$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * LTO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
LTO: Number of Landing and Take-off Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for LTOs per Year

$AE_{LTO} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for TGOs per Year

$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * TGO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
TGO: Number of Touch-and-Go Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for TGOs per Year
$AE_{TGO} = AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year
$AEPS_{POL} = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000$

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year
$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

2.4 Auxiliary Power Unit (APU)

2.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: No

- Auxiliary Power Unit (APU)

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer
1	0.25	No	GTCP 85-129	Honeywell Inc.

2.4.2 Auxiliary Power Unit (APU) Emission Factor(s)

- Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
GTCP 85-129	235.3	0.242	0.249	1.118	4.230	-1.000	-1.000	-1.0

2.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year

$APU_{POL} = APU * OH * LTO * EF_{POL} / 2000$

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)
APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

2.5 Aerospace Ground Equipment (AGE)

2.5.1 Aerospace Ground Equipment (AGE) Assumptions

- Default Settings Used: No. The AGE Type column in the following table identifies AGE for the surrogate commercial aircraft and the Designation column includes the ACAM-specific identifiers.

- AGE Usage

Number of Annual LTO (Landing and Take-off) cycles for AGE: 2250

- Aerospace Ground Equipment (AGE)

Total Number of AGE	Operation Hours for Each LTO	Exempt Source?	AGE Type	ACAM Designation
1	0.5	No	Air Conditioner	Air Conditioner, MA-3D - 110hp
1	1	No	Belt Loader	Cargo Loader
3	0.67	No	Fuel Truck, Service Truck, Water Service Truck	Fuel Truck
1	0.5	No	Lavatory Truck	Pumping Unit, R-22
1	0.25	No	Air Start	Start Cart, A/M32A-60A
1	1	No	Baggage Tractor	Tug - Medium
1	0.25	No	Aircraft Tractor	Tug - Large

2.5.2 Aerospace Ground Equipment (AGE) Emission Factor(s)

- Aerospace Ground Equipment (AGE) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
MA-3D - 110hp	4.6	0.284	0.032	0.640	0.058	0.063	0.061	103.8
Cargo Loader	7.3	0.399	0.253	2.554	1.862	0.279	0.271	165.4
Fuel Truck	16.4	0.300	0.480	3.300	0.900	0.210	0.204	373.0
R-22	6.3	0.129	0.044	3.128	1.048	0.063	0.061	142.9
A/M32A-60A	0.0	0.270	0.306	1.820	5.480	0.211	0.205	221.1
Tug - Medium	25.7	0.475	0.808	0.475	3.800	0.665	0.686	583.7
Tug - Large	33.4	0.617	1.049	0.617	4.936	0.864	0.839	758.6

2.5.3 Aerospace Ground Equipment (AGE) Formula(s)

- Aerospace Ground Equipment (AGE) Emissions per Year
$AGE_{POL} = AGE * OH * LTO * EF_{POL} / 2000$

AGE_{POL}: Aerospace Ground Equipment (AGE) Emissions per Pollutant (TONs)
AGE: Total Number of Aerospace Ground Equipment
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

3. Aircraft

3.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Kent
Regulatory Area(s): Philadelphia-Wilmin-Atlantic City, PA-NJ-MD-DE

- Activity Title: Dissault Falcon and Bombardier CL-600/601 Operations - Scenario 4a

- Activity Description:
The analysis uses a C-38 as a surrogate for the Dissault Falcon or Bombardier CL-600/601 aircraft. All aircraft flight operations are LTOs. Annual number of trim tests per aircraft lowered from the default value of 12 to 4 to better simulate commercial/civilian aircraft - per CZTQ recommendations.

- Activity Start Date
Start Month: 1
Start Year: 2025

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	6.129369
SO_x	4.841854
NO_x	25.585754
CO	32.865992
PM 10	2.935434

Pollutant	Emissions Per Year (TONs)
PM 2.5	2.841606
Pb	0.000000
NH_3	0.000000
CO_2e	5555.9

- Activity Emissions [Flight Operations (includes Trim Test & APU) part]:

Pollutant	Emissions Per Year (TONs)
VOC	3.238031
SO_x	0.806928
NO_x	5.982978
CO	17.019177
PM 10	0.153150

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.081741
Pb	0.000000
NH_3	0.000000
CO_2e	2465.6

- Activity Emissions [Aerospace Ground Equipment (AGE) part]:

Pollutant	Emissions Per Year (TONs)
VOC	2.891338
SO_x	4.034926
NO_x	19.602776
CO	15.846815
PM 10	2.782284

Pollutant	Emissions Per Year (TONs)
PM 2.5	2.759865
Pb	0.000000
NH_3	0.000000
CO_2e	3090.3

3.2 Aircraft & Engines

3.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: C-38
Engine Model: TFE731-40R-200G
Primary Function: General - Business Jet
Aircraft has After burn: No
Number of Engines: 2

- Aircraft & Engine Surrogate
Is Aircraft & Engine a Surrogate? No
Original Aircraft Name:
Original Engine Name:

3.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Emissions Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	206.00	10.40	1.07	3.72	47.70	0.13	0.12	3234
Approach	571.00	1.62	1.07	6.92	15.56	0.09	0.08	3234
Intermediate	1476.00	0.08	1.07	16.02	1.62	0.09	0.08	3234
Military	1786.00	0.07	1.07	19.15	1.13	0.08	0.08	3234
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3234

3.3 Flight Operations

3.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 23
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft: 5716
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft: 0
Number of Annual Trim Test(s) per Aircraft: 4

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)
Taxi/Idle Out [Idle] (mins): 6.5
Takeoff [Military] (mins): 0.4
Takeoff [After Burn] (mins): 0
Climb Out [Intermediate] (mins): 0.5
Approach [Approach] (mins): 1.6
Taxi/Idle In [Idle] (mins): 6.5

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner. (Exception made for F-35 where KARNES 3.2 flight profile was used)

- Trim Test

Idle (mins):	12
Approach (mins):	27
Intermediate (mins):	9
Military (mins):	12
AfterBurn (mins):	0

3.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year

$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * LTO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
LTO: Number of Landing and Take-off Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for LTOs per Year

$AE_{LTO} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for TGOs per Year

$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * TGO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
TGO: Number of Touch-and-Go Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for TGOs per Year

$AE_{TGO} = AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year
$AEPS_{POL} = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000$

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year
$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

3.4 Auxiliary Power Unit (APU)

3.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: No

- Auxiliary Power Unit (APU)

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer
1	0.25	No	GTCP 36-100	

3.4.2 Auxiliary Power Unit (APU) Emission Factor(s)

- Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
GTCP 36-100	272.6	0.493	0.289	1.216	3.759	0.131	0.037	910.8

3.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year
$APU_{POL} = APU * OH * LTO * EF_{POL} / 2000$

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)
APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

3.5 Aerospace Ground Equipment (AGE)

3.5.1 Aerospace Ground Equipment (AGE) Assumptions

- Default Settings Used: No. The AGE Type column in the following table identifies AGE for the surrogate commercial aircraft and the Designation column includes the ACAM-specific identifiers.

- AGE Usage
Number of Annual LTO (Landing and Take-off) cycles for AGE: 5716

- Aerospace Ground Equipment (AGE)

Total Number of AGE	Operation Hours for Each LTO	Exempt Source?	AGE Type	ACAM Designation
1	0.5	No	Belt Loader	Cargo Loader
2	0.63	No	Fuel Truck, Service Truck	Fuel Truck
1	0.33	No	Lavatory Truck	Pumping Unit, R-22
1	0.5	No	Baggage Tractor	Tug - Medium
1	0.25	No	Aircraft Tractor	Tug - Large

3.5.2 Aerospace Ground Equipment (AGE) Emission Factor(s)

- Aerospace Ground Equipment (AGE) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Cargo Loader	7.3	0.399	0.253	2.554	1.862	0.279	0.271	165.4
Fuel Truck	16.4	0.300	0.480	3.300	0.900	0.210	0.204	373.0
R-22	6.3	0.129	0.044	3.128	1.048	0.063	0.061	142.9
Tug - Medium	25.7	0.475	0.808	0.475	3.800	0.665	0.686	583.7
Tug - Large	33.4	0.617	1.049	0.617	4.936	0.864	0.839	758.6

3.5.3 Aerospace Ground Equipment (AGE) Formula(s)

- Aerospace Ground Equipment (AGE) Emissions per Year
$AGE_{POL} = AGE * OH * LTO * EF_{POL} / 2000$

AGE_{POL}: Aerospace Ground Equipment (AGE) Emissions per Pollutant (TONs)
AGE: Total Number of Aerospace Ground Equipment
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

4. Aircraft

4.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Kent
Regulatory Area(s): Philadelphia-Wilmin-Atlantic City, PA-NJ-MD-DE

- Activity Title: Cessna Citation 500 Operations - Scenario 4a

- Activity Description:

The analysis uses a UC-35A as a surrogate for the Cessna Citation 500. All aircraft flight operations are LTOs. Annual number of trim tests per aircraft lowered from the default value of 12 to 4 to better simulate commercial/civilian aircraft - per CZTQ recommendations.

- Activity Start Date

Start Month: 1
Start Year: 2025

- Activity End Date

Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	17.781457
SO_x	1.521497
NO_x	7.973191
CO	19.145543
PM 10	0.817055

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.798935
Pb	0.000000
NH_3	0.000000
CO_2e	1721.1

- Activity Emissions [Flight Operations (includes Trim Test & APU) part]:

Pollutant	Emissions Per Year (TONs)
VOC	16.996483
SO_x	0.247410
NO_x	1.151287
CO	15.884213
PM 10	0.140676

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.126616
Pb	0.000000
NH_3	0.000000
CO_2e	747.8

- Activity Emissions [Aerospace Ground Equipment (AGE) part]:

Pollutant	Emissions Per Year (TONs)
VOC	0.784974
SO_x	1.274087
NO_x	6.821904
CO	3.261330
PM 10	0.676379

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.672320
Pb	0.000000
NH_3	0.000000
CO_2e	973.3

4.2 Aircraft & Engines

4.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine

Aircraft Designation: UC-35A
Engine Model: JT15D-5D
Primary Function: General - Business Jet
Aircraft has After burn: No
Number of Engines: 2

- Aircraft & Engine Surrogate

Is Aircraft & Engine a Surrogate? No
Original Aircraft Name:
Original Engine Name:

4.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Emissions Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	235.50	136.97	1.07	1.66	119.20	0.82	0.74	3234
Approach	524.00	13.46	1.07	4.93	38.60	0.73	0.66	3234
Intermediate	1371.00	1.50	1.07	10.08	1.15	0.23	0.21	3234
Military	1630.00	0.00	1.07	11.13	0.00	0.13	0.12	3234
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3234

4.3 Flight Operations

4.3.1 Flight Operations Assumptions

- Flight Operations

Number of Aircraft: 9
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft: 2313
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft: 0
Number of Annual Trim Test(s) per Aircraft: 4

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)

Taxi/Idle Out [Idle] (mins): 6.5
Takeoff [Military] (mins): 0.4
Takeoff [After Burn] (mins): 0
Climb Out [Intermediate] (mins): 0.5
Approach [Approach] (mins): 1.6
Taxi/Idle In [Idle] (mins): 6.5

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner. (Exception made for F-35 where KARNES 3.2 flight profile was used)

- Trim Test

Idle (mins): 12
Approach (mins): 27
Intermediate (mins): 9
Military (mins): 12
AfterBurn (mins): 0

4.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year

$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * LTO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
LTO: Number of Landing and Take-off Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for LTOs per Year

$AE_{LTO} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for TGOs per Year
$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * TGO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
TGO: Number of Touch-and-Go Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for TGOs per Year
$AE_{TGO} = AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year
$AEPS_{POL} = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000$

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year
$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

4.4 Auxiliary Power Unit (APU)

4.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: Yes

- Auxiliary Power Unit (APU) (default)

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer

4.4.2 Auxiliary Power Unit (APU) Emission Factor(s)

- Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e

4.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year
$APU_{POL} = APU * OH * LTO * EF_{POL} / 2000$

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)
APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

4.5 Aerospace Ground Equipment (AGE)

4.5.1 Aerospace Ground Equipment (AGE) Assumptions

- Default Settings Used: No. The AGE Type column in the following table identifies AGE for the surrogate commercial aircraft and the Designation column includes the ACAM-specific identifiers.

- AGE Usage
Number of Annual LTO (Landing and Take-off) cycles for AGE: 2313

- Aerospace Ground Equipment (AGE)

Total Number of AGE	Operation Hours for Each LTO	Exempt Source?	AGE Type	ACAM Designation
3	0.58	No	Fuel Truck, Cabin Service Truck, Service Truck	Fuel Truck
1	0.33	No	Baggage Tractor	Tug - Medium

4.5.2 Aerospace Ground Equipment (AGE) Emission Factor(s)

- Aerospace Ground Equipment (AGE) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Fuel Truck	16.4	0.300	0.480	3.300	0.900	0.210	0.204	373.0
Tug - Medium	25.7	0.475	0.808	0.475	3.800	0.665	0.686	583.7

4.5.3 Aerospace Ground Equipment (AGE) Formula(s)

- Aerospace Ground Equipment (AGE) Emissions per Year
$AGE_{POL} = AGE * OH * LTO * EF_{POL} / 2000$

AGE_{POL}: Aerospace Ground Equipment (AGE) Emissions per Pollutant (TONs)
AGE: Total Number of Aerospace Ground Equipment
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

5. Aircraft

5.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Kent
Regulatory Area(s): Philadelphia-Wilmin-Atlantic City, PA-NJ-MD-DE

- Activity Title: Beechcraft 350 Operations - Scenario 4a

- Activity Description:
The analysis uses a C-12 as a surrogate for a Beechcraft 350. All aircraft flight operations are LTOs. Annual number of trim tests per aircraft lowered from the default value of 12 to 4 to better simulate commercial/civilian aircraft - per CZTQ recommendations.

- Activity Start Date
Start Month: 1
Start Year: 2025

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	7.246979
SO_x	1.367253
NO_x	7.471139
CO	10.907452
PM 10	0.662795

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.650055
Pb	0.000000
NH_3	0.000000
CO_2e	1533.1

- Activity Emissions [Flight Operations (includes Trim Test & APU) part]:

Pollutant	Emissions Per Year (TONs)
VOC	6.535106
SO_x	0.215063
NO_x	0.959846
CO	8.112176
PM 10	0.072132

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.065158
Pb	0.000000
NH_3	0.000000
CO_2e	650.0

- Activity Emissions [Aerospace Ground Equipment (AGE) part]:

Pollutant	Emissions Per Year (TONs)
VOC	0.711873
SO_x	1.152190
NO_x	6.511293
CO	2.795276
PM 10	0.590663

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.584897
Pb	0.000000
NH_3	0.000000
CO_2e	883.1

5.2 Aircraft & Engines

5.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: C-12
Engine Model: PT6A-27
Primary Function: General - Turboprop
Aircraft has After burn: No
Number of Engines: 2

- Aircraft & Engine Surrogate
Is Aircraft & Engine a Surrogate? No
Original Aircraft Name:
Original Engine Name:

5.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Emissions Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	115.00	57.70	1.07	2.43	64.00	0.50	0.45	3234
Approach	215.00	2.51	1.07	8.37	23.26	0.10	0.09	3234
Intermediate	400.00	0.00	1.07	7.00	1.20	0.25	0.23	3234
Military	425.00	0.00	1.07	7.81	1.01	0.24	0.22	3234
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3234

5.3 Flight Operations

5.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 9
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft: 2222
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft: 0
Number of Annual Trim Test(s) per Aircraft: 4

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)
Taxi/Idle Out [Idle] (mins): 19
Takeoff [Military] (mins): 0.5
Takeoff [After Burn] (mins): 0
Climb Out [Intermediate] (mins): 2.5
Approach [Approach] (mins): 4.5
Taxi/Idle In [Idle] (mins): 7

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner. (Exception made for F-35 where KARNES 3.2 flight profile was used)

- Trim Test
Idle (mins): 12
Approach (mins): 27
Intermediate (mins): 9
Military (mins): 12
AfterBurn (mins): 0

5.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year
$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * LTO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
LTO: Number of Landing and Take-off Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for LTOs per Year
$AE_{LTO} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for TGOs per Year
$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * TGO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
TGO: Number of Touch-and-Go Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for TGOs per Year
$AE_{TGO} = AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year
$AEPS_{POL} = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000$

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
NA: Number of Aircraft

NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year
$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

5.4 Auxiliary Power Unit (APU)

5.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: Yes

- Auxiliary Power Unit (APU) (default)

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer

5.4.2 Auxiliary Power Unit (APU) Emission Factor(s)

- Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e

5.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year
$APU_{POL} = APU * OH * LTO * EF_{POL} / 2000$

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)
APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

5.5 Aerospace Ground Equipment (AGE)

5.5.1 Aerospace Ground Equipment (AGE) Assumptions

- Default Settings Used: No. The AGE Type column in the following table identifies AGE for the surrogate commercial aircraft and the Designation column includes the ACAM-specific identifiers.

- AGE Usage
Number of Annual LTO (Landing and Take-off) cycles for AGE: 2222

- Aerospace Ground Equipment (AGE)

Total Number of AGE	Operation Hours for Each LTO	Exempt Source?	AGE Type	Designation
3	0.58	No	Fuel Truck, Cabin Service Truck, Service Truck	Fuel Truck
1	0.25	No	Baggage Tractor	Tug - Medium

5.5.2 Aerospace Ground Equipment (AGE) Emission Factor(s)

- Aerospace Ground Equipment (AGE) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Fuel Truck	16.4	0.300	0.480	3.300	0.900	0.210	0.204	373.0
Tug - Medium	25.7	0.475	0.808	0.475	3.800	0.665	0.686	583.7

5.5.3 Aerospace Ground Equipment (AGE) Formula(s)

- Aerospace Ground Equipment (AGE) Emissions per Year

$AGE_{POL} = AGE * OH * LTO * EF_{POL} / 2000$

AGE_{POL}: Aerospace Ground Equipment (AGE) Emissions per Pollutant (TONs)
AGE: Total Number of Aerospace Ground Equipment
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

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Appendix I

DAFB ICRMP (2020)

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 436TH AIRLIFT WING (AMC)
DOVER AIR FORCE BASE, DELAWARE 19902

436 CES INTEGRATED CULTURAL RESOURCES MANAGEMENT PLAN

JUNE 2020

OPR 436 CES/CEIE
DOVER AFB, DE 19902

ABOUT THIS PLAN

This installation-specific Environmental Management Plan (EMP) is based on the U.S. Air Force's (USAF's) standardized Integrated Cultural Resources Management Plan (ICRMP) template. This Plan is not an exhaustive inventory of all cultural resource requirements and practices. External resources, including Air Force Instructions (AFIs); Air Force Manuals (AFMANs); USAF Playbooks; and federal, state, local, and permit requirements are referenced, where applicable.

Certain sections of this ICRMP begin with standardized, USAF-wide "common text" language that addresses USAF and Department of Defense (DoD) policy and federal requirements. This common text language is restricted from editing to ensure that it remains standard throughout all plans. The designated Air Force Civil Engineer Center (AFCEC) Office of Primary Responsibility (OPR) with assistance from the AFCEC Office of Collateral Responsibility (OCR) maintains and updates common text language as appropriate.

Installation Supplement sections follow each of the USAF-wide common text sections. Installation Supplements sections contain installation-specific content to address state, local, and installation-specific requirements. Installation sections are unrestricted and are maintained and updated by AFCEC environmental Sections and/or installation personnel. Updates should be made only when there are unique requirements at an installation. They should not be used to reiterate standard USAF requirements, such as those found in AFIs or Department of Defense Instructions (DoDIs).

ABBREVIATIONS and ACRONYMS

AAC	Army Air Corps
AAFES	Army and Air Force Exchange Service
ac	acre
ACHP	Advisory Council on Historic Preservation
ADC	Air Defense Council
AFAA	Air Force Audit Agency
AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
AFIT	Air Force Institute of Technology
AFMAN	Air Force Manual
AFRIMS	Air Force Records Information Management System
AFROTC	Air Force Reserve Officer Training Corps
AMC	Air Mobility Command
ANG	Air National Guard
AFRC	Air Force Reserve Center
AFI	Air Force Instruction
AFLOA	Air Force Legal Operations Agency
AFMAO	Air Force Mortuary Affairs Operations
AFMES	Armed Forces Medical Examiner System
AFOSI	Air Force Office of Special Investigations
AMSL	above mean sea level
APE	Area of Potential Effects
APSR	Accountable Property System of Record
ARPA	Archaeological Resources Protection Act
AW	Air Wing
BAHP	Delaware Bureau of Archaeology and Historic Preservation
BC	Before Christ
BCE	Base Civil Engineer
BGP	Base General Plan
BR	Business Rule
CA	Comprehensive Agreement
CAP	Civil Air Patrol
CE	Civil Engineer
CEI	Installation Management Flight
CES	Civil Engineer Squadron
CFR	Code of Federal Regulations
CRM	Cultural Resources Management or Cultural Resource Manager

CRS	Cultural Resource Specialist
CSC	Controlled Surface Collection
cu	cubic
CZ	Environmental Directorate
DAR	Defense Acquisition Regulation
DCA	Departmental Consulting Archeologist
DeCA	Defense Commissary Agency
DEPARC	Defense Environmental Program Annual Report to Congress
DET	Detachment
DDHCA	Delaware Division of Historical and Cultural Affairs
DelDOT	Delaware Department of Transportation
DHS	Department of Homeland Security
Dig Permit	Base Civil Engineering Clearance Request
DoD	Department of Defense
DoDI	Department of Defense Instruction
EIAP	Environmental Impact Analysis Process
EMR	Environmental Management Review
EMS	Environmental Management System
EO	Executive Order
ERA	Environmental Risk Assessment
ERP	Environmental Restoration Program
FIS	Fighter-Interceptor Squadron
FY	Fiscal Year
GIS	Geographic Information System
GMP	General Management Plan
GPR	Ground Penetrating Radar
GSU	Geographically-Separated Unit
ha	hectare
HABS/HAER	Historic American Bldgs. Survey/Historic American Engineering Rec.
HQ	Headquarters
IAW	In Accordance With
ICRMP	Integrated Cultural Resource Management Plan
IDP	Installation Development Plan
IMT	Information Management Tool
INS	Immigration and Naturalization Service
IRP	Installation Restoration Program
ISO	International Organization for Standardization
ITLO	Installation Tribal Liaison Officer
JA	Judge Advocate

JBLE ISS	Joint Base Langley-Eustis Installation Support Section
LANDSAT	Land Remote-Sensing Satellite (System)
m	meter
MAJCOM	Major Command
MAC	Military Airlift Command
MAAR	MAAR Associates, Inc.
MAW	Military Airlift Wing
MOA	Memorandum of Agreement
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act of 1966, as amended
NPS	National Park Service
NRHP	National Register of Historic Places
OCR	Office of Collateral Responsibility
OPR	Office of Primary Responsibility
PA	Programmatic Agreement
POC	Point of Contact
POL	Petroleum, Oil, & Lubricants
PPBE	Planning, Programming, Budgeting and Execution
PPK	Projectile Point/Knife
RDS	Records Disposal Schedule
SHPO	State Historic Preservation Officer
SISR	Secretary of the Interior's Standards for Rehabilitation
SME	Subject Matter Expert
SOP	Standard Operating Procedure
STP	Shovel Test Pit
TCP	Traditional Cultural Property
THPO	Tribal Historic Preservation Officer
UDCAR	University of Delaware Center for Archaeological Research
UEC	Unit Environmental Coordinator
UPH	Unaccompanied Personnel Housing
URS	URS Group, Inc.
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USDA	United States Department of Agriculture
USDOE	United States Department of Energy
USO	United Services Organization of Delaware
USPS	United States Postal Service

TABLE OF CONTENTS

DOCUMENT CONTROL

Standardized ICRMP Template

In accordance with (IAW) the Air Force Civil Engineer Center (AFCEC) Environmental Directorate (CZ) Business Rule (BR) 08, *EMP Review, Update, and Maintenance*, the standard content in this ICRMP template is reviewed periodically, updated as appropriate, and approved by the Cultural Resources Subject Matter Expert (SME).

This version of the template is current as of 09/24/2018 and supersedes the 2015 version.

NOTE: Installations are not required to update their ICRMPs every time this template is updated. When it is time for an ICRMP update, installations should refer to the eDASH EMP Repository to ensure they have the most current template.

Installation ICRMP

Record of Review – The ICRMP is updated annually, or more frequently, as changes to cultural resource management and protection practices occur, including those driven by changes in applicable regulations. The ICRMP will be revised and approved at least every five years, or when there is a significant change to the mission or installation, in accordance with (IAW) AFMAN 32-7003, *Environmental Conservation*, and Department of Defense Instruction (DoDI) 4715.16, *Cultural Resources Management*. The Base Civil Engineer (BCE) level, at a minimum, will sign the five year/significant updates. The installation Cultural Resources Manager (CRM) or an AFCEC Branch or Section Cultural Resource Specialist (CRS) will update the Plan every year. ICRMP updates should consider the effects of installation missions on cultural resources, the maintenance and upkeep of those resources, and compliance with National Historic Preservation Act (NHPA) Sections 306108, 306101-107, and 306109-114, and new survey and evaluation data. The CRM, the CRS, or the Branch specialist will send the ICRMP, or a summary of updates since the last approval, BCE or comparable officer/civilian for review IAW DoDI 4716.16 and AFMAN 32-7003. Annual reviews do not require BCE signature, but are captured in a memo to the BCE. Annual review procedures are outlined below:

ICRMP Annual Review and Coordination

Annual Requirements

- Update data tables (minimum will include: resources, evaluations, locations, and references), including the Installation Profile
- Update survey locations tables and maps. Always include surveyed acreage and survey boundaries, note the dates of the surveys, and cite the survey report on the map or in map legends
- Add new Memoranda of Agreements (MOAs), Programmatic Agreements (PAs), Native American Graves Protection and Repatriation Act (NAGPRA) Comprehensive Agreements (CAs) and Plans of Action, and other signed agreements or understandings that drive work requirements
- Summarize MOAs, PAs, NAGPRA CAs/Plans of Action and other agreement or understanding documents in the Executive Summary and Work Plan
- Add outline of new planning data, to include mission changes, construction, destruction, development, etc., that will drive NHPA Section 306108 and/or Environmental Impact Analysis Process (EIAP) reviews and consultations

Timing

- Update period is at least annual
- ICRMP may (and should) be updated continuously through the year

Validation

- The AFCEC CRS writes an Annual Update Memo to the installation briefly outlining annual changes and additions
- Annual Update Memo included in the ICRMP
- Update is complete when the AFCEC CRS's Annual Update Memo is sent to the installation CRM for appropriate installation-level distribution. The annual review cycle is complete (and the ICRMP will show as "green" on all relevant eDASH dashboards) after the Memo is sent and all required metrics are updated in the Plans and Permits tool on eDASH

Digital File Storage and Archiving

- Current approved ICRMP PDF is kept on the installation's eDASH page
- Current approved ICRMP Word and Excel files are kept in the EMP Repository
- Installation will follow their installation's approved file management plan (e.g. Air Force Records Management System [AFRIMS]) for archiving older ICRMPs IAW with current USAF policy

Review Date	Review Participants	Notes/Remarks	Result in Plan Update? (Yes or No)
June 2018	John Wilson Lee DiSalvo	Initial Update	Yes
June 2020	Tami Calhoun Matt Nowakowski Gina Lavender Matt Goss	5 Year Review	Yes

Commander's Approval

This 436 CES Management Plan provides direction and guidance for squadron members and highlights opportunities for squadron members to collaborate with our mission partners to accomplish the Air Force mission at Dover AFB and to protect and conserve its cultural resources for current and future generations.

Nicholas J. Thomas, Major, USAF
Commander, 436th Civil Engineering Squadron

1.0 OVERVIEW AND SCOPE

This ICRMP was developed to provide for effective management and protection of cultural resources. It summarizes the history and prehistory of the installation and reviews past historical and archaeological survey efforts. It outlines and assigns responsibilities for the management of cultural resources, discusses related concerns, and provides standard operating procedures (SOPs) that will help to manage or preserve the cultural resources of the installation within the context of the mission. The ICRMP is intended for use by all personnel involved in installation planning. AFMAN 32-7003 acts as the main driver for the ICRMP. The Cultural Resources Management Playbook serves as supplemental guidance to this Plan.

1.1 Executive Summary

Dover Air Force Base (AFB) houses the 436th Airlift Wing (AW), which employs cargo aircraft to project war fighting personnel and assets globally from the Department of Defense's (DoD) largest aerial port, and it honors the remains of DoD personnel killed overseas in its Port Mortuary. Dover AFB is firmly committed to the identification, protection, and use of cultural resources under its control for the long-term benefit of the public and in harmony with its primary mission to provide strategic airlift capability. Established in December 1941 on the site of a public airfield, Dover AFB is located in an area of Delaware that is rich with both prehistoric and historic cultural resources. In acknowledgement of this heritage and of its stewardship role, the installation has created a Cultural Resources Management Program within the Installation Management Flight. The goal of the Cultural Resources Management Program is to manage Dover AFB's culturally and historically significant resources in a manner that is consistent with the NHPA. This is the primary Federal law governing the treatment of historic properties, which is any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on the National Register. In addition to the NHPA, the Cultural Resources Management Program ensures that Dover AFB is legally compliant with the National Environmental Policy Act (NEPA), the Archaeological Resources Protection Act (ARPA), the NAGPRA, the American Indian Religious Freedom Act, and Executive Order (EO) 13007 regarding "Indian Sacred Sites." Dover AFB must work within these legal restraints and other Federal laws protecting cultural resources in carrying out its activities.

The plan provides the following information:

- a general description of the installation;
- mission goals and objectives;
- outlines cultural resource responsibilities;
- provides prehistoric and historic overviews;
- documents the base's cultural resource status and need for additional work; and
- describes standard operating procedures for avoiding adverse effects resulting from project activities

Appendices A and B include tables for the archaeological and built resources, respectively. Survey and Site Forms for Archaeological and Historic Properties are in Appendices I and J, respectively.

Summary of Major Points

Although established in December 1941, most of Dover AFB's existing buildings and structures were constructed in the second half of the twentieth century. Therefore, outside of individual Section 106 undertakings, archaeology was the early primary focus of the Cultural Resource Management Program. Archaeological surveys were conducted on a large percentage of the open land at Dover AFB. Archaeological surveys identified 15 sites on base, five of which have been determined as eligible for listing

in the NRHP, including archaeological sites 7K-D-1 (St. Jones Adena Site), 7K-D-5 (Short Farm Site), 7K-D-26, 7K-D-129 (John Wesley Cemetery), and 7K-D-143 (School House #14 or Comegy's School). No new discoveries of Native American graves or other culturally sensitive areas have been identified on Dover AFB.

With an increasing number of built resources now 50 years old or older, the survey and evaluation of its facilities at Dover AFB has been a high priority in the recent past. The process of surveying built resources on base is an ongoing one, as buildings and structures approach 45 years of age. Many World War II- and Cold War-related facilities have been evaluated, resulting in the listing of the World War II hangar, Building 1301, in the National Register of Historic Places (NRHP). Now serving as the Air Mobility Command Museum, Building 1301 is preserved as a proud vestige of Dover AFB's history. The Dover AFB Middle School/Major George S. Welch School (Building 3100) was determined eligible for listing in the NRHP, but is slated for demolition.

Most of the activities related to the primary missions of the 436 AW and 512 AW are unlikely to have a direct effect on cultural resources. Future effects on cultural resources at the base are expected to result primarily from plans for new construction that may affect archaeological sites, and from the demolition, rehabilitation, repair, and maintenance of historic buildings and structures on the base.

In addition to identifying historic or prehistoric archaeological resources and built resources at Dover AFB, this plan provides:

- guidance for future updates;
- outlines the steps for following NHPA Section 106 procedures for an undertaking;
- standard procedures for dealing with unanticipated discoveries; and
- training of personnel

Cultural Resources Management Goals and Objectives

An Installation Development Plan (IDP) was prepared in 2016 to assess existing conditions at the installation and to guide future development. The IDP summarizes the management and recommendations of several base plans, including Composite Natural Resources, Environmental Quality Protection, Land Use, Airfield and Air Operations, Noise Contours, Utility Systems, Transportation, Site Analysis/Design Framework, Facilities Development, Contingency Plan, Cultural Resources, and Demolition Planning.

Dover AFB's cultural resources management requirements and objectives are described in Section 9.0.

Current and Priority CRM Requirements (5 Year Plan)

Complete a Cultural Resource Survey to evaluate buildings 45 years and older every five years.

Project FJXTA53205117 Survey/Inventory Update, Cultural Resources
This project has been funded in the amount of $26.338K to evaluate buildings and structures near 50 years of age or older that require evaluation, re-evaluation, or that are slated for demolition. The objectives of the survey are to update the existing inventory data for Dover AFB, add newly eligible properties to the inventory, and to include resource types overlooked in the earlier inventory. The NRHP evaluation of these resources fulfills the requirements of Section 110 of the NHPA to identify, evaluate, and nominate historic properties, and will enable the completion of the Section 106 process in a timely manner. Additionally, it is expected that this survey will lay the groundwork for a Programmatic Agreement (PA) that will describe the management of Dover AFB historic properties.

Project FJXTA53201118 Phase I Cultural Resources Survey, Land Acquisition
Dover AFB is evaluating the purchase of an estimated 100-acre plot of land/marsh for security reasons. This project has been funded in the amount of $26.338K to conduct a Phase I and II archaeological survey after the land is purchased.

Project FJXTA53235115 Management of Known Cultural Sites.
Dover AFB plans to purchase landscaping materials that are necessary to manage the John Wesley Methodist/Episcopal Church/Cemetery property. This project is programmed for FY2023.

In addition, stream bank stabilization has occurred adjacent to a portion of Site 7K-D-26 helping protect the site from erosion.

Project: Gather Agreement and Concurrence Documentation
As of the date of this ICRMP update, several official documents related to cultural resources such as Memoranda of Agreement, curation agreements, and SHPO concurrence documents could not be located. The CRM shall undertake to determine if copies of these documents exist and add them to future updates. A list of missing documents is included in the appendices.

Projects affecting cultural resources are also listed in Section 10.0.

1.2 General Information

Mission Statement

Dover AFB and its host unit, the 436 AW, operate the busiest and largest air freight terminal in the DoD. The 436 AW works around the clock to transport personnel and cargo to all corners of the world in fulfillment of its rapid global mobility mission. Dover AFB is also home to Air Force Mortuary Affairs Operations (AFMAO), the largest and only joint service mortuary facility in the nation. AFMAO conducts dignified transfers for the fallen and provides support for their families.

The Dover AFB currently supports the 436 AW and hosts the following tenant units:

- 512 AW
- AFMAO
- Armed Forces Medical Examiner System (AFMES)

Historical Perspective

The origins of Dover AFB begin in March 1941 when the United States Army Air Corps (AAC) determined it needed an airfield for training and, subsequently, assumed jurisdiction over the municipal airport at Dover, Delaware.

In March 1941, the conversion and expansion of the municipal airport began and the Municipal Airport, Dover Airdrome was opened on December 17, 1941. It was converted to an AAC airfield a few weeks after the December 7, 1941 attack on Pearl Harbor. It was renamed Dover Army Airbase on April 8, 1943; Dover Subbase on June 6, 1943 and Dover Army Airfield on February 2, 1944. With the establishment of the United States Air Force on September 18, 1947, the facility was renamed Dover AFB on January 13, 1948.

In 1948, the 436th Troop Carrier Wing was established and was re-designated the 436th Military Airlift Wing (MAW) on 27 December 1965. Assigned to Twenty-First Air Force, the wing was stationed at Dover AFB, Delaware, and flew C-124 Globemaster II, C-133 Cargomaster, C-141 Starlifter, and C-5 Galaxy aircraft.

The wing was re-designated the 436 AW on 1 December 1991 and began flying C-5 Galaxy and C-17 Globemaster III aircraft. As the active duty military host unit at Dover Air Force Base, the 436th Airlift Wing serves and provides command and staff supervision, along with support functions, for assigned airlift providing worldwide movement of outsized cargo and personnel on scheduled, special assignment, exercise and contingency airlift missions. The "Eagle Wing" flies hundreds of missions throughout the world and provides 25 percent of the Nation's strategic airlift capability, projecting global reach to over 100 countries around the globe.

Dover AFB operates the largest and busiest air freight terminal in the Department of Defense and operates The Charles C. Carson Center for Mortuary Affairs, DoD's largest joint-service mortuary facility and the only one located in the continental United States.

Most of the activities related to the primary missions of the 436 AW and 512 AW are unlikely to have a direct effect on cultural resources. Impacts to cultural resources at the base result primarily from plans for new construction that may affect archaeological sites and from the demolition, rehabilitation, repair, and maintenance of historic buildings and structures on the base.

In an unusual incident on 3 April 2006, a Lockheed C-5B Galaxy aircrew observed a No. 2 engine "Thrust Reverser Not Locked" indication light and decided to return to base. On final approach, the aircraft stalled, hit a utility pole, and crashed in a field on the location of the Bergold archaeological site (7K-D-126).

Legal Requirements

Cultural resource management must be performed IAW federal laws and regulations and DoD and USAF policies and requirements. Specific legal requirements are identified in applicable sections of this Plan, the Cultural Resources Management Playbook, the eDASH Cultural Resources Home Page, the eDASH Air Force Legal Operations Agency (AFLOA) Legal and Other Requirements List, and in referenced documents.

Installation Supplement – Legal Requirements

Delaware Code Title 29: State Government, General Provisions Chapter 5. State Archives and Historical Objects Subchapter II. Historical Buildings, sites, Objects and Archaeological Resources.

2.0 INSTALLATION PROFILE

Scope of Plan	436 AW Tenant units: • 512 AW • AFMAO • Armed Forces Medical Examiner System
OPR	436 AW has overall responsibility for implementing the Cultural Resources Management Program and is the lead organization for monitoring compliance with applicable federal, state and local regulations
Cultural Resources Manager	Name: Tami Calhoun Phone: 302-677-5691 Email: tami.calhoun.2@us.af.mil
State Historic Preservation Office	Delaware Division of Historical and Cultural Affairs 21 The Green Dover, DE 19901 302-736-7400 302-739-5660 fax
Consulting Native American Tribe(s)	Delaware Nation, Oklahoma Delaware Tribe of Indians Stockbridge-Munsee Community Band of Mohican Indians
Routinely consulted parties	Delaware Nation, Oklahoma Delaware Tribe of Indians Nanticoke Indian Association Lenape Indian Tribe of Delaware
Office of the Secretary of Defense most current "Base Structure Report" notion of the "total acres" managed by the Installation including GSUs	3824
Installation surveyable acres (i.e., undisturbed, accessible acres)	277
Total acres ever surveyed	3280
Acres surveyed in FY2019	0
Cultural Resources outreach program (e.g., website, welcome package, or brochures)	Air Mobility Command Museum; Booklet: *To Slip the Bonds of Earth: The History of Dover Air Force Base and Its Surroundings*
Total archaeology sites recorded	15
Archaeology sites recorded in FY2019	0
Cumulative number of archaeology sites recorded through FY2019	15
Number of eligible or listed sites	5
Number of non-eligible sites	10
Number of unevaluated sites	0
Number of archaeology sites evaluated in FY2019	0
Total number real property facilities as reported in Appendix B	120

Number of eligible or listed real property facilities as reported in Appendix B	3
Number of non-eligible real property facilities as reported in Appendix B	117
Number of unevaluated real property facilities as reported in Appendix B	0
Number of real property facilities evaluated in FY2019 as reported in Appendix B	0
Have Historic Status Codes been updated in the Accountable Property System of Record in FY2019?	Yes
Number of archaeology sites mapped into GIS	15
Number of surveyed acres mapped into GIS	3824
Are historic real property assets (buildings/structures) mapped into GIS?	Yes
Cumulative volume in cubic feet of archaeology collections	79 cu. ft.
Cumulative volume in linear feet of associated records	Included with collections
Cumulative volume of archaeology collections complying with 36 CFR Part 79	79 cu. ft.
Volume of archaeology collections acquired in FY2019	0
Volume of associated recorded acquired in FY2019	0
Archaeological collections repositories	Delaware Division of Historical and Cultural Affairs (DDHCA), Delaware State Museums 800 Otis Drive Dover, DE, 19901 302-739-6402

3.0 ENVIRONMENTAL MANAGEMENT SYSTEM

The USAF environmental program adheres to the Environmental Management System (EMS) framework and its "Plan, Do, Check, Act" cycle for ensuring mission success. Executive Order (EO) 13693,*Planning for Federal Sustainability in the Next Decade*; DoDI 4715.17, *Environmental Management Systems*; AFI 32-7001, *Environmental Management*; and International Organization for Standardization (ISO) 14001 standard, *Environmental Management Systems – Requirements with guidance for use*, provide guidance on how environmental programs should be established, implemented, and maintained to operate under the EMS framework.

The Cultural Resources Management Program employs EMS-based processes to achieve compliance with all legal obligations and current policy drivers, effectively manage associated risks, and to instill a culture of continual improvement. The ICRMP serves as an "administrative operational control" that defines compliance-related activities and processes.

4.0 GENERAL ROLES AND RESPONSIBILITIES

AFMAN 32-7003 and the Cultural Resources Management Playbook contain detailed roles and responsibilities for cultural resources management. Installation-specific cultural resources management roles and responsibilities are described throughout this Plan and in referenced documents.

Installation Supplement – General Roles and Responsibilities

The major roles/organizations involved in supporting the Cultural Resources Management Program include:

- Wing/Installation Commander
- Cultural Resource Manager (CRM)
- Installation Tribal Liaison Officer (ITLO)
- AFCEC Branch and Section specialists
- AFCEC Cultural Resources Subject Matter Expert (SME)
- Legal/Judge Advocate (JA)
- Unit Environmental Coordinators (UECs); see AFI 32-7001 for role description
- State Historic Preservation Officer (SHPO)
- Tribal Historic Preservation Officer (THPO)
- Tribal government leaders
- Interested public parties/stakeholders

436 AW

The 436 AW is the host unit of Dover AFB. The 436 AW consists of a headquarter staff, four groups, 18 squadrons, 12 divisions, and 17 tenant units. The organizations of the 436 AW potentially affected by CRM are in the Civil Engineer Squadron. The Civil Engineer Squadron (CES) oversees all construction, grounds maintenance, building maintenance, and engineering at Dover AFB.

Although the primary responsibility for CRM belongs to the CES, any base organizations that are involved in base planning need to be aware that failure to consider cultural resources issues early in project planning can lead to unanticipated costs and project delays. Any plans that include ground disturbance must be coordinated with 436 CES/CEI. In addition, any organization that may occupy or be involved in the self-help maintenance or repair of buildings that are eligible or potentially eligible for listing in the NRHP (e.g., Building No. 1301) should consult with CRM Program staff in 436 CES/CEIC before doing any work on these buildings. The CRM will conduct the necessary coordination with the Delaware SHPO and other consulting parties, as appropriate for these activities.

Wing Commander

The Wing Commander has the ultimate responsibility for ensuring that Dover AFB complies with the relevant historic preservation laws, regulations, EOs, and directives. The Commander:

- Ensures that all projects consider cultural resources early in the planning process by following the internal review procedures discussed in Section 7.10 Management and Coordination.
- Ensures that all historic properties are located, evaluated for NRHP eligibility, and if eligible, nominated for listing in the NRHP. This responsibility will be delegated primarily to the CRM.
- Ensures that cultural resources on the base are managed according to the procedures outlined in this ICRMP, and in any executed and active agreement document (e.g., PA, MOA). These duties will be delegated primarily to the CRM.

- Ensures that all historic properties listed in or eligible for listing in the NRHP, and any other culturally sensitive sites receive appropriate protection from base security forces.

Base Civil Engineer

The Civil Engineer Squadron has the responsibility for developing and implementing CRM policy. The Base Civil Engineer:

- Maintains historic properties in a manner consistent with applicable laws and regulations. This includes preservation and maintenance of historic properties and culturally significant resources to prevent damage, deterioration, inappropriate alteration, and demolition, and prevention of inadvertent transfer, sale, or lease without appropriate protections. This duty will be discharged in collaboration with the CRM.
- Protects historic properties by ensuring that all construction, repair, and maintenance projects receive the appropriate review by 436 CES/CEI.

Chief, Environmental Compliance

The Chief of Environmental Compliance supervises the CRM on Dover AFB. The Chief, Environmental Compliance:

- Appoints and supervises the CRM and ensures the person is properly trained.
- Ensures the CRM implements the ICRMP and Section 106 agreement documents.
- Ensures that all projects reviewed by 436 CES/CEIE receive appropriate review by the CRM according to the procedures outlined in Section 7.10 Management and Coordination.
- Reviews all NRHP nominations and requests for archaeological permits, prepared by the CRM. Prior to submission to higher headquarters.

CRM

An individual from 436 CES/CEIEC will be designated as the CRM and will assume the primary charge of managing the cultural resources of Dover AFB. The CRM's training should include the one-week course entitled DoD *Management of Cultural and Natural Resources*, and the three-day course entitled *Section 106 Compliance*. The CRM will receive updated training as required, or on an annual basis. Dover AFB will train the CRM to:

- Recognize when activities conducted on base may affect historic properties and culturally significant resources, including historic buildings and structures, archaeological sites, cultural landscapes, traditional cultural properties (TCPs), and sacred sites.
- Conduct consultation with the SHPO and other consulting parties as appropriate, such as the National Park Service (NPS) and Indian tribes, concerning cultural resources issues.

In carrying out assigned duties the CRM:

- Maintains an inventory of all historic properties, artifact collections, and culturally sensitive areas on base, including any resources listed in or eligible for listing in the NRHP.
- Implements the ICRMP and any Section 106 agreement documents.
- Updates the ICRMP on a yearly basis, as necessary, and submits for MAJCOM review every 5 years.
- Reviews all work at the installation to assure compliance with Section 106 and all other cultural resources regulations.
- Assists in the implementation of all historic and cultural programs on the base.
- Participates in base planning efforts, including the development of the Base General Plan (BGP) and Building Disposal Plan, and advises base planners on cultural resources issues.

Commander of Security Forces

The Commander of Security Forces will provide for the protection of cultural resources on the base. The Commander of Security Forces:

- Investigates any incidents where looting or vandalism has occurred on historic properties or culturally significant sites.
- Advises the CRM on procedures for protecting historic properties, if necessary.

Tenant Organizations

Dover AFB is home to several U.S. Air Force tenant organizations. These organizations primarily occupy office space and flight line facilities, and therefore, their day-to-day operations are not expected to have any impact on cultural resources at Dover AFB. Dover AFB has four major tenants, as described below:

The 512 AW is an Air Force Reserve unit. It helps maintain, repair, and fly the same aircraft as its active-duty counterparts. The 512 AW's mission is to recruit, train, equip, and retain a qualified force to augment major commands with people and units to support strategic aircraft during peace and war. One- half of the aircrews at Dover AFB are Air Force Reserve. The 512 AW has more than 1,700 people assigned and provides integrated support in the form of aircrews, maintenance, aerial port, and administrative support allowing full use of the military aircraft at Dover AFB under all conditions, up to and including full mobilization.

Detachment (DET) 3, 373rd Training Squadron is an Air Education and Training Command unit devoted to supporting the C-5 weapon system. DET 3 provides formal and informal maintenance and training for students from the 436 AW and 512 AW, Air Force Reserve Center (AFRC), Air National Guard (ANG), and other Air Mobility Command (AMC) units. The detachment also supports training sessions for aircrews.

The Civil Air Patrol (CAP) has two squadrons located at Dover AFB. The Delaware Wing assists the Delaware Emergency Management Agency during natural disasters and exercises, performs missions for the USAF, and provides services to the local community. CAP is a volunteer, nonprofit corporation functioning in three primary missions: emergency services, cadet programs, and aerospace education.
The following are other Government tenants on the base:

- Air Force Audit Agency (AFAA)
- Air Force Mortuary Affairs Operations (AFMAO)
- Air Force Office of Special Investigations (AFOSI)
- Army and Air Force Exchange Service (AAFES)
- Defense Commissary Agency (DeCA)
- Department of Homeland Security (DHS)
- USAF Judiciary Area Defense Council (ADC)
- U.S. Department of Agriculture (USDA)
- DET 306, HQ 3D FIR (AFOSI)
- DET 361, Training Squadron
- Flight System Services
- Immigration and Naturalization Service (INS)
- US Army Corps of Engineers (USACE)
- U.S. Postal Service (USPS)
- United Services Organization of Delaware (USO)
- USAF Recruiting
- USAF Reserve Officer Training Corps (AFROTC)

5.0 TRAINING

Cultural resources management training is crucial to ensure that installation personnel, contractors, and visitors are aware of their role in the program and the importance of their participation to its success. The eDASH Training Matrix, available from the eDASH Cultural Resources Home Page, identifies cultural resources-related training topics, target audiences, training frequency, etc. Appropriate personnel must complete required education, training, and certification necessary to perform their jobs. Training records are maintained IAW the Recordkeeping and Reporting section of this plan.

Installation Supplement – Training

Training Plan

Category	Training Course	**Installation Plan** (Describe training frequency, attendees and delivery method)
Archaeological	Archaeological Resources Protection	One time, CRM, Classroom
Buildings	Historic Facility Management	One time, CRM, Classroom
Buildings	Historic Structure Reports	One time, CRM, Classroom
General Cultural Resources	Introduction to Cultural Resources Management – Laws and Regulations	One time, CRM, Classroom
General Cultural Resources	Advanced Section 306108/Agreement Documents	Yearly, CRM, Classroom
Tribal	American Indian (or Alaskan) Cultural Communication Course	One time, as needed, CRM, Classroom
Tribal	American Indian Cultural Awareness Course	One time, as needed, CRM, Classroom
Tribal	Native American Graves Protection and Repatriation Act	One time, as needed, CRM, Classroom
NEPA/EIAP	Understanding and Preparing Preliminary EIAP Documents: USAF Specific	Yearly, CRM, Classroom
NEPA/EIAP	EIAP Course (Air Force Institute of Technology [AFIT])	Yearly, CRM, Classroom
NEPA/EIAP	Applying the National Environmental Policy Act (NEPA)/EIAP Process: USAF Specific	Yearly, CRM, Classroom

6.0 RECORDKEEPING AND REPORTING

Recordkeeping

The installation maintains required records IAW AFMAN 33-364, *Management of Records*, and disposes of records IAW the AFRIMS Records Disposition Schedule (RDS). Numerous types of records must be maintained to support implementation of the Cultural Resources Management Program. Specific records are identified in applicable sections of this Plan, in the Cultural Resources Management Playbook, and in referenced documents.

Reporting

The installation CRM is responsible for responding to cultural resources-related data calls and reporting requirements. The CRM and supporting AFCEC Branch and Section specialists should refer to the

Environmental Reporting Playbook for guidance on execution of data gathering, quality control/quality assurance, and report development.

Installation Supplement – Recordkeeping and Reporting

This section is intentionally left blank. No data.

7.0 STANDARD OPERATING PROCEDURES

This section contains SOPs for managing and protecting cultural resources. The CRM ensures that appropriate procedures are properly communicated and followed by necessary personnel.

7.1 Communication, Planning, and EIAP

Applicability Statement:

This SOP applies to all USAF installations.

Background/Overview:

The EIAP is the USAF procedure for performing environmental project review, in compliance with the requirements of the NEPA. The proponent of an action is responsible for initiating the EIAP early in the planning stages of a proposed action. The EIAP process is documented on Air Force (AF) Form 813, *Request for Environmental Impact Analysis*. The CRM must be familiar with NEPA and the EIAP process.

Procedure:

The CRM shall:

- Work in close coordination with the EIAP manager during all NEPA reviews
- Assist the EIAP manager to determine whether existing and planned formal agreements under NHPA or other cultural resources authorities may be associated with the NEPA planning effort
- Confirm that NHPA Section 306108 review is required and identify other considerable cultural resources laws
- Identify and consult with SHPO or THPO/local governments/other parties
- Plan for public participation, as necessary

7.2 36 CFR Part 800 Process (Implementing NHPA Section 306108)

Applicability Statement:

This SOP applies to all USAF installations.

Background/Overview:

36 Code of Federal Regulation (CFR) Part 800 implements Section 306108 of the NHPA (formally Section 106). It is a federal review process designed to ensure that historic properties are considered during the planning and execution of federal undertakings. Activities, programs, or projects that have the potential to involve or affect historic properties and could trigger a 36 CFR Part 800 review include, but are not limited to:

- Rehabilitation, renovation, or addition to buildings, structures, and/or utilities
- Replacement or maintenance of infrastructure

- Demolition of buildings and structure
- Proposed bed downs
- Environmental Restoration Program (ERP) investigations and clean-up
- Real property actions such as land transfers, out-leasing, etc.

The 36 CFR Part 800 review process should be initiated early in the planning stages of a project.

Procedure:

Project Proponents should:

- During initial project planning (e.g., TRIRIGA Work Request, AF Form 813; DoD Form 1391, *Military Construction Project Data*, AF Information Management Tool (IMT) 103, *Base Civil Engineering Work Clearance Request* ["Dig Permit"]), provide adequate information necessary to determine whether historic properties are present and to assess impact of the proposed project on historic properties
- If a proposed project could involve preparation of an environmental assessment or environmental impact statement, contact the installation CRM as early as possible to ensure that any required public participation, analysis, and review can be planned to meet the requirements of both NEPA and NHPA Section 306108 in a timely and efficient manner
- Implement mitigation or management conditions stipulated by the CRM resulting from the Section 306108 consultation/coordination process

The CRM shall:

- Determine whether the proposed action is an undertaking IAW 36 CFR Part 800. If the action is an undertaking, define the Area of Potential Effects (APE) and determine if any historic properties are present within the APE. Assess impact of proposed project on historic properties. Results of this review could include:
  - ***No Historic Properties Affected***: This determination is made when the project will have no foreseeable effects on historic properties. The installation should seek concurrence from the SHPO and other consulting parties (i.e., tribal stakeholders)
  - ***No Adverse Effect***: This determination is made when there might be an effect, but the effect will not be harmful to those characteristics that qualify the property for inclusion in the NRHP. The installation must seek concurrence from the SHPO and other consulting parties that no adverse effect is likely
  - ***Adverse Effect***: This determination is made when the effect of an undertaking could diminish the integrity of the characteristics that qualify the property for the NRHP. The installation will continue consultations with the SHPO and other interested parties whenever an "adverse effect" is likely, expected, or unavoidable
- Coordinate execution of 36 CFR Part 800 process to support desired project schedules. Refer to the Cultural Resources Management Playbook for detailed descriptions of the Section 306108 review process

7.3 Cultural Resources Contracting

Applicability Statement:

This SOP applies to all USAF installations.

Background/Overview:

USAF Planning, Programming, Budgeting, and Execution (PPBE) is the process of acquiring funding for activities. Contracting of cultural resources-related work follows standard USAF PPBE processes. The Environmental Quality PPBE Playbook and Activity Management Plan Playbooks contain detailed information on funding and contracting.

Procedure:

- The CRM proposes future projects and includes them in the ICRMP and in the Accountable Property System of Record (APSR)
- If the project is determined to be eligible and funds are available for the project, the CRM/Section specialist develops a detailed statement of work and moves forward with contracting options

Contracting Points of Contact

Types of Cultural Resources Actions	Contracting Plan	Points of Contact
Archaeological Resources	Identify requirement, contact ISS, validate requirement and update programming tool; discuss contracts and contracting tools with JBLE ISS Cultural	JBLE ISS PPBE POC; JBLE ISS Cultural Resources Specialist, Region SME
Historic Properties	Identify requirement, contact ISS, validate requirement and update programming tool; discuss contracts and contracting tools with JBLE ISS Cultural	JBLE ISS PPBE POC; JBLE ISS Cultural Resources Specialist, Region SME

7.4 Discoveries of Archaeological Resources and NAGPRA Cultural Items

Applicability Statement:

This SOP applies to all USAF installations that contain or potentially contain archaeological resources and/or NAGPRA cultural items.

Background/Overview:

Accidental or unanticipated discoveries of archaeological resources may occur on USAF controlled lands. When discoveries occur, the proper actions must be taken to minimize damage to these resources and to ensure that legal requirements are met. The relevant statute is ARPA and the regulation is 32 CFR Part 229, *Protection of Archaeological Resources*.

There is also an important legal subset of archaeological resources, which includes NAGPRA cultural items (i.e., Native American human remains, associated or unassociated burial artifacts, and objects of cultural patrimony). The relevant regulation is 43 CFR Part 10, *Native American Graves Protection and Repatriation Regulations*. See the Cultural Resources Management Playbook for detailed guidance on the requirements of NAGPRA and this regulation.

It is a federal offense, under the provisions of ARPA and 32 CFR Part 229, to excavate, remove, damage, or otherwise deface any archaeological resources located on federal lands, without authorization. The provisions of ARPA apply to archaeological material greater than 100 years in age, regardless of the NRHP status of the site where they are found. Any person wishing to excavate or remove archaeological resources from a USAF installation must apply for an ARPA permit. USAF-contracted work is exempted from the permitting provision of ARPA. In the event of a permit request, the installation CRM should notify the

AFCEC Section CRS. Detailed information to assist in facilitating ARPA permitting is available in the Cultural Resources Management Playbook.

Procedure:

USAF or contractor personnel that make or become aware of a potential archaeological discovery on installation lands should:

- Immediately notify the CRM of the nature and location of the discovery
- Immediately cease potentially damaging activities and take efforts to ensure protection of resources until arrival of the CRM or designee

The CRM shall:

- Notify Security Forces of the discovery
- Ensure that all archaeological items are left in place and that no further disturbance is permitted to occur
- Sufficiently identify the location of the discovery to provide efficient relocation, yet take efforts to minimize the types of signs that could attract personnel and place the discovery in danger
- Direct installation personnel and contractors to take efforts to resume mission-associated activities in a reasonable and timely manner

Security Forces should:

- Notify the Wing Commander regarding the location, nature, and circumstances of the discovery
- Provide security/protection for the site to prevent unauthorized disturbance, looting, or vandalism

If human remains are discovered or if there is sufficient reason to suspect that human remains are present (such as the observation of an oval-shaped rock or earthen mound), the CRM shall:

- Determine (with the aid of a coroner or forensic anthropologist) if the remains are human, and whether or not they are associated with an archaeological deposit
- If the remains are not human, and not associated with an archaeological deposit, work may continue
- If the remains are human, Security Forces should notify local law enforcement agency and a coroner, who will determine if the remains are recent, or ancient (with the aid of a forensic anthropologist). If the human remains are modern, the matter may become the responsibility of law enforcement officials who will determine when project activities may resume
- Invite consultation with Native American tribes, as appropriate. If a qualified professional finds the human remains to be Native American, the provisions of NAGPRA apply. Follow the procedures outlined in 43 CFR Part 10 or in existing installation NAGPRA agreements with tribes

7.5 Native American Access

Applicability Statement:

This SOP applies to USAF installations that receive requests from Native American Tribes or tribal members for access to USAF property for various reasons.

Background/Overview:

Members of federally recognized tribes have the right to access sites of traditional, cultural, or religious

importance on lands under USAF control and to practice traditional religious activities associated with these sites. Tribal members may also request permission to collect small amounts of minerals or plant or animal materials for traditional, cultural, or religious purposes. Installations should routinely grant such permission, within the constraints of operational and/or safety concerns.

Procedure:

NOTE: Specific access procedures are developed through coordination with affected Native American Tribes should a tribe/group request visitation. Below is an example procedure for consideration when developing an installation-specific procedure:

The Wing Commander, or Designee, should:

- Perform initial contact required to establish government-to-government relationships with tribes and consult with tribal leaders
- Establish procedures for day-to-day working relationships with appropriate tribal representatives
- Establish government-to-government relationships with federally recognized affiliated tribes
- Document all government-to-government contacts, identification of specific tribal requirements and Point of Contact (POC) for future consultation and coordination activities

The ITLO, with assistance from the CRM and other installation personnel as appropriate, should:

- Identify appropriate tribes with whom to establish ongoing relations for involvement in any subsequent planning processes. Document appropriate tribes, affected lands and specific access procedures in the 'Native American Tribes with Ancestral Ties to Installation Lands' table below
- Facilitate and maintain government-to-government relationships
- Compile and maintain a list of tribal POCs for consultation and coordination
- Brief incoming commanders on their responsibilities and arrange meetings, as appropriate
- Conduct routine consultation and coordination with affiliated tribes per the requirements identified during the government-to-government contact
- Maintain documentation of consultation and coordination and other contracts

Native American Tribes with Ancestral Ties to Installation Lands

Native American Tribe	Affected Lands	Access Procedures and Agreements
Delaware Nation, Oklahoma*	NA	NA
Delaware Tribe of Indians*	NA	NA
Stockbridge-Munsee Community Band of Mohican Indians of Wisconsin*	NA	NA
Nanticoke Indian Association	NA	NA
Lenape Indian Tribe of Delaware	NA	NA

*denotes federally recognized tribe

7.6 Accidents and Emergencies Affecting Historic Properties

Applicability Statement:

This SOP applies to all USAF installations.

Background/Overview:

Federal laws and regulations provide exceptions to the standard Section 306108, 306101-107, and 306109-114 reviews that may be used in times of emergency. Immediate rescue and salvage operations conducted to preserve life or property are exempt from the provisions of Section 306108, 306101-107, and 306109-114 and the procedures outlined in 36 CFR § 800.12. Per 36 CFR Part 78, the Secretary of the Air Force may waive all or part of the USAF's Section 306108 responsibility on a specific undertaking if the Secretary determines the existence of an imminent major natural disaster or a threat to national security. Such waivers will not exceed the period of the emergency, and generally do not extend to reconstruction or other activities beyond those immediately required to prevent endangerment of human life or property.

Procedure:

The following actions may be performed when responding to an accident or emergency (e.g., hazardous material spill, aircraft or vehicular accidents, fires/explosions, natural disasters) where cultural resources may be affected:

USAF Personnel, Construction Crews, Utility Workers, Contractors, and Rescue Workers should:

- Notify the CRM as soon as possible upon realizing potential for impact to cultural resources associated with an emergency
- Take reasonable steps to avoid or minimize disturbance of significant cultural resources during emergency operations, as appropriate to concerns for human life or property

The CRM shall:

- Identify cultural resources that might be affected by emergency response and provide guidance and advice to emergency operations workers on methods to avoid or minimize negative effects to cultural resources
- As soon as possible, notify the Installation Commander and AFCEC of the emergency or disaster, including descriptions of historic properties potentially affected
- As soon as practicable and within 14 days of the conclusion of the emergency situation, notify the SHPO/THPO of any adverse effects to historic properties that resulted from the emergency and emergency response
- Consult with the SHPO/THPO about steps necessary to reduce or mitigate adverse effects to historic properties when additional actions are necessary to stabilize, repair, or demolish historic properties damaged in the emergency or emergency response (e.g., demolition of historic properties that cannot be repaired, or have become unsafe)
- If a waiver is requested, provide information to installation personnel regarding the status of the waiver request (granted or denied) and direction regarding follow-on notification of parties
    - If a waiver is granted, provide information regarding the scope and limitations of the waiver to appropriate installation personnel and initiate required notifications to SHPO
    - If a waiver is not granted, provide direction to installation personnel regarding resumption of work and implement the Section 306108 consultation process

7.7 Suspected Vandalism

Applicability Statement:

This SOP applies to all USAF installations.

Background/Overview:

The installation has established procedures to deter vandalism and to investigate suspected acts of vandalism when a cultural resource protected under NHPA, ARPA, or NAGPRA is damaged as a result of unauthorized activity.

Procedure:

In the event of a discovery of damaged archaeological site or other historic property, the following actions should be performed:

Discoverer of potential looting or vandalism should:

- Immediately notify the CRM (302-677-5691) and Security Forces (302-677-6664)
- Take all necessary precautions to protect the resource from further damage, loss, or destruction
- Wait for further instructions from the CRM or other authority Security Forces should:
- Notify the Installation Commander immediately regarding the location, nature, and circumstances of the looting or vandalism
- Provide security/protection to prevent further unauthorized disturbance, looting, or vandalism

CRM shall:

- Inspect the site to assess damage
- Notify the Installation Commander of damage within 48 hours of discovery. Include the following information in the damage report: Circumstances of site damage, assessment of the nature and extent of damage, recommendations for treatment procedures (coordinate with SHPO and tribal authorities, as appropriate), and suggestions for future protection measures
- Notify Native American organizations and individuals if traditional cultural resources or sacred sites were damaged

Legal Department personnel should:

- Assess whether or not accused violators can be prosecuted
- Determine whether a civil penalty or other prosecution can be applied

7.8 Curation of Collections and Records

Applicability Statement:

This SOP applies to USAF installations that maintain archaeological collections that require curation. Dover AFB maintains such a collection and is therefore, required to implement this SOP.

Background/Overview:

Federal regulations require curation of archaeological collections and their associated records owned by federal agencies in perpetuity (36 CFR Part 79, *Curation of Federally Owned and Administered Archaeological Collections*). Curation of artifacts collected from USAF property shall be consistent with procedures in the *Guidelines for the Field Collection of Archaeological Materials and Standard Operating Procedures for Curating Department of Defense Archaeological Collections* (1999, Legacy Project No. 98-1714). Specific recommendations and procedures for curation are described in this ICRMP, where applicable, and in the Cultural Resources Management Playbook. Records related to historic properties or historic preservation should be evaluated for their usefulness in documenting the history of the installation's

cultural resources and should be maintained or disposed of as appropriate.

Procedure:

The CRM shall with assistance from the Base Historian:

- Ensure that installation personnel are aware of the historic value of old records, collections, etc.
- Identify federally owned and administered archaeological collections and associated records required to be curated.
- Identify an appropriate curation facility (or facilities). Location(s) where archaeological collections and their associated records are currently maintained include:
  - DDHCA, Delaware State Museum, 800 Otis Drive, Dover, DE, 19901 302-739-6402
- Prepare collections for moving to the identified curation facility.
- Make a duplicate copy of all documentation on either acid-free paper or in digital format and store in a separate, secure, fire-safe location.
- Transfer collections to the appropriate facility.
- Conduct an annual inventory and inspect curated collections for compliance with applicable requirements.
- Maintain records/documents regarding transferred collections.

7.9 Management and Coordination

Applicability Statement:

This SOP applies to all USAF installations.

Background/Overview:

The following procedure outlines and describes cultural resources-related communication, review, and coordination processes and workflows.

Procedure:

Internal Reviews

Internal review procedures will be initiated as early in project planning as possible, so that personnel are allowed sufficient time to implement appropriate cultural resource activities, as required. Specific documents and processes that typically require internal review include:

- Completion of TRIRIGA work request for proposed work to 436 CES/CEIE to determine whether the proposed work will affect any natural or cultural resources
- Completion of AF IMT 103 generally for work involving digging to 436 CES/CEIE to determine whether the proposed work will affect any natural or cultural resources
- NEPA project review including the EIAP and completion of AF Form 813

Notification and Consultation

- Consultation can occur at any time with Native American tribal groups or other stakeholders at the discretion of the CRM and the ITLO
- Notification and consultation with tribal groups must occur immediately if any human remains are encountered

Stakeholder Reviews

- Installation stakeholders can include, but are not limited to: the SHPO, the THPO, local surrounding communities, and the National Park Service (NPS)
- The Public Affairs Office manages the official website for the installation and uploads cleared, sanctioned information for public access
- The installation CRM and the ITLO are responsible for contacting NPS, SHPO, and any tribal groups for any reviews of cultural resource documents

  - State Historic Preservation Officer
    The SHPO should be consulted whenever a proposed project may affect an NRHP- listed, -eligible or potentially eligible resource, or if Native American human remains, funerary objects, sacred objects, or objects of cultural patrimony are found, or if potentially NRHP eligible archaeological sites are found during an undertaking.

    State of Delaware Department of State
    Division of Historical and Cultural Affairs
    21 the Green
    Dover, DE 19901-3611
    Phone: (302) 739-5685
    Fax: (302) 739-5660

  - National Park Service
    The Departmental Consulting Archeologist (DCA) of the NPS should be contacted in the event that potentially NRHP-eligible archaeological remains are encountered during an undertaking according to the provisions of the AHPA.

    Departmental Consulting Archeologist Archeology and Ethnography Program Manager, Chief Archeologist
    Department of the Interior
    National Park Service
    1849 C Street (7508)
    Washington, D.C. 20240
    Phone: (202) 354-2123
    Email: NPS_ChiefArcheologist@nps.gov

    The Keeper of the National Register is consulted when Dover AFB and the SHPO do not agree on the NRHP eligibility of a property.

    Keeper of the National Register
    Department of the Interior National Park Service
    1849 C Street, NW (7228)
    Washington, DC 20240
    Phone: (202) 354-2211

- Advisory Council on Historic Preservation (ACHP)
  The ACHP is contacted if the undertaking is determined to be within the purview of the Section 106 Review process. Since reorganization in 2003, project information, MOAs, PAs, and other documentation should be directed to:

  Office of Federal Agency Programs
  Advisory Council on Historic Preservation
  401 F Street, N.W., Suite 308
  Washington, D.C. 20001-2637
  Phone: (202) 517-0228 (general inquiries)
  Email: OWilliams@achp.gov (general inquiries)

  Under the new procedures and organization, projects will be assigned to specialists based on the nature of the undertaking, location, and other factors.

  For information on Federal Agency services not specifically related to Section 106 review, the eastern region contact at the ACHP is:

  Program Analyst for USAF
  Katry Harris
  Advisory Council on Historic Preservation
  401 F Street, N.W., Suite 308
  Washington, D.C. 20001-2637
  Phone: (202) 517-0213
  Email: kharris@achp.gov

- Department of Air Force

  Federal Preservation Officer
  Otis L. Hicks, Jr.
  Office of the Deputy Assistant Secretary
  (Environment, Safety & Infrastructure)
  1665 Air Force Pentagon Room 4B941
  Washington, DC 20330-1665
  Phone: (703) 693-9328
  Fax: (703) 693-7568
  Email: Otis.L.Hicks.civ@mail.mil

- Delaware Unmarked Human Remains Committee
  The Delaware Unmarked Human Remains Committee exists to oversee unanticipated discoveries of human remains on state land. Dover AFB may contact the committee in the event that unanticipated Native American or non-Native American human remains, funerary objects, sacred objects, or objects of cultural patrimony are found on Dover AFB in order to solicit guidance on a proper treatment of the remains.

Delaware Unmarked Human Remains Committee
State of Delaware Department of State
Division of Historical and Cultural Affairs
21 The Green
Dover, DE 19901-3611
Phone: (302) 739-5685 or (302) 736-7400
Fax: (302) 739-5660

- Native American Points of Contact

Dover AFB is required to consult with appropriate Native American groups for NHPA and NAGPRA related issues, pursuant to 36 CFR 800 and AFMAN 32-7003. The following Federally recognized tribes should be contacted in order to initiate consultation on any Section 106 undertakings, to inventory any TCPs, or to identify any other historic properties of religious or cultural importance. In the event that unanticipated Native American human remains, funerary objects, sacred objects, or objects of cultural patrimony are found on Dover AFB, Dover AFB will consult with the SHPO and the appropriate Native American groups. Establishing and maintaining a government- to-government consultative relationship prior to any unanticipated need is in accordance with the DoD policy stated in the Department of Defense American Indian and Alaska Native Policy, October 20, 1998. Federally recognized tribes with potential interests at Dover AFB are:

Delaware Nation
Nekole Alligood
NAGPRA Representative
Delaware Nation Cultural Preservation
P.O. Box 825
Anadarko, Oklahoma 73005
Phone: (405) 247-1177
Fax: (409) 237-6627

Delaware Tribe of Indians
Dr. Brice Obermeyer
Director, Delaware Tribe Historic Preservation Office
Roosevelt Hall, Rm 212
1200 Commercial St.
Emporia, KS 66801
Phone: (918) 335-7026
Email: bobermeyer@delwaretribe.org

Stockbridge-Munsee Community Band of Mohican Indians
Bonney Hartley, THPO Manager/NAGPRA
W13447 Camp 14 Road
Bowler, WI 54416
Phone: 715-793-4387
Fax: 715-793-1307

In addition to the above federally recognized Delaware tribes, there are two state-recognized tribes that may have an interest in historic properties at Dover AFB. These groups may be interested or concurring parties during the Section 106 and NAGPRA process and may be consulting parties if agreed to by other consulting parties. The Nanticoke Indian Association is recognized by the State of Delaware, and the Lenape Tribe of Delaware is recognized by New Jersey and has applied for Federal recognition. Dover AFB may choose to initiate contact with these groups or may first consult with the SHPO concerning the tribes' interest.

Nanticoke Indian Association
Chief Natosha Norwood Carmine
27073 John J. Williams Highway
Millsboro, Delaware 19966
Phone: (302) 945-3400
Email: nanticok@verizon.net

Lenape Indian Tribe of Delaware
Chief Dennis J. Coker
Lenape Tribe of Delaware
4164 N. Dupont Highway, Suite
6
Dover, DE 19901-1573
Phone: (302) 730-4601
Email: denniscoker@lenapeindiantribeofdelaware.com

Agreement Documents

- Agreement documents, such as MOAs, PAs, CAs, Plans of Action, etc. will be drafted and coordinated by the CRM and approved by the Installation Commander
- Agreement documents are referenced in the Appendix section of this ICRMP

GIS Management

- The installation maintains maps showing locations of certain significant cultural resources. These maps are maintained: by 436 CES/CEN
- According to 32 CFR Part 229, information divulging the location and character of archaeological sites should be limited to parties involved in management and/or planning and shall not be divulged to the general public. Such confidentiality prevents damage to sites. In the spirit of ARPA, all maps of archaeological sites have restricted access. Access will be granted by the CRM IAW user need and 32 CFR Part 229

7.10 Alterations to Buildings and Structures

Dover AFB contains buildings, structures, sites, and objects that may require repair and maintenance, and these actions may be subject to Section 106 of the National Historic Preservation Act (NHPA). Repair and maintenance activities can affect character-defining features of historic properties; therefore, review of these actions is subject to Section 106. Additionally, Section 110 of the NHPA mandates that Federal agencies manage and maintain historic properties under their jurisdiction or control in a manner

that considers the preservation of the properties' historical, architectural, archaeological, and cultural values.

All project proponents conducting work that results in alterations to buildings or structures at Dover AFB have a responsibility with the CRM to determine if their project may affect cultural resources, and to identify what measures are necessary to mitigate or compensate for any of these impacts. This requires the advice and participation of the CRM prior to undertaking the work. Maintenance and repair actions may be administered under applicable DoD Program Comments.

Repetitive Maintenance and Repair

Dover AFB contains buildings, structures, sites, and objects that require repair and maintenance; these actions may be subject to Section 106 of the NHPA. Repair and maintenance activities have the potential to affect character-defining features of historic properties, and therefore review of these actions is subject to Section 106. Additionally, Section 110 of the NHPA mandates that Federal agencies manage and maintain historic properties under their jurisdiction or control in a manner that considers the preservation of the properties' historical, architectural, archaeological, and cultural values.

This section outlines consultation procedures and effect determinations for preservation and rehabilitation (e.g., maintenance, repair, alteration) of historic buildings and structures that are consistent with the *Secretary of the Interior's Standards for Rehabilitation* (SISR) (36 CFR 67) (Department of the Interior 1990) and *Design Guidelines for Department of Defense Historic Buildings and Districts*. These standards and guidelines identify classes of activities that result in a determination of no adverse effect on historic properties. This SOP cannot exempt undertakings from coordination with the SHPO; that exemption must be accomplished through a Programmatic Agreement (PA). Once a maintenance or repair project is proposed for a historic property, Dover AFB will determine the effect of the project on the historic property.

Procedure:

For all project proponents, the following steps are to be followed during repetitive maintenance and repair activities in order to preserve character-defining features of historic properties and meet legal requirements under the NHPA.

- The CRM identifies, evaluates eligibility of, reviews proposed projects, and determines effects on historic properties. Under Program Comments issued by the ACHP, installations, including Dover AFB, have no further requirements to identify, evaluate, treat, or mitigate, or consult with the applicable SHPO regarding, any Cold War-era unaccompanied personnel housing (UPH) (1946– 1974) or World War II-or Cold War-era ammunition storage facilities (1939–1974). Dover AFB and its project proponents may proceed with the maintenance and repair of these properties without further NHPA Section 106 compliance responsibilities.
- If the historic property is not covered by a Program Comment for Cold War-era UPH or ammunition storage facilities, the CRM (in consultation with SHPO) must determine if the action can be undertaken in conformity with the Program Comment for DoD Rehabilitation Treatment Measures. The intent of this Program Comment is to reduce compliance timeframes for routine repair and maintenance undertakings involving historic properties when the DoD chooses to repair and maintain those resources in accordance with the SISR. Four standard treatment measures have been implemented by this Program Comment:
    - Removal of mortar joints and repointing

- Preparation of lime- and cement-amended mortar
- Preparation of lime- or Portland cement-based stucco
- Repair of historic stucco

For actions not subject to the Program Comments listed above, the CRM will determine (in consultation with SHPO and tribes if appropriate) if a proposed action has the potential to affect historic properties. Some routine or low-impact actions associated with the maintenance and repair of historic properties do not have the potential to result in effects on historic properties. All routine maintenance and repair activities involving historic properties at Dover AFB should comply with the *Secretary of the Interior's Standards for Rehabilitation*. Many actions associated with the maintenance and repair of historic properties are unlikely to affect historic properties.

- Rehabilitation projects that are not consistent with the SISR will have an adverse effect on historic properties and may require the development of mitigation measures in consultation with the SHPO and ACHP. The amount of time required for consultation is the same as that for a no adverse effect determination. Examples of an adverse effect action include demolition or a major addition that is not in scale with the original structure.

Demolition

For all project proponents, the following steps are to be followed to demolish a historic property in order to meet legal requirements under the NHPA.

- The Dover AFB CRM will notify the ACHP in writing and provide the following documentation, in accordance with 36 CFR 800.11(e):
  - A description of the undertaking, specifying the Federal involvement and its APE, including photographs, maps, and drawings, as necessary
  - A description of the steps taken to identify historic properties
  - A description of the affected historic properties, including information on the characteristics that qualify them for the NRHP
  - A description of the undertaking's effects on historic properties
  - An explanation of why the criteria of adverse effect were found applicable or inapplicable, including any conditions or future actions to avoid, minimize, or mitigate adverse effects
  - Copies or summaries of any views provided by consulting parties and the public
- Concurrently, the CRM will initiate consultation with the SHPO and any other party interested in the undertaking (e.g., public groups, concerned citizens). The CRM will provide documentation to both the SHPO and ACHP. Consultation with the SHPO will include agreement on the type and magnitude of mitigation required. The CRM will execute an MOA, in accordance with Section 7.10 Management and Coordination, with the SHPO and ACHP, as required. (If the ACHP participates in the consultation process, he or she will execute the MOA along with the Federal agency official and the SHPO. If HABS/HAER documentation is required by the MOA, the CRM will consult with the SHPO or the NPS to determine the type and level of documentation required.)
- The CRM will ensure mitigation is complete and addresses any stipulations of the MOA. If HABS/HAER standards of recordation is required (Delaware has established its own documentation standards and the mitigation may not be required to meet HABS/HAER standards.), upon completion (see also Section 8.4 Installation Areas of Concern), the CRM will provide the documentation to the SHPO. Upon satisfaction of all stipulations of the MOA, the project may proceed.

- The implementing regulations of the NHPA (i.e., 36 CFR 800) require Dover AFB to complete the above-described consultation process prior to the approval of the expenditure of federal funds on an undertaking. This requirement is designed to encourage early planning and coordination among agencies, so that mitigation measures can be implemented in a time-effective manner, thereby ensuring that the undertaking is not unnecessarily delayed. Installation personnel and project proponents should be aware that demolition, adverse effect consultation, and recordation by HABS/HAER standards is a time-intensive process and should be undertaken only when all other alternatives for the treatment of a historic property have been exhausted.

8.0 CULTURAL RESOURCES INVENTORY

8.1 Physical Setting

From its original size of 587 acres, Dover AFB now encompasses 3,824 acres within the corporate limits of Dover and partially within the unincorporated areas of Kent County, Delaware (Aerial View of Dover AFB Map). The Eagle Heights Family Housing Area was privatized in October 2005 and the houses are leased to the residents. The two 5,000-foot runways originally built at the airport over the years have been lengthened to accommodate heavier aircraft. The lands under the jurisdiction of Dover AFB include three off-base facilities: the Port Mahon Petroleum, Oil & Lubricants (POL) Annex (2.14 acres), a small parcel that accommodates a Next Generation Radar site (0.5 leased acres), and the Eagle Creek Golf Club (10.5 leased acres). More than 8,000 military staff and civilians work at Dover AFB.

Dover AFB is located in the Mid-Drainage area of the Lower Coastal Plain, about 3 miles from Delaware Bay. Dover AFB lies in the Atlantic Coastal Plain Physiographic Province, a wide belt of Cretaceous-to- recent sedimentary deposits of sand, gravel, silt, clay, limestone, chalk, and marl. The topography of Dover AFB is generally level. Surface elevations range from 10 feet above mean sea level (AMSL) by the St. Jones River, to 30 feet AMSL in other areas.

Surface soils of Kent County, Delaware that have been recorded on Dover AFB include the Sassafras-Fallsington Association, the Othello-Matapeake-Mattapex Association, and the Tidal Marsh Association (Mathews and Ireland 1971). The climate is continental, marked by well-defined seasons. Major plant communities on Dover AFB include: mesic hardwood forest, wet hardwood forest, tidal swamp forest, successional shrub/sapling communities, red cedar, emergent non-tidal wetlands, emergent tidal wetlands, and maintained grass areas (U.S. Department of Energy [USDOE] 1996).

Aerial View of Dover AFB Map

8.2 Prehistory and History

Six sites with prehistoric components have been recorded on Dover AFB property: 7K-D-1, 7K-D-2, 7K- D-5, 7K-D-26, 7K-D-126, and 7K-D-135 (Section 8.3 Resource Inventories). Of these, 7K-D-1, 7K-D-5 and 7K-D-26 have been determined eligible for listing in the NRHP. Prehistoric sites span the Archaic and Woodland periods. Thirteen sites have been recorded with historic components: 7K-D-1, 7K-D-2, 7K-D- 26, 7K-D-125, 7K-D-126, 7K-D-129, 7K-D-131, 7K-D-132, 7K-D-133, 7K-D-134, 7K-

D-136, 7K-D-143, and 7K-D-151. The historic components of 7K-D-129 and 7K-D-143 have been determined eligible for the NRHP. Identified historic sites span the late eighteenth century through the twentieth century. The following is an outline of the prehistory and history of the area, including the kinds of sites and artifacts that might be encountered from each period, and the context for interpreting them. More information can be found in the public document *To Slip the Bonds of Earth: The History of Dover Air Force Base and Its Surroundings* included in Appendix N.

Prehistoric Period (10,000 B.C. – A.D. 1400)

Native Americans may have first arrived in the vicinity of Dover AFB between 12,000 and 8,500 years ago during what archaeologists call the Paleoindian Period. This was a time when the climate was cooler and moister than today, when the broad fields of Dover were locked in the dense evergreen forests sprawling south of the last Ice Age's retreating glaciers. The men and women who traversed this vast wilderness camped in accordance with the seasons, cycling through the landscape as food became available. Settling near water where resources were most abundant, Paleoindian people hunted wild game, fished, and collected plant foods amid forays to gather stone materials for tool production (Custer 1984; Dent 1995; Gardner 1977; McNett 1985). The large, fluted projectile points/knives characteristic of Paleoindian cultures are often the only artifacts that remain to tell of the earliest people to inhabit the mid-Atlantic. A few Paleoindian sites have been found in Kent County, including Dover's Blueberry Hill site, marking humankind's earliest known entries into the area (Heite and Blume 1995).

As the climate warmed at the end of the last Ice Age, the landscape transformed into deciduous forests. With new ecosystems came an abundance of new resources available to people living here between 8,500 and 5,000 years ago during the Archaic Period. They set up base camps near estuaries and smaller, outlying camps where specialized resources, such as raw stone, could be gathered (Custer 1986; Gardner 1977). Stones were crafted into new tools as Archaic Period people adapted their technology to the shifting environment, and there is evidence to suggest they were so successful that populations began to grow.

Native American people thrived during the Woodland Period between 5,000 and 400 years ago, during which the climate became more like modern conditions (Custer 1989). As the planet warmed, sea levels rose to near present-day levels, permanently flooding rivers and streams to create massive estuaries where fish and shellfish flourished in great numbers (LeeDecker et al. 2005). People during the Woodland Period chose to live near reliable waterways where resources were most abundant. While hunting wild game and collecting edible wild plants remained cornerstones of their subsistence, increasingly accessible marine resources meant that fish and shellfish also became key components in their diets (Custer 1989; Dent 1995; Mouer 1991).

Through time, people became less nomadic, establishing settlements occupied nearly year round surrounded by foray camps for procurement of specific resources (Custer 1984, 1989; Custer et al. 1983). What some archaeologists see as the remains of large sedentary occupations, however, may actually be small, overlapping camps that were frequently revisited by smaller, mobile groups of people. New artifact types appeared, such as woodworking tools such as stone adzes and celts as well as pottery used for food preparation, consumption, and storage (Custer 1989; Dent 1995).

Vast trade networks blossomed during this period, stretching west from the coast through the mountains and into the valleys beyond. Several burial sites have been found in Delaware along the St. Jones and Murderkill Rivers (Custer 1989; Stewart 1994). These sites are attributed to the Delmarva Adena culture, so named for the trade relationship shared with the Ohio Valley's mound-building Adena culture.

The emergence of agriculture toward the end of the Woodland Period meant that people began to live in semi-sedentary villages in areas where cultivated or collected plant foods were stored (Custer 1989; LeeDecker et al. 2005). Because the region's fertile floodplains offered the best agricultural land, settlements likely shifted to these areas where the rich soil could yield surpluses to feed the growing populations.

Woodland Period sites have been found on or very near to Dover AFB. One of the most important is the St. Jones Adena site, located partially on base and used as a Delmarva Adena mortuary-exchange center. This large site contained dozens of cremated and non-cremated burials along with exotic stone artifacts from the Ohio Valley and copper ornaments from the Great Lakes region. The type and quantity of these grave goods varied among the burials, suggesting that differences in social status grew more complex during this time (Custer 1989; Stewart 1970). Immediately to the northwest, a large encampment was discovered that may have been associated with the nearby burial and trading activities (Koziarski et al. 2014; Thomas and Payne 1996).

Farther up the St. Jones River, archaeologists identified a large site on Dover AFB with components dating from the Archaic and Woodland Periods. The site included large cooking hearths and separate activity areas suggesting the site was occupied by large groups for extended time periods (Furgerson and Wall 2005). Just to the northwest, another large base camp was unearthed, revealing evidence for dwellings that could house up to six family groups along with storage and refuse pits and distinct activity areas (Custer 1984; Custer et al. 1996). Small camps lying at a distance from the larger settlements would have provided resources to the central groups, and at least one such site has been found on Dover AFB. Downriver from the larger camps, archaeologists discovered a Woodland Period procurement site where river stones were shaped into tools (Bedard and Formica 2011).

Historic Period (1600-1969)
Seventeenth Century

The earliest known European settlements in what is now Delaware were planted by the Dutch and Swedes in the early to mid-seventeenth century, each vying for claims on the continent's supposed riches. While the vicinity of what is now Dover AFB remained unoccupied during the initial colonial ventures, the occasional trapper or trader may have pressed into its wilds in pursuit of his own prosperity (Jackson 1983; Weslager 1987).

The New Sweden Company established Fort Christina, Delaware's first permanent European colony, near present-day Wilmington in 1638. The colony proved successful, attracting Swedish and Finnish farmers and merchants until the Dutch captured Fort Christina in 1655 (URS 2011). By 1664, however, England was targeting Dutch landholdings along the Delaware River and Chesapeake Bay. Undaunted by wars with Native Americans and European powers, as well as internal land disputes, the English pressed their interests until the Dutch relinquished the New Netherlands colonies. English settlement was encouraged at New Castle and Lewes while migrants from the Virginia and Maryland colonies came to occupy what would become Kent County (Jackson 1983). Thirteen land titles issued in 1671 were the area's first signs of the many farmlands to come. Most of these tracts were clustered along the St. Jones River, which was prized for its transportation potential and the fertile lands rising above its floodplain (Jackson 1983).

Based on a 1680 census of central Delaware at this time, five property owners lived in the vicinity of what is now Dover AFB. The Duke of York, proprietor of the Delaware lands, chartered St. Jones (later Kent) County in 1680 (Jackson 1983; USDOE 1996). Toward the close of the seventeenth century, large

swaths of land were planted in tobacco and grain cash crops. Much of the agrarian work was borne on the backs of enslaved African Americans, of whom there were 500 throughout Delaware by 1721 (Newtown 1997).

William Penn established the county seat in a place he called Dover, though it was only in 1697 that a village began to coalesce with the construction of the courthouse. Twenty years later, the town of Dover was officially platted on 125 acres and the population began to grow (A.D. Marble and Company [ADMC] 2012). To date, no archaeological sites from the seventeenth century have been found on Dover AFB.

Eighteenth Century

As the eighteenth century proceeded, the second and third generations of Delaware planters built more permanent brick, frame, or log houses. Several such eighteenth-century houses still survive in Kent County; one of which, Poplar Hall, is located immediately south of Dover AFB. Those who could not afford to own land often worked as tenant farmers. They typically leased a small house and garden plot on their landlord's property in exchange for fieldwork. Usually log or wood-frame dwellings, tenant houses were often built so they could be disassembled and relocated within the farm at the landowner's discretion (Sheppard et al. 2001). By the mid-eighteenth century, 80 to 90 percent of Delaware's population was engaged in agriculture (Egnal 1975). The sale of wheat to markets in New York and Philadelphia brought prosperity to many area planters, leading to rising real estate values and a shift toward large scale commercial farms.

The town of Dover, while slow to grow during the early eighteenth century, began to bloom after 1750 (Louis Berger and Associates [LBA] 2000). In that year, only 20 families called Dover home, but by 1762, the town included 200 to 300 citizens as well as churches, tradesmen's shops, a tavern, and a general store (Hancock 1976). The town also boasted a landing on the St. Jones River which, along with a far-reaching road network, made Dover a commercial center (ADMC 2012; Heite and Heite 1986).

On the eve of the American Revolutionary War, Dover had grown to include a large residential section, becoming a bustling center of activity amid the expansive fields of its farming community (Edwards et al. 2003). When Delaware became independent in 1776, it was soon realized that the state's capital of New Castle would be vulnerable to British coastal attacks. To protect the new state's seat of power, the capital was transferred to Dover in 1777.

Nineteenth Century

While much of Kent County was spared the destruction of the Revolutionary War and the War of 1812, the wakes of economic disruption that followed destabilized its agrarian foundation. Compounded by trade embargoes and soil depletion, many Delaware farmers were no longer able or willing to stay. As new, fertile land became available west of the Allegheny Mountains, many bid farewell to their Delaware fields in hopes of a better life beyond the highlands. Kent County's population dropped during the 1820s before hovering around 20,000 for the next decade. The population of the county's enslaved laborers also declined from around 2,300 in 1790 to 588 by 1830 (ADMC 2012). The only portion of the county's population to grow during this time was its free African-American citizenry.

Industrial ventures in Delaware's burgeoning urban areas helped offset the agricultural downturn (URS 2011). E.I. du Pont opened the state's first gunpowder mill in 1802, signaling his family's rise to an industrial prominence that endures to this day (Munroe 1993). Such success was bolstered by transportation improvements that allowed goods to be shipped quickly and more broadly. By 1829, the

Chesapeake and Delaware Canal cut through the Delmarva Peninsula, linking the Chesapeake Bay and Delaware River (Munroe 1993). Railroads quickly followed on the heels of canal builders, heralding the dominance of overland shipping, while waterways silted in due to soil erosion instigated by farming (De Cunzo and Catts 1990; Munroe 1993).

Advances in regional transportation offered great advantages to Delaware agriculture, which rebounded by the mid-nineteenth century. Railroads, canals, steamboats, and a web of roadways provided producers with improving access to the markets they needed to supply (ADMC 2012). Furthermore, the use of fertilizers, improved drainage techniques, mechanized equipment, and crop rotation helped to rejuvenate enervated soils, restoring thousands of acres to productive farmland (Thomas and Payne 1996; USDOE 1996).

Amid this bustle of industry and agriculture, the nation sank into the Civil War. No battles were fought on Delaware soil, and while its legislature ultimately elected to remain in the Union, it was nonetheless a divided state. Many in the northern part of Delaware supported the Union's cause, while Confederate sympathizers typically hailed from Kent and Sussex Counties. Thriving industrial ventures provided the federal government with wagons, textiles, ships, and gunpowder.

The upswing in Delaware's agricultural and industrial activity continued after the Civil War, but the size and relative wages of the farm labor force fell. This contributed to the established trend toward tenant farming, which had grown throughout the nineteenth century and became so commonplace that by 1900, more than half of Delaware's farmers were tenants or sharecroppers (De Cunzo and Catts 1990; Thomas and Payne 1996; USDOE 1996).

Several archaeological sites with components dating to the nineteenth century have been discovered on Dover AFB, many of which are attributed to tenant farmers and the community of which they were a part. These include five artifact scatters in former agricultural fields, four farmsteads, one schoolhouse, and the John Wesley Methodist Episcopal Church and cemetery.

Twentieth Century

As industry and manufacturing expanded state-wide during the late nineteenth and early twentieth centuries, the number of farmers declined. By 1880, Kent County's 204 manufacturing facilities were enticing many people to leave farm labor behind, and urban centers, including a rapidly evolving Dover, were ready to accept them (ADMC 2012). The city built a waterworks (1881), steam-powered electric plant (1900–1902), paved the streets (1907), and built a municipal sewer system (1936; Edwards et al. 2003; LBA 2000; Sammak and Winslow 1967). Less labor-intensive farms and growing urban industries likely precipitated an out-migration from Kent County that lasted until 1940.

By the mid-twentieth century, Dover was in the midst of dramatic changes. With the arrival of the military at what is now Dover AFB, new commercial and residential developments began to stretch across the old agricultural fields. The unprecedented population boom that came with the military installation led to new neighborhoods, shopping centers, and a host of business enterprises that rushed in to serve the growing community. Many of these changes occurred during the 1950s and 1960s and were largely concentrated along the previously rural U.S. Route 13 corridor leading to Dover AFB (ADMC 2012; Edwards et al. 2003; Frucht 1994). The base's impact on Dover is hard to overstate, especially as it grew to be one of the most important terminals within the USAF.

Dover Air Force Base (1940-Present)

In response to the Nazi invasion of Poland and escalating aggressions in Europe and Asia, the Civil

Aeronautics Authority began offering financial assistance to state and local governments in 1939 for the construction of municipal airports that the U.S. military could use in case it was drawn into war (City of Dover 1940; Dover AFB 1995; Heite 1994). In 1940, the City of Dover purchased 587 acres of farmland to build three runways (Wiggins 2016). The project languished until December 17, 1941, 10 days after the attack on Pearl Harbor, when the War Department leased the airport for the U.S. Army Air Force (AAF) and quickly resumed construction. Within two years, nearly 100 temporary structures, including hangars, mess halls, and barracks, appeared across the fields. Most were concrete masonry buildings constructed using design plans dating back to 1917, typical of other contemporary Army installations (Mueller 1989; Myers 1959).

The base opened on December 20, 1941 and was known variously as Dover Airdrome, Dover Sub-Base, and Dover Army Air Base. It served as a Coastal Patrol Base for the Eastern Defense Command, equipped to patrol and defend the coast from German submarines if necessary (Lauria 2000; Mueller 1989; Wiggins 2011, 2016). In 1943, the base was repurposed as a training facility for P-47 fighter pilots (Wiggins 2016). This fighter pilot program constitutes the base's longest WWII mission, training 1,000 airmen in seven squadrons before deploying them to the European theater (Dover AFB n.d.; Lauria 2000; Weitze 1996; Wiggins 2011).

The base was renamed Dover Army Airfield in 1944 and, in addition to training fighter pilots, was tasked with developing a secret accelerated rocket engineering program (Mueller 1989). Building 1301, the hangar that currently houses the Air Mobility Command Museum, was erected as the part of an experimental station, which also included barracks, a shop, a power plant, a magazine, an administrative building, and a large range (AMCM 2016a).

Following WWII, the base became a processing center for discharging and recruiting airmen before it was deactivated and given caretaker status in September 1946. It was placed under the Tactical Air Command's jurisdiction and used as a training center by the Army National Guard from 1946 to 1950 (Weitze 1996). With the creation of the USAF, the base was designated Dover Air Force Base on January 13, 1948 (Mueller 1989). When Dover AFB was reactivated early in 1951, it was placed under the Air Defense Command's (ADC) jurisdiction. Later in the year, the 148th Air National Guard Fighter-Interceptor Squadron (FIS) was transferred to Dover from Reading, Pennsylvania and the squadron's aircraft were upgraded from F-47s and F-51s to F-84 day fighters. The following year, F-94 interceptors arrived, and the squadron was placed under the Military Air Transport Service's (MATS) jurisdiction in April 1952 (Dover AFB n.d.; Weitze 1996). As a MATS base, Dover AFB joined Charleston AFB and McGuire AFB as part of the larger Atlantic Division (Heist 2006).

While reactivation invigorated Dover AFB's flight program, it also necessitated an expansive construction program to accommodate the new equipment and personnel. The USACE Philadelphia District began renovating 95 buildings constructed in 1942 and built a new hangar and alert apron for the FIS (Myers 1959). With Dover AFB's expansion came significant economic developments and a large population influx, both of which would forever change Dover from a small city in the farmlands to a sprawling landscape of housing and commercial developments. Many of these developments were focused along the U.S. Route 13 corridor leading to the base, displacing downtown Dover as the area's commercial focus (Czerwinski 2014).

Dover AFB was designated a permanent installation in 1953 and strategic airlift support became the base's primary mission under MATS. A $26 million construction program was already underway to improve and expand the base, which became the east coast terminal for airlift operations (Dover AFB n.d.; U.S. Senate 1951). Construction continued into the 1960s and eventually included an airfreight

terminal, maintenance buildings, and warehouses in support of the cargo missions to which the base was principally dedicated (Myers 1959). In 1971, Dover AFB became the first all C-5 equipped Wing in the Air Force. Jurisdiction of the airlift fleet passed from MAC to the Air Mobility Command (AMC) after the Gulf War, re-designating the 436th MAW as the 436th Airlift Wing (AW) in the process (URS 2011). In June 2017, the 436th AW received its first C-17 Globemaster III aircraft into its inventory.

8.3 Resource Inventories

Cultural resources inventories are key tools in the identification and protection of existing cultural resources. The following resources inventories are maintained, as necessary, by the installation:

- Archaeological sites
- Buildings and structures
- Traditional cultural properties and sacred sites
- Cultural landscapes

The Cultural Resources Inventory Tables are maintained in Microsoft Excel format and are available as an Appendix to this Plan.

Installation Supplement – Resource Inventories

This section documents cultural resource survey and evaluation efforts undertaken by Dover AFB since the inception of the CRM Program in 1985, and the inventory of historic properties resulting from these efforts as of the latest revision of this ICRMP (2018). Dover AFB's inventory of historic properties is not intended to be a static list. On the contrary, it will change over time as new areas are surveyed, resources are discovered or re-evaluated, buildings are altered or demolished, or properties achieve historical significance upon reaching 50 years of age or inclusion in a new historic context. This section of the ICRMP should be updated annually to reflect changes in the historic properties inventory. In addition, a real-time inventory of historic properties is maintained by the CRM.

Cultural resources at Dover AFB that have been evaluated for listing in the NRHP are listed in Appendices A and B. As of the preparation of this ICRMP update, 15 archaeological sites and 120 above-ground resources (117 extant) have been evaluated for NRHP eligibility. Only one property at Dover AFB, Building 1301, is listed in the NRHP. Five archaeological sites (7K-D-1, 7K-D-5, 7K-D-26, 7K-D-129, and 7K-D-
143) and one above-ground resource (Building 3100) have been determined eligible for the NRHP.

Archaeological Studies in the Vicinity of Dover AFB

Inventory Studies

In 1978, the Kent County Chapter of the Delaware Archaeological Society conducted an archaeological survey of the St. Jones Neck, southeast of Dover AFB. This survey recorded five prehistoric sites dating from the Archaic through Woodland II Periods. The sites are located around the headwaters of small streams flowing into the St. Jones River, and Delaware Bay. In 1983, Jay Custer and George Galasso surveyed portions of the St. Jones and Murderkill River drainages. They recorded sites dating from Paleoindian through Woodland II Periods. Custer's analysis of one of the sites, the Barker's Landing site, is the now the basis for the Woodland I Period Barker's Landing Complex. During the 1980s, Jay Custer used Land Remote Sensing Satellite (LANDSAT) technology to help in the development of models for archaeological site distribution (Federal Highway Administration and Delaware Department

of Transportation [DelDOT] 1987). The work was conducted in support of DelDOT planning. The results of the study underscored the importance of estuarine resources in prehistoric land use patterns. Also, during the 1980s, Diane Gelburd conducted a systematic survey for prehistoric sites in the St. Jones and Murderkill drainages designed to test some of the predictive models being developed at the time by Custer (Gelburd 1988). Her work confirmed the importance of estuarine resources (USDOE 1996). Edward Heite conducted historical and archaeological studies on archaeological properties associated with Bridge 356a near Lebanon, on the opposite side of the St. Jones River from Dover AFB. Properties studied by Heite included Hunn Town, an eighteenth-century house location, an eighteenth-century forge, an early nineteenth century sawmill, a cannery, a mill dam, a mill race, and wharf remains (Heite and Heite 1989). While the proposed project was not anticipated to have any adverse effects to historic properties, the cannery site was found to be potentially eligible for the NRHP.

In 2012, A.D. Marble & Company conducted a Phase I archaeological survey of 41.85-ac. for the development and expansion of the Dover AFB Cargo Ramp project to create an expanded parking surface for airplanes adjacent to DAFB. A previously identified historic farmstead site (7K-D-131) was identified but deposits were clearly disturbed and lack integrity. No further investigations were recommended (A.D. Marbel 2013).

Data Recovery Investigations

Two sites in the vicinity of Dover AFB had data recovery investigations completed. Site 7K-D-1, the St. Jones Adena site, was accidentally discovered on private land adjacent to Dover AFB during gravel quarry excavations. In 1961, the site was excavated under the auspices of the Delaware State Museum (de Valinger 1970; Stewart 1970). The St. Jones Adena site dates to 275 BC, falling within the Woodland I Period. Distinctive artifacts from the site include: bifaces, copper beads, pendants, gorgets, and tubular pipes. Ronald Thomas (1976) reanalyzed the material from this site. He identified eight burial loci comprising 50 burials. He found that many of the artifacts came from the Ohio River Valley, the copper beads came from Lake Superior, and the slate for the gorgets came from Pennsylvania (USDOE 1996).

The University of Delaware investigated the Carey Farm (7K-D-13), and the Island Farm (7K-C-13) sites in connection with the Delaware Route 1 expansion (Custer et al.1995). Both sites are located near the north gate of Dover AFB. Both sites are multicomponent habitations that date from the Early Archaic through the Woodland Periods. The Carey Farm site (7K-D-13) was first investigated in the 1970s and is listed on the NRHP; the Island Farm site was considered to be part of the Carey Farm site and is not listed on the NRHP (Thomas and Payne 1996; USDOE 1996).

In 1990, data recovery excavations were conducted at the Collins, Geddes Cannery site, at Lebanon Landing. Excavations recovered can-making waste and delineated the principal cannery building. Analysis focused on the development of the cannery, working conditions, and elaborating the manufacturing context for Delaware (Heite et al. 1990).

Cultural Resources Studies on Dover AFB

Numerous cultural resources studies have been conducted on Dover AFB in compliance with Section 106 and Section 110 of the NHPA. The Cultural Resources Studies on Dover AFB Table contains a summary of investigations carried out on the base to date. As of 2015, a total of 242.5 acres had been surveyed on Dover AFB. The Archaeological Survey Areas Map shows the location of archaeological survey areas on base.

Cultural Resources Studies on Dover AFB

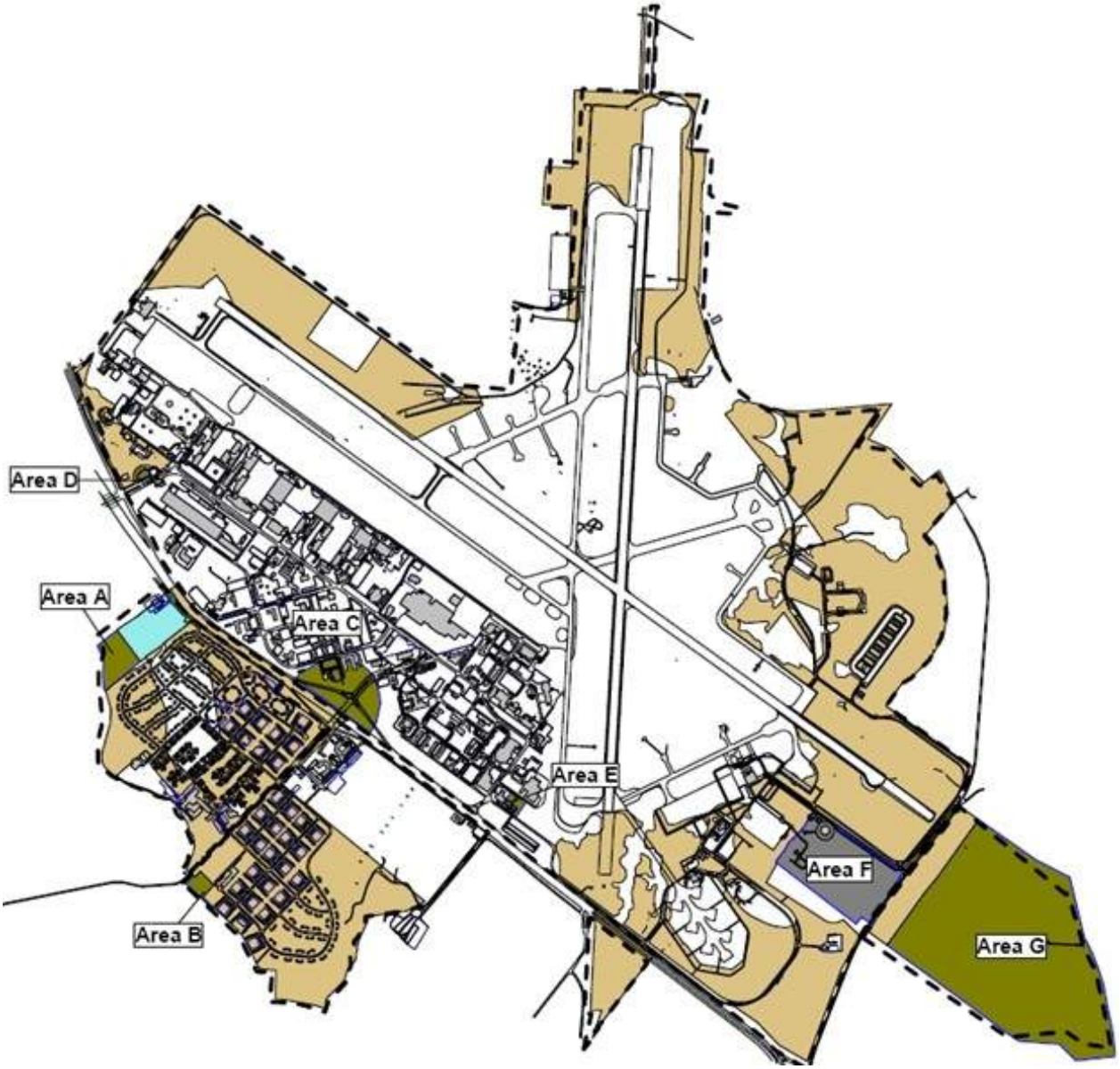
Year*	Author	Study Type	Results
1985	NPS 1985	Cultural Resource Management Recommendations	The report indicates no buildings or structures potentially eligible for the NRHP. Sites 7K-D-1, 2, 26 listed as requiring evaluation; 50 acres recommended for survey.
1987	Dover AFB 1987	Correspondence: Request for SHPO review of World War II Facilities	This letter request from Dover AFB resulted in a SHPO determination that Building 1301 "has special architectural and historic qualities."
1991	DDHCA 1991	Correspondence: SHPO eligibility of Bldg. 1301	Provides details regarding the eligibility of Building 1301.
1991-1996	Thomas and Payne 1996	Section 110 Survey of 5 areas on Dover AFB (216.5 acres total)	Sites 7K-D-2 and 7K-D-26 were recommended as potentially NRHP eligible. Site 7K-D-1 not encountered. Five new historic archaeological loci potentially eligible for the NRHP are recorded, site forms are filled out for two (7K-D-125, 7K-D-126).
1993	Dames & Moore	Phase IA Archaeological Assessment and Predictive Model	Study resulted in a historic context and the identification of 11 areas having little or no ground disturbance and areas having a high potential for archaeological sites. This report was superseded in 1996 by UDOE 1996.
1993	Nelson-Salabes, Inc.	Structural Fabric Analysis, Building 1301	A field investigation conducted on May 10, 1993 was conducted to determine the existing conditions of Building 1301 and to prepare a construction cost estimate.
1993-1995	Catts et al.1995	Section 106 Survey for DelDOT (12 acres)	Portion of Lisbon farm recorded as Area A, recommended as ineligible for NRHP. Prehistoric site potentially eligible for NRHP recorded as Area B (7K-D-26).
1995	Heite 1995a	Section 106 Historical Overview for Main Gate Area	Pre-military archaeological sites considered unlikely to survive.
1995	Heite 1995b	Section 106 Survey for the Fire Training Area (38 acres, same area as NPS Area F).	Four archaeological loci were recorded. Locus 1 (Site 7K-D-136) considered potentially eligible for the NRHP.
1995	Wayne T. McCabe & Associates	Management Plan for the John Wesley Methodist-Episcopal Cemetery, Site	Recommendations made for the rehabilitation, interpretation and management of the site.
1995-1996	USDOE 1996	Section 106 and 110 Base-wide Documentary Archaeological Assessment for the IRP Program	Delineated disturbed areas on Dover AFB, areas of high, medium, and low potential for archaeological sites; 103 potential historic locations mapped.
1994-1996	HQ AMC 1996	Inventory of Cold War Properties	The report recommended Building 1303 as potentially eligible for NRHP and recommended that several other buildings should be evaluated when they reach 50 years of age.

Year*	Author	Study Type	Results
1998	HQ AMC 2000	Base-wide archaeological survey	Four new sites identified (three historic, one prehistoric), 7K-D-5 re-identified, new component of 7K-D-126 found. 1 site (7K-D-132) recommended potentially eligible for the NRHP.
1998	John Milner Associates, Inc. 1999	Phase I Archaeological Survey for the Civil Air Terminal Expansion	Report identified site 7K-D-131 with historic artifacts related to the Slaughter Farm. The site lacked integrity was and was found not eligible for the NRHP.
2001	Parsons 2002a	Phase II Study of John Wesley Cemetery, Site 7K-D-129	Site was evaluated for eligibility for the NRHP under Criteria A and D, and a management plan was prepared for the site. The study found the site not eligible for the NRHP; the Delaware SHPO did not concur with the finding, and the matter was referred to the Keeper. The Keeper determined the cemetery was eligible on May 1, 2006.
2002	Parsons 2002b	Phase II Evaluation of the Hoffecker Site, 7K-D-132.	Phase II investigation recommended the site as not eligible for listing in the NRHP based on lack of integrity and research potential. The SHPO has concurred with that recommendation.
2003	URS Group, Inc. (URS) 2003	Phase II Evaluation of the Lackey Site, 7K-D-136	The site was determined ineligible for listing in the NRHP based on the lack of research potential. The SHPO has concurred with that recommendation.
2004	Boyd, Furgerson and Barnes	Phase II Archaeological Evaluation of Site 7K-D-136, the Lackey Site	Site 7K-D-136 was recommended ineligible for listing. The SHPO has concurred with this recommendation.
2004-2005	Scherer and Fiegel	HABS No. DE-347-A	Documentation of Building 1303, SAC Crew Readiness Building and Alert Apron
2005	Furgerson and Wall	Phase II Evaluation of the Lisbon Tract Site, 7K-D-26, the Lisbon Tract	URS found the prehistoric component at the site is eligible for the NRHP and should be avoided and protected. The historic component was determined not eligible for the NRHP. The SHPO has concurred with those recommendations.
2006	Furgerson and O'Reilly 2006	Extended Phase I Survey of Sites 7K-D-125 and 7K-D-126	Site 7K-D-125 was recommended ineligible for listing in the NRHP. Loci A and E at Site 7K-D-126 were recommended potentially eligible for listing in the NRHP. Phase II or avoidance was recommended for both loci.
2009	Kerns-Nocerito 2009a	Phase I Survey of Location 21 (7K-D-143)	The survey identified site 7K-D-143. A Phase II Evaluation was recommended to determine if the site was eligible for listing in the NRHP.
2009	Kerns-Nocerito 2009b	Phase I Survey of Location 31	No archaeological sites were identified.
2009	Randolph 2009	John Wesley Methodist Episcopal Cemetery Treatment Project	URS performed tasks to assist Dover AFB in the protection of the cemetery from further deterioration. These tasks included the completion of the NRHP nomination for the

Year*	Author	Study Type	Results
2010	Bedard and Formica 2011	Phase II Evaluation of Site 7K- D-5	URS performed a Phase II Evaluation of 7K-D-5 in 2010 to determine its eligibility for listing in the NRHP. Recommendations are forthcoming.
2011	Versar	Location 45 Phase I Survey	The survey analysis concluded that Location 45 should not be recorded as an archaeological site and was, not eligible for listing in the NRHP. The SHPO concurred with this determination in 2011.
2011	Crowl, Johnson, and O'Reilly 2011	Phase II Evaluation of Site 7K- D-143	URS conducted a Phase II Evaluation of site 7K-D-143 in 2010 to determine its eligibility for listing in the NRHP. The site was recommended eligible for listing on the NRHP under Criteria A and D.
2011	Cleven 2011	National Register of Historic Places Evaluation of Buildings 260 and 312	URS found that Building 260 is an example of Unaccompanied Personnel Housing (UPH) subject to the *Program Comment for Cold War Era Unaccompanied Personnel H*ousing (1946-1974), and therefore not subject to Section 106 review. Building 3112 was highly modified and no longer eligible for the NRHP.
2012	Cleven and Albee 2011	Inventory of Above-Ground Facilities for Historical Potential	URS evaluated 91 above-ground facilities for eligibility for listing in the NRHP. Building 3100 (Dover AFB Middle School/Welsh Elementary School), located in the family housing section of Dover AFB, was recommended eligible for listing in the NRHP under Criterion C as exemplary of school design from its period of construction (1959-1964).
2013	Crowl, Johnson, and Furgerson 2013	Phase II Evaluation of Site 7K- D-126, Loci A, D, and E, Bergold Farm	AECOM recommended the site is ineligible for listing in the NRHP, and no further investigation is recommended.
2014	Koziarski, Bedard, Husted, Johnson, Pelletier, and	Geophysical Survey of Cemetery 1 and Cemetery 2	GPR could not definitively demonstrate the presence or absence of a historic cemetery. URS recommended that ground-disturbing activities be monitored by a professional archaeologist.
2014	Koziarski, Seibel, and Lazelle, 2011, 2013	Phase II Archaeological Evaluation of Site 7K-D-2	URS recommended that site 7K-D-2 was ineligible for listing in the NRHP. The site has a diffuse and low-density artifact distribution. It has little potential for advancing knowledge of local prehistory or history.
2014	Bedard and Formica	Phase II Evaluation of Site 7K- D-5	URS found Area A of the site retains integrity and recommended it eligible for NRHP listing under Criterion D, but only Area A contributes to that NRHP eligibility.

Year*	Author	Study Type	Results
2015	Cleven 2013	National Register of Historic Places Evaluation of 13 Facilities	URS evaluated 13 above-ground resources primarily built between 1970 and 1975. URS recommended that the Dover AFB Middle School/Welch Elementary School as eligible for NRHP listing under Criterion C as an example of school construction from the 1950s and 1960s.
2016	Cleven 2015	HABS Documentation of Dover Air Force Base Middle School/Major George S. Welch	URS prepared HABS documentation of Dover Air Force Base Middle School/Major George S. Welch Elementary School
2016	Koziarski, Regan, and Seibel 2015	Phase I and II Evaluation of Sites 7K-D-1 and 7K-D-151 (Wharton Farmstead)	AECOM conducted Phase I and II Evaluation of Sites 7K-D-1 and 7K-D-151 to determine the boundary of the sites and their eligibility for listing in the NRHP. Upon completion of the surveys 7K-D-1 was recommended eligible and 7K-D- 151 ineligible for listing on the NRHP.

*The year indicated is the year(s) during which the research was performed.



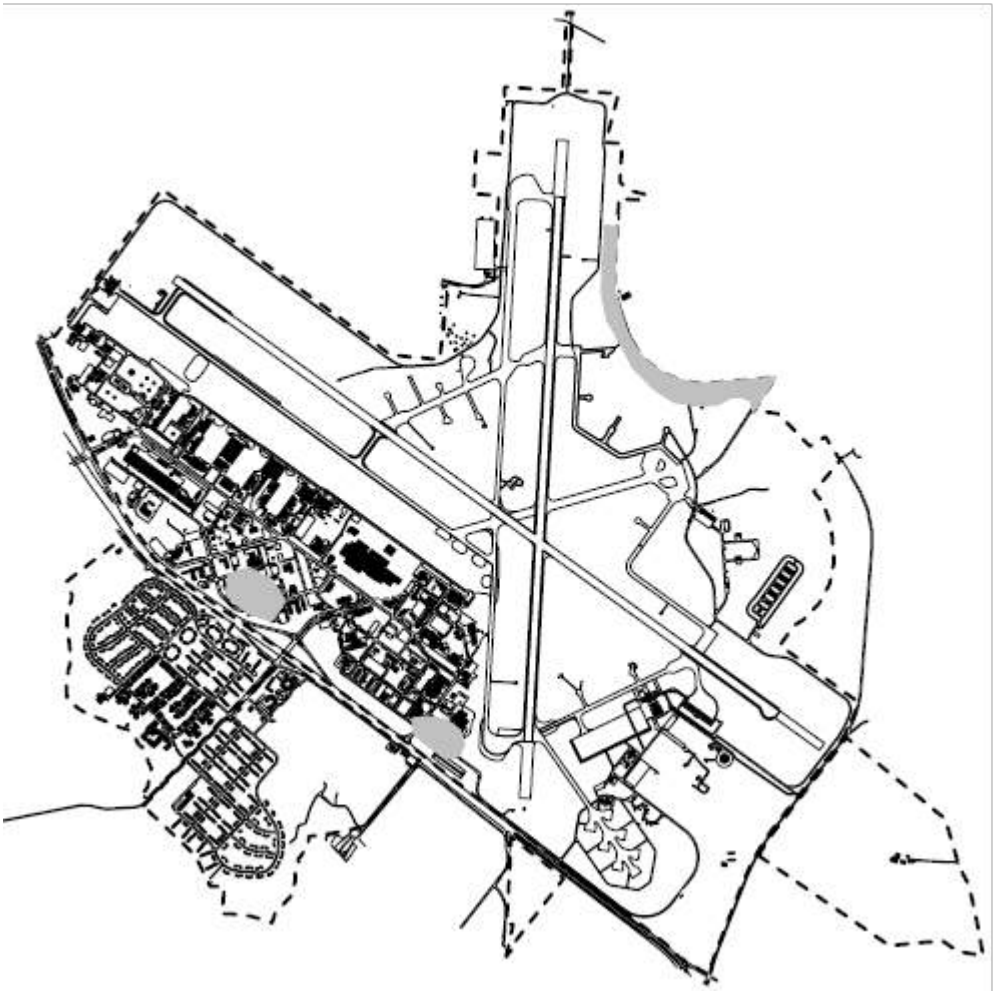
Archaeological Survey Areas

Cultural Resource Management Recommendations

In 1985, NPS personnel visited Dover AFB to assess the archaeological potential of the base (NPS 1985). This work was done as part of a nationwide program conducted by the NPS for the Military Airlift Command (MAC) in support of Section 110 identification and evaluation.

NPS personnel interviewed the Base Historic Preservation Officer, and staff of the State of Delaware Bureau of Archaeology and Historic Preservation (BAHP). Information was compiled concerning the archaeological potential of base property, and this was compared to information related to construction

disturbance on the base obtained from maps and other records. The NPS concluded that most of the base had been disturbed and retained little archaeological potential. It concluded that up to 50 acres on the base required archaeological survey, comprising an undisturbed area along the eastern boundary of the base, and two areas with the potential for historic sites toward the St. Jones River (NPS Survey Recommendations Shown in Grey Map). It also concluded that NRHP evaluations should be performed on three prehistoric sites near the St. Jones River, 7K-D-1 (to see if it extended onto the base), 7K-D-2, and 7K-D-26. The SHPO concurred with these findings on May 6, 1985.



NPS Survey Recommendations Shown in Gray National Park Service Archaeological Survey

In 1990, the NPS contracted with MAAR Associates, Inc. (MAAR), on behalf of the AMC, to conduct an archaeological survey of Dover AFB. The purpose of the survey was to complete Section 110 responsibilities for the base; the AMC and the NPS initially based the scope on the recommendations in the NPS 1984 Management Recommendations Report. Between 1991 and 1993, MAAR conducted archaeological field work (Thomas and Payne 1996). The actual survey encompassed two areas with potential for historic sites identified in the 1984 management recommendations report (Areas D and E), preliminary evaluation of sites 7K-D-26 and 7K- D-1 (Areas A and B), and survey of three areas not identified in the management recommendations report (Areas C, F, and G). The AMC and NPS excluded the area in the vicinity of Pipe Elm Branch from the survey because of the potential for contamination from Installation Restoration Program (IRP) sites. MAAR performed only limited surface investigation

of Areas C and D. Dover AFB removed these from the scope of work prior to any subsurface testing because DelDOT was to perform surveys in those areas. Area D was subsequently the focus of the main gate study (Heite 1995a). DelDOT never completed the Area C Phase I.

The MAAR survey totaled 216.5 acres. The Survey Methodologies Employed by the National Park Service Table describes the survey areas, and findings. The contractor plowed and disked Area A (7K-D-26) and conducted a controlled surface collection (CSC) on a 20-m grid (Thomas and Payne 1996). Twelve shovel test pits (STPs) supplemented the CSC. The contractor plowed Area A for a second time and conducted a second CSC at a 10-m interval, supplemented by the excavation of an additional seven STPs. In Area B (7K-D-1 and 7K-D-2), 39 STPs were excavated at 20-m intervals, supplemented by 17 auger probes. Thirty- five STPs were excavated at 50-foot intervals in Area E. Surface survey of Area F was conducted at 20- m intervals. No sites were recorded in Area F during the MAAR (Thomas and Payne 1996) survey. A later survey of Area F conducted by Heite Consulting (1995b) resulted in the identification of four archaeological loci, including one locus that was considered potentially eligible for the NRHP (7K-D-136). Area G was investigated through CSC (20-m intervals) and the excavation of STPs (35 total).

Survey Methodologies Employed by the National Park Service

Area	Expected Resource	Methodology	Findings
A 12.5 acres	7K-D-26	Plowed and disked. Surface collection on 20-m, then 10-m grid. Supplemented by 19 Shovel Tests.	7K-D-26 recommended as Potentially Eligible for the NRHP
B 4.4 acres	7K-D-1, 7K-D-2	39 STPs, 17 auger probes.	No evidence of 7K-D-1 was found 7K-D-2 is potentially eligible for the
C	D.C. Hoffecker Site	Dropped from Scope of Work	
D	Nineteenth century farmstead	Dropped from Scope of Work	
E 3.6 acres	C.M. Wharton Residence	35 STPs dug at 50-foot intervals	No sites identified
F 38 acres	G.G. Logan farm	Surface survey along 20-m transects	No sites identified (coincides with Fire Training Survey Area)
G 158 acres	Nineteenth century farms	Surface survey along 20-m transects supplemented by STPs	Five historic loci identified. All five are potentially eligible for the NRHP. Loci 1 and 2 were recorded as sites 7K-D-125 and 7K-D-126. The remaining loci were added to 7K-D-126 in 1999.

The archaeologists concluded that prehistoric sites 7K-D-2 and 7K-D-26 are potentially eligible for the NRHP, and that 7K-D-1 was not found on base property (Thomas and Payne 1996). Five historic loci were recorded in Area G; Loci 1 and 2 were given site numbers 7K-D-125 and 7K-D-126, respectively. Thomas and Payne (1996) concluded that there was insufficient information to evaluate the eligibility of the five historic loci. On October 12, 1995, the SHPO stated the opinion that there is not sufficient information to evaluate the NRHP eligibility of the sites recorded. For management purposes, Dover AFB will treat them as potentially eligible for the NRHP. The limited surface investigations of Areas C and D failed to recover any intact evidence of documented historic resources.

Phase IA Archaeological Assessment and Predictive Model

In 1993, Dames & Moore prepared prehistoric and historic contexts for Dover AFB and developed an archaeological predictive model. Through the use of historic maps and aerial photography, the model identified 11 areas with little to no ground disturbance and other areas having high potential for archaeological sites. The study made six recommendations ranging from field verification to incorporating results into project planning.

Structural Fabric Analysis of Building 1301

On May 10, 1993. Nelson-Salabes, Inc. conducted a field investigation to determine the existing conditions of Building 1301. Based on the survey and existing drawings, a construction cost estimate was prepared.

Lisbon Tract Survey

In 1993, archaeologists from the University of Delaware Center for Archaeological Research (UDCAR) conducted a survey at the Lisbon Tract of the Dover AFB (Catts et al.1995). The survey was conducted to comply with Sections 106 and 110 of the NHPA and to assess the potential effect to archaeological properties resulting from the relocation of base housing required by construction of Route 1. UDCAR surveyed the eastern half of the tract, totaling 12 acres. UDCAR focused their field strategy on locating and identifying the historic Lisbon farmstead.

Work began with historic background research and initial field reconnaissance. Initial Phase I testing involved the excavation of 259 STPs placed on a 50-foot grid. Two areas of archaeological interest were located: Area A, with poured concrete foundations, thought to be the historic farmstead; and Area B, a concentration of both prehistoric and historic artifacts found mostly in the plow zone. An additional 174 STPs were placed at 25-foot intervals within Areas A and B. In Area B, 33 3- x 3-foot test units were excavated where significant prehistoric or historic artifacts were identified. While most of the prehistoric artifacts were recovered from the plow zone, several test units and STPs showed evidence of some intact, or unplowed, areas.

Phase II testing focused on Area A, the possible historic farmstead. Nine 3- x 3-foot test units were placed in likely locations for the discovery of historic features and to investigate the concrete foundations. All the historic artifacts uncovered were dated to the nineteenth and twentieth centuries and the concrete foundations were dated to the twentieth century. The foundations were identified as outbuildings and no evidence for a dwelling was found.

Main Gate Area Survey

In 1994, DelDOT contracted Heite Consulting to conduct historic background research in compliance with Section 106 of the NHPA for the vicinity of the intersection of Route 113 and County Road 357 (Heite 1995a). As part of the Route 1 project, DelDOT planned to alter the highway entrances to Dover AFB. The goal of the Heite study was to locate and more precisely identify cultural resources previously identified and to locate other resources in the project's immediate vicinity. Historic records were researched, along with the utilization of predictive models, to identify and locate sites. The study concluded that military features associated with Dover AFB, established in 1942, are well documented and probably archaeologically intact. However, pre-military features that were identified from the research are probably disturbed from military and modern construction. The main gate area has been further disturbed by utility excavations to depths of 10 feet, and 15 to 20 feet in width, along with 1996 construction associated with Delaware State Route 1.

Fire Training Area Survey

In 1994, the U.S. Army Corps of Engineers contracted Heite Consulting to conduct historic background research and archaeological field testing in compliance with Section 106 of the NHPA for the vicinity of a proposed Fire Training Area on Dover AFB (Heite 1995b). Heite consulted various historic maps and aerial photographs in order to predict possible historic archaeological site locations. The consultants plowed and disked a 38-acre parcel containing the proposed project location (coinciding with the 38 acres surveyed by the NPS), and then conducted surface collection of artifacts following a rain. Four archaeological loci were recorded. Loci 2, 3, and 4 consist of small historic and prehistoric artifact scatters. The report considers them isolated finds, ineligible for the NRHP. Locus 1 may be the remains of an eighteenth-century farm site belonging to Andrew Lackey, and is potentially eligible for the NRHP. In a letter dated 10 October 1995, the SHPO concurred that construction of the fire training area would not affect historic properties.

Dover AFB contracted with URS to conduct a Phase II Archaeological Evaluation of site 7K-D-136, the Lackey site. Testing occurred at two loci previously associated with the site, one associated with the 18th century Lackey Barn (Locus B) and one thought to be the possible location of a domestic structure associated with the barn (Locus A). Investigations found artifact scatters with no vertical or horizontal integrity observed in either loci. Therefore, the site was recommended as ineligible for the NRHP (Boyd et al. 2004).

Church and Cemetery Survey

Dover AFB contracted with Wayne T. McCabe & Associates, Inc. in 1994 to develop a General Management Plan (GMP) for the property of the former John Wesley Methodist Episcopal Church and Cemetery (Wayne T. McCabe & Associates, Inc., 1995). This work was conducted in accordance with Section 110 of the NHPA. The GMP recorded the history of the site and the results of the archaeological investigations. It also provided recommendations for the rehabilitation, interpretation and ongoing care and maintenance of the site. The survey area was approximately 0.7 acres.

Historic document research and interviews were utilized to establish the history of the site, and a larger historic context of the Methodist Episcopal Church and the participation of the black community. A combination of field walkover, STPs, auger probes and soil cores uncovered the northern and western site limits and the location and patterning of 150 marked and unmarked burial locations (Wayne T. McCabe & Associates, Inc., 1995). A historic aerial photograph was instrumental in locating and uncovering the foundations for the church. Interviews revealed the possible location of a privy, but that area was inaccessible, and no testing was conducted.

The report made recommendations for further archaeological work including: retrieval of burial remains from the back-dirt of woodchuck burrows; location and documentation of the privy; and archaeological monitoring of tree removal (Wayne T. McCabe & Associates, Inc., 1995). The report made further recommendations for the improvement of the site to make it accessible to visitors, provide visitors with a site interpretation, and outlined future maintenance requirements. The site was recommended not eligible for the NRHP, but in a letter dated December 20, 1996, the SHPO did not concur with the report recommendations. The SHPO assigned site number 7K-D-124 in this letter. It later was determined that that number duplicated another site and number 7K-D-129 was assigned. The error resulted in some of the documentation for this site being recorded as site 7K-D-124. For management purposes, the site was considered potentially eligible for the NRHP. Parsons Engineering Science carried out additional Phase II investigations in 2002 including a visual inspection of 100 percent of the ground surface, as well as excavation of shovel tests, test units, and mechanized trenches in an attempt to identify structural or

artifact concentrations. A report on the investigation was prepared, along with a draft protection plan for the site, and a Determination of Eligibility form (Crane 2002). The site was recommended as not eligible for listing in the NRHP.

Between September 2007 and May 2009, URS performed four tasks based on the 1995 GMP to assist Dover AFB in the protection of the John Wesley Methodist Episcopal Cemetery from further deterioration (Randolph 2009). The first task was to locate, document, and remove gravestones from the 0.7-acre project area. A total of 22 gravestones or gravestone elements were located, documented, and removed. Ten large trees were removed from the cemetery. The surface of the cemetery was leveled by depositing and spreading 8 inches of clean fill and 4 inches of topsoil. Grass seed was spread on the newly leveled cemetery. The 22 gravestones were then replaced in their original locations; three of these markers were repaired before replacement. These efforts resulted in the improvement of the cemetery's appearance and the retention of relevant gravestone data. The markers themselves were also preserved and protected during these efforts.

On May 1, 2009, Dover AFB held a reburial ceremony of the unassociated human remains. The remains were placed in a sealed coffin and reburied in the southeastern portion of the cemetery in a previously unused section. Dover AFB and SHPO officials attended the ceremony, along with numerous family members of those buried in the cemetery. The service was officiated by a Dover AFB Chaplain and a local Methodist Episcopal minister.

Installation Restoration Program Archaeological Assessment

In 1995, Dames & Moore conducted an archaeological assessment of Dover AFB as part of Section 106 compliance for proposed IRP activities under contract to the USDOE (1996). In a letter dated April 29, 1992, the SHPO indicated that proposed IRP activities had the potential to affect archaeological properties. The SHPO indicated that the NPS 1985 management recommendations report had not completed the USAF's responsibility to identify historic properties in the project area, as required by NHPA Section 106, because additional significant resource materials and informants remained to be consulted. This study consisted of an extensive literature search including historic maps, aerial photographs, archaeological and historic secondary literature, construction records, and historic topographic maps. The researchers began by constructing the archaeological potential of the area prior to the construction of the base. Delaware archaeological site files, and secondary archaeological literature were consulted to develop a predictive model for prehistoric sites. A predictive model for historic archaeological sites was developed from historic maps and aerial photographs. The researchers then determined the extent of disturbance on the base by reviewing construction records, and historic topographic maps (in order to measure the extent of cut and fill activity on the base). Areas with more than 2 feet of disturbance were considered unlikely to contain preserved archaeological sites. The information on soil disturbance was then compared to the original archaeological potential of the base.

The historic potential was estimated by developing overlay maps of the base from historic maps, and by considering historic settlement patterns. Areas considered to have a high probability for historic sites are those where previous surveys, SHPO records, historic maps, or aerial photographs indicate locations of historic resources. These historic resource locations are depicted in the Historic Locations on Dover AFB shown in red on the Historic Locations Map. Moderate probability areas for historic sites were those areas within 3,000 feet of the St. Jones River. Areas that were considered to have had a high probability for prehistoric resources were located within 1,000 feet of the St. Jones River and its two tributaries, or within 1,000 feet of the Pipe Elm Branch and its tributaries. Low probability areas for prehistoric resources were considered to be those areas that are poorly drained or have moderate slope.

Medium probability areas for prehistoric sites were considered to have been all those areas that are not high or low probability. This assessment of potential was then compared to documented disturbance on the base. Areas with 2 or more feet of documented ground disturbance were considered to have a low potential for archaeological resources; areas with less than 2 feet of documented ground disturbance were considered to have an archaeological potential. Areas that lacked evident disturbance were described as having an unknown potential.

The researchers assessed a total of 3,175 acres (all of the main base, but none of the discontinuous properties). They concluded that of 58 IRP sites, 47 had a low potential for intact archaeological resources, three had a moderate potential, and eight had a high potential for intact archaeological resources. They concluded that 782 acres of the base had an unknown level of disturbance. The potential of the remaining 2,393 acres of the base were assessed separately for historic and prehistoric resources. For historic resources, there were 46 acres with a high potential, 80 acres had a moderate potential, and 2,267 acres had a low potential. For prehistoric resources, there were 231 acres with a high potential, 354 acres with a moderate potential, and 1,808 acres with a low potential.

Base-Wide Archaeological Survey

In 1997 and 1998, Parsons Engineering Science conducted a base-wide inventory of archaeological sites on Dover AFB in compliance with Section 110 of the NHPA (HQ AMC 2000). The survey consisted of systematic shovel test pits (STPs) placed over portions of the base not known to be heavily disturbed at 90- m intervals, with areas found not to be heavily disturbed or composed of wetland soils further tested at 30- m intervals.

One hundred and seven potential historic archaeological sites suggested by historic maps and aerial photographs (103 identified by the USDOE for the IRP program, an additional three identified in consultation with the Delaware SHPO, and one identified from Beers' atlas [1868] and Byles' map [1859]) were investigated (Historic Map Locations on Dover AFB Table). Forty-one of these are located off the base, and another 31 have probably been destroyed during base development. At the time of the 1997/1998 base-wide survey, it was thought that portions of six may have survived in the industrial area (Locations 2, 31, 42, 45, 57, 60), and one may have survived near the Weapons Storage Area (Location 21). Fourteen of the remaining 28 historic locations fall within archaeological survey areas and are associated with archaeological sites or site components. No evidence of the remaining 14 was found.

Investigation of as-built plans and limited archaeological testing was conducted during the 1997/1998 base- wide survey. This effort identified six locations in the highly developed Industrial Area that were thought to have some potential for archaeological resources. Of these, two were cleared during consultation for facility construction and additional investigation suggests that the other four may also have been impacted by development.

Four new sites were identified during the base-wide survey (7K-D-132, 7K-D-133, 7K-D-134, and 7K-D- 135). New portions of sites 7K-D-26 and 7K-D-126 were also identified. Site 7K-D-5, which had been assumed destroyed, was relocated. Site 7K-D-132 was recommended as potentially eligible for the NRHP, and sites 7K-D-5, 7K-D-133, 7K-D-134, and 7K-D-135 were recommended not eligible for the NRHP.

Subsequent to fieldwork, base personnel identified possible remains of a wooden porch in the vicinity of Location 21. These remains were associated with a planting of daffodils, probably remaining from the historic occupation of the location. Nearby tests produced no artifacts. This location was designated an Area of Concern and additional investigation of its archaeological potential was conducted.

Historic Locations on Dover AFB Shown in Red

Historic Map Locations on Dover AFB

Site Number	Description	Probability of Site Identification	Remarks
1	J. B. Wharton [2]	Low	
2	C. M. Wharton [2]	Industrial Area	No further work recommended per 11/30/2001 Delaware
3	J. D. Kimmey “Cherry Dale” [2]	Low	
4	J. B. K. [2] J. D. Kimmey [1]	Low	
5	J. C. Wallace [2]	Low	
6	R. L. Wharton [2]	Area Surveyed, no evidence found	Area is disturbed
7	R. L. Wharton [2] L. Wharton [1]	Recorded	Edge of NPS Area B, historic component of 7K-D-2
8	B. F. Holcomb [2] B. Helmsley [1] Wharton’s Upper Fishery [3] [4]	Area Surveyed, no evidence found	Edge of NPS Area B/ may be disturbed by Treatment Plant
9	B. F. Holcomb [2]	Low	
10	W. A. Benton “Lisbon” [2]	Recorded	Recorded during the Lisbon Tract survey as Area A.
11	Dr. J. G. Baker [2]	Low	
12	D. C. Hoffecker [2]	Recorded	7K-D-132
13	D. C. Hoffecker [2] D. C. Hoffecker “Troy” [1]	Low	
14	T. Slaughter [2] Existing Farm Building [7]	Low	
15	Jas Raymond [2]	Low	
16	J. G. Jackson [2] T. Postles [1]	Area Surveyed, no evidence found	Standing water in area, nearest tested soil was gleyed
17	R. Horan [2]	Area Surveyed, no evidence found	
18	T. Postles [1] [2]	Low	
19	Mrs. Herrington “Elm Cottage” [2]	Low	
20	G. G. Logan [2] Existing Farm Building [7]	Area Surveyed, no evidence found	
21	Mrs. H. [2]	Recorded	7K-D-143
22	S. H. [2] School H. No. 11 [1]	Area Surveyed, no evidence found	
24	C. M. Wharton “Store” [2]	Low	
25	Existing Farm Buildings [7]	Low	
26	Existing Farm Building [7]	Possibly Recorded	May be associated with 7K-D-133
27	Unlabeled	Possibly Recorded	Near Lisbon Tract survey
28	J. D. Kimmey [1]	Area Surveyed, no evidence found	Edge of High and Unknown Disturbance/ Near National Test Site
29	D. C. Hoffecker [1]	Possibly Recorded	May be associated with 7K-D-132

Site Number	Description	Probability of Site Identification	Remarks
30	C. P. Holcomb [1]	Area Surveyed, no evidence found	
31	A. Loftland [1]	Area Surveyed, no evidence found	Area is disturbed
32	J. Wallace [1]	Low	
33	G. G. Logan [1]	Low	
34	C. M. Wharton [1]	Low	Edge of Airfield Pavement
35	C. M. Wharton “Store” [1]	Low	
36	H. Wharton [1]	Area Surveyed, no evidence found	
37	J. Raymond [1]	Low	
38	Unlabeled	Low	
39	Unlabeled	Low	
40	Unlabeled	Recorded	7K-D-134
41	John Wesley Ch. [6] Cemetery [8]	Recorded	7K-D-129
42	Unlabeled	Industrial Area	No further work necessary per 11/30/2001 Delaware SHPO letter
43	Unlabeled	Low	
44	Unlabeled	Low	
45	Unlabeled	Industrial Area	Site determined not eligible
46	Unlabeled	Area Surveyed, no evidence found	Area appears to have been disturbed during base construction
47	Unlabeled	Area Surveyed, no evidence found	Near Boundary
48	Mrs. Cowgill [2]	Recorded	NPS Area G, recorded as Locus 5
49	Unlabeled	Area Surveyed, component of 7K-D-126 recorded	Most of site is likely off-base.
50	Unlabeled	Recorded	7K-D-126
51	Unlabeled	Recorded	7K-D-133
52	Unlabeled	Area Surveyed, no evidence found	
53	Unlabeled	Recorded	7K-D-134
54	Unlabeled	Low	
55	Unlabeled	Low	Edge of low and unknown potential
56	Unlabeled	Area Surveyed, no evidence	NPS Area F
57	Unlabeled	Industrial Area	Site determined not eligible
58	Unlabeled	Low	
59	Unlabeled	Low	
60	Unlabeled	Industrial Area	Site determined not eligible
61	Halcomb’s Landing [3]	Possibly Recorded	Appears to be within boundaries of 7K-D- 26
62	Halcomb’s Fishery [3]	Possibly Recorded	NPS Area A, may be a historic component of 7K-D-26
63	Unlabeled	Low	

Historic Locations Near Dover AFB

Site Number	Description	Probability of Site Identification	Remarks
23	T. P. [2] R. Miller [1] St. Jones Ch. [6]		
66	J. B. Wharton [2] A. Loftland [1]		Near Boundary
69	Mrs. Slaughter [2] J. & T. Slaughter [1]		Near Boundary. May have cemetery
70	J. Millaway [1] [2]		Near Boundary
74	M. B. Ch. [2] M. E. Ch. [1]		Near Boundary
79	Unlabeled		Near Boundary
80	Unlabeled		Near Boundary
85	Unlabeled		Near Boundary
95	Unlabeled		Near Boundary
98	Unlabeled		Near Boundary

Sources for Names (USDOE 1996): [1] Byles' *Map of Kent County,* 1859; [2] Beers' *Atlas of the State of Delaware,* 1868; [3] U.S. Army Corps of Engineers (USACE) *Reconnaissance of St. Jones Creek, Delaware,* 1880; [4] USACE *Revised Map of St. Jones River, Delaware,* 1888; [5] U.S. Geological Survey (USGS) *Vineland, New Jersey Quadrangle,* 1899; [6] USGS *Bowers, Delaware Quadrangle,* 1936; [7] USACE *Dover Airdrome Locality Map,* 1943; [8] USGS *Frederica, Delaware Quadrangle,* 1956.

Cold War Properties Survey

The NRHP establishes 50 years as the general threshold for eligibility. This is qualified, however, under NRHP Criterion Consideration G, which states that a property achieving significance within the last 50 years is eligible if it is of exceptional importance. Historic contexts that are likely to support NRHP eligibility under Criterion Consideration G include the Civil Rights Movement, Space Exploration, and the Cold War. In 1994, HQ AMC began a reconnaissance inventory of Cold War-era resources and related material culture at eight selected USAF bases throughout the United States. The overall goal of the study was to comply with Section 110 of the NHPA and to provide CRMs with a tool for determining the NRHP eligibility of Cold War-era properties. Dover AFB was included in the survey and the results are presented in *Dover Air Force Base, Dover, Delaware*, *Inventory of Cold War Properties* (HQ AMC 1996). Recommendations from this Cold War inventory and evaluation are summarized below.

Not Eligible

- Building 714 was re-evaluated in 2005. It was determined not eligible, and the SHPO has concurred with this determination.
- Buildings 1315 and 1324 due to substantial modification.
- Buildings 1305, 1306, 1311, 1312, 1313, 1314, 1350, due to their substantial modification and because they are ancillary and not of independent historical significance.

Site 7K-D-136 Phase II Evaluations

In May and June of 2003, URS conducted a Phase II Evaluation of site 7K-D-136, known as the Lackey site. Dover AFB was proposing to construct a secure access road from State Route 9 to the Air Mobility Command Museum that would have impacted site 7K-D-136. Although the construction plans were

subsequently adjusted to avoid the site, Dover AFB requested that URS proceed with the Phase II Evaluation of the site in order to determine its eligibility for listing on the NRHP. During the Phase I Survey of the site, two loci were identified (Heite 1995). Locus A was considered to have the potential to contain an 18th century domestic site, possibly associated with Andrew Lackey, a local planter. Locus B was associated with a historically documented barn (Lackey's Barn).

The Phase II evaluation of the site was completed through a combination of STP and mechanical trench excavation. A total of 276 STPs, 133 in Locus A and 143 in Locus B were excavated at 10 ft intervals in order to redefine the loci boundaries and identify artifact concentrations. Ten mechanically excavated trenches, two in Locus A and eight in Locus B, were placed across the site in order to investigate artifact concentrations, determine the integrity of the soil deposits, and identify any features present. Small quantities of historic artifacts were recovered across both loci, primarily representing generalized field scatter from the late 18th through 20th centuries. The recovery of architectural artifacts in Locus B confirmed it was the likely location of the Lackey Barn, but it was determined that any substantive evidence of the barn or other structures had been destroyed by plowing. The field results from the Phase II investigations demonstrated that the site had been repeatedly and intensively plowed, evidenced by the general mixing of artifacts from different time periods, the lack of horizontal or vertical integrity, and the documentation of numerous plow scars. Given the integrity and context problems associated with the site, it was recommended as ineligible for listing in the NRHP.

HABS Documentation of Building 1303

In 2004 and 2005, AMEC Earth & Environmental, Inc. and Palmer Engineering teamed to document Building 1303, a SAC crew readiness facility and alert bomber apron. In 1959, an alert bomber apron and readiness crew facility were constructed for a SAC detachment of fighters and KC-97 air refueling tankers, the first of which arrived in 1960. The apron, called the "Christmas tree", was designed in a herringbone pattern to allow the KC-97s to quickly pull onto the runway. The readiness facility, Building 1303, was affectionately known as the "mole hole" and included dormitories, classrooms, a briefing room, a kitchen and a latrine. The two-story concrete structure could be accessed via six underground tunnels or one of seven aboveground entrances (Scherer and Fiegel 2005).

Sites 7K-D-125 and 7K-D-126 Phase I Survey

In October 2005, URS conducted an extended Phase I Survey of the 296.98-acre Bergold Farm tract (Furgerson and O'Reilly 2006). Dover AFB was proposing to construct a paintball facility at the site. Two previously identified sites, 7K-D-125 and 7K-D-126, had been identified on this property. Two previous studies, one by MAAR in 1996 (Thomas and Payne 1996) and the AMC 2000 survey, noted that loci within the two sites may have needed additional studies to determine if they were eligible for listing in the NRHP. The extended Phase I Survey focused on site 7K-D-125 and Loci A and E of site 7K-D-126. The primary goals of the extended Phase I Survey were to recover additional artifacts and determine the presence of cultural features that would aid in the determination of the site's date and function. As these sites had been previously subjected to shovel test surveys, it was determined that the excavation of 1-x-1 m test units and additional close interval shovel tests would be the best testing method. Site 7K-D-125 was determined to be a mid-nineteenth to twentieth century trash scatter and was recommended ineligible for listing in the NRHP. Loci A and E of site 7K-D-126 represented the remains of two early nineteenth to twentieth century domestic occupations and were recommended potentially eligible for listing in the NRHP. After completion of the Phase II evaluation in 2013 the site was not recommended for inclusion in the NRHP.

Phase I Archaeological Survey for the Civil Air Terminal Expansion

In October and November 1998, John Milner Associates, Inc., conducted a Phase I Survey of a parcel under consideration for expansion of the Civil Air Terminal at Dover AFB. The survey found historical artifacts associated with the Slaughter Farm in disturbed contexts. The 7K-D-131 site number was assigned. However, it was determined that the sites lack integrity and was determined not eligible for listing in the NRHP.

Location 21 Phase I Survey

In July 2009, URS conducted a Phase I Archaeological Survey of Location 21 (Kerns-Nocerito 2009a) to comply with Section 110 of the NHPA. Location 21 was identified in the ICRMP as having potential for archaeological resources (R. Christopher Goodwin & Associates 2005). Location 21 is situated in the northeastern corner of Dover AFB along Reno Street, adjacent to the airfield, directly north of Building 1212. The triangular testing area consists of approximately 3.5 acres of open field and wooded land. Twenty-seven STPs were excavated; one site and one related feature (Feature 1) were identified inside the wooded section of Location 21. Feature 1 was interpreted as the concrete steps and brick foundation remains of a historic African American schoolhouse dating to the first quarter of the twentieth century. The steps were marked "1926". A small quantity of artifacts was recovered from the site. The surrounding area was overgrown, but the site appeared relatively undisturbed. The Delaware SHPO assigned site number 7K-D-143. URS recommended a Phase II Evaluation to determine the extent of the building remains and to collect additional data to determine if site 7K-D-143 is eligible for the NRHP.

Location 31 Phase I Survey

In July 2009, URS conducted a Phase I Archaeological Survey of Location 31 (Kerns-Nocerito 2009b). This work was conducted to comply with Section 110 of the NHPA. Location 31 was identified in the ICRMP as having potential for archaeological resources (R. Christopher Goodwin & Associates 2005). Location 31 is located along the southernmost edge of Dover AFB, adjacent to U.S. Route 1. The rectangular testing area consisted of approximately 2.5 acres of open space between the base perimeter fence and Arnold Street. A series of storm water management culverts, an associated drainage ditch, a gas pipeline, buried electric and communication lines, and sewer and water pipes are present in Location 31. Sixteen STPs were excavated and no artifacts were recovered. The area has been graded and is covered with fill deposits that reach a depth of 80 centimeters (cm) on the west side of the testing area and 40 cm on the east side. The fill overlays subsoil and no intact strata were encountered. Due to the extensive ground disturbance and lack of artifacts, no further work is recommended for Location 31.

John Wesley Methodist Episcopal Cemetery Treatment Project

The John Wesley Methodist Episcopal Church and Cemetery Improvement Project was completed between September 2007 and August 2008. URS archaeologists first documented 22 gravestones in situ; this undertaking included recordation on datasheets, pre-removal photo-documentation, and the creation of a comprehensive site plan showing the location of the gravestones. URS' monument company subcontractor then successfully removed the gravestones, which were transported via truck to a secured on base facility for temporary storage. URS' tree removal subcontractor then removed all designated trees, which were cut at ground level to ensure that no grubbing or root disturbance occurred that could affect the graves. Approximately 8 inches of clean fill and 4 inches of topsoil were then spread within the cemetery to level the ground surface. Soils were spread with low ground pressure equipment to prevent further ground disturbance. The monument company subcontractor then repaired, reinstalled, and oriented the grave stones under supervision of a URS archaeologist. GPS data, and site plan and

photographic records were used to ensure that gravestones were placed in the original locations and orientations. Final Photographs were taken to document the results and included in the submittal of the NRHP nomination package. The successful completion of these tasks has aided Dover AFB in the improvement, protection, and partial restoration of the John Wesley Methodist Episcopal Church and Cemetery site.

Site 7K-D-5 Phase I Survey/Phase II Evaluation

Testing in the vicinity of site 7K-D-5 conducted during the completion of the base-wide archaeological survey by Parsons Engineering Science in 1997 and 1998 (HQ AMC 2000) revealed intact soil horizons in the southeastern portion of the Eagle Heights Housing Area. Additional testing was conducted in the adjacent section of the golf course. Three different soil profile groups were encountered within the boundaries of 7K-D-5.

Intact soils were primarily encountered along the eastern edge of the site. The B Horizon in this area was overlain by fill, an Ap, and/or an E Horizon (HQ AMC 2000:76). The only diagnostic artifact, a Perkiomen Projectile Point/Knife (PPK), dates from approximately 2,000 to 1,500 BC, or the Woodland I Period. Despite the apparent general lack of integrity found in parts of the site, it was believed that some significant data still remain that may have been only minimally impacted by the construction of the golf course or where fill has buried intact deposits. Because of these factors, avoidance or Phase II Evaluation was recommended in the Dover AFB ICRMP (HQ AMC 2005:2, 57).

URS conducted a Phase II Evaluation of the site in August 2010 to determine if it was eligible for listing in the NRHP (Bedard and Formica 2011). Using the previous research data, the archaeology team excavated a series of auger tests, shovel tests, and 1- by 1-m test units within the previously defined boundaries of the site. The project area was divided into four sub-areas, labeled A through D, for the purposes of shovel testing and test unit excavation. Excavations in Areas B and C documented the presence of numerous fill strata and evidence of grading, likely associated with the construction of the golf course, overlying a culturally sterile B Horizon. Excavations in Areas A and D encountered intact, artifact-bearing deposits. The Phase II Evaluation identified a prehistoric and historic component at the site. Prehistoric artifacts were recovered from the same intact soil horizons along the northeastern edge of the site that had been identified during the Phase I Survey. A portion of the site containing prehistoric artifacts was recommended eligible for the NRHP.

Location 45 Phase I Survey and National Register Evaluation

This historic location is under the motor pool and adjacent ballfields in the Industrial Area. It was described as the possible location of a farm depicted on an 1899 USGS map. As-built plans from 1954 show existing farm buildings that were removed during construction of the motor pool. Versar conducted testing and concluded the Location 45 should not be recorded as an archaeological site and, subsequently, not eligible for listing in the NRHP. The SHPO concurred with this determination in 2011. No further work is recommended for Location 45.

Phase II Archaeological Evaluation of Site 7K-D-143

The Phase II evaluation included the excavation of nine 1 x 1-meter (3.3 x 3.3-ft.) test units and four 0.5 x 0.5-meter (1.6 x 1.6 ft.) test units, resulting in recovery of 5,306 historic artifacts and identification of 10 cultural features associated with three episodes of schoolhouse construction on the site. The first school was built on the property ca. 1836 and called School No. 14 or Comegys. A partial stone foundation and an artifact deposit associated with this schoolhouse were identified. In 1893 a new Comegys School No. 14 was built in the same location on the property. This school was a two-story

frame building set on a continuous brick foundation with double entry doors centered on the gable end. Concrete steps were added to the north side entrance of the school in 1926, and other modifications may have taken place. Features identified during excavation include the brick foundations, concrete steps, possible chimney support, a possible storage pit, and the location of an outbuilding. The school continued to operate until around 1936 and burned down at some point after 1941.

Site 7K-D-143 retains integrity and was recommended eligible for listing in the NRHP under Criteria A and D. The site reflects the history of public education in Delaware and in the United States in general. Site 7K-D-143 has the potential to contribute to our understanding of the history of education in Delaware and add to our knowledge of rural American life. It was recommended that the 0.39-ac site be preserved in place.

National Register of Historic Places Evaluation of Building 260 and 312

Building 260 is an example of a Standard Airmen's Dormitory built for the USAF in the late 1950s at installations across the United States. An example of Unaccompanied Personnel Housing (UPH), the building is subject to the Program Comment for Cold War Era Unaccompanied Personnel Housing (1946- 1974), which went into effect on August 18, 2006. By following this Program Comment, the DoD met its responsibilities under Section 106.

Building 312 was a highly modified example of a small photo laboratory built for the USAF in 1943 and, therefore, did not appear to be eligible for listing in the National Register of Historic Places. On March 9, 2011, the Delaware SHPO concurred with these findings.

Inventory of Above-Ground Facilities for Historical Potential

Consistent with NRHP guidance for large-scale survey and evaluation, URS developed a historic context and identified 17 property types. Analysis of the property types and their relative importance to key missions, programs, and events served as a framework for comparative evaluation and assessment of physical integrity of the 91 resources surveyed in this study. Only one was found to be eligible for listing in the NRHP. Building 3100 (Dover AFB Middle School/Welsh Elementary School), located in the family housing section of Dover AFB, was recommended eligible for the NRHP under Criterion C as exemplary of school construction from its period of construction (1959-1964). The remaining 90 resources were found to be ineligible for the NRHP owing to a lack of historical significance under the NRHP Criteria, or loss of integrity from significant alterations since their original construction.

Phase II Evaluation of Site 7K-D-126, Loci A, D, and E, Bergold Farm

URS conducted Phase II excavations that were divided between two loci, Loci A and E, representing two tenant farms on the property. In addition, a remote sensing survey was conducted over a portion of Locus D, which had been the main owner-occupied farm. The historic buildings were demolished in the 1960s when the owners built a new house in Locus D. The artifact assemblages from both Loci A and E were similar, consisting primarily of architectural materials, bottle and vessel glass, undecorated white ceramics, oyster shell, and coal/clinker. The site was occupied for an extended period and into the modern era. Plowing and alterations to the property in the twentieth century have resulted in a lack of temporally stratified deposits. Alterations were made to the property in the 1960s and again in the 1990s, which resulted in disturbance to earlier deposits.

The Bergold Farm site does not represent a good example of this common site type. It does not have potential to yield significant information and does not retain a high level of integrity. The site was recommended ineligible for listing in the NRHP, and no further investigation was recommended.

Geophysical Survey of Cemetery 1 and Cemetery 2

URS conducted geophysical survey at the reported locations of two historic cemeteries, Cemetery 1 and Cemetery 2, at Dover Air Force Base. Both cemeteries are noted on design plans for the extension of the North Runway, which was completed in 1956. Ground penetrating radar (GPR) was used to determine if burials were present at the areas indicated on the 1956 as-built plans.

Numerous GPR anomalies were identified during the surveys of both cemetery areas. At Cemetery 1, the anomalies appear to be remnant subsurface features associated with the construction of the North Runway taxiway to its east and a tarmac to the west. The Cemetery 1 location appears to be extensively disturbed. At the Cemetery 2 location, most of the anomalies appear to be natural subsurface phenomena. However, anomalies that may represent grave shafts were located approximately 300 ft. northwest of the cemetery location as indicated on the 1956 as-built plans.

The probability for encountering historic burials within the Cemetery 1 area is low. The probability of encountering historic burials in the Cemetery 2 survey area is low to moderate. The only way to conclusively determine if the recorded anomalies represent grave shafts is to conduct stripping or excavation. Therefore, due to the inability of the GPR survey and background research to definitively demonstrate the presence or absence of a historic cemetery, URS recommended that ground-disturbing activities be monitored by a professional archaeologist.

Phase II Archaeological Evaluation of Site 7K-D-2

URS conducted a Phase II evaluation of site 7K-D-2. A series of postholes that appeared to be part of a historic agricultural structure, a prehistoric refuse pit, and an isolated prehistoric posthole were recorded.

The recovered artifact assemblage was interpreted as including remains of Woodland I period short-term camp or camps distributed over an approximate 6.17-ac (2.5 ha) area, and with an intrusive late nineteenth to twentieth century agricultural component. The boundaries of 7K-D-2 have also been extended north of their previously documented limits.

The site has been heavily disturbed by historic plowing and modern landscaping activity. A large portion of the prehistoric and historic artifact assemblages were found in plow zone soils. Historic and recent subsurface construction-related activities, filling and grading have further damaged the site.

Site 7K-D-2 was recommended as not eligible for the NRHP. Because of the site's diffuse and low-density artifact distribution, and lack of stratigraphic integrity, it has little potential of yielding significant data for the advancement of knowledge of local prehistory or history.

Phase II Archaeological Evaluation of Site 7K-D-5

URS conducted a Phase II evaluation of site 7K-D-5. The historic component of site 7K-D-5 consisted of a light scatter of early nineteenth through twentieth century architectural and domestic artifacts that are interpreted as the disarticulated remains of a small outbuilding associated with one of the known historic farmsteads in the area, likely dating to the early–late nineteenth century.

The prehistoric component of 7K-D-5 represents a Woodland I and Woodland II lithic procurement site. Analysis of the debitage indicates the site's occupants were making stone tools at the site through a pebble- cobble reduction strategy in which river pebbles and small cobbles were being reduced directly into bifacial tools.

Although the majority of the site has been heavily impacted by historic plowing and the construction of the Eagle Creek Golf Course, relatively intact prehistoric deposits were documented within Area A of the site. This section of the site does appear to retain integrity and information potential; therefore, the site was recommended eligible for listing on the NRHP under Criterion D, but only Area A contributes to that NRHP eligibility. The balance of the site has been significantly impacted by both historic and modern activities and does not contribute to the site's NRHP eligibility. As a result, those portions of the site do not warrant protection or additional investigations.

National Register of Historic Places Evaluation of 13 Facilities

URS assessed the historical significance of 13 Cold War-era properties. Twelve of the 13 facilities were less than 50 years of age at the time of the survey in October/November 2013. These resources were evaluated under NRHP Criteria Consideration G: Properties That Have Achieved Significance within the Last Fifty Years, and consideration was also given to the potential eligibility of these resources upon reaching 50 years of age in the next decade. None were found to be of exceptional significance and owing primarily to their extensive modifications, URS did not recommend re-evaluation of these 12 resources upon reaching 50 years of age.

The Dover AFB Middle School/Welch Elementary School (Building 3100), was previously found to be eligible for listing in the NRHP. However, it was recommended that additional investigation of the eligibility of the school was appropriate to support a formal determination of NRHP eligibility by Dover AFB. URS found the school is an excellent example of school architecture from the period of its construction (1959-1964). The building was designed by Brenton G. Wallace of Wallace & Warner, a prominent architectural firm in the Philadelphia area. By 1963, the elementary school was the largest in the state of Delaware with an enrollment of 1,075 students in grades 1 through 6. The school retains a high degree of integrity of location, design, materials, workmanship, feeling, and association and character- defining features such as its massing, form, plan, ceramic covered walls, doors, and windows. URS recommended the school as eligible for the NRHP under Criterion A and C.

The Delaware SHPO concurred with the NRHP eligibility finding on April 2, 2014 and determined that the removal of this building will result in an adverse effect on this historic property.

HABS Documentation of Dover Air Force Base Middle School/Major George S. Welch Elementary School

URS prepared a Historic American Buildings Survey Level II report for the Dover AFB 436 CES/CEI at Dover Air Force Base, Dover, Delaware, in part to fulfill the requirements of a MOA between the USAF and the Delaware SHPO regarding the disposition of Building 3100.

Phase I and II Evaluation of Sites 7K-D-1 and 7K-D-151 (Wharton Farmstead)

AECOM conducted Phase I and II archaeological investigations of site 7K-D-1 and 7K-D-151. A small area of intact archaeological deposits was identified at site 7K-D-151, consisting of an isolated locus of historic plow zone and a large historic cellar filled with vast quantities of burned structural material and charcoal, suggesting a rural dwelling burned and deposited in the open cellar.

Significant ground disturbances have severely limited its research potential. Therefore, site 7K-D-151 was recommended not eligible for inclusion on the NRHP, and no further work was recommended.

The investigations at 7K-D-1 documented features relating to the Woodland I and II periods and the nineteenth and twentieth centuries. The Woodland I component appears to be contemporaneous with

the Delmarva Adena burials discovered south of Dover AFB in the 1960s; however, the Adena cemetery does not appear to extend onto Dover AFB property. The location was also used for temporary encampments both before and after the Adena period. The historic occupation consists of a very small artifact assemblage and a series of features suggesting an agricultural field with roads and possibly outbuildings or fences.The historic component of site 7K-D-1 contains little information. The prehistoric component of the site has also been impacted by recent construction and landscape modification. However, moderate densities of prehistoric features near the boundary fence demonstrate the potential of the site to yield information important in the prehistory of the area. Site 7K-D-1 is recommended eligible for listing in the NRHP, but the archaeological deposits contributing to its NRHP eligibility on Dover AFB is limited to a small area adjacent to the southwest boundary fence.

Relevant Program Comments for the Air Force

The implementing regulations for Section 106 of the NHPA outline the process to be followed for a case- by-case Section 106 review of individual undertakings. In the 15 years since the Cold War survey, no large- scale identification and evaluation of above-ground historic properties has been carried out at Dover AFB. The CRM Program has made determinations of eligibility for each resource based on the receipt of demolition work orders; however, in 2007, the USAF adopted the ACHP Program Comments for Cold War Era Unaccompanied Personnel Housing (1946–1974) and World War II and Cold War Era (1939–1974) Ammunition Storage Facilities. Program comments are among the streamlining program alternatives to case-by-case Section 106 specified in 36 CFR §800.14. The DoD has made use of the program comments to address the NRHP eligibility and Section 106 consideration of classes of resources agency-wide, and to eliminate the need for individual determinations of eligibility and case-by-case Section 106 review.

These two Program Comments pertain to all buildings and structures designed and built as ammunition storage facilities (DoD Real Property Category Group 42XXXX) between 1939 and 1974, and all buildings and structures designed and built as Unaccompanied Personnel Housing (DoD Real Property Category Group 72XXXX) between 1946 and 1974. The Program Comments include treatment measures for the following undertakings: ongoing operations; maintenance and repair; rehabilitation; renovation; mothballing; cessation of maintenance; new construction; demolition; deconstruction and salvage; remediation activities; and transfer, sale, lease, and closure. The buildings covered by these program comments are listed in the Cultural Resources on Dover AFB Covered by Program Comments Table.

The DoD has indicated that these Program Comments will remain in effect until the Office of the Secretary of the Defense determines that they are no longer needed and notifies the ACHP in writing, or the ACHP withdraws the comments in accordance with 36 CFR § 800.14(e)(6). Following such withdrawal, the DoD and its military departments would be required to comply with the requirements of standard case-by-case Section 106, as stipulated in 36 CFR § 800.3 through 800.7.

Cultural Resources on Dover AFB Eligible for the Purposes of a Program Alternative (ELPA)

Building No.	Year Built	Original Use	Program Comment
261	1959	Unaccompanied Personnel Housing	Cold War-Era Unaccompanied Personnel Housing
262	1959	Unaccompanied Personnel Housing	Cold War-Era Unaccompanied Personnel Housing
263	1959	Unaccompanied Personnel Housing	Cold War-Era Unaccompanied Personnel Housing

Building No.	Year Built	Original Use	Program Comment
1269	1957	Hazardous Storage Building	World War II/Cold War-Era Ammunition Storage Facilities
1272	1957	Checkout and Assembly Building	World War II/Cold War-Era Ammunition Storage Facilities
1273	1957	Missile Storage Igloo	World War II/Cold War-Era Ammunition Storage Facilities
1274	1957	Missile Storage Igloo	World War II/Cold War-Era Ammunition Storage Facilities
1275	1957	Missile Storage Igloo	World War II/Cold War-Era Ammunition Storage Facilities
1276	1957	Missile Storage Igloo	World War II/Cold War-Era Ammunition Storage Facilities
1277	1957	Missile Storage Igloo	World War II/Cold War-Era Ammunition Storage Facilities

Archaeological Sites

Fifteen archaeological sites have been recorded on the base. Five of these are eligible for listing in the NRHP, while 10 have been determined not eligible for listing in the NRHP. These sites are discussed below and listed in Appendix A with their NRHP status.

Archaeological Sites on Dover AFB

Recorded archaeological sites on Dover AFB and their NRHP eligibility status are described below.

Site 7K-D-1 St. Jones Adena Site (Eligible)

Most of site 7K-D-1, including all evidence of burials, is located off of Dover AFB property. The site was initially identified in 1960 during the excavation of a gravel pit. It was subsequently excavated by Leon de Valinger, with the first publication produced in 1970 (de Valinger 1970). A mix of approximately 50 cremated, non-cremated, and cremated secondary internments was recorded during the course of excavation, along with numerous artifact caches (Custer 1989). A radiocarbon date obtained at the site dates it to ca. 380 BC, during the Woodland I Period. The excavators noted variation in the treatment of the deceased at the site, with differences in the quantities and types of grave goods, suggesting the presence of some higher status burials (Stewart 1970). Artifacts recovered from burials and caches included bifaces made from non-local Ohio Valley cherts and Great Lakes copper ornaments, as well as beads and drilled animal teeth (Custer 1989).

The presence of Ohio River Valley chert and Great Lakes copper artifacts indicate direct contact or exchange ties with Adena Complex groups living in the Ohio River Valley. The appearance of both large and small mortuary-exchange sites across the Mid-Drainage region of the Delmarva Peninsula during this timeframe is interpreted as representing significant change in group social organization. The differential treatment of the dead and attendant disparities in the quantities or types of grave goods have been interpreted as signifying the appearance of increased ranking within groups and, possibly, the appearance of ascribed social status (Custer 1989).

In 2016, AECOM conducted Phase II testing of 7K-D-1 within Dover AFB (Koziarski et al. 2015). The investigations documented features relating to the Woodland I and II periods. The Woodland I component appears to be contemporaneous with the Delmarva Adena burials discovered south of Dover AFB in the 1960s; however, the Adena cemetery does not appear to extend onto Dover AFB property.

Site 7K-D-1 was recommended eligible for listing in the NRHP, with the archaeological deposits contributing to its NRHP eligibility on Dover AFB limited to a small area adjacent to the southwest boundary fence.

Site 7K-D-2 (Not Eligible, SHPO Concurred)

This site was recorded in 1965 by an avocational archaeologist named D. Rhinehart. The NPS conducted limited testing on a portion of 7K-D-2 in 1991 while testing to see if 7K-D-1 extended onto the base (Thomas and Payne 1996). The prehistoric component of the site may be dated to the Archaic or Woodland Periods. The nineteenth century component may be associated with R.L. Wharton, a property owner documented on an 1868 map (NPS 1985; Thomas and Payne 1996). The site was initially identified based on limited avocational and scientific surface collecting during the 1960s and 1970s. Artifacts from the site were accessioned by the Island Field Museum in 1965, 1971, and 1977. When the NPS performed the archaeological assessment of the base in 1985, this site was listed by the State as destroyed. However, the testing in 1991 found evidence of the site, and the NPS recommended the historic component of the site as potentially eligible for the NRHP (Thomas and Payne 1996). The majority of the site is currently buried beneath athletic fields owned and operated by the Dover AFB school system. The site is adjacent to the St. Jones Adena site and, based on diagnostic artifacts, has been dated to the Woodland I and II Periods.

Woodland I Period artifacts recovered from 7K-D-2 include Marcey Creek, Mockley, and Hell Island wares ceramic sherds; Brewerton, Susquehanna, Perkiomen, Bare Island, and Fox Creek PPKs; and soapstone bowl fragments. Artifacts made from exotic raw materials, such as Ohio Valley cherts, suggest site 7K-D-2 and the St. Jones Adena site may be related (Thomas and Payne 1996). If the two sites are contemporary, 7K-D-2 may represent a domestic/habitation site associated with the St. Jones Adena mortuary-exchange site. Woodland II Period artifacts include Rappahannock ware ceramic sherds and Madison/Levanna PPKs. In addition to these diagnostic materials, grinding stones, pestles, gorgets, and pendant fragments were recovered.

Phase I investigations by Thomas and Payne (1996) encountered modern fill and disturbed soil contexts containing a mixture of prehistoric, historic, and modern material overlaying a B Horizon. Although the majority of the prehistoric material came from disturbed contexts, a small amount of lithic debitage was recovered from the fill/B Horizon interface and from the upper portions of the B Horizon. Due to the limited scope of their investigations, Thomas and Payne (1996) were not able to assess the site's potential eligibility for listing in the NRHP. Phase II investigations were conducted in 2014 and the site is recommended as not eligible for inclusion in the NRHP.

Site 7K-D-5 (Recommended NRHP Eligible, SHPO Concurred)

Site 7K-D-5 is located on a terrace above the St. Jones River in the southwestern corner of the base on the 5th and 6th holes of the Eagle Creek Golf Course. Data regarding the nature of the site and the period(s) of occupation are not available on the Delaware State site form. The form merely indicates that the site is prehistoric and that the site was destroyed in 1965.

A historic component and a prehistoric component were identified during the Phase II Evaluation of 7K-D-5 (Bedard and Formica 2011). The historic component consisted of a light artifact scatter of early nineteenth to twentieth century architectural and domestic artifacts recovered from the Ap Horizon. Historic artifacts recovered from the site included pearlware and whiteware ceramic sherds, vessel glass, cut nails, window glass, and brick fragments. The relatively low density of domestic artifacts, coupled with the light scatter of architectural debris recovered from Area D, was interpreted as representing the remains of a small shed or outbuilding associated with one of the known historic farmsteads in the area.

Prehistoric artifacts were recovered from the Ap Horizon and the BE Horizon in Area A and the Ap Horizon in Area D. The prehistoric artifacts recovered from the BE Horizon in Area A were interpreted as representing intact prehistoric deposits. Prehistoric artifacts recovered from Area A spanned the Woodland I through Woodland II Periods and included: Lackawaxen/Bare Island; a Rossville and two Woodland I stemmed PPKs; 29 prehistoric ceramic sherds (including examples of Marcey Creek, Selden Island, Wolfe Neck, clay-tempered, Mockley, Minguannan, Townsend, and Yeocomico wares); and more than 1,000 lithic debitage. Analysis of the debitage indicates the site's occupants were making stone tools at the site using a pebble-cobble reduction strategy in which river pebbles and small cobbles were reduced directly into bifacial tools. The available data indicate site 7K-D-5 represents a Woodland I and Woodland II lithic procurement site.

Site 7K-D-26 (Prehistoric Component NRHP Eligible, SHPO Concurred)

This site was recorded in 1972 and is located on the bank of the St. Jones River northwest of Building 3499. It has been identified as a Woodland I base camp, similar to the Carey Farm site (7K-D-3) located approximately 200 m to the northwest. Catts et al. (1995:14) reported two Woodland I PPKs (Late Archaic/Transitional) and several sherds of steatite-tempered pottery, probably Dames Quarter (Marcey Creek), from their investigations. Thomas and Payne (1996:II-8 -II-10) also reported a Woodland I occupation, but they reported quartz and sand-tempered ceramics in association with small stemmed points, possibly Rossville-like. The assemblage reported by Thomas and Payne (1996) appeared more typical of late Woodland I (late Middle Woodland) occupations as opposed to the early Woodland I occupation reported by Catts et al. (1995). Data from the 1997 base-wide survey suggested either a late Woodland I or early Woodland II occupation (HQ AMC 1999).

The 1995 evaluation of the Lisbon Area A component of the site by DelDOT found that it was not eligible for the National Register. The investigators found that the material dated to the late nineteenth or early twentieth century. Concrete foundation remains were identified, but the overall integrity of the site was poor. Using the Delaware guidelines, DelDOT concluded that the information potential of that portion of the site was too low for eligibility to the NRHP, based on the low artifact density and lack of integrity in Area A. No further work was recommended in Area A of the Lisbon Tract.

Site 7K-D-26 was nominated to the National Register in 1985, at the same time as the neighboring Carey Farm site. Due to insufficient information, it was not accepted onto the register (NPS 1985). On April 11, 1984, in a letter to the Base Civil Engineer, the SHPO expressed the opinion that due to erosion from river meandering, Site 7K-D-26 was not eligible for the NRHP. However, in their archaeological assessment of the base, the NPS recommended that the site be evaluated to determine its eligibility (NPS 1985). The NPS tested a portion of this site along the St. Jones River in 1991. The University of Delaware tested another portion of it to the east of the NPS study in 1993. The NPS found no subsurface evidence of hearths or other cultural features; but a surface collection of the site included fire-cracked rock, lithic flakes and tools, and pottery (Thomas and Payne 1996). Both UDCAR and the NPS studies recommended the site as potentially eligible for the NRHP (Catts et al.1995; Thomas and Payne 1996).

The 1997 survey (HQ AMC 1999) expanded the site boundaries to the south along the St. Jones River. During pedestrian walkover of the St. Jones terrace along the edges of areas known to be heavily disturbed, fire cracked rock was apparent on the surface. It is possible that integrity remains along the fringe of the St. Jones River, possibly as far as a former drainage behind the base school, north of Lebanon Road. Additional fieldwork has been recommended in order to determine the extent of the site along the St. Jones River, and the boundary between sites 7K-D-2 and 7K-D-26.

In 2004, Phase II investigations were conducted at site 7K-D-26 by URS (Furgerson and Wall 2005). This project included a review of previous studies at the Lisbon Tract, and excavations within the eastern portion of the site. The report on the results of those investigations recommended that the historic component was not eligible for the NRHP. The prehistoric component, spanning the Paleoindian through Woodland II Periods, was recommended as eligible for listing in the NRHP. The SHPO concurred with those recommendations in a letter dated August 26, 2005.

Because the prehistoric component of the site is eligible for the NRHP, avoidance is recommended. Should avoidance not be possible, data recovery is recommended. Data recovery and testing should also investigate how far along the St. Jones River the site extends, and whether the southern portion of the site retains any integrity.

Site 7K-D-125 (Not Eligible, SHPO Concurred)

This site is located in the northwest corner of the intersection of Route 352 and the driveway to the modern Bergold house. Artifacts collected during survey included pearlware, whiteware, and cut nails. All of these date from the nineteenth century. No evidence of structures was identified, and the site was not associated with any documented occupation (Thomas and Payne 1996). An extended Phase I Survey conducted in 2006 determined that site 7K-D- 125 was a mid-nineteenth to twentieth century trash scatter possibly associated with manure practices (Furgerson and O'Reilly 2006). No artifact patterning was evident within the site and the artifacts were not of sufficient quality to address research questions. For these reasons, the site was recommended ineligible for listing in the NRHP.

Site 7K-D-126 (Not Eligible, SHPO Concurred)

This site was recorded during the NPS survey. It is located west of the Bergold house. This site comprises five loci identified by Thomas and Payne (1996) and during the 1997/1998 survey (HQ AMC 1999) and found during the 2005 survey conducted by URS (Furgerson and O'Reilly 2006). Artifacts collected included pearlware, whiteware, and cut nails; all date from the nineteenth century (Thomas and Payne 1996). Locus A corresponds to an unidentified structure documented on 1868 and 1899 historic maps. While no direct artefactual evidence was recovered, this may be the location of the Mrs. Cowgill residence depicted on 1899 and 1949 historic maps (Thomas and Payne 1996). Loci B and C appeared to be short-term agricultural and domestic occupations. Locus D corresponds to the location of the modern Bergold house. Locus E may be related to Historic Location 49. This location remains unidentified, but it is possible that this could be the location of the nineteenth century St. Jones Neck School. The locus is near the former John Wesley Methodist Episcopal Church and the African-American settlement context developed for Delaware notes that schools and churches in the African-American community tended to be located near each other (Skelcher 1995).

An extended Phase I Survey conducted by URS in 2006 determined that Loci A and E of site 7K-D-126 represented the remains of two early nineteenth to twentieth century domestic occupations (Furgerson and O'Reilly 2006). Locus A consisted of a moderate concentration of artifacts and two sub-plow zone cultural features were identified. The results of the URS survey indicate a domestic structure was located north of the farm lane, with outbuildings to the east and south. Locus E represents a domestic occupation dating to the early nineteenth to late twentieth centuries. Loci A and E were recommended potentially eligible for the NRHP. Phase II Evaluation was conducted in 2013 and Loci A, D and E of site 7K-D-126 (Bergold Farm) were recommended ineligible for listing in the NRHP.

Site 7K-D-129 (John Wesley Methodist Episcopal Church and Cemetery) (NRHP Eligible, SHPO and Keeper Concurred)

This site had been identified as site 7K-D-124 in earlier reports and documents. Because that number duplicated a previously assigned site number, the number was changed by the SHPO's office in 1996 (December 20, 1996) to 7K-D-129.

The John Wesley Methodist Episcopal Church and Cemetery is located on an approximately half-acre tract just southwest of the Dover AFB airfield. The church first was established in 1867 to meet the needs of a small rural, agrarian African American population (McCabe 1995). The church building, a clapboard-covered, one-story wood frame sanctuary and narthex, was built shortly after that. The church was used until 1940, when declining membership in the area forced a consolidation and shift of worship services. The building remained empty for the next decade; in 1950 the physical remains of the structure were removed by a local civic organization. Associated with the church is a cemetery, where a minimum of 150 burials has been documented by archaeological investigations (McCabe 1995). The Keeper of the NRHP has concluded that the site is eligible. Dover AFB is taking this under consideration. Until such time as a final determination is made, Dover AFB Dover AFB will continue to treat the site as potentially eligible for the NRHP.

7K-D-131 (Slaughter Farm) (Not Eligible, SHPO Concurred)

Site 7K-D-131 consists of a scatter of historic artifacts associated with the Slaughter Farm. The site was identified during Phase I survey for expansion of the Civil Air Terminal (Milner 1998). Artifacts were recovered from disturbed contexts and the site was determined not eligible for the NRHP due to lack of integrity.

Site 7K-D-132 (Hoffecker Site) (Not Eligible, SHPO Concurred)

This site is located near the north gate of Dover AFB. It is located to the north of two rows of trees planted along an old farm road. Dover AFB personnel have also reported a shaft feature at this site—although it appears to have been filled prior to site identification and survey. The site was identified during 1998 base-wide survey carried out by Parsons ES (HQ AMC 1999) and a Phase II investigation was completed in 2002 (Bupp et al. 2002). The trees and farm appear on an aerial photograph made of the area in 1948, indicating that the property was occupied during the twentieth century as well (USDA, No. 34, Frame 930). The Byles' map of 1859 and the Beers' atlas of 1868 show that this area was occupied by D.C. Hoffecker during the nineteenth century.

Initial testing indicated that few areas survived with intact soil horizons. The artifacts consisted of a mixture of domestic and architectural artifacts from the nineteenth and twentieth centuries. All of the artifacts were recovered from disturbed contexts. No cultural materials were recovered from subsurface contexts. Given the horizontal extent of cutting and filling that took place at the site, it was suggested that only very deep cultural features would have survived. During the Phase II investigations, 84 shovel tests were excavated at 20-ft and 10-ft intervals within the site. Five backhoe trenches also were excavated. Features encountered included the concrete and brick foundations and piers associated with the main dwelling and outbuilding. Additional structural post holes and post molds were identified. A total of 2,110 artifacts were recovered from A horizon and A/B horizon strata. No deep features were identified, and no intact vertical stratigraphy was noted (Bupp et al. 2002:iii). Based on the results of the Phase II investigations, it was determined that site 7K-D-132 was not eligible for listing in the NRHP. The SHPO concurred with this finding.

Site 7K-D-133 (Not Eligible, SHPO Concurred)

This is a historic period site identified during Phase I Survey in 1998 (HQ AMC 1999) along the eastern

margins of the approach lights area. This site consists of a surface scatter of nineteenth and twentieth century artifacts. The site covers an area of 29,700 square meters. A farm building was standing at this site in 1946, and a probable farmstead appears on 1899 and 1936 USGS maps and on a 1937 aerial photograph. The 1857 Dickinson Family Survey book includes a map that shows a house somewhere in the vicinity of the approach lights area; however, the map is not drawn to scale, and a definite placement of the house on a modern map is not possible. Artifacts diagnostic of the early to mid-nineteenth century were limited to one creamware fragment, a cut or wrought nail fragment, two pieces of pearlware, and one piece of blown, aqua glass from a medicine bottle. The artifact density of the site appears to be low, and much of the site appears also to have a scatter of twentieth century artifacts; much of the site stratigraphy is disturbed. Many of the recovered artifacts are very small in size, consistent with being found in contexts that have been repeatedly disturbed. Because of the low density and poor integrity of the site, its research potential is very low. This site was recommended not eligible for the NRHP, and the SHPO concurred with that determination.

Site 7K-D-134 (Not Eligible, SHPO concurred)

This historic period site was identified during Phase I Survey conducted in 1998 along the margins of the Christmas tree area adjacent to the former location of Building 1303 (HQ AMC 1999). This site consists of a surface scatter of nineteenth and twentieth century artifacts. The site covers an area of 6,650 square meters. This site may be associated with buildings that appear on the 1899 and 1936 USGS maps and may also appear on the 1937 aerial photograph of the base area. Artifacts diagnostic of the nineteenth century included one pearlware body sherd, one piece of yellow ware, and three pieces of whiteware. Artifacts were recovered from a layer of twentieth century fill, and from a possible twentieth century plowzone that underlay the later fill deposits. No evidence of subsurface cultural features was encountered. The artifact density of the site was low and many of the artifacts were very small in size, consistent with being found in contexts that have been repeatedly disturbed. Because of the low density and apparent poor integrity of the site, its research potential is very low. Site 7K-D-134 was recommended not eligible for the NRHP, and the SHPO concurred with that determination.

Site 7K-D-135 (Not Eligible, SHPO Concurred)

Site 7K-D-135 was identified in 1998 during shovel- testing on the golf course (HQ AMC 1999), which is located directly east of the Eagle Heights Housing Area south of Lebanon Road. The site is located on opposite bank (i.e., left bank) and upstream from site 7K-D-5. This site included three positive STPs, producing lithic flakes and fire-cracked rock.These positive STPs were located within a small wooded area that was not disturbed during construction of the golf course. STPs excavated in the other portions of the golf course indicated that the landscape was heavily modified during construction. Given the small size of the area containing relatively intact deposits, it is unlikely that this site has the potential to contain significant information. This site is recommended not eligible for the NRHP, and the SHPO concurred with that determination.

Site 7K-D-136 (Lackey Site) (Not Eligible, SHPO Concurred)

This site is on a small ridge northeast of the John Wesley Methodist Episcopal Churchyard. The site first was recorded in 1994 (Heite 1995b) and a Phase II investigation was completed in 2003 (Boyd et al. 2004). During the Phase I investigation, artifacts included a white clay pipe stem, pearlware, and tin-glazed earthenware. The site was thought to be the remains of a house occupied during the eighteenth and nineteenth centuries, possibly by Andrew Lackey, the landowner documented from that period (Heite 1995b). The site boundaries included the concentration of artifacts identified by Heite (Locus A), and

the possible location of a barn (Locus B). The Phase II investigation was intended to provide further clarification of the nature of the site and its occupants. The Phase II evaluation originally was intended to satisfy the requirements of Section 106 review, prior to the construction of an access road to Facility 1301. The planned access road corridor was changed, and no impact to the site was planned. Despite this, the evaluation of the site and its eligibility for the NRHP was completed in partial satisfaction of the Section 110 responsibilities of Dover AFB.

During the Phase II investigations, 165 historic period artifacts were recovered, all from plowzone contexts. In Locus A, no evidence of structural features or intact subsurface architecture was identified. In Locus B, larger quantities of brick and nails suggested that a structure once may have been present, but no subsurface features were identified. Both areas had been extensively disturbed by plowing and other earthmoving activities (Boyd et al. 2004). Because of the lack of integrity at the site, there was little potential for the site to yield significant data, and the site was recommended as ineligible for listing in the NRHP. The SHPO has concurred with this determination.

Site 7K-D-143 (Kent County School #14) (Eligible)

URS conducted a Phase II Evaluation of site 7K-D-143 from October through November 2010 (Crowl and Johnson 2011). Historic research suggests a school existed in this general area in 1829 as part of the passage of the Free School Act. A school was constructed on the site in 1836. According to the records of the Service Citizens of Delaware, the original building was torn down and replaced in 1893. Renovations were done on the school in 1926 with funds from the DuPont School Program and the Delaware School Auxiliary Association. The extent of these renovations is unknown, but they likely included new concrete steps and an overhanging porch. Based on historic photographs, Kent County School #14, or Comegy's School, continued to operate until at least 1932 but, by 1936, the school is no longer shown on maps of the area.

Features identified during the Phase II excavations included the brick foundation of the 1920s-era school house, which appears to have had continuous brick foundations with concrete steps on the gable end. The steps were marked 1926. The brick foundations were approximately 9 x 6.5 m, extended into subsoil, and were bordered by a builder's trench. Based on the large number of nails recovered, the school house was likely of wood frame construction. A discontinuous brick foundation ran through the center of the building, parallel to its long axis. A layer of dark soil with charcoal, nails, and melted window glass was found across the building site, suggesting that the school house burned at some point. Few non-architectural artifacts were recovered from this stratum, suggesting the building had been abandoned and most items removed prior to the fire.

In addition to the brick foundations of the 1920s, a stone foundation wall was encountered. The stones rested on subsoil and did not include builders' trenches. The wall was not centered in the building site and is not likely associated with the twentieth-century school. The central brick wall of the 1920s school cut through the stone wall, suggesting the stone wall was in place when the brick foundations were added. The presence of nineteenth century artifacts, including cut nails, annular-decorated pearlware and whiteware, blue transfer-printed whiteware, and clay marbles, suggests the presence of a nineteenth century component. These data indicate the 1920s-era school house was built on the site of the nineteenth century school house.

Site 7K-D-151 (Wharton Farmstead) (Not Eligible, SHPO Concurred)

Site 7K-D-151 is a historic site associated with the Wharton Farmstead. Shovel testing revealed the majority of the site has been subjected to extensive ground disturbances. A small area of intact

archaeological deposits consisting of an isolated locus of historic plowzone and a large historic cellar filled with vast quantities of burned structural material and charcoal, suggesting the overlying building burned and deposited in the open cellar. The artifact assemblage suggests the building was a rural dwelling dating from the late nineteenth to mid-twentieth century and may be the residence of the Wharton farmstead. While the site contained a feature and a small variety of historic artifacts, significant ground disturbances have severely limited its research potential. Therefore, site 7K-D-151 was determined not eligible for inclusion in the NRHP.

Archaeological Sites near Dover AFB

In addition to sites located within Dover AFB, a number of archaeological sites have been recorded within a mile radius. The Archaeological Sites near Dover AFB Table contains a summary of some of the known archaeological sites recorded near Dover AFB. Of particular note are Sites 7K-D-1 (discussed above), 7K- D-3, and 7K-D-13. These sites have proven to be of particular importance to the prehistory of Delaware and have been the subject of intensive archaeological study.

Archaeological Sites Near Dover AFB

Site #	Site	Cultural Affiliation
7K-C-22 Wildcat Farm	Surface Scatter	Paleoindian; Woodland I; Woodland II
7K-D-1 St. Jones Adena Site	Woodland I component is a mortuary site	Paleoindian; Archaic; Woodland I; Woodland II
7K-D-3 Carey Farm	Fall/Winter macro-band base camp	Archaic; Woodland I
7K-C-13 Island Farm	Base camp, procurement site	Archaic; Woodland I
7K-D-4 Pickering Farm	Surface scatter	Prob. Prehistoric
7K-D-6 Allee-Freer Farm	Surface scatter	Prob. Prehistoric
7K-D-8 Air Base Site	Unknown	Woodland I; Woodland II
7K-D-23	Unknown	Unknown Prehistoric
7K-D-28	Surface Scatter	Woodland I
7K-D-64	Procurement Site	Prehistoric
7K-D-119	Surface Scatter	Unknown

Site 7K-D-3 Carey Farm and Site 7K-D-13 Island Farm

These two sites were recorded separately but are now considered to be a part of the same site (Thomas and Payne 1996). The Carey Farm site was identified as a Woodland I base camp by Custer (1984), and subsequent data recovery excavations recorded several hundred features. A variety of Woodland I artifacts, including Mockley shell-tempered ceramics and Fox Creek PPKs dated to ca. AD 100/200–900; Hell, Island ceramic sherds dated ca. AD 500 to 1000; and triangle PPKs typically dated to the Woodland II Period, were recovered at the site (Custer 1984, 1989; Custer et al.1997; DDHCA 1977;). A radiocarbon date of AD 200 +/- 90 was obtained from a feature at the site. The data recovery excavations revealed habitation structures, storage and refuse pits, processing areas, and tool manufacturing and tool use areas.

The identified habitation loci appear to represent a seasonally occupied macro-band base camp (no larger than six contemporaneous family groups) established in a location that also contained evidence of numerous intermittent and small-scale occupations during the Woodland I Period. Based on available floral and faunal data recovered from features, it appears the primary occupation period at the site was

mid-fall to late winter (Custer 1989; DDHCA 1977). Carey Farm appears to be principally a habitation area, while contemporaneous occupations at the nearby Island Farm Site (7K-D-13) show a settlement that was more focused on processing and habitation support activities (i.e., activities that were not directly household-related) (Custer et al.1997).

Historic Buildings and Structures

World War II Properties

There are nine World War II-era facilities at Dover AFB that have been reviewed for their potential eligibility for inclusion in the NRHP. Of these, Building 1301, was determined eligible and is now listed in the NRHP.

Evaluated World War II-era Resources at Dover AFB

Building No.	Original Use	Architect/ Engineer	Year Built	Date of Evaluatio	NRHP Eligibilit	SHPO Concur?
108 (no longer extant)	Warehouse	U.S. Army	1942	1987	Not Eligible	Yes
109 (no longer extant)	Warehouse	U.S. Army	1942	1987	Not Eligible	Yes
110 (no longer extant)	Warehouse	U.S. Army	1942	1987	Not Eligible	Yes
214 (no longer extant)	Officers' Quarters	U.S. Army	1942	1987	Not Eligible	Yes
312	Photographic Laboratory	U.S. Army	1942	2011	Not Eligible	Yes
1203	Weapons Storage Igloo	U.S. Army	1942	1987	Not Eligible	Yes
1204	Weapons Storage Igloo	U.S. Army	1942	1987	Not Eligible	Yes
1205	Weapons Storage Igloo	U.S. Army	1942	1987	Not Eligible	Yes
1301	Aircraft Hangar	U.S. Army	1944	1987	Eligible	Yes

Building 1301

Building 1301 was identified as possessing "special architectural and historic qualities" by the SHPO in 1987 (DDHCA 1987) and was determined eligible for listing in the NRHP in 1991 (DDHCA 1991). A description of Building 1301 and a discussion of its significance is provided below.

Physical Description

Building 1301 is a single-story, World War II aircraft hangar and support facility. It consists of three connected sections: a hangar, a heating plant, and a shop (Dames & Moore 1994; Lebovich 1994).

Hangar

The main and largest of the three sections is the hangar, which is built on a 7-inch-thick, reinforced-concrete slab; the walls are 8-inch concrete block and 9 feet in height. The metal-covered roof is curved and supported by a series of reinforced concrete buttresses that extend from the walls for eight feet. Originally the buttresses were designed to be exposed; however, during construction, plans were modified to use the buttresses as room dividers for offices and workspaces placed along the sides of the

exterior walls. At each end of the hangar are massive sliding panels on tracks which recess into "pockets" at each side of the door assembly; personnel doors and fixed windows are set into the sliding panels. The interior of the hangar is a large open space with the roof's structural steel truss system exposed. The spaces between the trusses are paneled with Masonite/plywood composite sheets, and lighting is provided by hanging metal fixtures.

Power Plant

Attached to the north side of the hangar is a two-story power plant constructed of cinder block on concrete slab. The north facade of the power plant supports a tall, stepped, brick chimney and the west facade displays a cinder block buttress, three small windows (one of which has been added), and a wood-louver vent. There are no interior floors; rather, the building was originally designed to be open to the second story to accommodate heating and generating equipment.

Shop

The shop is a rectangular, wood-frame, single-story building sheathed in corrugated metal (sides and roof) with windows on all facades. There are 12 vertically-oriented windows, one horizontal window, and three large bay doors placed within the north facade. Vertical window placements are original; however, horizontal windows and two of the bay doors are not. The shop is connected to the hangar by a long, narrow corridor that forms part of the east wall of the power plant.

Historical Significance

Built in 1944 as an experimental station, Building 1301 is listed in the NRHP under Criterion A for its use as the headquarters and engineering facility of the 4146th Army AFB Unit (1944–1946). The unit was responsible for the design and testing of air-launched rockets and the majority of the fitting work (e.g., mounting of rocket launchers onto P-47 aircraft) was performed inside Building 1301 (Dames & Moore 1994).

Current Building Status

Subsequent to HABS recordation, all three sections of Building 1301 were extensively renovated (asbestos removal, new roof and windows, exterior sheathing, electrical and heating system, and minor interior improvements). In 2000, Dover AFB submitted plans to the SHPO for the installation of a communications antenna on Building 1301 and received concurrence (May 1, 2000). In 2003, Dover AFB requested and received concurrence from the SHPO for replacement of exterior windows and doors (September 12, 2003). The hangar now serves as the base museum and houses vintage aircraft; the shop houses offices (including that of the museum director) and a gift shop; and the power plant is currently used for storage.

Post-World War II Properties (1946–1989)

The RPI for Dover AFB lists 1,126 facilities within the boundary of the base in 2005. Eight facilities were constructed during World War II; no extant facilities pre-dating that period are known to exist at Dover AFB. During the initial efforts of the Cold War survey, all 1946-1989-era facilities were considered for their potential historical significance. Subsequently, those with mundane functions (e.g., bus shelters, antennas, water towers) and/or those having experienced substantial physical alteration were removed from additional evaluation (HQ AMC 1996). Ultimately, 23 facilities from that time period were evaluated, and only one building (Building 1303, no longer extant) and its associated bomber alert apron was determined to be eligible for listing in the NRHP under Criterion A and Criteria Consideration G for exceptional significance required of properties less than 50 years in age.

Ten of the facilities identified in the Evaluated Cold War-Era Resources at Dover AFB Table (Building Nos. 714, 1269, 1270, 1271, 1272, 1273, 1274, 1275, 1276, and 1277) were not evaluated due to their physical integrity. Authors of the Cold War study indicated that none of these facilities met NRHP Criteria Consideration G but recommended that they be re-evaluated upon reaching that age. Building 714 was re- evaluated in 2005 and determined to be ineligible for listing in the NRHP, with SHPO concurrence received in August 2005.

Building 1303 Bomber Alert Apron

The 1996 Cold War survey at Dover AFB determined that Building 1303 (no longer extant) and its associated bomber alert apron, was an exceptionally intact example of a SAC mole hole with an equally pristine Christmas tree bomber alert apron. Determined eligible for listing in the NRHP, Building 1303 was demolished in 2005 because of its location in the runway clear zone. However, the bomber alert apron remains. Although the loss of Building 1303 may have diminished the integrity of the bomber alert apron such that it is not eligible for listing in the NRHP despite the historical significance with which it is associated, this cannot be assumed. The CRM Program will consider the re-evaluation of the bomber alert apron in future survey efforts, or upon Section 106 review of projects that may affect the resource.

Evaluated Cold War-era Resources at Dover AFB*

Building #	Original Use	Architect/ Engineer	Year Built	Date of Evaluation	NRHP Eligibility	SHPO Concur
260	Unaccompanied Personnel Housing	NA	1963	2011	Not Eligible	Yes
714	Bomber Hangar	Kuljian Corporation	1954-56	2005	Not Eligible+	Yes
1269	Hazardous Storage	Black & Veatch	1958-59	1996	Not Eligible+	Yes
1270	Guardhouse	Black & Veatch	1956-57	1996	Not Eligible+	Yes
1271	Water System	Black & Veatch	1956-57	1996	Not Eligible+	Yes
1272	Checkout and Assembly	Black & Veatch	1956-57	1996	Not Eligible+	Yes
1273	Missile Storage Igloo	Black & Veatch	1956-57	1996	Not Eligible+	Yes
1274	Missile Storage Igloo	Black & Veatch	1956-57	1996	Not Eligible+	Yes
1275	Missile Storage Igloo	Black & Veatch	1956-57	1996	Not Eligible+	Yes
1276	Missile Storage Igloo	Black & Veatch	1956-57	1996	Not Eligible+	Yes
1277	Missile Storage Igloo	Black & Veatch	1956-57	1996	Not Eligible+	Yes
1301	Hangar	Original construction, U.S. Army/Modified for the ADC by Whiteside, Foster, Damon & Doane, Inc.	1944/ Modified for the ADC 1955	1996	Eligible (As a WWII-era Resource)	Yes
1303; no longer extant	SAC Readiness Crew	Leo A. Daly	1958-60	1996	Potentially Eligible (1996); Recommended eligible 2003 (Criterion A, Considerati	Yes
1304	ADC Readiness Crew	Whiteside, Foster, Damon & Doane, Inc.	1955-56	1996	Not Eligible	Yes

Building #	Original Use	Architect/ Engineer	Year Built	Date of Evaluation	NRHP Eligibility	SHPO Concur
1305	Rocket checkout and assembly	William Gehron	1955	1996	Not Eligible	Yes
1306	Rocket checkout and assembly	Unknown	1954-59	1996	Not Eligible	Yes
1311	Liquid fuel pump station	Unknown	1954	1996	Not Eligible	Yes
1312	Liquid fuel pump tank	Unknown	1954	1996	Not Eligible	Yes
1313	Liquid fuel pump tank	Unknown	1958-59	1996	Not Eligible	Yes
1314	Liquid fuel pump tank	Unknown	1958-59	1996	Not Eligible	Yes
1315	FIS Alert hangar	Strobel & Salzman	ca. 1951-52	1996	Not Eligible	Yes
1324	Flight simulator training building	Whiteside, Foster, Damon & Doane, Inc.	1958-59	1996	Not Eligible	Yes
1350	ADC training building	Unknown	1959-60	1996	Not Eligible	Yes
1355	SAC maintenance shop	Unknown	1960-61	1996	Not Eligible	Yes

*Evaluated in the 1995 Cold War Survey (HQ AMC 1996) or individual surveys
+To be re-evaluated upon reaching 50 years of age (HQ AMC 1996)

Dover Air Force Base Middle School/Major George Welch Elementary School

As noted above, both the *Inventory of Above-Ground Facilities for Historical Potential* and the *National Register of Historic Places Evaluation of 13 Facilities* recommended that the Dover AFB Middle School/Welch Elementary School (Building 3100) was eligible for the NRHP as an excellent example of school architecture from the period of its construction (1959-1964). The building was designed by Brenton G. Wallace of Wallace & Warner, a prominent architectural firm in the Philadelphia area. By 1963, the elementary school was the largest in the state of Delaware with an enrollment of 1,075 students in grades 1 through 6. The school retains a high degree of integrity of location, design, materials, workmanship, feeling, and association and character-defining features such as its massing, form, plan, ceramic covered walls, doors, and windows. For these reasons, URS recommended the school as eligible for the NRHP under Criterion A and C. The Delaware SHPO concurred with the NRHP eligibility finding on April 2, 2014 and determined that the removal of this building will result in an adverse effect on this historic property. Consequently, URS prepared the *HABS Documentation of Dover Air Force Base Middle School/Major George S. Welch Elementary School* report for Dover AFB in part to fulfill the requirements of the MOA between the USAF and the Delaware SHPO regarding the disposition of Building 3100.

Native American Concerns

To date, Native American entities have not played a significant role in the management of cultural resources at Dover AFB. No Federally recognized Indian tribes currently reside in Delaware. The Delaware Nation, the Delaware Tribe of Indians, and the Stockbridge-Munsee Community Band of Mohicans do have potential historic and cultural ties to the land now occupied by Dover AFB, however, the first two tribes currently are located in Oklahoma and the third is in Wisconsin. All are federally recognized. Additionally, two Native American groups that now resident in Delaware also have potential cultural interests at Dover AFB, however do not hold federal recognition status. These two groups are

the Lenape Tribe of Delaware and the Nanticoke Indian Association, and have been actively consulting on Native American issues within Delaware.

Dover AFB has a requirement to identify historic properties that have religious or cultural importance to Indian tribes, as stipulated in AFMAN 32-7003, Section 2.6, and is required to engage Indian tribes in the Section 106 consultation process if they have a legitimate and demonstrated interest in the cultural resources affected by an undertaking.

It is important to initiate contact with interested Native American groups in order to determine the level and nature of their interest, and to identify any properties of cultural interest to them that may be located at Dover AFB. General federal practice indicates that consultation with federally recognized tribal authorities should be conducted on a government-to-government basis in an open, candid, and respectful manner. After initially establishing the level of interest from each Indian tribe, the installation should meet periodically with designated tribal representatives to review any affected resources. All consultations should be documented to demonstrate compliance. The process for consulting state-recognized tribes in practice is similar to consultation with federally recognized tribes, although state-recognized tribes do not typically serve as consulting parties on formal agreements (e.g., MOA).

Should any inadvertent discoveries of Native American cultural items or Native American human remains be made at Dover AFB, these Native American groups should be notified as part of the procedures outlined in AFMAN 32-7003, Section 2.13 but only if it is determined that the cultural items or remains are NAGPRA items. Currently, no Native American graves have been identified at Dover AFB, but several prehistoric period archaeological sites have the potential to contain burials or other culturally sensitive features that may be NAGPRA related. A list of Tribal authorities and their contact information is located in Section 7.9 Management and Coordination of this document.

Mapping

The CRM will maintain maps showing the location of any cultural resources listed in or potentially eligible for listing in the NRHP in accordance with AFPD 32-70. These maps will be kept at 436 CES/CEN and updated as necessary. In accordance with 32 CFR 229, Protection of Archaeological Resources, the location of any archaeological sites discovered in the future will be kept confidential.

The USDOE prepared digitized maps of Dover AFB containing information concerning: the location of archaeological sites recorded before 1993 (7K-D-2, 7K-D-5, and 7K-D-26 are shown within the base boundaries); potential historic archaeological site locations; areas of prehistoric and historic archaeological potential; and areas of disturbance. This information, together with site locations found and updated during the base-wide survey (HQ AMC 1999), was converted into a GIS format. The original CAD files are in Delaware State Plan, NAD 1927 coordinates, and the digitized maps are in Arc View shape file format. Current standards for digital graphic data are below.

- Digital data must be provided in Arc View or compatible shape file format
- The coordinate system used must be the Delaware State Plan using NAD-83 coordinates
- The shape file must be SDSFIE compliant
- Metadata must be supplied

A comprehensive GIS database for archaeological resources at Dover AFB should include information concerning the site depth, soil type, artifact density, report citations, date, cultural affiliation, NRHP status, and any other information necessary to properly manage the resource. For above-ground resources, a comprehensive GIS database should include the facility number, original/historic and current name, original date of construction, and original function, and NRHP status. These data are to be integrated with other base-related GIS information. Archaeological site location information is to remain confidential and will be released only on a need-to-know basis. A copy of the maps will be kept in the office of the CRM for reference during project review.

8.4 Installation Areas of Concern

Archaeological Resources

Dover AFB has been proactive both in identifying through survey and in evaluating through assessment archaeological historic properties in accordance with Section 110 of the NHPA. At this time, there are no known archaeological areas of concern.

Above-ground Resources

Identification and NRHP evaluation of 25 buildings and structures that have achieved 45 years of age or require re-evaluation is scheduled to occur in 2020.

Buildings and Structures Requiring Re-evaluation

Facility #	Year Built	Facility #	Year Built	Facility #	Year Built	Facility #	Year Built	Facility #	Year Built
263	1975	266	1974	267	1975	268	1974	270	1973
300	1958	403	1975	420	1967	503	1972	520	1974
614	1971	638	1972	640	1974	642	1974	711	1971
715	1975	725	1971	841	1967	842	1967	845	1974
2101	1966	1209	1974	2110	1975	1333	1972	1344	1974

After the 2011 ICRMP, a large number of older family housing units were privatized and replaced with new buildings; therefore, they are no longer in the Dover AFB inventory. Buildings previously surveyed and found determined not eligible for listing on the NRHP are listed in Appendix B.

Cultural Resource Issues

No cultural resources issues that are unique to Dover AFB have been identified.

8.5 Other Cultural Resources

No cultural resources other than archaeological sites, cemeteries, and built resources have been identified at Dover AFB. Future consultation with Indian tribes and other interested parties to identify and inventory any cultural landscapes, sacred sites, or TCPs that may be present at Dover AFB will be carried out in the future. Should any other significant cultural resources be identified, Dover AFB will consult with the SHPO and the interested parties on measures to avoid, to preserve, or to mitigate impact to such resources, if appropriate.

9.0 GOALS AND OBJECTIVES

The installation establishes long term, expansive goals and objectives to protect historic properties and other cultural resources while accomplishing mission objectives. These goals and objectives may serve as drivers for implementation of this ICRMP and for funding of related projects and activities. The Goals and Objectives table below summarizes key targets for the Cultural Resources Management Program.

Goals and Objectives

Goal	Associated Objectives	Statu
Ensure that Dover AFB is fully compliant with the NHPA and applicable federal cultural resources laws, regulations, and Executive Orders (EOs).	Integrate historic preservation requirements into base planning and decision-making by participation in planning activities and increasing awareness among decision-makers at Dover AFB.	Meetings are on-going; historic preservation included in current planning documents such as the Installation Development Plan
	Identify, evaluate, and nominate historic properties at Dover AFB for listing in the NRHP.	Archaeological studies are up to date; above-ground resources last surveyed in
	Preserve or maintain historic properties in accordance with the Secretary of the Interior's (SOI's) Standards for the Treatment of Historic Properties. Acquire sufficient documentation to facilitate SHPO concurrence with the National Register eligibility determinations on base cultural resources.	Maintenance is on-going at Building 1301 and documentation of Building 3100 is complete
Carry out its CRM Program in partnership with the SHPO, other Federal and State agencies, Indian tribes, and the public.	Carry out the Section 106 process in a timely manner.	Consultation is on-going as needed

NOTE: Refer to the Cultural Resources Environmental Action Plan (EAP) when setting goals. Document installation objectives and supporting tasks in the ICRMP as well as into the EAP tool.

10.0 PROGRAMMING AND PLANNING

10.1 USAF and Installation Actions

USAF and installation mission-related activities have the potential to adversely affect cultural resources and historic properties. Federal regulations and USAF policy require that cultural resources are protected or effects to said resources are minimized or mitigated. Activities or projects that could pose an adverse effect to cultural resources include, but are not limited to:

- Continued use, repair, modernization, adaptation/reuse, preservation, and/or demolition of existing facilities, including historic buildings. New construction of facilities
- Land use (e.g., training exercises, flight operations, off-road vehicular traffic, forest management, threatened and endangered species management, wildland fire suppression, erosion control, prescribed burning, and live ordnance use)
- Ground disturbance

The installation eliminates and/or resolves conflicts by assuring that undertakings with the potential to adversely affect cultural resources are properly planned and executed. The CRM and installation project managers and planners work together to identify and manage potential conflicts. Adverse effects to cultural resources resulting from standard or routine activities may be avoided or mitigated by following established environmental and cultural resources management procedures.

Installation Supplement – USAF and Installation Actions

Base Programs Affected by Cultural Resources Management

The CRM Program may impact any base program whose activities or projects may involve alterations to historic buildings or structures, or ground disturbance in archaeologically sensitive areas. Such programs include:

- Installation Restoration Program (IRP).
- Operations and Maintenance Program.
- Contract work through such avenues as SABER, General Services Administration, Air Force Civil Engineer Center (AFCEC), USACE, and Defense Logistics Agency: When contracting any maintenance or repair work on historic properties.
- Self-Help Program: When used by any of the occupants of historic properties.

Currently, there is one NRHP-listed historic property at Dover AFB: Building 1301 (associated with World War II). Building 1301 was extensively renovated in 1995/1996 and in 2002 and 2003, windows and doors were replaced, and heating alterations were completed. The building is used as the base museum. Some routine maintenance is expected at Building 1301 over the next 5 years, in addition to, some modest upgrades or modifications to prevent further water intrusion and consequential deterioration within the structure. Building 1303 and its associated bomber alert apron were determined eligible for the NRHP (associated with the Cold War). The building was demolished in 2005 but affects to the bomber alert apron should be considered under Section 106, and the NRHP eligibility of the extant resource determined.

There are 59 IRP sites on Dover AFB and one of these is located adjacent to an archaeological site that is potentially eligible for listing in the NRHP. IRP site LF 26 is adjacent to site 7K-D-26. Any ground disturbance associated with the cleanup of IRP sites will be conducted in consultation with the SHPO and Tribes, when appropriate. Excavations at this site should be preceded by consultation with the IRP/ERA Remedial Project Manager, as appropriate, prior to carrying out the excavations.

Base Civil Engineering Clearance Request or "Dig Permit"

ARPA permits are required for the excavation, collection, removal, and disturbance of archaeological resources on USAF property. The provisions of ARPA apply to any archaeological material greater than 100 years of age, regardless of the NRHP status of the site or location where they are found. Any person wishing to excavate or remove archaeological resources from Dover AFB must apply to 436 CES/CEI for an ARPA permit. ARPA permits will be issued to qualified individuals after technical review of the application by BCE, as specified in AFMAN 32-7003, Section 2.12, and Tribal consultation where appropriate. One copy of the signed permit should be sent to the proponent and another to HQ. The CRM monitors the activities of permit holders to ensure compliance with all stipulations. All work on Dover AFB involving ground disturbance must be reviewed by 436 CES/CEIE according to the procedures in Section 7.10 Management and Coordination.

Archaeological Resources Protection Act Violations

The John Wesley Methodist and Episcopal Church and Cemetery (Site 7K-D-129) was vandalized prior to acquisition by Dover AFB. Damage included bullet holes in gravestones. Because of the past history of vandalism, Dover AFB has taken steps to ensure that ARPA violations do not take place at the cemetery. The cemetery now is fenced and locked, and because it is situated on a public road, Dover

AFB has posted a sign that clearly states that the cemetery is on U.S. Government Property. Dover AFB will continue to ensure that the cemetery gate is secured, that base boundaries are clearly marked, that archaeological site location information is kept confidential and provided only on a need-to-know basis, and that security police include historic properties on routine patrol routes.

Preservation and Mitigation Strategies

Archaeological Resources

Existing Issues

There are five archaeological sites (7K-D-1, 7K-D-5, 7K-D-26, and 7K-D-129 and 7K-D-143) that have been determined to be eligible for listing in the NRHP.

Sites 7K-D-2, 7K-D-26, 7K-D-125, and 7K-D-126 all are primarily located in areas planted in lawn grass; maintenance mowing is not expected to impact these sites. Portions of 7K-D-126 are within the Airfield Clear Zone, and sites 7K-D-125, 7K-D-126 are located within Accident Potential Zone I. This effectively prohibits most potential development in the vicinity of these sites. A portion of Site 7K-D-26 is subject to erosion from a drainage channel located adjacent to a storm drainage pipe. Stream bank stabilization is ongoing.

Historic locations that have not been identified as sites but that may need further archaeological investigation have been addressed in above. These areas are relatively stable, and unless undertakings are planned in these areas, should not be impacted by normal Base activities.

Mitigation Plans Affecting NRHP-Eligible Sites

Site 7K-D-26 is eligible for listing in the NRHP. Archaeological testing carried out there (Furgerson and Wall 2005) recommended the prehistoric component of the site as eligible for the NRHP under Criterion. The SHPO concurred with that determination in August 2005. A small portion of site 7K-D-26 is experiencing erosion in the vicinity of a drainage pipe that crosses a portion of the site. This erosion appears to be naturally occurring and is not related to or caused by the drainage pipe. A bank stabilization project is on-going.

If any potential adverse effects to the site cannot be avoided through changes in the planned design, Dover AFB will develop a data recovery plan for the site in consultation with the SHPO and THPOs, as appropriate. Data recovery as a mitigation measure is discussed in more detail below.

Overall Protection Strategy

Dover AFB will preserve NRHP-eligible or potentially eligible archaeological sites in place. Until evaluated, Dover AFB will treat unevaluated sites or inadvertent discoveries as potentially NRHP-eligible. Except for 7K-D-26 and 7K-D-129, special protection strategies are not necessary beyond those described in this section. Any potential effects to these resources resulting from undertakings proposed on Dover AFB will be reviewed according to the procedures outlined in Section 7.9 Management and Coordination. The CRM will conduct any necessary consultation according to procedures outlined in Section 7.9 Management and Coordination.

If any adverse effects to NRHP-eligible archaeological sites are anticipated as a result of a proposed undertaking, Dover AFB will seek to minimize impacts to such sites in consultation with the SHPO, interested Indian tribes, and ACHP (if participating). Potential adverse effects to archaeological properties on Dover AFB will be avoided primarily through siting projects away from known sites.

Where adverse effects to sites are unavoidable, monitoring or data recovery may be viable mitigations. Avoidance, monitoring and data recovery are discussed in more detail below.

Avoidance

It is Dover AFB policy to avoid, where practical and possible within mission and budgetary constraints, adverse effects to historic properties. Consequently, at the earliest possible point in the design process for a particular base activity, the CRM will provide site location information to appropriate planning and design teams. Ways of avoiding effects to archaeological sites include redesigning the project so that the site no longer falls in the Area of Potential Effects or burying the site so that the undertaking is carried out above the site and does not actually disturb it. Site burial should not result in changes in soil chemistry, the water table, or other factors that could affect preservation of archaeological material. Site burial plans need to be coordinated with the SHPO.

Monitoring

After consultation with the SHPO, Dover AFB may conduct monitoring of ground disturbing activities as a mitigation strategy at identified archaeological sites in instances where the impact to the information potential of the site is anticipated to be unlikely or minimal when data recovery has been determined to be impractical. Examples may include minor disturbance over a small portion of a site (e.g., installation of a pole), shallow ground disturbance (e.g., driving heavy equipment over a site), or where archaeological testing has shown archaeological deposits to be sparse. Qualified professional archaeologists who are familiar with the historic and prehistoric cultural material of the region will conduct such monitoring.

The archaeologist monitoring the ground disturbance will collect any cultural material uncovered during the undertaking and will record provenance information. In the event that the undertaking exposes dense archaeological deposits or intact features, work will be stopped, and the archaeologist will notify the CRM. If human remains are identified during monitoring, the CRM will follow the procedures outlined in Section 7.4. The CRM will take actions to evaluate the discovery and, within 24 hours, will provide guidance to the project engineer on any actions that should be taken to provide appropriate management treatment of the resource. These findings and recommendations may lead to the following actions:

- Resumption of work.
- Change order to redirect project activity or alter siting to avoid impact.
- Extension of 24-hour stoppage for a specified period of time to allow for data recovery consultation with the SHPO and NPS.
- Construction stoppage at the affected location for an undetermined period of time pending completion of mitigation.

Dover AFB will submit a report detailing any findings during the monitoring to the SHPO and ACHP (if participating). This report will be consistent with the report format recommended in the Archeological Survey in Delaware (Delaware SHPO 2015).

Project contracts will require that work affecting archaeological resources cease upon the discovery of deposits or intact features. In those instances where emergency data recovery measures are recommended, every effort will be made to accomplish study objectives within the shortest time frame possible and within the spatial confines of areas subject to construction-related disturbance.

Data Recovery

Efforts will be made whenever possible to preserve archaeological resources in place. When archaeological site impacts cannot be avoided, excavation, removal, and scientific study of site data, based on a research design, may be an acceptable mitigation of adverse effects to an archaeological site. Any mitigation induced data recovery will be carried out after consultation with the SHPO, interested Indian tribes, ACHP (if participating), and other consulting parties; preparation and acceptance of a MOA; and in accordance with an accepted research design and MOA.

All archaeological data recovery programs conducted or permitted by the USAF will be carried out in accordance with a professionally adequate data recovery plan. At a minimum, such a plan will meet the following criteria:

- It will be prepared by cultural resource specialists who meet the *Secretary of the Interior's Professional Qualification Standards*, as amended and annotated (36 CFR Part 61) and submitted by the CRM for approval by the SHPO and, when appropriate, ACHP.
- It will present a definite set of research objectives to be met in analysis of the data to be recovered.
- It will specify the field methods to be employed for the recovery of data samples sufficient to address the research objectives described in the plan. It will specify the means by which sample adequacy will be determined in order to avoid collection of data that are redundant.
- It will specify the laboratory methods and techniques to be used for analysis of the data. Destructive analytical methods will not be used if non-destructive methods are available.

Recovery of archaeological data from properties selected for this management treatment will occur primarily through excavation and controlled surface collection. Because recovery can be viewed as a destructive management treatment, the spatial extent of such activities (particularly excavation) should be restricted to the smallest area that will provide the necessary data to answer agreed upon research questions. Dover AFB will submit a report detailing all findings to the SHPO and ACHP (if participating), consistent with the format recommended in the Archeological Survey in Delaware (Delaware SHPO 2015).

Curation of Archaeological Collections

Federal regulations (36 CFR Part 79—Curation of Federally Owned and Administered Archeological Collections) require that archaeological collections and their associated records, owned by Federal agencies, be properly curated in perpetuity. Artifacts and associated documentation from archaeological excavations on Dover AFB currently are housed at the DDHCA , Delaware State Museums, 800 Otis Drive, Dover, DE, 19901, 302-739-6402. Collections were consolidated at this facility in 2001 following rehabilitation of the collections by the USACE, St. Louis District (Drew et al. 2001). This rehabilitation project was undertaken to address the specific recommendations found in the An Archeological Curation- Needs Assessment for the U.S. Air Force, Air Mobility Command, Technical Report No. 6. (Drew et. al. 1995). The project included the preparation of proper accession records, the appropriate labeling of all artifacts, the sorting and re- bagging of artifacts in appropriate primary and secondary containers, and the preparation of data inventory and catalog records for the collections. All paper records were copied to acid- free paper and placed in acid-free folders labeled in indelible ink. All folders were housed in acid-free cardboard boxes. Photographs and negatives were removed from the original folders and organized for the collection. They then were placed in archival polypropylene sleeves and were placed in an archival file folder.

Since 2001, artifacts and records recovered from archaeological investigations have continued to be curated at the Delaware State Museum Tudor Annex in compliance with federal and state guidelines and regulations. The table below lists the current collections at the museum as of 2019. There currently is no permanent curation agreement with the Delaware State Museum and an agreement should be negotiated between the Museum and Dover AFB.

Archaeological Collections at the Delaware State Museums (Including Tudor Annex)

Site #	Temporal Affiliation	# Boxes
N/A	Prehistoric and historic isolated artifacts	1
7K-D-1	Woodland; 19th to 20th century	7
7K-D-2	Archaic to Woodland; 19th century	8
7K-D-5	Archaic to Woodland	11
7K-D-26	Woodland; 19th century	21
7K-D-125	19th – 20th century Bergold Farm	Sites 125/126 boxed together
7K-D-126	Undetermined prehistoric; 19th – 20th century Bergold Farm	12
7K-D-129	ca. 1867 John Wesley Cemetery	0
7K-D-131	Historic Slaughter Farm	0
7K-D-132	19th – 20th century	5
7K-D-133	19th – 20th century	5
7K-D-134	19th – 20th century	3
7K-D-135	Undetermined prehistoric	Sites 134, 135, and 136 boxed
7K-D-136	18th -19th century Lackey Site	Sites 134, 135, and 136 boxed
7K-D-143	19th – 20th century school house	8
7K-D-151	19th – 20th century Wharton Farm	3
Total		**79**

Above-Ground Historic Properties

This subsection presents information related to the protection of historic above-ground properties at Dover AFB. Because only one above-ground resource, Building 1301, is currently listed in the NRHP, treatment of this building is the primary concern of Dover AFB at present. Buildings 3100 and 3103 were determined eligible for the NRHP but have been demolished. Building 3100 was documented as an outcome of a MOA between Dover AFB and the DE SHPO. As more above-ground historic properties are identified at Dover AFB, this section may be applied to those historic properties. This discussion includes overall protection strategies, pending/potential projects, and suggested protection and mitigation strategies for specific types of projects.

Overall Protection Strategy

The overall protection strategy for built resources at Dover AFB is, when feasible, to encourage the continued use of historic properties in a manner compatible with their original design. The installation will make every reasonable effort to avoid adverse effects on historic properties located on Dover AFB and historic properties beyond the Base that are within the project APE. In those cases where avoidance is not possible because of mission requirements, economic feasibility, or other reasons, the base will seek to minimize those adverse effects as required by Section 106. Where appropriate, mitigation plans will be prepared in consultation with the SHPO and ACHP (if participating). Part of any mitigation plan

will be recordation of the structure. In addition, Dover AFB will continue its commitment to good stewardship practices regarding historic properties and will use as guidance the Secretary of the Interior's Standards for the Treatment of Historic Properties (SOI Standards [36 CFR §68]) in planning and executing work to NRHP-eligible facilities.

Mitigation Strategies

Although preservation and protection of identified historic properties is the primary goal, there are circumstances (e.g., new mission requirements) when adverse effects cannot be avoided or minimized in project planning. In these cases, mitigation measures are developed through Section 106 consultation. The mitigation that has been employed most often in the past for construction (e.g., additions to historic buildings), major rehabilitation, or demolition is recordation to the standards established for the HABS/HAER collections submitted to the Library of Congress. Mothballing is an alternative mitigation that can be employed when properties are to be preserved for future use or when prolonged vacancy would cause an adverse effect (deterioration from lack of use).

Maintenance Considerations

Periodic, scheduled inspections and maintenance are essential elements in the protection of historic properties. Maintenance activities generally require a low level of intervention and are a key to the early detection of intrusive deterioration that can damage or destroy character-defining features (e.g., spider cracks in masonry; rusted door frames and sashes; roof leaks). Typical maintenance considerations for historic properties at Dover AFB should include:

- Periodically inspect roofs, window frames, and door frames for leaks and repair as needed.
- Periodically inspect concrete and concrete block for cracking; seal, repoint, and repaint as needed.
- Periodically inspect brick chimney for damage; seal and repoint as needed.
- Periodically inspect hangar doors; repair and lubricate upper and lower tracks and rollers to ensure proper alignment and movement. Inspect, repair, and/or replace glass panes and weather stripping to prevent water damage.
- Periodically inspect metal siding for rust and deterioration. Repair, seal, and repaint as needed.
- Maintain as is with no visual alterations (e.g., no door, window, or major additions added) until such time as any HABS/HAER recordation is complete.
- Periodically inspect the roof trim for damage and repair to prevent damage to underlying framework.
- Periodically inspect concrete and concrete block for cracking; seal, repoint and repaint as needed.
- Continue other routine building upkeep the same as is employed for any actively used facility at Dover AFB.

The Mission Activities and Solution table below identifies mission-related activities that will adversely affect cultural resources and proposed solutions and mitigating activities to address the identified effect.

Mission Activities and Solutions

USAF/Installation Activity and Cultural Resources Affected	Solutions and Mitigating Activities	Status
Building 3100 will be demolished once a new school has been built	Archaeological investigations of 7K-D-1and HABS documentation of the existing school	Section 106 consultation and documentation are complete
Proposed demolition of 10 buildings nearing end of life expectancy	Verify building and APE have been identified and evaluated	Due to possible visual effects to other resources in the APE, Section 106 consultation is required, no matter the age of the building(s) to be demolished
AMC Museum Support Facility; Building 1301	Insure support facility does not impact character-defining features and historic fabric of Building 1301	On Short-Range (1-5 Years) Capital Improvements Plan
AMC Museum Education and Events Center	Ensure support facility does not impact character-defining features and historic fabric of Building 1301	On Mid-Range (6-10 Years) Capital Improvements Plan
Joint Readiness Center	Ensure support facility does not impact character-defining features and historic fabric of Building 1301 On Mid-Range Capital Improvements Plan	On Long-Range (11+ Years) Capital Improvements Plan

10.2 Cultural Resources Project Programming and Execution

The CRM ensures that cultural resource management activities are planned and programmed to receive funding. Cultural resource projects and actions may be required by: agreement documents, results of gap analyses, audit/assessment findings, ongoing program requirements (e.g., Sections 306101(a) and 306102 surveys and evaluations), urgent installation needs (e.g., changes to military training requirements), and other drivers. Cultural resources activities are executed according to fund eligibility guidelines. The Environmental Quality PPBE Playbook and the Activity Management Plan Playbooks contain detailed instruction on programming and planning.

The Project Programming and Execution Work Plan table below outlines cultural resources management requirements for the five years of this ICRMP cycle. Projects entered into this Work Plan should match APSR entries. The link below is to a spreadsheet posted on the installation's eDASH cultural resources page, which contains a detailed list of all installation cultural resources requirements over the five-year period of the ICRMP. This spreadsheet is prepared by the Section through a download from the APSR, then forwarded to the installation CRM for posting. The installation and Section must download and post the link at least once a year.

Installation Supplement – Cultural Resources Project Programming and Execution

Project Programming and Execution Work Plan

FY	Project Title and Description	Acquisition Strategy and Execution Agent	Status/Notes
2020	**Project FJXTA53205117** **Survey/Inventory Update, Cultural Resources, Historic Buildings** Actual Funded Cost: $26.338 K Dover AFB has identified buildings to be re-surveyed in 2020. The objectives of the survey are to update the existing inventory data for Dover AFB, review newly eligible properties, and to include resource types overlooked in the earlier inventory	Discuss contracts and contracting tools with JBLE ISS Cultural Resources Specialist, Region SME	Funded in FY 2020
2020	**Project FJXTA53201118** **Phase I Cultural Resources Survey, Land Acquisition** Actual Funded Cost: $26.388 K Dover AFB is considering the purchase of an estimated 100-acre plot of land/marsh for security reasons. A Phase I and II archaeological survey is being programmed for execution after land is purchased.	Discuss contracts and contracting tools with JBLE ISS Cultural Resources Specialist, Region SME	Funded in FY 2020
2023	**Project FJXTA53235115** **Management of Cultural sites.** Estimated Cost: $10 K	Discuss contracts and contracting tools with JBLE ISS Cultural Resources Specialist.	Programmed for FY 2023

11.0 REFERENCES

11.1 Standard References *(Applicable to all USAF Installations)*

- AFI 32-7001, *Environmental Management* (Includes UEC Role)
- AFMAN 32-7003, *Environmental Conservation*
- AFI 90-2002, *Air Force Interactions with Federally Recognized Tribes*
- Cultural Resources Environmental Action Plan (EAP)
- Cultural Resources Management Playbook
- eDASH AFLOA Legal and Other Requirements List
- eDASH Cultural Resources Home Page
- eDASH Training Matrix
- Environmental Reporting Playbook (webinar)
- Environmental Quality PPBE Playbook
- ISO 14001, *Environmental Management Systems–Requirements with Guidance for Use*
- Activity Management Plan Playbooks

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12.0 ACRONYMS

12.1 Standard Acronyms (Applicable to all USAF Installations)

- eDASH Acronym Library
- Cultural Resources Management Playbook – Acronym Section (page 127)
- U.S. EPA Terms & Acronyms

12.2 Installation Acronyms

- BAHP - Delaware Bureau of Archaeology and Historic Preservation
- DCA - Departmental Consulting Archeologist
- DDHCA - Delaware Division of Historical and Cultural Affairs
- DelDOT - Delaware Department of Transportation
- UDCAR - University of Delaware Center for Archaeological Research
- USO - United Services Organization of Delaware

13.0 DEFINITIONS

13.1 Standard Definitions (Applicable to all USAF Installations)

- Cultural Resources Management Playbook – Definitions Section (page 131)

13.2 Installation Definitions

N/A

14.0 INSTALLATION-SPECIFIC CONTENT

N/A

APPENDICES

Appendix A. Archaeological Resources Inventory Tables

CRS #	Site Number	Site Name	Time Period	NRHP Eligibility
K00593	**7K-D-1**	**St. Jones Adena Site**	**Woodland; 19th to 20th century**	**NRHP Eligible**
K00594	7K-D-2	Air Base School Site	Archaic to Woodland; 19th century	Not Eligible
K00595	**7K-D-5**	**Short Farm Site**	**Archaic to Woodland**	**NRHP Eligible**
K00592	**7K-D-26**		**Woodland; 19th century**	**Prehistoric Component NRHP Eligible**
K06785	7K-D-125		19th – 20th century	Not Eligible
K06786	7K-D-126	Bergold Farm Site	Undetermined prehistoric; 19th – 20th century	Not Eligible
K00909	**7K-D-129**	**John Wesley M.E. Church Cemetery**	**ca. 1867**	**NRHP Eligible**
K00971	7K-D-131	Slaughter Farmhouse Site	Historic	Not Eligible
K06956	7K-D-132	D.C. Hoffecker Site	19th – 20th century	Not Eligible
K06757	7K-D-133		19th – 20th century	Not Eligible
K06958	7K-D-134		19th – 20th century	Not Eligible
K06959	7K-D-135		Undetermined prehistoric	Not Eligible
K06960	7K-D-136	Lackey Site	18th -19th century	Not Eligible
K07636	**7K-D-143**	**School House #14 or Comegy's School**	**19th – 20th century**	**NRHP Eligible**
K07766	7K-D-151	Wharton Farmstead	19th – 20th century	Not Eligible

Appendix B. Built Resources Inventory Tables

CRS #	Facility No.	Facility Name	Date
K06669	Building 260	Airmen's Dormitory	12/29/2011
K06706	**Building 1301**	**Hangar**	**5/1/1994**
K06707	*Building 1305*	*Warehouse*	*10/1/1993*
K06708	Building 1306	Warehouse	10/1/1993
K06779	*Building 1304*	*Base Readiness Crew Facility*	*2/2/1995*
K07141	Building 1315	Alert Aircraft Hangar	2/2/1995
K07152	Building 707	General Purpose Shop	8/29/2011
K07153	Building 708	Administration Office	8/29/2011
K07154	Building 135	Utility Vault	8/9/2011
K07155	Building 200	Wing Headquarters	8/9/2011
K07156	Building 201	Wing Command Headquarters	8/9/2011
K07157	Building 204	Pilot Proficiency Building	8/9/2011
K07158	Building 205	Flight Simulator Bldg/Reproduction	8/9/2011
K07159	Building 206	Field and Flight Training Building	8/29/2011
K07160	Building 211	Post Exchange	8/29/2011
K07161	Building 223	Water Tower	8/29/2011
K07162	Building 261	Airmen's Dormitory	8/8/2011
K07163	Building 262	Airmen's Dormitory	8/8/2011
K07164	Building 263	Airmen's Dormitory	8/8/2011
K07165	Building 300	Hospital	8/8/2011
K07166	Building 302	Medical Clinic	8/8/2011
K07167	Building 428	Gymnasium	8/9/2011
K07168	Building 439	Squadron Headquarters	8/9/2011
K07169	Building 459	Squadron Headquarters	8/9/2011
K07170	Building 469	Squadron Headquarters	8/9/2011
K07244	Building 479	NCO Open Mess	8/10/2011
K07245	Building 500	Operations Control Tower	8/8/2011
K07246	Building 501	Passenger Air Terminal	8/9/2011
K07247	Building 519	Post Exchange	8/29/2011
K07248	Building 524	Base Theater	8/29/2011
K07249	Building 607	Carpenter Shop/Engineering Office	8/9/2011
K07250	Building 608	Warehouse	8/9/2011
K07251	Building 609	Warehouse	8/9/2011
K07252	Building 610	Water Pumping Station	8/9/2011
K07253	Building 612	Water Supply Building	8/9/2011

CRS #	Facility No.	Facility Name	Date
K07254	Building 615	Air Installations Office (AIO) Shop	8/9/2011
K07255.001	Building 617	Central Heating Plant	8/9/2011
K07255.002	Building 618	Fuel Oil Storage Tank	8/9/2001
K07255.003	Building 619	Pump and Valve House	8/9/2011
K07255.004	Building 620	Fuel Oil Storage Tank	8/9/2011
K07255.005	Building 621	Fuel Oil Storage Tank	8/9/2011
K07256	Building 633	Administration Office	8/10/2011
K07257	Building 635	Automotive Maintenance Shop	8/10/2011
K07258	Building 636	Refueling Vehicle Shop	8/10/2011
K07259	Building 641	Water Pumping Station	8/9/2011
K07260	Building 701	Parachute and Dingy Shop	8/29/2011
K07261	Building 702	Squadron Operations Building	8/29/2011
K07262	Building 703	Sewage Pumping Station	8/29/2011
K07263	Building 704	Organizational Maintenance Shop	8/29/2011
K07264	Building 709	Squadron Operations Building	8/29/2011
K07265	Building 710	Operations Building	8/29/2011
K07266	Building 712	Multi-Purpose Hangar	8/29/2011
K07267	Building 716	Multi-Purpose Hangar	8/29/2011
K07268	Building 717	Deluge System Building	8/29/2011
K07269	Building 718	Deluge System Tank	8/29/2011
K07270	Building 719	Engine Inspection and Repair Shop	8/29/2011
K07271	Building 726	Auto Pilot Shop	8/29/2011
K07272	Building 727	Organizational Maintenance Shop	8/29/2011
K07273	Building 734	Jet Fuel Tank	2/3/2014
K07273.001	Building 729	Fuel Pumping Station	8/10/2011
K07273.002	Building 730	Jet Fuel Storage Tank	8/10/2011
K07273.003	Building 731	Jet Fuel Storage Tank	8/10/2011
K07273.004	Building 732	Jet Fuel Storage Tank	8/10/2011
K07273.005	Building 733	Jet Fuel Storage Tank	8/10/2011
K07273.006	Building 736	Fuel Pumping Station	8/10/2011
K07273.007	Building 737	Fuel Operations Building	8/10/2011
K07274	Building 778	Hangar	8/29/2011
K07275	Building 779	Hangar	8/29/2011
K07276	Building 780	Hangar	8/29/2011
K07277	Building 781	Hangar	8/29/2011
K07278	Building 789	Hangar	8/29/2011
K07279	Building 792	Hangar	8/29/2011

CRS #	Facility No.	Facility Name	Date
K07280	Building 793	Hangar	8/29/2011
K07281	Building 794	Hangar	8/29/2011
K07282	Building 795	Pump House	8/29/2011
K07283	Building 850	Sewage Pumping Station	8/30/2011
K07284	Building 910	Squadron Operations Building	8/29/2011
K07285	Building 913	Armament & Electronic Shop	8/29/2011
K07286	Building 914	Aircraft Service Dock (Hangar)	8/29/2011
K07287	Building 918	Aircraft Service Dock (Hangar)	8/29/2011
K07288	Building 919	A/C Maintenance Shop	8/29/2011
K07289	Building 921	Ground Powered Equipment Shop	8/29/2011
K07290	Building 922	Aircraft Service Dock (Hangar)	8/29/2011
K07291	Building 1219	Communications Receiver	8/8/2011
K07292	Building 1251	Commination Transmitter	8/8/2011
K07293	Building 1252	Tactical Air Navigation (TACAN) System Facility	8/8/2011
K07294	Building 1269	Paint and Grease Storage Building	8/9/2011
K07295	Building 1270	Security Guardhouse	8/9/2011
K07296	Building 1272	Assembly and Check-out Building	8/9/2011
K07297	Building 1274	Missile Storage Igloo	8/9/2011
K07298	Building 1275	Missile Storage Igloo	8/9/2011
K07299	Building 1276	Missile Storage Igloo	8/9/2011
K07300	Building 1277	Missile Storage Igloo	8/9/2011
K07301	Building 1329	Aircraft Surveillance Radar (ASR)	8/8/2011
K07302	Building 1402	Skeet and Trap Range	8/8/2011
K07303	Building 1908	Warehouse	8/30/2011
K07304	**Building 3100**	**Dover AFB Middle School / Welch Elementary School**	**8/30/2011**
K07305	Building 3496	Sewage Pumping Station	8/30/2011
K07572	Building 714	Medium Bomber Hangar	8/4/2015
K07578	***Building 1303***	***Base Readiness Crew Facility (NRHP-eligible), building demolished but apron is extant.***	***2/2/1995***
K07727	Building 212	Child Development Center	2/3/2014
K07728	Building 266	Base Exchange	2/3/2014
K07729	Building 268	Commissary	2/3/2014
K07730	Building 270	Squadron Headquarters	2/3/2014
K07731	Building 638	Warehouse	2/3/2014
K07732	Building 711	Aircraft Maintenance Hangar	2/3/2014
K07733	Building 715	Aircraft Maintenance Nose Dock	2/3/2014

CRS #	Facility No.	Facility Name	Date
K07734	Building 721	Aircraft Corrosion Control Facility	2/3/2014
K07735	Building 725	Engine Regional Repair Center	2/3/2014
K07736	Buildings 945 and 946	Nose Dock and Deluge Tank	2/3/2014
K07846	Building 202	Operational Mission Training Building	5/1/2017
K07847	Building 401	Airmen's Dormitory	5/1/2017
K07848	Building 402	Airmen's Dormitory	5/1/2017
K07849	Building 613	Engine Test Cell Facility	5/1/2017
K07850	Building 639	Warehouse	5/1/2017
K07851	Building 637	Fuel Shed	5/1/2017
K07852	Building 722	Shop Avionics/Headquarters	5/1/2017
K07853	Building 724	General Purpose Aircraft Shop	5/1/2017
K07854	Building 1320	Fire Station	5/1/2017
K08755	Building 2998	Post Chapel	5/1/2017

Bold – Building is NRHP listed or eligible
Italics – Building is no longer extant

Appendix C. Traditional Cultural Resources Inventory Tables

None Exist on Dover AFB

Appendix D. NHPA Section 306108 Memoranda of Agreement

DE SHPO and Dover AFB were not able to locate a copy of the finalized MOA documents as of January 2020. The CRM shall determine if the documents exist and obtain copies to add to future ICRMP updates.

Appendix E. NHPA Section 306108 Programmatic Agreements

Dover AFB was not able to locate a copy of the final PA documents as of January 2020. The CRM shall determine if the documents exist and obtain copies to add to future ICRMP updates.

Appendix F. Installation Tribal Relations Plan

None Exists

Appendix G. Tribal Agreements

N/A

Appendix H. Wing Instructions or Policy Documents

N/A

Appendix I. Archaeological Survey and Site Forms

See Volume 2 – Site Forms.

Appendix J. Historic Property Survey and Site Forms

See Volume 2 – Site Forms

Appendix K. Historic Building Maintenance Plans

N/A

Appendix L. Privatized Housing Documents

N/A

Appendix M. SHPO Concurrence Documents

Copies of available SHPO concurrence documents are included. DE SHPO and Dover AFB were not able to provide missing concurrence documentation noted in below table by January 2020. The CRM shall determine if the documents exist and obtain copies to add to future ICRMP updates.

Unavailable Archaeology Concurrence Documents

Project	Citation	Concurrence note
Site 7K-D-2	Thomas, Ronald A., and Ted M. Payne 1996 Cultural Resource Survey at the Dover Air Force Base, Dover, Delaware. Prepared for the National Park Service by MAAR Associates, Inc.	Not Eligible, SHPO Concurred
Site 7K-D-5	Bedard, Justin, and Tracy Formica 2011 Phase II Archaeological Evaluation of Site 7K-D-5. Prepared for Dover Air Force Base by URS Group, Inc. Gaithersburg, MD.	Recommended NRHP Eligible, SHPO Concurred
Site 7K-D-26	Furgerson, Kathleen A., and Robert D. Wall, Ph. D. 2005 Phase II Archaeological Evaluation of Site 7K-D-26, Dover Air Force Base, Kent County, Delaware. Report prepared for Dover Air Force Base by URS Corporation, Inc., Gaithersburg, MD.	Prehistoric Component NRHP Eligible, SHPO Concurred
Site 7K-D-125	Furgerson, Kathleen A., and Carey O'Reilly 2006 Extended Phase I Archaeological Survey Sites 7K-D-125 and 7K-D-126. Report prepared for Dover Air Force Base by URS Group, Inc., Gaithersburg, MD.	Not Eligible, SHPO Concurred
Site 7K-D-129 John Wesley Methodist Episcopal Church and Cemetery	Crowl, Heather 2008 John Wesley Methodist Episcopal Church and Cemetery National Register of Historic Places Nomination Form.	NRHP Eligible, SHPO and Keeper Concurred
7K-D-131 (Slaughter Farm)	Kellogg, Douglass C. and Wade, P. Catts 1999 Phase I Archaeological Survey for the Civil Air Terminal Expansion, Dover Air Force Base, Dover, Kent County, Delaware. John Milner Associates, Inc., West Chester, PA.	Not Eligible, SHPO Concurred
Site 7K-D-132 Hoffecker Site	Bupp, Susan L., Christopher Sperling, and Laurie Paonessa 2002 Management Summary: Phase II Evaluation of the Hoffecker Site (7K-D-132), Kent County, Delaware. Prepared for Dover Air Force Base by Parsons, Inc., Fairfax, VA.	Not Eligible, SHPO Concurred
Site 7K-D-133 Site 7K-D-134 Site 7K-D-135	U.S. Air Force, Air Mobility Command Headquarters (HQ AMC) 2000 Archeological Survey of Dover Air Force Base, Delaware. Contract F11623-94-D0024. June. Prepared by Parsons Engineering Science.	Not Eligible, SHPO Concurred

Project	Citation	Concurrence note
Site 7K-D-136 (Lackey Site)	Boyd, Varna G., Kathleen A. Furgerson, and Amy V. Barnes 2004 Phase II Archaeological Evaluation of Site 7K-D-136, the Lackey Site, Dover Air Force Base, Kent County, Delaware. Prepared for Dover Air Force Base by URS Corporation, Inc., Bethesda, MD.	Not Eligible, SHPO Concurred
Site 7K-D-143 (Kent County School #14	Crowl, Heather, Bridget Johnson, and Carey O'Reilly 2012 Phase II Archaeological Evaluation of the Schoolhouse Site, 7K-D-143, Location 21, Dover Air Force Base, Kent County, Delaware. Report prepared for Dover Air Force Base by URS Group, Inc., Gaithersburg, MD.	Recommended eligible, unknown if SHPO ever concurred

Unavailable Architectural History Concurrence Documents

Building No.	Original Use	Year Built	Date of Evaluation	NRHP Eligibility	SHPO Concurrence
108 (no longer extant)	Warehouse	1942	1987	Not Eligible	Yes
109 (no longer extant)	Warehouse	1942	1987	Not Eligible	Yes
110 (no longer extant)	Warehouse	1942	1987	Not Eligible	Yes
214 (no longer extant)	Officers' Quarters	1942	1987	Not Eligible	Yes
312	Photographic Laboratory	1942	2011	Not Eligible	Yes
1203	Weapons Storage Igloo	1942	1987	Not Eligible	Yes
1204	Weapons Storage Igloo	1942	1987	Not Eligible	Yes
1205	Weapons Storage Igloo	1942	1987	Not Eligible	Yes
1301	Aircraft Hangar	1944	1987	Eligible	Yes
260	Unaccompanied Personnel Housing	1963	2011	Not Eligible	Yes
714	Bomber Hangar	1954-56	2005	Not Eligible	Yes
1269	Hazardous Storage	1958-59	1996	Not Eligible	Yes
1270	Guardhouse	1956-57	1996	Not Eligible	Yes
1271	Water System	1956-57	1996	Not Eligible	Yes
1272	Checkout and Assembly	1956-57	1996	Not Eligible	Yes
1273	Missile Storage Igloo	1956-57	1996	Not Eligible	Yes
1274	Missile Storage Igloo	1956-57	1996	Not Eligible	Yes
1275	Missile Storage Igloo	1956-57	1996	Not Eligible	Yes
1276	Missile Storage Igloo	1956-57	1996	Not Eligible	Yes
1277	Missile Storage Igloo	1956-57	1996	Not Eligible	Yes

Building No.	Original Use	Year Built	Date of Evaluation	NRHP Eligibility	SHPO Concurrence
1301	Hangar	1944/ Modified for the ADC 1955	1996	Eligible (As a WWII-era Resource)	Yes
1303; no longer extant	SAC Readiness Crew	1958-60	1996	Potentially Eligible	Yes
1304	ADC Readiness Crew	1955-56	1996	Not Eligible	Yes
1305	Rocket checkout and assembly	1955	1996	Not Eligible	Yes
1306	Rocket checkout and assembly	1954-59	1996	Not Eligible	Yes
1311	Liquid fuel pump station	1954	1996	Not Eligible	Yes
1312	Liquid fuel pump tank	1954	1996	Not Eligible	Yes
1313	Liquid fuel pump tank	1958-59	1996	Not Eligible	Yes
1314	Liquid fuel pump tank	1958-59	1996	Not Eligible	Yes
1315	FIS Alert hangar	ca. 1951-52	1996	Not Eligible	Yes
1324	Flight simulator training building	1958-59	1996	Not Eligible	Yes
1350	ADC training building	1959-60	1996	Not Eligible	Yes
1355	SAC maintenance shop	1960-61	1996	Not Eligible	Yes

Appendix N. Excerpts from To Slip the Bonds of Earth: The History of Dover Air Force Base and Its Surroundings

The full excerpt is provided in Volume 2

Appendix J

Threatened and Endangered Species in Delaware

Threatened and Endangered Species in Delaware

Species (common name)	Species (scientific name)	Status (T/E)
Amphibians		
Eastern Mud Salamander	Pseudotriton montanus montanus	E
Eastern Tiger Salamander	Ambystoma tigrinum tigrinum	E
Barking Treefrog	Hyla gratiosa	E
Birds		
Pied-billed Grebe (BR)	Podilymbus podiceps	E
Northern Harrier (BR)	Circus cyaneus	E
Broad-winged Hawk (BR)	Buteo platypterus	E
Black-Crowned Night Heron	Nycticorax nycticorax	E
Yellow-Crowned Night Heron	Nyctanassa violacea	E
American Kestrel	Falco sparverius	E
Red Knot	Calidris canutus	T
Piping Plover	Charadrius melodus	T
Short-eared Owl (BR)	Asio flammeus	E
American Oystercatcher	Haematopus palliatus	E
Black Rail	Laterallus jamaicensis	E
Upland Sandpiper	Bartramia longicauda	E
Black Skimmer	Rynchops niger	E
Henslow's Sparrow	Ammodramus henslowii	E
Common Tern (BR)	Sterna hirundo	E
Forster's Tern (BR)	Sterna forsteri	E
Least Tern	Sterna antillarum	E
Cerulean Warbler	Setophaga cerulea	E
Hooded Warbler (BR)	Setophaga citrina	E
Swainson's Warbler	Limnothlypis swainsonii	E
Sedge Wren	Cistothorus platensis	E
Fish		
Glassy Darter	Etheostoma vitreum	E
Blueridge Sculpin	Cottus caeruleomentum	E
Bridled Shiner	Notropis bifrenatus	E
Ironcolor Shiner	Notropis chalybaeus	E
Atlantic Sturgeon	Acipenser oxyrhynchus	E
Shortnose Sturgeon	Acipenser brevirostrum	E
Blackbanded Sunfish	Enneacanthus chaetodon	E
Insects		
Little White Tiger Beetle	Cicindela lepida	E

White Tiger Beetle	Cicindela dorsalis	E
Seth Forest Scavenger Beetle	Hydrochus ~~sp.~~spangleri	E
Burgundy Bluet	Enallagma dubium	E
Pale Bluet	Enallagma pallidum	E
Baltimore Checkerspot	Euphydryas phaeton	E
Banner Clubtail	Gomphus apomyius	E
Laura's Clubtail	Stylurus laurae	E
Midland Clubtail	Gomphus fraternus	E
Sable Clubtail	Gomphus rogersi	E
Black-tipped Darner	Aeshna tuberculifera	E
Taper-tailed Darner	Gomphaeschna antelope	E
Black Dash	Euphyes conspicua	E
Frosted Elfin	Incisalia irus	E
Treetop Emerald	Somatochlora provocans	E
Bethany Beach Firefly	Photuris bethaniensis	E
Hessel's Hairstreak	Mitoura hesseli	E
King's Hairstreak	Satyrium kingi	E
Aralia Shoot Borer Moth	Papaipema araliae	E
Dark Stoneroot Borer Moth	Papaipema duplicatus	E
Maritime Sunflower Borer Moth	Papaipema maritima	E
Pitcher Plant Borer Moth	Papaipema appassionata	E
Yellow Stoneroot Borer Moth	Papaipema astuta	E
Elfin Skimmer	Nannothemis bella	E
Rare Skipper	Problema bulenta	E
Brown Spiketail	Cordulegaster bilineata	E
Sely's Sundragon	Helocordulia selysii	E
Marbled Underwing	Catocala marmorata	E
Ulalume Underwing	Catocala ulalume	E
Mulberry Wing	Poanes massasoit massasoit	E
Chermock's Mulberry Wing	Poanes massasoit chermocki	E
Mammals		
Little Brown Bat	Myotis lucifugus	E
Northern Long-eared Bat	Myotis septentrionalis	T
Delmarva Fox Squirrel	Sciurus niger cinereus	E
Blue Whale	Balaenoptera *musculus*	E
Fin Whale	Balaenoptera physalus	E
Humpback Whale	Megaptera novaengliae	E
North Atlantic Right Whale	Eubalaena glacialis	E
Sei Whale	Balaenoptera borealis	E

Sperm Whale	Physeter macrocephalus	E
Mollusks		
Yellow Lampmussel	Lampsilis cariosa	E
Eastern Lampmussel	Lampsilis radiata	E
Dwarf Wedgemussel	Alasmidonta heterodon	E
Eastern Pondmussel	Ligumia nasuta	E
Brook Floater	Alasmidonta varicosa	E
Triangle Floater	Alasmidonta undulata	E
Tidewater Mucket	Leptodea ochracea	E
Reptiles		
Leatherback Turtle	Dermochelys coriacea	E
Kemp's Ridley Turtle	Lepidochelys kempii	E
Green Turtle	Chelonia mydas	E
Loggerhead Turtle	Caretta caretta	E
Bog Turtle	Clemmys muhlenbergii	T
Corn Snake	Elaphe guttata guttata	E
Eastern Scarlet Snake	Cemophora coccinea	E
Redbelly Watersnake	Nerodia erythrogaster	E
Plants		
Virginia Jointvetch	Aeschynomene virginica	T
Seaside Amaranth	Amaranthus pumilus	T
Swamp Pink	Helonias bullata	T
Small Whorled Pogonia	Isotria medeoloides	T
Canby's Cowbane	Oxypolis canbyi	E
Knieskern's Beaksedge	Rhynchospora knieskernii	T
Chaffseed	Schwalbea americana	E

**BR= Breeding population only*

Appendix K

Biological Resources Support Information (IPaC)

IPaC Information for Planning and Consultation **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Delaware and New Jersey

Local offices

Chesapeake Bay Ecological Services Field Office

(410) 573-4599
(410) 266-9127

177 Admiral Cochrane Drive
Annapolis, MD 21401-7307

http://www.fws.gov/chesapeakebay/
http://www.fws.gov/chesapeakebay/endsppweb/ProjectReview/Index.html

New Jersey Ecological Services Field Office

(609) 646-9310
(609) 646-0352

4 E. Jimmie Leeds Road, Suite 4
Galloway, NJ 08205

http://www.fws.gov/northeast/njfieldoffice/Endangered/consultation.html

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species

[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Birds

NAME	STATUS
Red Knot Calidris canutus rufa No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1864	Threatened

Flowering Plants

NAME	STATUS
Swamp Pink Helonias bullata No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4333	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act [1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
American Oystercatcher Haematopus palliatus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8935	Breeds Apr 15 to Aug 31
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Aug 31
Black Rail Laterallus jamaicensis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/7717	Breeds Mar 1 to Sep 15

Black Scoter Melanitta nigra — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Black Skimmer Rynchops niger — Breeds May 20 to Sep 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/5234

Black-billed Cuckoo Coccyzus erythropthalmus — Breeds May 15 to Oct 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9399

Bobolink Dolichonyx oryzivorus — Breeds May 20 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Bonaparte's Gull Chroicocephalus philadelphia — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Brown Pelican Pelecanus occidentalis — Breeds Jan 15 to Sep 30
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/6034

Buff-breasted Sandpiper Calidris subruficollis — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9488

Canada Warbler Cardellina canadensis — Breeds May 20 to Aug 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Clapper Rail Rallus crepitans — Breeds Apr 10 to Oct 31
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Common Eider Somateria mollissima — Breeds Jun 1 to Sep 30
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Common Loon gavia immer — Breeds Apr 15 to Oct 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/4464

Common Tern Sterna hirundo — Breeds May 10 to Sep 10
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/4963

Double-crested Cormorant phalacrocorax auritus — Breeds Apr 20 to Aug 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/3478

Dunlin Calidris alpina arcticola — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Eastern Whip-poor-will Antrostomus vociferus — Breeds May 1 to Aug 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Great Black-backed Gull Larus marinus — Breeds Apr 15 to Aug 20
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Gull-billed Tern Gelochelidon nilotica — Breeds May 1 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9501

Herring Gull Larus argentatus — Breeds Apr 20 to Aug 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Hudsonian Godwit Limosa haemastica — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Kentucky Warbler Oporornis formosus — Breeds Apr 20 to Aug 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

King Rail Rallus elegans — Breeds May 1 to Sep 5
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8936

Least Tern Sterna antillarum — Breeds Apr 20 to Sep 10
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Lesser Yellowlegs Tringa flavipes — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9679

Long-eared Owl asio otus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3631

Long-tailed Duck Clangula hyemalis — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/7238

Nelson's Sparrow Ammodramus nelsoni — Breeds May 15 to Sep 5
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Northern Gannet Morus bassanus — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Prairie Warbler Dendroica discolor — Breeds May 1 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Prothonotary Warbler Protonotaria citrea — Breeds Apr 1 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Purple Sandpiper Calidris maritima — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Red-breasted Merganser Mergus serrator — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Red-headed Woodpecker Melanerpes erythrocephalus — Breeds May 10 to Sep 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Red-necked Phalarope Phalaropus lobatus — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Red-throated Loon Gavia stellata — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Ring-billed Gull Larus delawarensis — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Royal Tern Thalasseus maximus — Breeds Apr 15 to Aug 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Ruddy Turnstone Arenaria interpres morinella — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Rusty Blackbird Euphagus carolinus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Seaside Sparrow Ammodramus maritimus — Breeds May 10 to Aug 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Semipalmated Sandpiper Calidris pusilla — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Short-billed Dowitcher Limnodromus griseus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9480

Snowy Owl Bubo scandiacus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Surf Scoter Melanitta perspicillata — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Whimbrel Numenius phaeopus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9483

White-winged Scoter Melanitta fusca — Breeds elsewhere
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Willet Tringa semipalmata This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 5
Wilson's Storm-petrel Oceanites oceanicus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds elsewhere
Wood Thrush Hylocichla mustelina This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its

entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

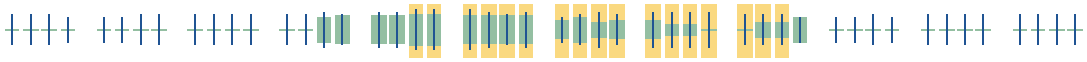
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

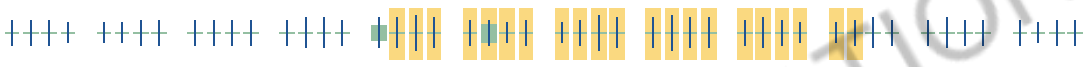
Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

Black Scoter
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

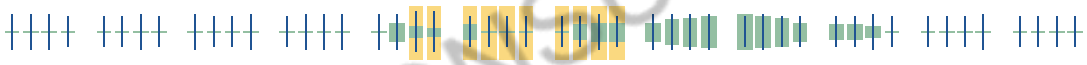
Black Skimmer
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Black-billed Cuckoo
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

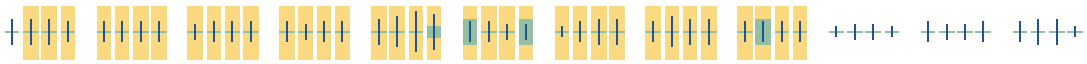


Bobolink
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Bonaparte's Gull
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Brown Pelican
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



Buff-breasted Sandpiper
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Canada Warbler
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

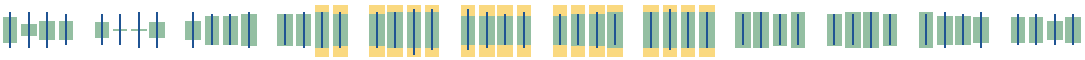
Clapper Rail
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

Common Eider
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Common Loon
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

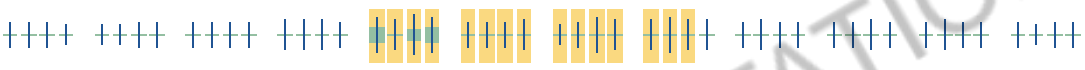
Common Tern
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Double-crested Cormorant
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

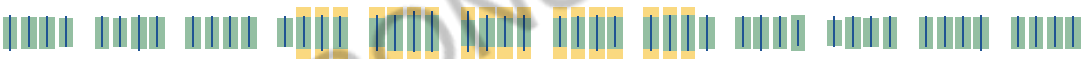


Dunlin
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

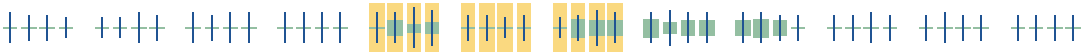
Eastern Whip-poor-will
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



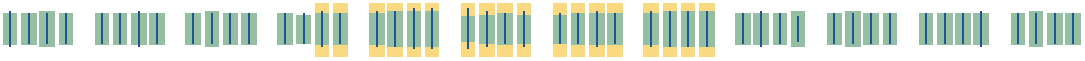
Great Black-backed Gull
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



Gull-billed Tern
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Herring Gull
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



Hudsonian Godwit
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Kentucky Warbler
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

King Rail
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

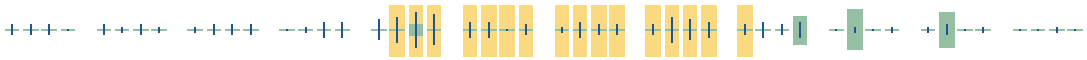
Least Tern
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

Lesser Yellowlegs
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Long-eared Owl
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

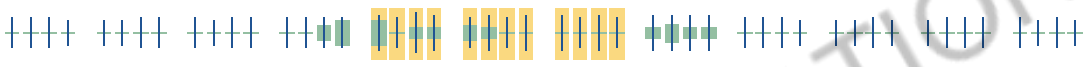
Long-tailed Duck
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Nelson's Sparrow
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

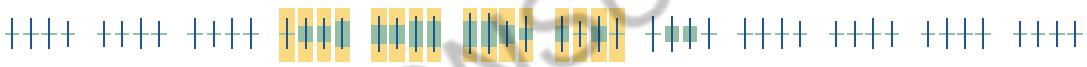


Northern Gannet
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Prairie Warbler
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



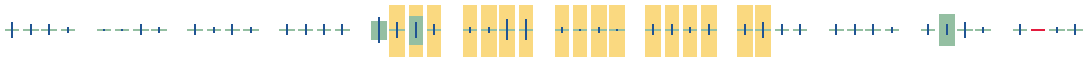
Prothonotary Warbler
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Purple Sandpiper
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Red-breasted Merganser
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Red-headed Woodpecker
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



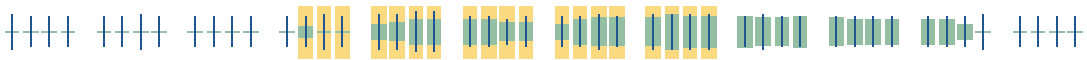
Red-necked Phalarope
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

SPECIES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Red-throated Loon
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Ring-billed Gull
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

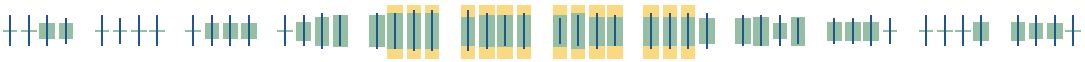
Royal Tern
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



Ruddy Turnstone
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

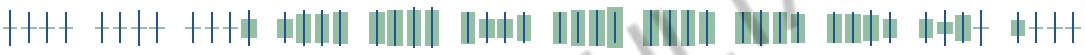
Rusty Blackbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Seaside Sparrow
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Semipalmated Sandpiper
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

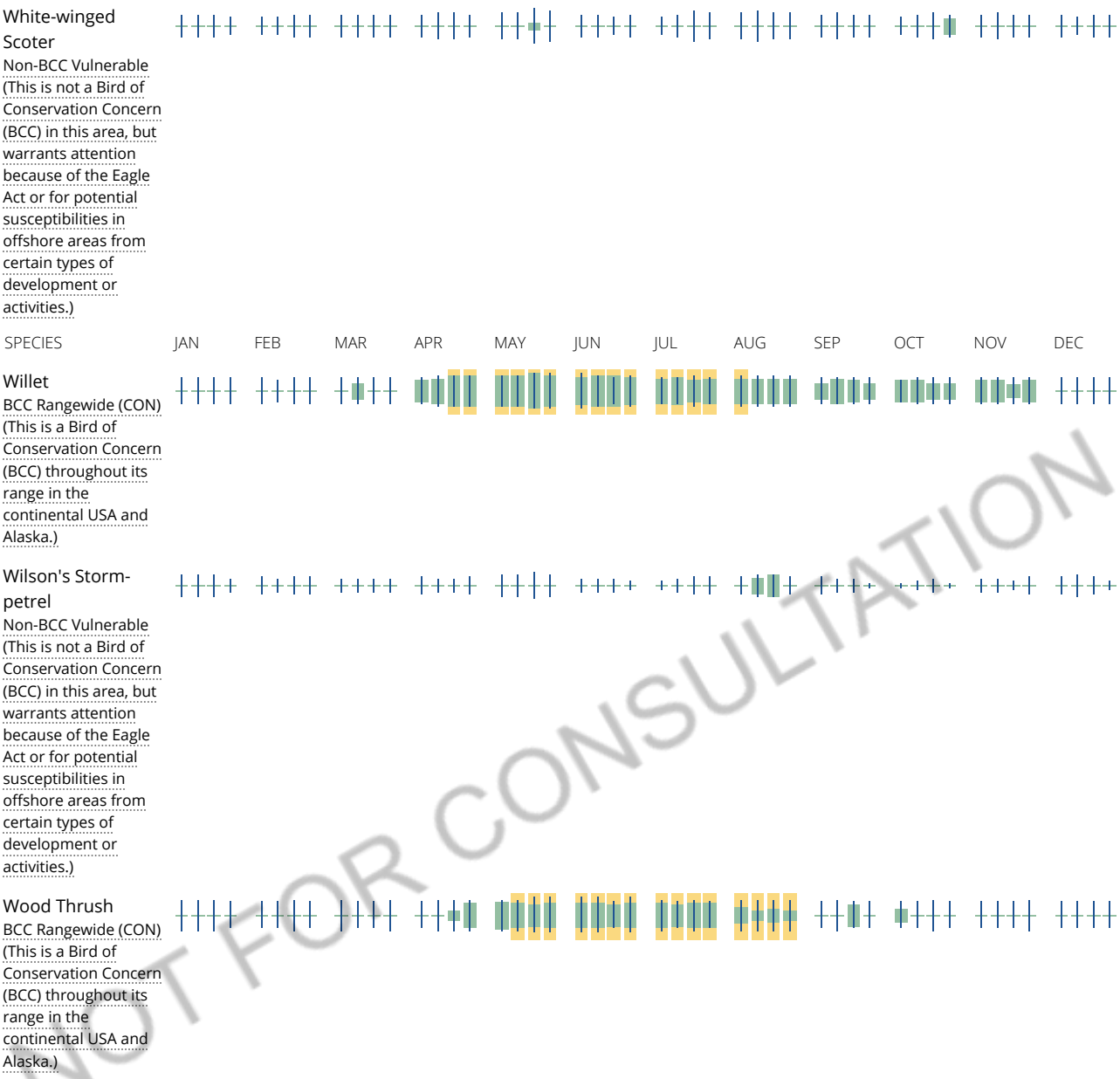
Short-billed Dowitcher
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Snowy Owl
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Surf Scoter
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Whimbrel
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

This location overlaps the following National Wildlife Refuge lands:

LAND	ACRES
Bombay Hook National Wildlife Refuge	15,425.83 acres

(302) 653-9345
(302) 653-0684

2591 Whitehall Neck Road
Smyrna, DE 19977-2912

https://www.fws.gov/refuges/profiles/index.cfm?id=51550

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

WETLAND INFORMATION IS NOT AVAILABLE AT THIS TIME

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or

local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

IPaC Information for Planning and Consultation **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Kent County, Delaware

Local office

Chesapeake Bay Ecological Services Field Office

(410) 573-4599
(410) 266-9127

177 Admiral Cochrane Drive
Annapolis, MD 21401-7307

http://www.fws.gov/chesapeakebay/
http://www.fws.gov/chesapeakebay/endsppweb/ProjectReview/Index.html

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species

[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

THERE ARE NO ENDANGERED SPECIES EXPECTED TO OCCUR AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act

[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE"

INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Bald Eagle Haliaeetus leucocephalus — Breeds Oct 15 to Aug 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1626

Bobolink Dolichonyx oryzivorus — Breeds May 20 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Buff-breasted Sandpiper Calidris subruficollis — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9488

Dunlin Calidris alpina arcticola — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Lesser Yellowlegs Tringa flavipes — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9679

Prothonotary Warbler Protonotaria citrea — Breeds Apr 1 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Ruddy Turnstone Arenaria interpres morinella — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Rusty Blackbird Euphagus carolinus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Semipalmated Sandpiper Calidris pusilla — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Short-billed Dowitcher Limnodromus griseus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Snowy Owl Bubo scandiacus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Wood Thrush Hylocichla mustelina This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

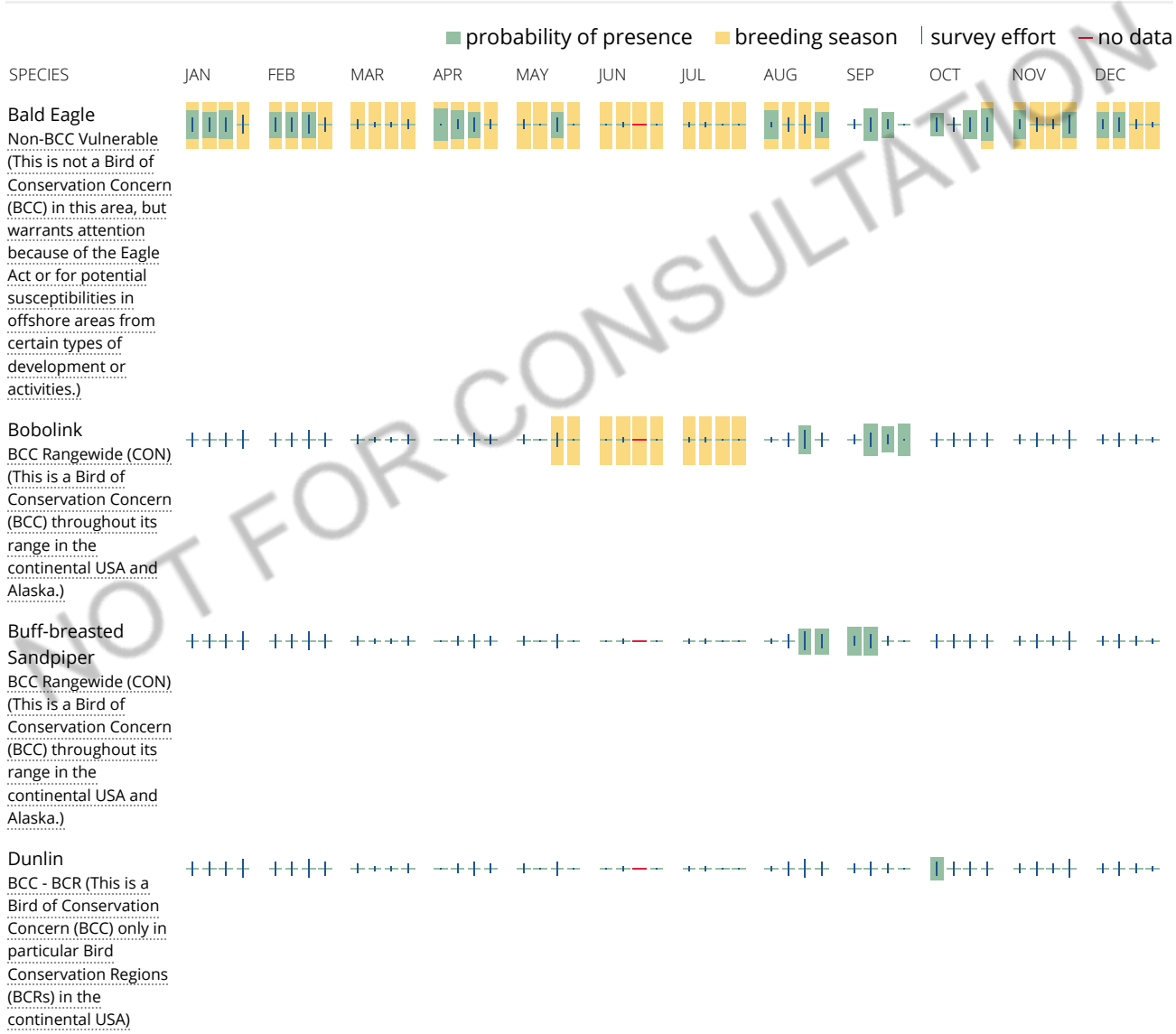
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

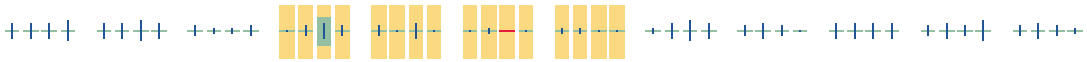
No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Lesser Yellowlegs
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Prothonotary Warbler
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Ruddy Turnstone
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

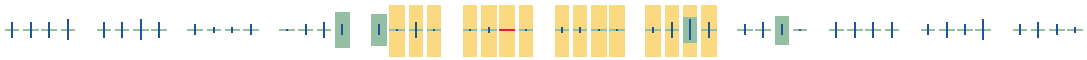
Rusty Blackbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Semipalmated Sandpiper
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Short-billed Dowitcher
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Snowy Owl
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Wood Thrush
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ “What does IPaC use to generate the migratory birds potentially occurring in my specified location”. Please be aware this report provides the “probability of presence” of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the “no data” indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ “Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds” at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

- PEM1Bd
- PEM1E

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1/4C
- PFO1Cd
- PSS1/EM1C
- PFO1/4B

FRESHWATER POND

- PUBHx

RIVERINE

- R4SBC

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Appendix L

Stormwater Runoff Analysis (DURMM)

PROJECT:	185044.01 Civil Air Terminal Development Support
DRAINAGE SUBAREA ID:	PLD
LOCATION (County):	Kent
UNIT HYDROGRAPH:	DMV

CONTRIBUTING AREA RUNOFF CURVE NUMBER (C.A. RCN) WORKSHEET

Cover Type	Treatment	Hydrologic Condition	A Acres	A RCN	B Acres	B RCN	C Acres	C RCN	D Acres	D RCN
CULTIVATED AGRICULTURAL LANDS										
Fallow	Bare soil	----		77		86		91		94
	Crop residue (CR)	poor		76		85		90		93
	Crop residue (CR)	good		74		83		88		90
Row Crops	Straight row (SR)	poor		72		81		88		91
	Straight row (SR)	good		67		78		85		89
	SR + Crop residue	poor		71		80		87		90
	SR + Crop residue	good		64		75		82		85
	Contoured (C)	poor		70		79		84		88
	Contoured (C)	good		65		75		82		86
	C + Crop residue	poor		69		78		83		87
	C + Crop residue	good		64		74		81		85
	Cont & terraced(C&T)	poor		66		74		80		82
	Cont & terraced(C&T)	good		62		71		78		81
	C&T + Crop residue	poor		65		73		79		81
	C&T + Crop residue	good		61		70		77		80
Small Grain	Straight row (SR)	poor		65		76		84		88
	Straight row (SR)	good		63		75		83		87
	SR + Crop residue	poor		64		75		83		86
	SR + Crop residue	good		60		72		80		84
	Contoured (C)	poor		63		74		82		85
	Contoured (C)	good		61		73		81		84
	C + Crop residue	poor		62		73		81		84
	C + Crop residue	good		60		72		80		83
	Cont & terraced(C&T)	poor		61		72		79		82
	Cont & terraces(C&T)	good		59		70		78		81
	C&T + Crop residue	poor		60		71		78		81
	C&T + Crop residue	good		58		69		77		80
Close-seeded	Straight row	poor		66		77		85		89
or broadcast	Straight row	good		58		72		81		85
legumes or	Contoured	poor		64		75		83		85
rotation	Contoured	good		55		69		78		83
meadow	Cont & terraced	poor		63		73		80		83
	Cont & terraced	good		51		67		76		80
OTHER AGRICULTURAL LANDS										
	Pasture, grassland or range	poor		68		79		86		89
		fair		49		69		79		84
		good		39		61		74		80
	Meadow -cont. grass (non grazed)	----		30		58		71		78
	Brush - brush, weed, grass mix	poor		48		67		77		83
		fair		35		56		70		77
		good		30		48		65		73
	Woods - grass combination	poor		57		73		82		86
		fair		43		65		76		82
		good		32		58		72		79
	Woods	poor		45		66		77		83
		fair		36		60		73		79
		good		30		55		70		77
	Farmsteads	----		59		74		82		86
FULLY DEVELOPED URBAN AREAS (Veg Established)										
Open space (Lawns,parks etc.)										
	Poor condition; grass cover < 50%			68		79		86		89
	Fair condition; grass cover 50% to 75 %			49		69		79		84
	Good condition; grass cover > 75%			39		61		74		80
Impervious Areas										
	Paved parking lots, roofs, driveways			98		98	1.55	98		98
	Streets and roads									
	Paved; curbs and storm sewers			98		98		98		98
	Paved; open ditches (w/right-of-way)			83		89		92		93
	Gravel (w/ right-of-way)			76		85		89		91
	Dirt (w/ right-of-way)			72		82		87		89
Urban Districts		Avg % impervious								
	Commercial & business	85		89		92		94		95
	Industrial	72		81		88		91		93
Residential districts by average lot size		Avg % impervious								
	1/8 acre (town houses)	65		77		85		90		92
	1/4 acre	38		61		75		83		87
	1/3 acre	30		57		72		81		86
	1/2 acre	25		54		70		80		85
	1 acre	20		51		68		79		84
	2 acre	12		46		65		77		82
DEVELOPING URBAN AREA (No Vegetation)										
	Newly graded area (pervious only)			77		86		91		94
USER DEFINED										

Subarea Contributing Area per Soil Type (ac)		0	0	1.55	0
Subarea Contributing Area (ac)	1.55				
Subarea Weighted RCN	98				

UPSTREAM CONTRIBUTING AREAS	*Subarea ID*	*Acres*	*RCN*
Upstream Contributing Area 1			
Upstream Contributing Area 2			
Upstream Contributing Area 3			
Upstream Contributing Area 4			

Total Contributing Area w. Upstream Areas (ac)	**1.55**
Weighted Runoff Curve Number (RCN)	**98**

PROJECT:	185044.01 Civil Air Terminal Development Support
DRAINAGE SUBAREA ID:	PLD
LOCATION (County):	Kent
UNIT HYDROGRAPH:	DMV

LIMIT OF DISTURBANCE (LOD) WORKSHEET

Step 1 - Subarea LOD Data	**HSG A**	**HSG B**	**HSG C**	**HSG D**
1.1 HSG Area Within LOD (ac)			1.55	
1.2 Pre-Developed Woods/Meadow Within LOD (ac)			1.55	
1.3 Pre-Developed Impervious Within LOD (ac)			0	
1.4.a Post-Developed Imperviousness Within LOD, Option #1 (ac); ***OR***			1.55	
1.4.b Post-Developed Imperviousness Within LOD, Option #2 (%)	0%	0%	100%	0%

Step 2 - Subarea LOD Runoff Calculations				
2.1 RCN per HSG	0.00	0.00	98.00	0.00
2.2 RPv per HSG (in.)	0.00	0.00	2.50	0.00
2.3 Target RCN per HSG	0.00	0.00	70.00	0.00
2.4 Target Runoff per HSG (in.)	0.00	0.00	0.91	0.00

2.5 Subarea LOD (ac)	1.55
2.6 Subarea Weighted RCN	98.00
2.7 Subarea Weighted RPv (in.)	2.50
2.8 Subarea Weighted Target Runoff (in.)	0.91

Step 3 - Upstream LOD Areas ***(from previous DURMM Report as applicable)***	**Area 1**	**Area 2**	**Area 3**	**Area 4**
3.1 Upstream Sub-Area ID				
3.2 Upstream Contributing Area (ac)				
3.3 Target Runoff for Upstream Area (in.)				
3.4 Adjusted CN after all reductions				
3.5 Adjusted RPv (in.)				
3.6 Adjusted Cv (in.)				
3.7 Adjusted Fv (in.)				

Step 4 - RPv Calculations for Combined LOD	
4.1 Combined LOD (ac)	1.55
4.2 Weighted RCN	98.00
4.3 Weighted RPv (in.)	2.50
4.4 Weighted Target Runoff (in.)	0.91
4.5 Estimated Annual Runoff (in.)	37.27
4.6 Req'd Runoff to be Managed within LOD (in.)	1.00
4.7 Req'd Runoff to be Managed within LOD (%)	40%

Appendix M

Noise Report and Air Quality Report for DAFB (2019)

FINAL

Noise Report for Civil Air Terminal Expansion at Dover Air Force Base, Delaware

Prepared For:

Century Engineering, Inc.

10710 Gilroy Road

Hunt Valley, MD 21031

July 2019

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ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
ANSI	American National Standards Institute
ASA	Acoustical Society of America
dB	Decibel(s)
dBA	A-weighted decibel(s)
CAT	Civil Air Terminal
DelDOT	Delaware Department of Transportation
DNL	day-night average sound level
EA	Environmental Assessment
FAA	Federal Aviation Administration
HVAC	heating, ventilation, and air conditioning
Hz	hertz
L_{max}	maximum sound level
NEPA	National Environmental Policy Act
NF	fan speed
SEL	sound exposure level
UPS	United Parcel Service

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SECTION 1. OVERVIEW

1.1 OBJECTIVE

This study supports an environmental assessment of increased Civil Air Terminal (CAT) operations at Dover Air Force Base (AFB). The objective is to determine whether significant environmental impacts would result from implementation of the Proposed Action. Because the future user(s) of the proposed CAT are not known at this time, a hypothetical use scenario was developed that would yield conservative (i.e., high-end of possible) impacts. The scenario includes the construction and operation of a civilian cargo facility (e.g., a United Parcel Service [UPS] hub). If actual CAT user(s) - and expected noise impacts - turn out to be substantively different from the modeled cargo operation, then supplemental environmental noise impacts analysis could be appropriate.

1.2 SCENARIOS MODELED

Three scenarios were developed to describe ongoing and potential future operations at Dover AFB:

- **Current.** The 'Current' scenario reflects baseline operations and noise conditions. The scenario includes flight and static engine run operations by both military and civilian aircraft as documented in the 2016 Final Environmental Assessment (EA) for Flight Operations at Dover AFB. It includes approximately 44,000 military/transient aircraft operations The aircraft operations that are included in the 'Current' scenario are also included unchanged in the 'Approved' and 'Future' scenarios described below.
- **Approved.** This scenario reflects total civilian operations increasing to 13,500 per year, which is the number of operations approved under the current Joint Use Agreement. The additional civilian operations (i.e., operations above and beyond those included in the 'Current' scenario), would be conducted as part of the hypothetical civilian cargo operation discussed briefly in Section 1.1. This scenario corresponds to Alternative 1, as described in the Draft Civil Air Terminal EA.
- **Future.** This scenario reflects the implementation of a new Joint Use Agreement that would permit 25,000 civilian aircraft operations per year. Under this scenario, hypothetical civilian cargo operations would scale up such that the total annual civilian operations would equal 25,000. This scenario corresponds to Alternative 2, as described in the Draft Civil Air Terminal EA.

1.3 NOISE CONCEPTS

Noise is considered unwanted sound that interferes with normal activities or otherwise diminishes the quality of the environment. Responses to noise vary widely according to the characteristics of the sound source, the time of day, the distance between the noise source and the person hearing the sound, and the sensitivity and expectations of the person hearing the sound. This section will discuss noise as it relates to human health and welfare, as well as the potential for noise to affect structures.

Sound intensity varies widely (e.g., from a soft whisper to a jet engine), and it is measured on a logarithmic scale to accommodate this wide range. The logarithm is a mathematical tool used to simplify dealing with very large and very small numbers. For example, the logarithm of the number 1,000,000 is 6, and the logarithm of the number 0.000001 is −6.

The frequency (or pitch) of sound is measured in cycles per second, or hertz (Hz). This measurement reflects the number of times per second the air vibrates from the acoustic energy. Low-frequency sounds are heard as rumbles or roars, and high-frequency sounds are heard as screeches.

The communication of sound intensity is refined to account for frequency through the use of "A-weighting." The normal human ear can detect sounds that range in frequency from approximately 20 to 20,000 Hz. However, not all sounds in this range are heard equally well. Therefore, through internal electronic circuitry, some sound meters are calibrated to emphasize frequencies in the 1,000 to 4,000 Hz range and de-emphasize sound energy in other frequencies. The human ear is most sensitive to frequencies in this range, and sounds measured with these instruments are termed "A-weighted." For purposes of this document, decibel (dB) levels provided are A-weighted and provided in A-weighted decibels (dBA) unless otherwise noted. Examples of typical dBA of common sounds are shown on Figure 1-1.

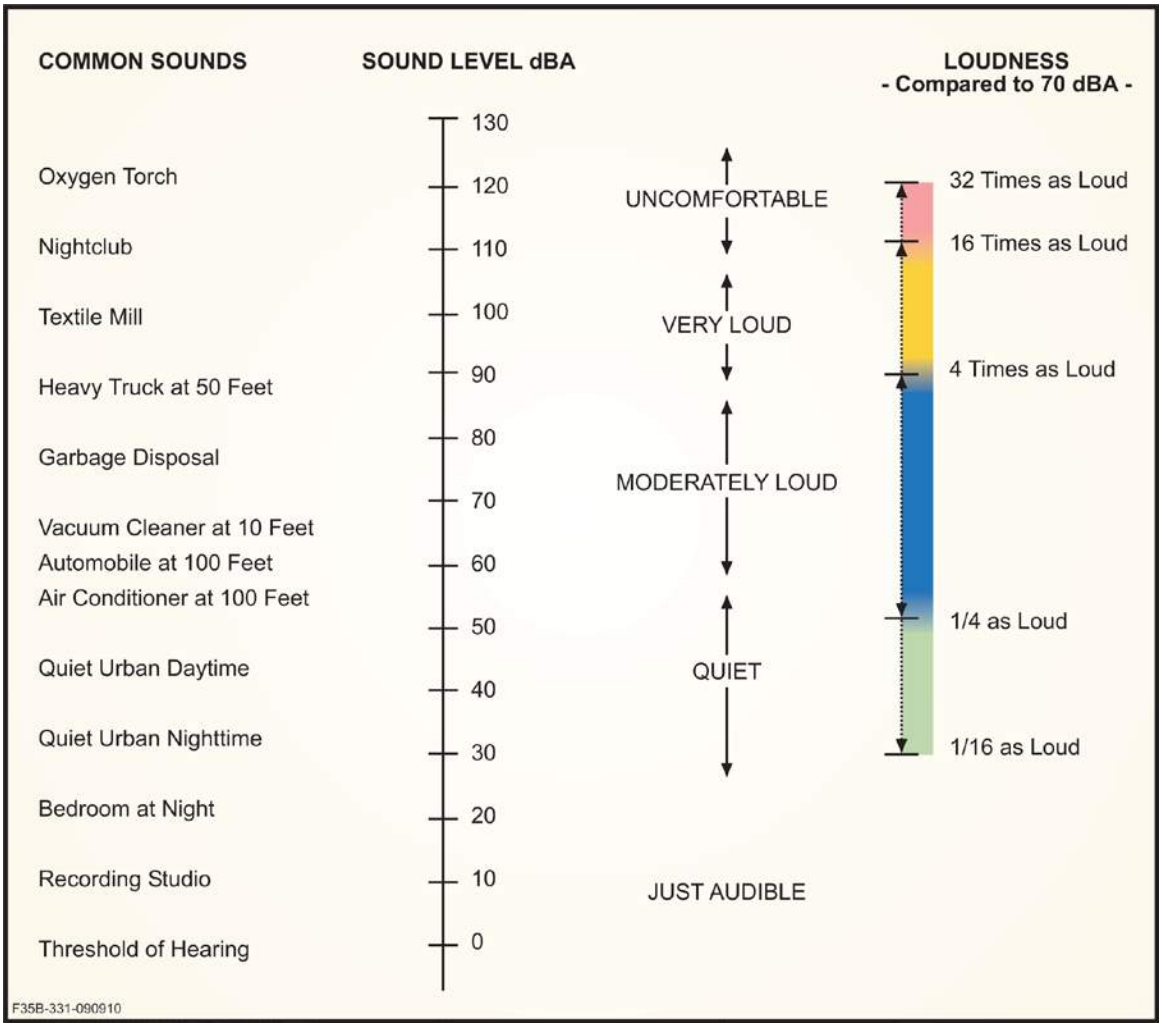

Figure 1-1. Typical A-Weighted Levels of Common Sounds

The word "metric" is used to describe a standard of measurement. As used in environmental noise analysis, there are many different types of noise metrics. Each metric has a different physical meaning and was developed by researchers attempting to represent a particular set of noise effects. The metrics supporting the assessment of noise from aircraft operations and other activities evaluated

in this document are the maximum sound level (L_{max}), sound exposure level (SEL), and day-night average sound level (DNL).

Maximum Sound Level (L_{max}). The L_{max} is the highest sound level measured during a noise event which is typically logged in 1/8-second intervals during aircraft noise level measurements. In many situations, noise levels vary over time for one reason or another. In the case of an aircraft overflight, the noise level varies as the aircraft moves closer to or farther away from the observer on the ground. L_{max} is a useful metric for judging a noise event's interference with conversation and other common activities.

Sound Exposure Level (SEL). The SEL compresses the total sound energy of an overflight event into a single second reflecting both the intensity and duration of the noise event. For noise events lasting more than one second, the SEL will be higher than the L_{max}.

Day-Night Average Sound Level (DNL). The DNL metric sums individual A-weighted noise events and averages the acoustic energy over a 24-hour period. Thus, it is a composite metric that considers the maximum noise levels, the duration of the events, the number of events that occur, and the time of day during which they occur. This metric adds 10 dB to those events that occur between 10:00 P.M. and 7:00 A.M. to account for the increased intrusiveness of noise events that occur at night when ambient noise levels are normally lower than during the daytime.

Ignoring the acoustic nighttime penalty, DNL may be thought of as the continuous or cumulative A-weighted sound level that would be present if all of the variations in sound level over the given time period were smoothed out so as to contain the same total sound energy. It is fully recognized that the DNL metric does not provide specific information on the number of noise events or the specific individual sound levels that occur. For example, a DNL of 65 dB could result from a few very noisy events or a large number of quieter events.

Although it does not represent the sound level heard at any one particular time, DNL does accurately represent the total sound exposure at a location. Social surveys have found the DNL metric to be the best predictor of community annoyance resulting from transportation noise. Its use is endorsed by the scientific community and several governmental agencies (U.S. Environmental Protection Agency, 1974); (Federal Interagency Committee on Noise, 1992); (Federal Interagency Committee on Urban Noise, 1980).

1.4 NOISE LEVEL CALCULATION METHOD

The computer program NoiseMap, version 7.3, was used to calculate noise levels under the three scenarios described in Section 1.2. This model accepts inputs related to aircraft flight paths, altitudes, engine power settings, and airspeeds as well as inputs related to static engine runs conducted on the ground. The model references a database, known as NoiseFile, containing measured flyover and static engine run noise levels measured for various aircraft types in several configurations. Several factors, including atmospheric conditions, terrain, and ground impedance, are considered in the calculation of noise levels received at various points of interest.

Computer noise modeling allows informed decision-making without actually exposing people to the noise associated with the proposed action. The alternative to noise modeling would be to begin the action in question - potentially requiring construction and other preparatory actions - and then conduct field measurements of noise levels to assess impacts. If impacts were found to be excessive, then all of the preparatory actions that had been taken would need to be reversed, very likely at great expense.

Computer aircraft noise modeling to assess community impacts has been being conducted since the 1970s, and the capabilities of the noise models have increased in the intervening years. Most relevant is NoiseMap's ability to calculate a wider variety of supplemental metrics (i.e., characterizations of noise level other than the primary metric DNL). Supplemental metrics provide a more complete picture of noise levels than is provided by DNL alone. In this document, results are compared between the three operational scenarios for sleep disturbance and speech interference.

As mentioned in Section 1.1, the objective of this study is to provide a conservative estimate of possible impacts. The Boeing 757-200 and Boeing 747-400 were selected to represent 'medium capacity' (max payload less than 200,000 pounds) and 'heavy capacity' (max payload greater than 200,000 pounds) cargo aircraft, respectively. These aircraft types were selected because (1) they comprise a large part of the current UPS fleet, and (2) they have source noise level data in the NoiseFile. The percent of total CAT flying operations conducted by the representative 'medium' and 'heavy' capacity aircraft types could be expected to be the same as the fraction of the UPS fleet comprised of 'medium' (72 percent) and 'heavy' capacity (28 percent) aircraft. However, the air quality analysis of this scenario indicated that nitrogen oxide (NO_x) emissions resulting from aircraft operations would exceed 250 tons per year (TPY). Follow-on air quality analysis of a different scenario with 90 percent of proposed CAT operations conducted by Boeing 757-200 aircraft and 10 percent conducted by Boeing 747-400 aircraft, resulted in NO_x emissions below 250 TPY. For consistency between the air quality and noise analyses, this scenario (90 percent Boeing 757 and 10 percent Boeing 747) was adopted for modeling the potential noise impacts. Because the static engine run NoiseFile does not include civilian aircraft, the most similar military aircraft were selected as surrogates for cargo aircraft static engine run noise. The KC-135R was used as surrogate for the Boeing 757-200 and the C-5M was used as surrogate for the Boeing 747-400.

The details of the modeled cargo mission were developed in coordination with Century Engineering and the Delaware Department of Transportation (DelDOT). On 30 May 2019, Century Engineering approved noise modeling parameters via e-mail. The approved modeling parameters include frequency of operations (Section 2 of this Noise Report), flight paths (Section 3), flight profiles (Section 4), and static engine runs (Section 5). The effects of atmospheric conditions and terrain were also considered in the noise modeling (Section 6). Noise modeling results are described in Section 7 of this Noise Report.

1.5 NOISE IMPACTS ASSESSMENT METHOD

The most common impact associated with exposure to elevated noise levels is public annoyance. Annoyance due to aircraft noise can be predicted based on the noise metric DNL (Schultz, 1978); (Finegold, 1994). When subjected to DNL of 65 dB, approximately 12 percent of persons exposed will be "highly annoyed" by the noise. At levels below 55 dB, the percentage of annoyance is correspondingly lower (less than 3 percent). The percentage of people annoyed by noise never drops to zero (some people are always annoyed), but at levels below 55 dB, noise is reduced enough to be essentially negligible. Based on numerous sociological surveys and recommendations of Federal interagency councils, the most common benchmark referred to is 65 dB DNL. This threshold is often used to determine residential land use compatibility around airports, highways, or other transportation corridors.

The U.S. Air Force considers "significance" of noise impacts in the context of the National Environmental Policy Act (NEPA) in terms of context and intensity, and has not defined uniformly applicable significance thresholds. The Federal Aviation Administration (FAA), on the other hand, defines a threshold for "significant" noise impacts in FAA Order 1050.1F as any increase relative

to the No Action Alternative in noise level at a noise-sensitive areas that is exposed to greater than or equal to 65 dB DNL of greater than 1.5 dB DNL. The FAA also establishes thresholds for "reportable" impacts if a noise sensitive area experiences a 3 dB increase and the end-state is between 60 and 65 dB DNL or if a noise sensitive area experiences a 5 dB increase and the end-state is between 45 and 60 dB DNL. If "reportable" impacts would be associated with a proposed action, other factors must be considered in determining whether a significant impact would occur.

The likelihood of sleep disturbance by aircraft noise depends on a host of situational factors, including depth of sleep, previous exposure to aircraft noise, familiarity with the surroundings, and the physiological and psychological condition of the sleeper. In 1997, the Federal Interagency Committee on Aircraft Noise published a revised relationship between SEL and sleep disturbance (U.S. Air Force Research Laboratory, 1997). This relationship, which predicts the maximum percentage of people awakened by sounds that are new to an area, predicts that about 16 percent of sleepers would be disturbed by a 96 dB SEL noise event. A typical residential structure provides approximately 15 dB outdoor-to-indoor noise level reduction with windows open and 25 dB reduction with windows closed. An overflight generating 96 dB SEL outdoors could generate roughly 76 dB SEL indoors and would be expected to result in 8 percent of sleepers being awakened. The percentage of sleepers disturbed decreases substantially for persons accustomed to aircraft noise. In this report, the percentage of people awakened by aircraft noise at least once per night was estimated using the calculation method described in American National Standards Institute (ANSI)/Acoustical Society of America (ASA) Standard 12.9-2008 (Part 6).

Indoor speech interference from flight operations can be annoying to the public. For this analysis, the recommended conservative indoor noise threshold of 50 dBA is used to indicate flight events, which have the potential to interfere, at least momentarily, with speech. The average number of events per hour exceeding 50 dB during 7:00 A.M. to 10:00 P.M. was calculated under each scenario for a person outdoors, indoors with windows open, and indoors with windows closed. When windows are open, the noise reduction from the outside of the house to inside is 15 dB (this depends on house construction and is an average). When windows are closed, the noise reduction from the outside of the house to the inside is 25 dB (this depends on the windows type and is an average for newer construction homes). Thus, to calculate the number of events above 50 dBA indoors with windows open, a 65 dBA threshold is applied (50 dBA plus house reduction of 15 dBA). To calculate the number of events above 50 dBA indoors with windows closed, a 75 dBA threshold is applied (50 dBA plus house and windows reduction of 25 dBA).

A DNL of 75 dB is a threshold above which impacts other than annoyance may occur. While it is well below levels known to damage hearing (Occupational Safety and Health Administration, 1983) it is also a level above which non-auditory health effects cannot be categorically discounted.

Structural impacts caused by subsonic noise are possible only under extreme circumstances (Sutherland, 1989). Normally, the most sensitive components of a structure to airborne noise are the windows and, infrequently, the plastered walls and ceilings. While certain frequencies (such as 30 Hz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than 1 second above a sound level of 130 dB (un-weighted) are potentially damaging to structural components (Committee on Hearing, Bioacoustics and Biomechanics, 1977).

For the purposes of this Noise Report, noise impacts would be considered potentially significant if the FAA thresholds described above were exceeded. The degree of change in probabilities of sleep disturbance and speech interference were also considered in assessment of impacts significance.

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SECTION 2. FREQUENCY OF OPERATIONS

As discussed in Section 1, the Current, Approved, and Future scenarios include 358, 13,500, and 25,000 annual CAT operations, respectively. Table 2-1 breaks out the relative frequency of departures on each runway and the associated flight paths. Table 2-2 provides the same information for approaches. The tables also list the relative frequency of operations during 'acoustic night' (i.e., 10:00 P.M. to 7:00 A.M.).

Because civilian operations being conducted under the Current scenario would continue unchanged under the Approved and Future scenarios, 358 operations were subtracted from the total number of approved civilian operations (13,500 total operations minus 358 baseline operations equals 13,142 new operations). Because half of total operations are departures and half are approaches, implementation of the Approved scenario would result in 6,571 annual departures and the same number of annual approaches. Implementation of the Future scenario would result in the same relative frequencies of each flying operation, but the overall number of civilian operations would increase to 25,000 (24642 after subtraction of baseline civilian operations; equating to 12,321 departures and the same number of approaches).

Table 2-1. Departure Operations Frequency

Total Annual Departures	Percent Departure During Acoustic Night	Runway Used	Percent	Flight Path Description	Percent
6,571 (Approved) 12,321 (Future)	62	1	25	Sea Isle	25
				North via DQO	25
				South or West via SBY (East side)	25
				Toward ENO then turn toward Baltimore	25
		14	50	Sea Isle	25
				North via DQO	25
				South or West via SBY (East side)	25
				Toward ENO then turn toward Baltimore	25
		19	25	Sea Isle	25
				North via DQO	25
				South or West via SBY (East side)	25
				Toward ENO then turn toward Baltimore	25
		32	0	Runway 32 departures rare due to flight restrictions	N/A

N/A – not applicable

Table 2-2. Arrival Operations Frequency

Total Annual Arrivals	Percent Departure During Acoustic Night	Runway Used	Percent	Flight Path Description	Percent
6,571 (Approved) 12,321 (Future)	62	1	29	Instrument approach from South or West	25
				Instrument approach from Sea Isle	25
				Instrument approach from North (East)	25
				Instrument approach from North (West)	25
		14	0	Arrivals to Runway 14 are rare due to flight restrictions	N/A
		19	21	Instrument approach from North	25
				Instrument approach from Sea Isle	25
				Instrument approach from South (East)	25
				Instrument approach from South (West)	25
		32	50	Instrument approach from South	25
				Instrument approach from East	25
				Instrument approach from North	25
				Instrument approach from West	25

N/A – not applicable

Research was conducted into the percent of operations conducted during acoustic night at existing UPS hubs. Based on this research, it was determined that 62 percent of total hypothetical cargo flying operations would be modeled as occurring during acoustic night.

Runway use was estimated to be equally split between Dover AFB Runway 01/19 and Runway 14/32. Runway 32 is rarely used for departures and Runway 14 is rarely used for approaches because several noise-sensitive land uses (including the state capitol) are located west of the airfield (and usage of these runways requires low-altitude overflight of these noise-sensitive land uses). Military aircraft pilots are required to complete special flight maneuvers when using these runways. Cargo aircrews would be expected to strongly prefer standard departures and approaches, which can be conducted on the other runways. Hypothetical cargo mission usage of Runway 32 for departures and Runway 14 for approaches was set to zero reflecting minimal expected use.

Flight paths were selected to and from each cardinal direction from the flight tracks that are currently used. Because the routes that would be flown by the hypothetical cargo operation are not known, an equal number of operations was assigned to each flight path. Cargo aircrews do not typically fly second approaches to the airfield, and therefore none were modeled.

SECTION 3. REPRESENTATIVE FLIGHT PATHS

The flight tracks illustrated in this section are flown by military pilots currently operating at Dover AFB. They were developed based on published flying procedures and input from pilots, air traffic control, and other operational points of contact. Members of the operational community updated and validated the tracks as part of analysis supporting the 2016 EA for Flight Operations. The hypothetical civilian cargo operation at Dover AFB would be expected to follow flight paths that are similar to or the same as the flight paths used currently. Flight paths were selected that transit to/from each cardinal direction. Figure 3-1 shows modeled departure flight paths and Figure 3-2 shows modeled approach flight paths from and to each runway. In both maps, color-coding is used to associate each track with a particular runway. All of the approaches modeled are instrument approaches because cargo flight aircrews can be expected to prefer the procedural certainty of instrument approaches to visual approaches. All flight tracks used in noise modeling are representative of actual flight paths, which vary from one flight to the next due to winds and weather, pilot preference, guidance from air traffic control, and other factors.

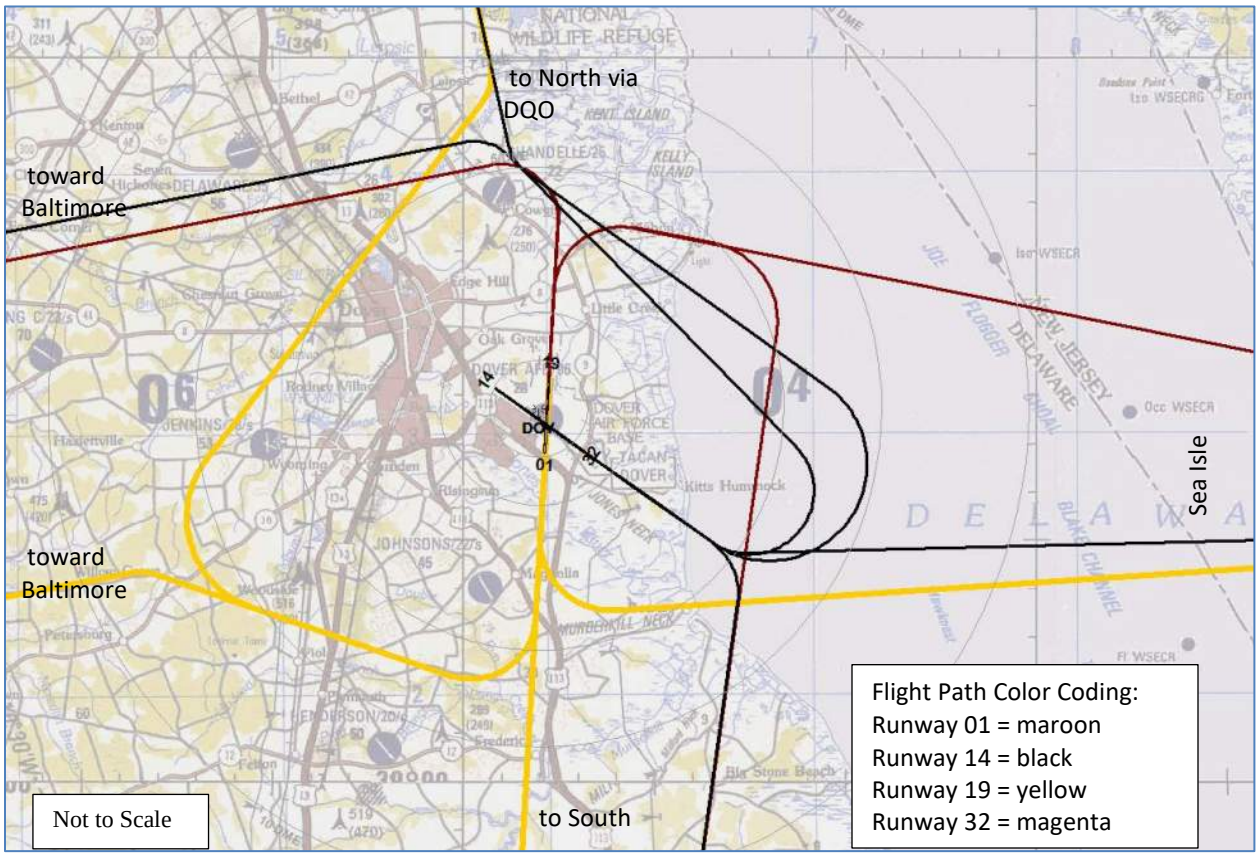

Figure 3-1. Representative Departure Flight Paths

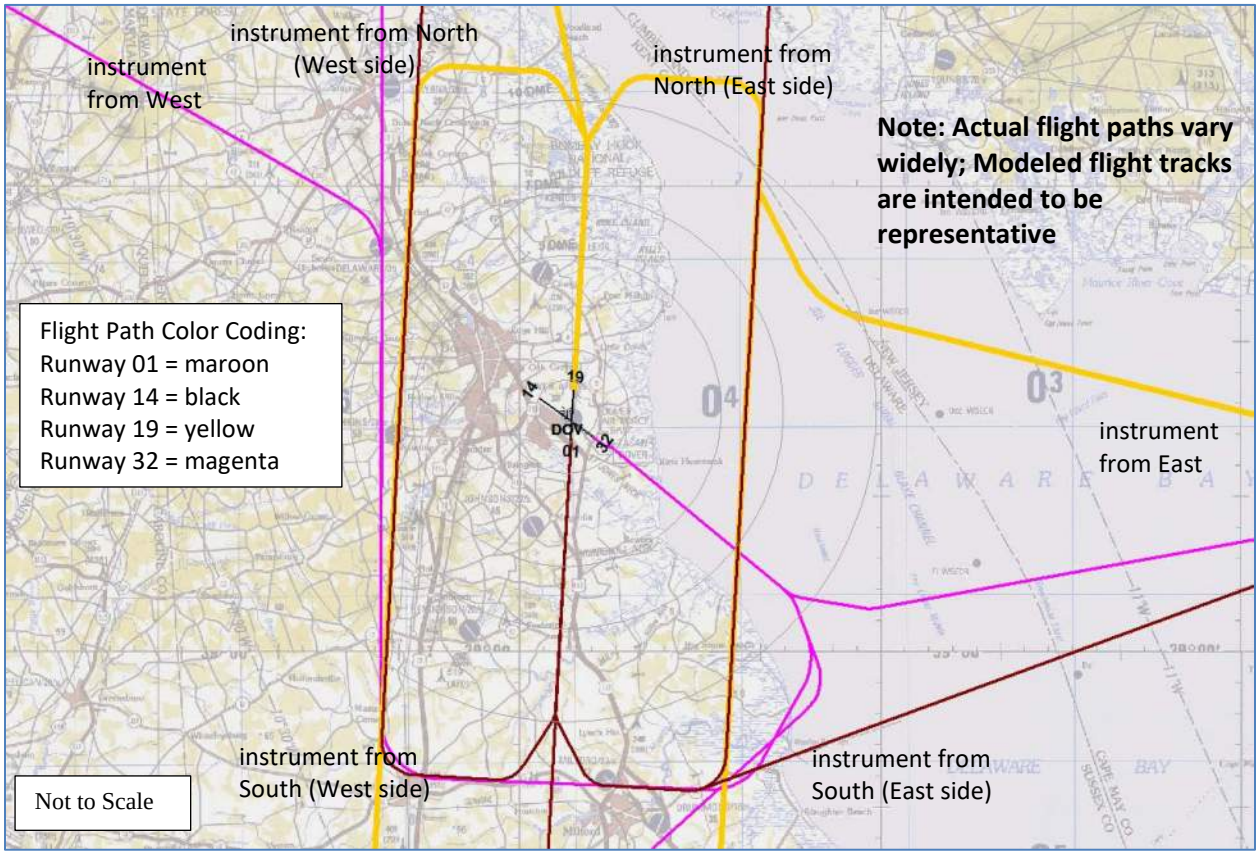

Figure 3-2. Representative Approach Flight Paths

SECTION 4. REPRESENTATIVE FLIGHT PROFILES

Representative Boeing 757-200 altitude, engine power, and airspeed profiles for departures and approaches are shown on Figure 4-1 and 4-2 respectively. Representative Boeing 747-400 profiles for departures and approaches are shown on Figure 4 3 and Figure 4-4, respectively. Because actual profiles vary from one flight to the next depending on factors such as aircraft load, atmospheric conditions (e.g., winds, temperature, humidity, etc.), air traffic control guidance, and pilot preference, all modeled flight paths are 'representative.' Flight profiles for the Boeing 757-200 and Boeing 747-400 were based on profiles for the same aircraft that were developed at Wright Patterson AFB in 2008. The approach profile was modified to match published Dover AFB instrument approach procedures (e.g., initial approach fix location/altitude).

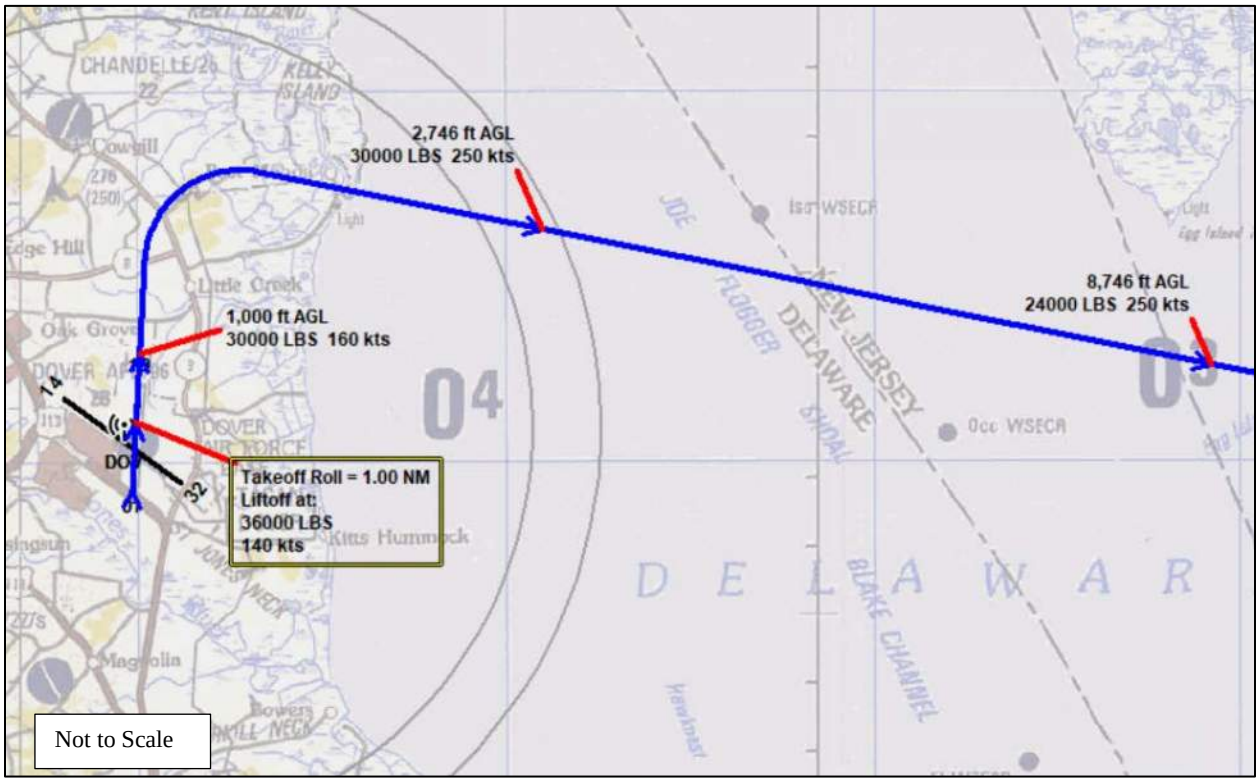

Figure 4-1. Representative Boeing 757-200 Departure Altitude / Engine Power / Airspeed Profiles

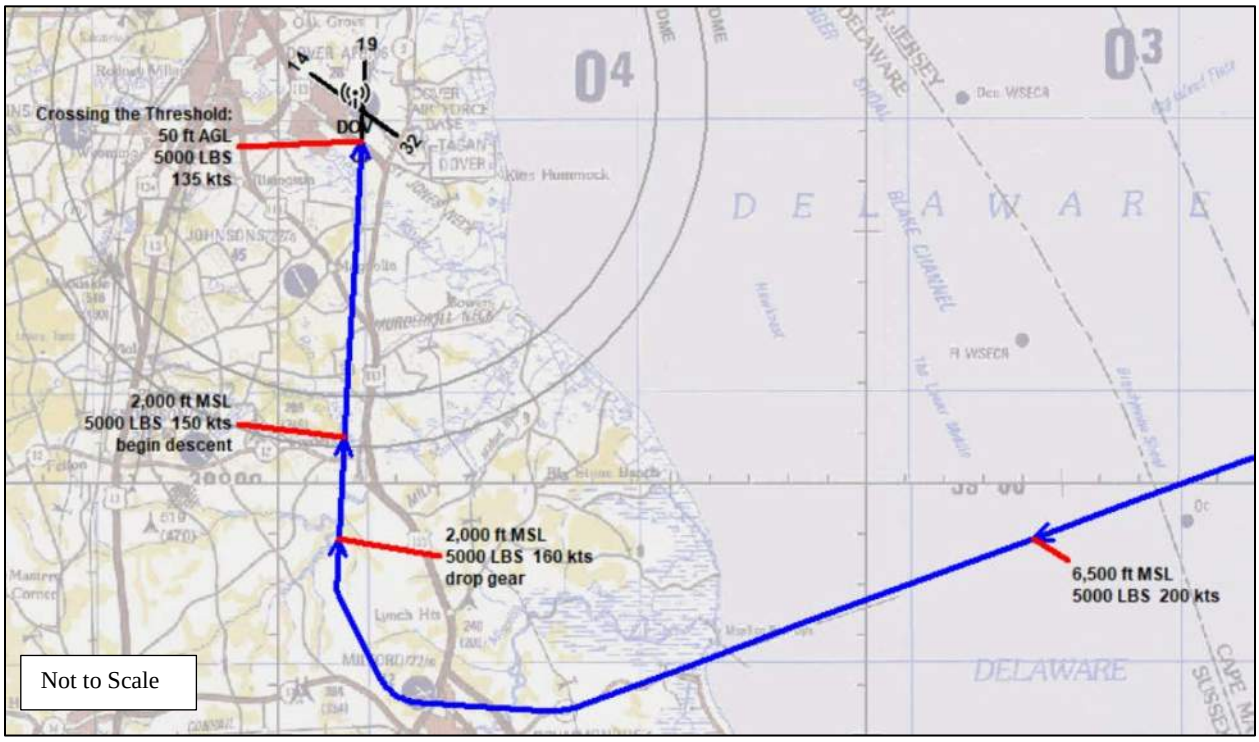

Figure 4-2. Representative Boeing 757-200 Approach Altitude / Engine Power / Airspeed Profiles

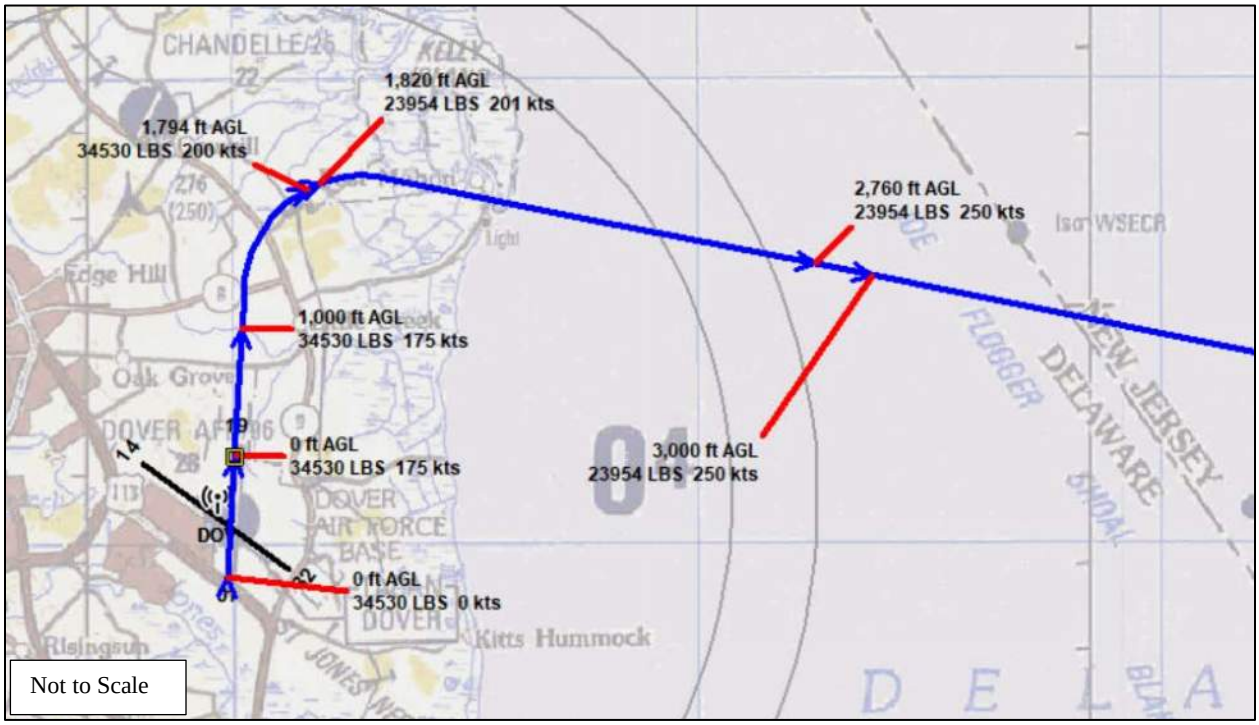

Figure 4-3. Representative Boeing 747-400 Departure Altitude / Engine Power / Airspeed Profiles

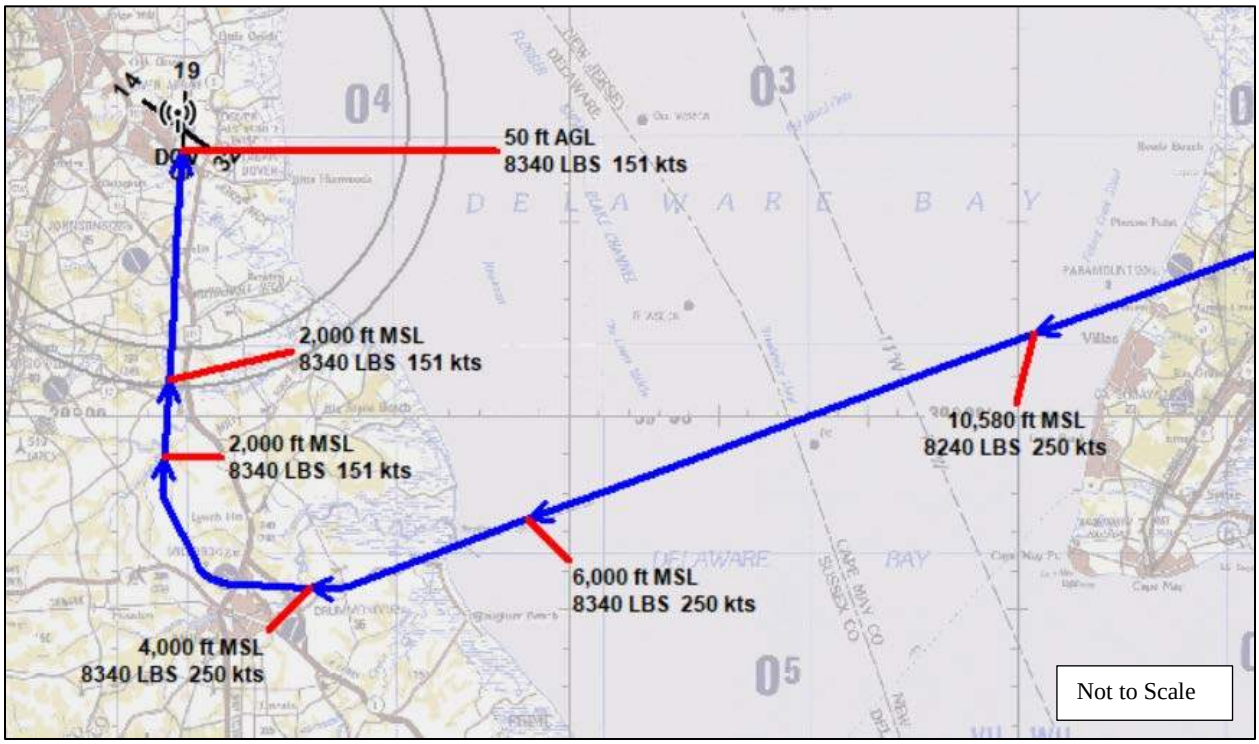

Figure 4-4. Representative Boeing 747-400 Approach Altitude / Engine Power / Airspeed Profiles

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SECTION 5. STATIC ENGINE RUNS

A static engine run scenario was developed in coordination with DelDOT and Century Engineering. Representative locations (see Table 5-1 and Figure 5-1) identify locations where cargo aircraft might park and their orientation (i.e., aircraft noise orientation in degrees from magnetic north). Representative 'cargo parking' engine run locations were located in areas being considered for a future cargo parking apron and the representative CAT maintenance location was placed in an area being considered for expanded CAT parking apron. As has been mentioned previously, if actual development and/or aircraft operations deviate substantially from modeling parameters, noise impacts could also differ and supplemental analysis may be appropriate.

Table 5-1. Representative Static Engine Run Locations

Description	Identification Number	Latitude	Longitude	Orientation (Nose Orientation in Degrees Magnetic)
Cargo Parking, Northwest	NW_pkg	39° 9'7.05"N	75°28'21.81"W	285
Cargo Parking, West	W_pkg	39° 8'58.60"N	75°28'22.70"W	285
Cargo Parking, Southwest	SW_pkg	39° 8'49.72"N	75°28'23.55"W	285
Cargo Parking, Northeast	NE_pkg	39° 9'6.56"N	75°28'5.41"W	105
Cargo Parking, East	E_pkg	39° 8'57.60"N	75°28'6.20"W	105
Cargo Parking, Southeast	SE_pkg	39° 8'48.56"N	75°28'6.90"W	105
CAT Maintenance	CAT_Maint	39° 8'31.63"N	75°28'6.57"W	285

Figure 5-1. Representative Static Engine Run Locations

As shown in Table 5-2 and 5-3, low-power static engine runs are modeled as occurring prior to each departure (warmup) and following each landing (cooldown) for a total of 10 minutes per sortie. Maintenance-driven static engine runs (1,000 low-power and 750 high-power runs annually) were also modeled and were evenly split between the CAT maintenance location and the southeast cargo parking apron location. The pre-flight and post-flight engine runs were modeled with 62 percent occurring during acoustic night (mirroring flying operations). Most maintenance activity is conducted during daytime hours to minimize noise concerns and for worker convenience. Therefore, maintenance-driven static engine runs were modeled with 10 percent occurring during acoustic night.

Table 5-2. Boeing 757-200 Static Engine Run Profiles

Representative Aircraft Type	Run Description	Engine Runs Per Year	Run Locations	Engine Power			Number of Engines	Duration (minutes)	Percent Runs During Acoustic Night
				Description	Setting	Units			
B-757	Engine run-up before taxi and cooldown after landing	5,942	Split equally among 6 representative spots	Idle	60	%NF	1	10	62
	Low-Power Runs	488	CAT Maintenance and Southeast cargo parking	Idle	60	%NF	1	10	10
	High-Power Runs	366	CAT Maintenance and Southeast cargo parking	Idle	60	%NF	1	10	10
				Mid	70	%NF	1	16	10
				Full	90	%NF	1	4	10

NF = fan speed

Table 5-3. Boeing 747-400 Static Engine Run Profiles

Representative Aircraft Type	Run Description	Engine Runs Per Year	Run Locations	Engine Power			Number of Engines	Duration (minutes)	Percent Runs During Acoustic Night
				Description	Setting	Units			
B-747	Engine run-up before taxi and cooldown after landing	629	Split equally among 6 representative spots	Idle	60	%NF	1	10	62
	Low-Power Runs	52	CAT Maintenance and Southeast cargo parking	Idle	60	%NF	1	10	10
	High-Power Runs	39	CAT Maintenance and Southeast cargo parking	Idle	60	%NF	1	10	10
				Mid	70	%NF	1	16	10
				Full	90	%NF	1	4	10

NF = fan speed

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SECTION 6. ATMOSPHERIC CONDITIONS AND TERRAIN

The effects of atmospheric conditions and terrain were also considered in the noise modeling. Local weather conditions (e.g., temperature, relative humidity, and air pressure) influence how quickly sound is absorbed by the atmosphere as it travels outward from its source. The month with median acoustic atmospheric conditions was February, with an average 36 degrees Fahrenheit, 66 percent relative humidity, and air pressure of 29.9212 inches of mercury (Table 6-1).

Table 6-1. Average Atmospheric Conditions by Month

Month	Temperature	Humidity	Pressure[a]
January	34	68	29.9212
February	36	66	29.9212
March	44	65	29.9212
April	54	65	29.9212
May	63	70	29.9212
June	72	71	29.9212
July	77	72	29.9212
August	75	73	29.9212
September	69	73	29.9212
October	58	70	29.9212
November	48	69	29.9212
December	38	68	29.9212

Note: [a]Atmospheric pressure used in noise modeling is presented for completeness, but in accordance with standard practice, a default value of the average sea level pressure is used.

Terrain effects on noise include the effects of terrain elevation (e.g., hills, valleys) and terrain impedance (i.e., the amount of sound energy absorbed by the surface). Surface elevation data were obtained from the U.S. Geological Survey and were modeled on a 250-foot grid.

In the current version of NoiseMap, ground impedance can take one of two possible values: acoustically hard or acoustically soft. Following standard procedures, all water areas were treated as being acoustically hard and all solid ground (including asphalt, concrete, and vegetation-covered ground) was treated as being acoustically soft. The impedance values for acoustically hard and acoustically soft surfaces are 100,000 and 225 kilopascal seconds per square meter, respectively. Ground impedance data were derived from elevation data and were modeled on a 250-foot grid.

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SECTION 7. RESULTS

7.1 AIRCRAFT NOISE

Noise levels resulting from the three scenarios are shown on Figure 7-1 as contours in 5-dB intervals ranging from 65 to 85 dBA DNL. Because hypothetical CAT operations would be expected to follow the same flight paths currently used by aircraft, changes in noise contour and extent would primarily occur on and near the extended runway centerlines in areas already exposed to frequent overflight noise. However, static engine runs are expected to be conducted in areas not currently used for static engine runs. Noise contours resulting from the Approved and Future scenarios expand to include areas on and near the proposed CAT ramp expansion and hypothetical new cargo parking apron (located west of northern end of Runway 01/19).

Table 7-1 lists the number of acres affected by each contour interval under each scenario. Under the Future scenario, the total number of acres affected by DNL greater than 65 dBA would increase relative to the Approved scenario by 560 from 4,851 to 5,411 acres.

Table 7-1. Acres Affected by DNL of 65 dB or Greater Resulting from Each Scenario

Contour Interval (dBA DNL)	Current Scenario	Approved Scenario	Future Scenario	Change from Approved
65-69	2,393	2,852	3,223	371
70-74	1,028	1,237	1,370	133
75-79	536	571	616	45
80-84	173	184	194	10
>=85	6	7	8	1
Total	4,136	4,851	5,411	560

Several representative points of interest were identified for more in-depth noise analysis (see Figure 1-1 for locations). The locations studied include residences (e.g., residence #1), towns (e.g., Little Creek), historic sites (e.g., Dickinson Mansion), and commercial centers (e.g., Target store). Each type of location has its own set of sensitivities that might not be shared by other types of locations. For example, historic sites, such as the Dickinson Mansion, are used primarily during the day, and are particularly sensitive to loud events that could interfere with speech. Residences are sensitive to daytime events that could interfere with speech and are also sensitive to nighttime noise that could disrupt sleep. For the purposes of this Noise Report, all noise metrics are presented for all representative points of interest. Even though the Target store is not a location where people sleep, sleep disturbance results for the Target store are useful as a proxy for nearby residences where people do sleep.

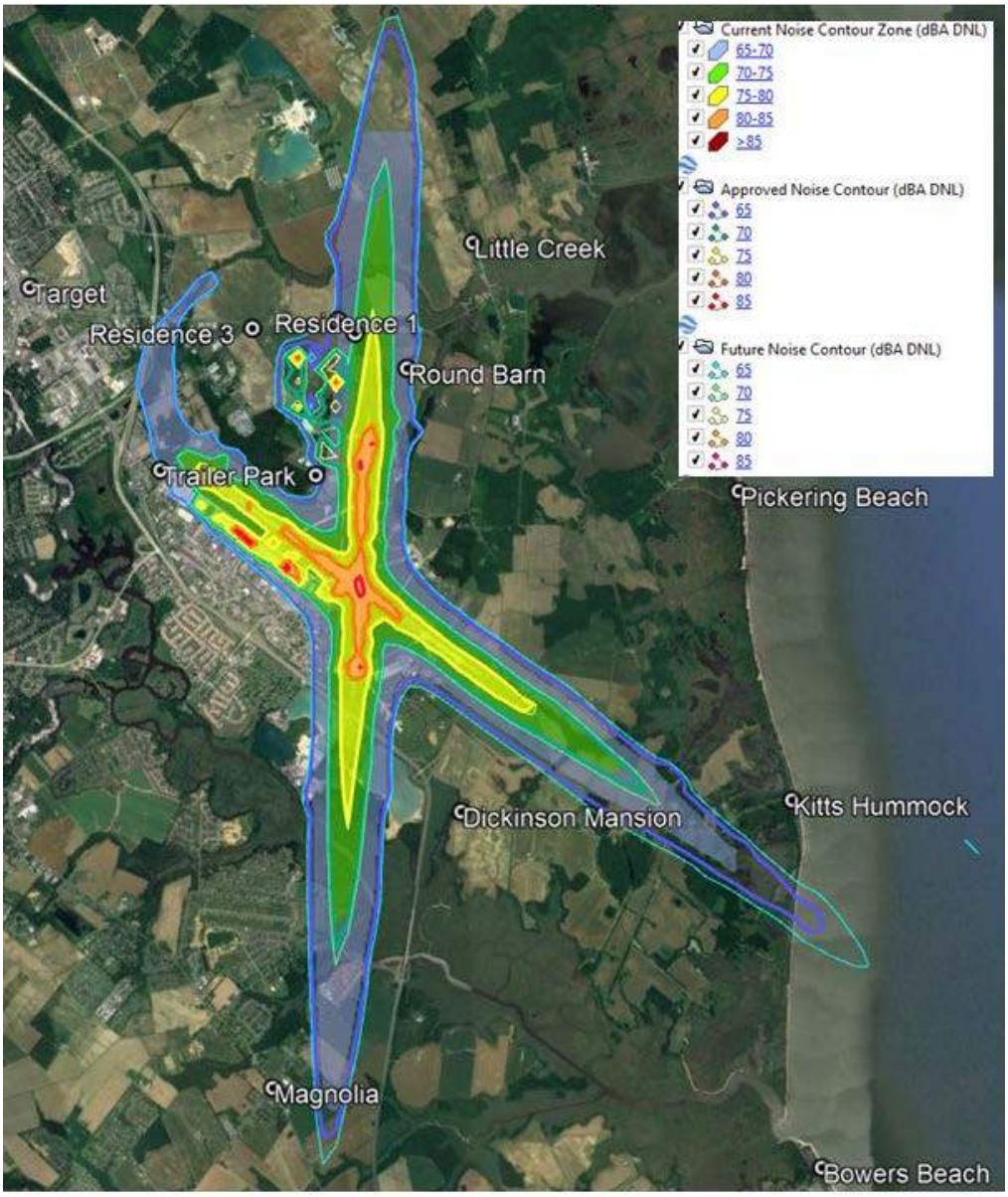

Figure 7-1. DNL Contours Resulting from Each Scenario

DNL at the representative points of interest under each scenario are listed in Table 7-2. DNL increases between the Approved and Future scenarios do not exceed thresholds described in FAA 1050.1F under any scenario.

Table 7-2. DNL at Points of Interest Under Each Scenario

Representative Points of Interest	Current Scenario	Approved Scenario	Future Scenario	Change from Approved	Exceed FAA thresholds
Bowers Beach	50.2	52.7	54.1	1.4	No
Dickinson Mansion	57.0	57.9	58.6	0.7	No
Kitts Hummock	54.5	56.4	57.5	1.1	No
Little Creek	57.2	57.8	58.2	0.4	No
Magnolia	57.1	58.2	59.0	0.8	No
Pickering Beach	53.2	53.6	54.0	0.4	No
Residence 1	70.0	70.4	70.8	0.4	No
Residence 2	65.0	65.7	66.1	0.4	No
Residence 3	58.1	58.5	58.9	0.4	No
Residence 4	63.5	64.0	64.4	0.4	No
Round Barn	65.4	65.9	66.2	0.3	No
Target (Store)	48.4	48.6	48.8	0.2	No
Trailer Park 1	64.3	64.3	64.4	0.1	No

The operational scenario modeled includes 62 percent of hypothetical CAT flying operations being conducted during acoustic night – and these late-night operations could result in an increased potential for sleep disturbance. The probability of being awakened at least once per night by aircraft noise was estimated using the method prescribed by ANSI/ASA S12.9-2008/Part 6. Probabilities were calculated with windows open, reflecting a 15 dBA attenuation provided by the structure, and with windows closed, reflecting a 25 dBA structural attenuation. As shown in Table 7-3, the probability of awakening would increase relative to the Approved scenario by as much as 11 percent under the 'Future' scenario with windows open and by as much as increases by as 8 percent under the 'Future' scenario with windows closed. Awakenings could result in an increased likelihood of annoyance and disruption of quality sleep can result in increased tiredness during the day for affected people. The ongoing military mission at Dover AFB currently involves late-night operations. Therefore, most of the people living near the base currently experience nighttime aircraft noise.

Table 7-3. Minimum Probability (Percentage) of Being Awakened per Night by Aircraft Noise Resulting from Each Scenario

Representative Points of Interest	Current Scenario		Approved Scenario		Future Scenario		Change Relative to Approved Under Future	
	Windows Open	Windows Closed	Windows Open	Windows Closed	Windows Open	Windows Closed	Windows Open	Windows Closed
Bowers Beach	7	2	19	6	28	8	2	2
Dickinson Mansion	13	8	30	16	41	21	11	7
Kitts Hummock	11	6	25	14	35	22	10	8
Little Creek	13	8	21	11	28	13	7	2

Table 7-4. Minimum Probability (Percentage) of Being Awakened per Night by Aircraft Noise Resulting from Each Scenario (Continued)

Representative Points of Interest	Current Scenario		Approved Scenario		Future Scenario		Change Relative to Approved Under Future	
	Windows Open	Windows Closed	Windows Open	Windows Closed	Windows Open	Windows Closed	Windows Open	Windows Closed
Magnolia	9	5	18	10	24	15	6	5
Pickering Beach	10	4	16	5	21	6	5	1
Residence 1	19	12	33	19	43	24	10	5
Residence 2	17	11	30	16	39	21	90	5
Residence 3	13	8	24	10	32	12	8	2
Residence 4	18	12	31	19	41	24	10	5
Round Barn	17	11	30	17	40	21	10	4
Target (Store)	8	3	10	3	12	3	2	0
Trailer Park 1	14	8	24	9	31	9	7	0

Notes: Percentage probability of being awakened at least once per night by aircraft noise was estimated using the method prescribed by ANSI/ASA S12.9-2008/Part 6. Probabilities were calculated with windows open, reflecting a 15-dBA attenuation provided by the structure, and with windows closed reflecting a 25-dBA structural attenuation.

Table 7-5 lists the number of events per average daytime hour (i.e., 7:00 A.M. to 10:00 P.M.) that have some potential to disrupt speech (i.e., background sound level exceeds 50 dBA L_{max}). This assessment assumes that voices are not raised when background noise levels increase thereby allowing conversation to continue. Values are presented for people outdoors where no structure is present to block noise, indoors with windows open, and indoors with windows closed. Typical residential structures provide 15 dB noise level reduction with windows open and 25 dB noise level reduction with windows closed. At most of the locations evaluated, the number of events per hour with potential to interfere with speech would not measurably increase. Under the 'Future' scenario, the number of events with potential to interfere with speech would increase relative to the Approved scenario by as much as 0.2 events per hour (approximately one additional event every 5 hours) for people outdoors at Residences #1-4.

Table 7-5. Events With the Potential to Interfere With Speech Resulting from Each Scenario

Representative Points of Interest	Current Scenario			Approved Scenario			Future Scenario			Change Relative to Approved Under Future		
	Outdoor	Open	Closed	Outdoor	Open	Closed	Outdoor	Open	Closed	Outdoor	Open	Closed
Bowers Beach	0.9	0.4	0.0	0.9	0.4	0.0	0.9	0.4	0.0	+0	+0	+0
Dickinson Mansion	1.8	0.8	0.1	1.8	0.8	0.1	1.8	0.8	0.1	+0	+0	+0
Kitts Hummock	1.3	0.6	0.2	1.3	0.6	0.2	1.3	0.6	0.2	+0	+0	+0
Little Creek	1.6	1.0	0.5	1.6	1.0	0.5	1.7	1.0	0.5	+0	+0	+0
Magnolia	1.1	0.5	0.1	1.1	0.5	0.1	1.1	0.5	0.1	+0	+0	+0
Pickering Beach	1.5	0.5	0.2	1.5	0.5	0.2	1.5	0.5	0.2	+0	+0	+0
Residence 1	2.2	1.4	1.2	2.3	1.4	1.2	2.5	1.4	1.2	+0.1	+0	+0

Table 7-6. Events With the Potential to Interfere With Speech Resulting from Each Scenario (Continued)

Representative Points of Interest	Current Scenario			Approved Scenario			Future Scenario			Change Relative to Approved Under Future		
	Outdoor	Open	Closed	Outdoor	Open	Closed	Outdoor	Open	Closed	Outdoor	Open	Closed
Residence 2	2.2	1.4	1.1	2.4	1.4	1.1	2.6	1.4	1.1	+0.2	+0	+0
Residence 3	2.1	1.2	0.4	2.2	1.2	0.4	2.3	1.2	0.4	+0.1	+0	+0
Residence 4	2.3	1.7	1.2	2.5	1.7	1.2	2.7	1.8	1.2	+0.2	+0	+0
Round Barn	2.1	1.4	0.9	2.2	1.4	0.9	2.2	1.4	0.9	+0.1	+0	+0
Target (Store)	1.3	0.5	0.0	1.3	0.5	0.0	1.3	0.5	0.0	+0	+0	+0
Trailer Park 1	2.0	1.1	0.5	2.0	1.1	0.5	2.0	1.1	0.5	+0	+0	+0

7.2 CONSTRUCTION NOISE

Construction activities generate noise that is localized (i.e., limited to the area immediately surrounding the construction site) and temporary (i.e., lasting only for the duration of the construction project). The proposed CAT infrastructure expansion would require the use of several types of heavy equipment potentially including the types listed in Table 7-7. Table 7-7 shows maximum noise levels generated by each type of equipment at a reference distance of 50 feet and an overall noise level on a hypothetical day when all equipment types simultaneously operate. Equipment noise levels were calculated in the Federal Highway Administration's Roadway Construction Noise Model (Federal Highway Administration, 2006).

Table 7-7. Typical Construction Equipment Noise Levels

Equipment Type	Noise Level (dBA L_{max})	
	At 50 feet	At 550 feet
Backhoe	78	57
Dozer	82	61
Concrete Mixer Truck	79	58
Dump Truck	77	56
Roller	80	59
TOTAL	83	61

Source: Roadway Construction Noise Model

The closest noise-sensitive locations to the proposed CAT are several residences that are located approximately 550 feet south of the proposed facility. At this distance, the overall L_{max} generated at the construction site would be 61 and the DNL would also be 61. Heavy-duty trucks carrying equipment and materials to and from the construction site would use Route 438, and would pass within approximately 50 feet of the residences. At this distance, heavy trucks generate an L_{max} of approximately 77 dBA. Truck trips would be expected to be relatively infrequent, occurring primarily at the beginning and end of the construction project. Construction and transportation noise could be considered annoying at these closest residences. This noise could temporarily interfere with activities that involve listening (e.g., conversation or watching television) at times when particularly loud activities are under way. The proposed construction would occur in the context of frequent military aircraft operations noise generating approximately 64 dB DNL. The combined noise level, including both temporary construction noise and ongoing aircraft noise

would be approximately 65 dB DNL. Construction activity would be expected to be limited to normal working hours (7:00 A.M. to 5:00 P.M.). As mentioned previously, the noise would be temporary lasting only the duration of the project. Construction workers would use hearing protection when necessary in accordance with applicable laws and regulations. As discussed in Section 1.1, future noise analysis may be required depending on future tenants of the CAT.

7.3 NON-AIRCRAFT DAY-TO-DAY OPERATIONS NOISE

Day-to-day operations of the expanded CAT could include increased vehicular traffic (e.g., delivery trucks) and equipment noise (e.g., forklifts; heating, ventilation, and air conditioning [HVAC]). The nature of the noise would be dependent on the user(s) of the expanded CAT. For example, a cargo operation with extensive nighttime activities would probably involve frequent truck traffic that could also occur at night. If heavy trucks were used for cargo transport, noise levels generated by the trucks would be similar to levels stated for dump truck in Section 7.2. Truck traffic could be considered annoying to people living along frequently travelled routes. As discussed in Section 1.1, future noise analysis may be required depending on future tenants of the CAT.

SECTION 8. REFERENCES

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The proposed Civil Air Terminal (CAT) Expansion project would result in an increase in civilian aircraft operations and use of the CAT and resulting air emissions at Dover AFB. The following section describes the air quality affected environment and estimations of impacts due to proposed construction on Dover AFB property and increase in civilian aircraft operations.

1.0 Affected Environment

Air quality in a given location is defined by the size and topography of an air basin, the air emissions that occur within and outside of the air basin, local and regional meteorological influences, and the resulting types and concentrations of pollutants in the atmosphere. The significance of a pollutant concentration often is determined by comparing its concentration to an appropriate national or state ambient air quality standard. These standards represent the allowable atmospheric concentrations at which the public health and welfare are protected and include a reasonable margin of safety to protect the more sensitive individuals in the population. The U.S. Environmental Protection Agency (USEPA) establishes the National Ambient Air Quality Standards (NAAQS) to regulate the following criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than or equal to 10 micrometers in diameter (PM_{10}), particulate matter less than or equal to 2.5 micrometers in diameter ($PM_{2.5}$), and lead. Ozone is not directly emitted, but forms in the atmosphere by photochemical reactions between primary emissions of nitrogen oxides (NO_x), which includes both nitric oxide (NO) and NO_2, and reactive volatile organic compounds (VOCs).

The Delaware Department of Natural Resources and Environmental Control (DNREC) Division of Air Quality is responsible for enforcing air pollution regulations in Delaware. The DNREC implements the NAAQS and additional state ambient air quality standards for purposes of regulating air quality within Delaware.

Air emissions resulting from the proposed increase in civilian flight operations at Dover AFB primarily would affect air quality within the surrounding Kent County region. The USEPA designates all areas of the United States in terms of having air quality better (attainment) or worse (nonattainment) than the NAAQS. An area is in attainment of a NAAQS if its pollutant concentration remains below the standard value, as defined by annual to tri-annual metrics. Former nonattainment areas that have attained NAAQS are designated as maintenance areas. Currently, Kent County is designated by the USEPA as in attainment of the NAAQS for all pollutants (USEPA 2019a). Therefore, the proposed action is not subject to the requirements of the USEPA General Conformity Rule.

In addition to criteria pollutants, implementation of the proposed action also would emit greenhouse gas (GHG) emissions as a result of fossil fuel combustion. Therefore, the analysis also presents estimates of potential GHG emissions generated by the proposed action in terms of carbon dioxide (CO_2), as about 99 percent of the total global warming potential (GWP) of all pollutants emitted from the combustion of gasoline, diesel, or aviation fuels is in the form of CO_2.

2.0 Environmental Consequences

The air quality analysis estimated annual emissions that would result from construction and operation of the proposed CAT Expansion at Dover AFB. Attachment 1 of this report presents the calculations used to estimate air pollutant emissions from proposed construction and operational sources.

The project air quality analysis used the Prevention of Significant Deterioration (PSD) Regulation thresholds as indicators of the significance of potential impacts to air quality. These indicators only

provide a clue to the potential impacts to air quality. Since the immediate area surrounding Dover AFB within Kent County currently attains all of the NAAQS, the analysis compared the increase in annual air pollutant emissions estimated for the project to an indicator value of 250 tons per year for all criteria pollutants, as identified in the PSD Regulation. If proposed emissions exceed an indicator threshold, further analysis was conducted to determine whether proposed emissions would contribute to an exceedance of an ambient air quality standard. If this were the case, then the impact would be significant.

2.1 Construction

The CAT increase in flight operation usage would require construction of a 75-foot wide taxiway connecting Runway 1/19 to the existing 6.5-acre CAT ramp. Air quality impacts resulting from the proposed construction activities would occur from (1) combustive emissions due to the use of fossil fuel-powered trucks and nonroad equipment and (2) fugitive dust emissions ($PM_{10}/PM_{2.5}$) from the operation of equipment on exposed soil.

Construction activity data were developed to estimate construction equipment usages and areas of disturbed ground due to the proposed construction activities. These data were used as inputs to estimate air emissions from proposed construction activities. Factors needed to derive construction source emission rates were obtained from the *Compilation of Air Pollutant Emission Factors*, AP-42, Volume I (USEPA 1995) for fugitive dust and the USEPA MOVES2014b model (USEPA 2018) for on-road trucks and nonroad equipment. The analysis assumed the use of standard construction practices, which would reduce fugitive dust emissions generated from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels. The air quality analysis assumed that all proposed construction activities would occur in year 2019.

Table 1 presents estimates of emissions from the construction activities for the CAT taxiway at Dover AFB. These data show that even if total construction emissions occurred in one year, the construction emissions would be well below the annual indicator thresholds. Therefore, construction emissions associated with the proposed CAT taxiway would not result in significant air quality impacts.

Table 1. Total Construction Emissions from the CAT Taxiway at Dover AFB

Construction Activity	Air Pollutant Emissions (tons)						
	VOCs	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2e (mt)
Taxiway Site Preparation	0.00	0.01	0.03	0.00	0.06	0.01	12
Taxiway Paving	0.00	0.01	0.01	0.00	0.02	0.00	5
Total Emissions[a]	**0.01**	**0.02**	**0.04**	**0.00**	**0.08**	**0.01**	**17**
Annual Indicator Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**NA**

[a] Calculated values and totals have been rounded; therefore, sum total may not match the totals row.
Key: CO_2e (mt) = carbon dioxide equivalent in metric tons; NA = not applicable

2.2 Operations

The proposed CAT Expansion at Dover AFB primarily would generate air emissions from (1) commercial aircraft operations, (2) commercial aircraft engine maintenance and testing, and (3) usage of aerospace ground equipment (AGE). To estimate emissions from proposed aircraft operations, the analysis relied on landing and take-off (LTO) cycle emissions factors obtained from the International Civil Aviation Organization (ICAO) (ICAO 2013a and 2013b). To estimate emissions from the usage by aircraft of AGE, the analysis employed the USAF Air Conformity

Applicability Model (ACAM) version 5.0.14a (Solutio Environmental, Inc. 2019). The analysis assumed that the project would reach full operations and resulting emissions in year 2022, after the completion of all required infrastructure improvements.

The aircraft operations evaluated in the air quality analysis were obtained from the project noise analysis. A summary of these include the following:

- The analysis evaluated an aircraft fleet of medium and large capacity cargo carriers. The aircraft chosen for these categories include the Boeing 757-200 and 747-400. The analysis assumed that project aircraft fleet would comprise 90/10 percent 757-200/747-400 aircraft.
- The analysis evaluated the net increase in activities associated with the proposed maximum increase of 25,000 annual civilian fight operations, minus currently approved operations. This increment amounts to an increase of 11,500 total aircraft operations per year, or 5,750 annual LTOs at full buildout. This equates to 5,200/550 LTOs performed by 757-200/747-400 aircraft during this peak year of operation.
- On-wing engine tests – The analysis used the assumptions internal to the ACAM model to estimate on-wing or static aircraft engine tests.

The analysis of proposed aircraft operations focuses on operations that would 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. In general, aircraft emissions released above the mixing layer would not appreciably affect ground-level air quality.

Table 2 summarizes the increase in annual operational emissions that would result from the full build-out of the CAT Expansion at Dover AFB. The data in Table 2 show that proposed aircraft operations and AGE usages would result in emissions that would remain below all emission indicator thresholds. The majority of emissions generated by the project would occur from commercial aircraft operations up to an altitude of 3,000 feet AGL and across several square miles that make up the Dover AFB airspace and adjoining aircraft flight patterns. These emissions would be adequately mixed through this volume of atmosphere to the point that they would not result in substantial ground-level concentrations in any localized area. Therefore, operational emissions associated with the proposed CAT Expansion at Dover AFB would result in less than significant impacts to all air pollutant levels.

Project aircraft operations would emit hazardous air pollutants (HAPs) that could potentially impact public health. As discussed above for project criteria pollutant impacts, since proposed aircraft operations would occur intermittently over a volume of atmosphere, they would produce minimal ambient impacts of HAPs in a localized area.

The potential effects of GHG emissions from the proposed CAT Expansion are by nature global. 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 analysis presents estimates of GHG emissions from the CAT Expansion project for use as indicators of their potential contributions to climate change effects.

Table 2. Projected Annual Emissions Increases from Aircraft Operations – Dover AFB CAT Expansion Year 2022

Aircraft/Activity Type	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO_2e (mt)
B757-200							
Aircraft Flight Operations	6.08	64.16	92.94	7.11	0.47	0.40	19,709
Aircraft On-wind Engine Tests	0.02	0.23	4.07	0.17	0.01	0.01	480
Aerospace Ground Equipment	11.99	93.27	105.41	7.56	7.84	7.59	6,073
Total Annual B757-200 Emissions[a]	**18.09**	**157.66**	**202.42**	**14.84**	**8.32**	**8.00**	**26,262**
B747-400							
Aircraft Flight Operations	1.58	18.42	29.07	2.14	0.14	0.12	5,948
Aircraft On-wind Engine Tests	0.09	0.42	4.33	0.20	0.01	0.01	543
Aerospace Ground Equipment	1.44	11.22	11.32	1.09	1.07	1.03	832
Total Annual B747-400 Emissions[a]	**3.11**	**30.06**	**44.72**	**3.43**	**1.22**	**1.16**	**7,323**
Total Annual CAT Expansion Emissions[a]	**21.20**	**187.73**	**247.14**	**18.27**	**9.54**	**9.16**	**33,585**
Indicator Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**NA**
Kent County Year 2014 Emissions	**4,856**	**30,135**	**5,968**	**477**	**5,187**	**1,116**	**1,044,552**
Project Fraction of Kent County Emissions	**0.004**	**0.01**	**0.04**	**0.04**	**0.002**	**0.01**	**0.03**

[a] Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.
Key: CO_2e (mt) = carbon dioxide equivalent in metric tons; NA = not applicable.

2.3 Mitigations

To minimize air quality impacts from the increase in civilian flight operations at Dover AFB, operators would implement the following mitigation measure:

- Mitigation Measure AQ-1: To the extent feasible, aerospace ground equipment used by project aircraft shall have engines certified to USEPA nonroad Tier 4 emission standards.

The calculation of unmitigated emission due to project AGE usages are based on equipment that have engines rated with Tier 1 to Tier 3 nonroad emission standards. Therefore, implementation of Mitigation Measure AQ-1 would have the potential to produce substantial emission reductions from unmitigated AGE usages.

3.0 References

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ATTACHMENT 1

Emission Calculations for Construction and Operation of the Civil Air Terminal Expansion at Dover Air Force Base

	A	B	C	D	E	F	G	H	I
1	**Table 1. Emission Source Data for Construction of the Civil Air Terminal at Dover Air Force Base**								
2		*Hp*	*Ave. Daily*	*Number*	*Hourly*	*Hours/*	*Daily*	*Work*	*Total*
3	*Construction Activity/Equipment Type*	*Rating*	*Load Factor*	*Active*	*Hp-Hrs*	*Day*	*Hp-Hrs*	*Days*	*Hp-Hrs*
4	*Taxiway Site Preparation*								
5	Bulldozer - D9	405	0.43	1	174	8	1,393	4	5,573
6	Grader	180	0.41	1	74	6	443	3	1,328
7	Loader	215	0.36	2	155	6	929	5	4,644
8	Scraper	195	0.48	1	94	6	562	2	1,123
9	Vibratory Compactor - CB 355D	105	0.42	2	88	8	706	2	1,411
10	Water Truck - 5000 Gallons	175	0.38	1	67	6	399	5	1,995
11	Truck - Demo Material (1)	NA	NA	15	NA	14	208	4	833
12	Truck - Runway Base (1)	NA	NA	20	NA	19	370	1	370
13	Truck - Supplies (1)	NA	NA	40	NA	2	80	4	320
14	Fugitive Dust (2)	NA	NA	0.7	NA	8	NA	6	4.2
15	*Taxiway Paving*								
16	Concrete Paver	25	0.42	2	21	8	168	2	336
17	Concrete Pump Truck, 110' Boom	285	0.42	1	120	8	958	2	1,915
18	Concrete Vibrator	8	0.42	2	7	8	54	2	108
19	Water Truck - 5000 Gallons	175	0.38	1	67	6	399	2	798
20	Truck - Concrete (1)	NA	NA	15	NA	41	617	2	1,235
21	Truck - Supplies (1)	NA	NA	40	NA	3	120	3	360
22	Fugitive Dust (2)	NA	NA	0.7	NA	8	NA	2	1.4
23	Notes: (1) Number Active = miles/roundtrip, Hours/Day = daily truck trips, Daily Hp-Hrs = daily miles, and Total Hp-Hrs = total miles.								
24	(2) Number Active is acres disturbed at one time and Total Hp-Hrs is acre-days for the entire activity.								

	K	L	M	N	O	P	Q	R	S	T
1	**Table 2. Air Emission Factors for Construction of the Civil Air Terminal at Dover Air Force**									
2		*Fuel*	*Emission Factors (Grams/Horsepower-Hour)*							
3	*Project Year/Source Type*	*Type*	*VOC*	*CO*	*NOx*	*SO2*	*PM10*	*PM2.5*	*CO2*	*References*
4	**Year 2019**									
5	Nonroad Equipment - 7-11 Hp	D	0.67	4.56	4.48	0.00	0.40	0.39	591	(1)
6	Nonroad Equipment - 26-40 Hp	D	0.30	1.17	3.60	0.00	0.18	0.18	634	(1)
7	Nonroad Equipment - 101-175 Hp	D	0.25	0.70	1.48	0.00	0.15	0.14	566	(1)
8	Nonroad Equipment - 176-300 Hp	D	0.17	0.28	0.93	0.00	0.05	0.04	536	(1)
9	Nonroad Equipment - 301-600 Hp	D	0.18	0.63	1.62	0.00	0.09	0.09	536	(1)
10	HDDV	D	0.49	1.71	4.90	0.01	0.16	0.15	1,477	(2)
11	Disturbed Ground - Fugitive Dust						27.50	2.75		(3)
12	Notes: (1) Emissions factors estimated with the use of the EPA NONROAD2008a model for Hampden County, MA, assuming default conditions.									
13	Composite emission factors were calculated for each Hp category by averaging all of the different types of equipment wihin the same Hp category.									
14	Model was used to produce factors for year 2019.									
15	(2) Estimated with the use of the EPA MOVES2014a model for default conditions in year 2021.									
16	(3) Units in lbs/acre-day from section 11.2.3 of AP-42 (USEPA 1995). Emissions reduced by 50% from uncontrolled levels to simulate									
17	implementation of best management practices (BMPs) for fugitive dust control									

	V	W	X	Y	Z	AA	AB	AC
1	**Table 3. Emissions from Construction of the Civil Air Terminal at Dover Air Force.**							
2		*Tons*						
3	*Construction Activity/Equipment Type*	*VOC*	*CO*	*NOx*	*SOx*	*PM10*	*PM2.5*	*CO2*
4	*Taxiway Site Preparation*							
5	Bulldozer - D9	0.00	0.00	0.01	0.00	0.00	0.00	3.29
6	Grader	0.00	0.00	0.00	0.00	0.00	0.00	0.78
7	Loader	0.00	0.00	0.00	0.00	0.00	0.00	2.74
8	Scraper	0.00	0.00	0.00	0.00	0.00	0.00	0.66
9	Vibratory Compactor - CB 355D	0.00	0.00	0.00	0.00	0.00	0.00	0.88
10	Water Truck - 5000 Gallons	0.00	0.00	0.00	0.00	0.00	0.00	1.24
11	Truck - Demo Material (1)	0.00	0.00	0.00	0.00	0.00	0.00	1.36
12	Truck - Runway Base (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.60
13	Truck - Supplies (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.52
14	Fugitive Dust (2)					0.06	0.01	
15	**Subtotal**	**0.004**	**0.01**	**0.03**	**0.0001**	**0.06**	**0.01**	**12.09**
16	*Taxiway Paving*							
17	Concrete Paver	0.00	0.00	0.00	0.00	0.00	0.00	0.23
18	Concrete Pump Truck, 110' Boom	0.00	0.00	0.00	0.00	0.00	0.00	1.13
19	Concrete Vibrator	0.00	0.00	0.00	0.00	0.00	0.00	0.07
20	Water Truck - 5000 Gallons	0.00	0.00	0.00	0.00	0.00	0.00	0.50
21	Truck - Concrete (1)	0.00	0.00	0.01	0.00	0.00	0.00	2.01
22	Truck - Supplies (1)	0.00	0.00	0.00	0.00	0.00	0.00	0.59
23	Fugitive Dust (2)					0.02	0.00	
24	**Subtotal**	**0.002**	**0.01**	**0.01**	**0.00003**	**0.02**	**0.003**	**4.53**
25	**Total Emissions - Tons**	**0.006**	**0.02**	**0.04**	**0.0001**	**0.08**	**0.01**	**16.62**

Table 4. Aircraft LTO Modal Emission Rates.

Source	Fuel Usage (Pounds)	Emissions per LTO (Pounds) (1)						
		VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Aircraft Engine (1)								
PW2037 for the B757-200 (2)	1,289	1.2	12.3	17.9	1.4	0.1	0.1	4,169
PW4056 for the B747-400 (3)	1,839	1.4	16.7	26.4	1.9	0.1	0.1	5,948
Aircraft								
B757-200	2,578	2.3	24.7	35.7	2.7	0.2	0.2	8,339
B747-400	7,357	5.7	67.0	105.7	7.8	0.5	0.4	23,792

Note: (1) Data are for 1 engine - the B757-200/B747-400 aircraft have 2/4 engines.

(2) Source: ICAO 2013a.

(3) Source: ICAO 2013b.

Table 5. Annual Aircraft LTOs and Emissions.

Source	Annual LTOs	Annual Emissions (Tons)						
		VOC	CO	NOx	SO2	PM10	PM2.5	CO2
Aircraft								
B757-200	5,200	6.1	64.2	92.9	7.1	0.5	0.4	21,680
B747-400	550	1.6	18.4	29.1	2.1	0.1	0.1	6,543
Subtotal		**7.66**	**82.59**	**122.01**	**9.25**	**0.61**	**0.52**	**28,223**

Table 6. Annual Operational Emissions for the CAT Expansion at Dover AFB.

Aircraft/Activity	*Tons per Year*							CO_2e (mt)
	VOC	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2e	
B757-200								
Flight Operations and Engine Trim Tests	6.08	64.16	92.94	7.11	0.47	0.40	21,680	19,709
Engine Test Cells	0.02	0.23	4.07	0.17	0.01	0.01	528	480
Aerospace Ground Equipment	11.99	93.27	105.41	7.56	7.84	7.59	6,680	6,073
Total - B757-200 Operations	**18.09**	**157.66**	**202.42**	**14.84**	**8.32**	**8.00**	**28,888**	**26,262**
B747-400								
Flight Operations and Engine Trim Tests	1.58	18.42	29.07	2.14	0.14	0.12	6,543	5,948
Engine Test Cells	0.09	0.42	4.33	0.20	0.01	0.01	597	543
Aerospace Ground Equipment	1.44	11.22	11.32	1.09	1.07	1.03	915	832
Total - B747-400 Operations	**3.11**	**30.06**	**44.72**	**3.43**	**1.22**	**1.16**	**8,055**	**7,323**
Total Operations	**21.20**	**187.73**	**247.14**	**18.27**	**9.54**	**9.16**	**36,943**	**33,585**
Kent County Indicator Thresholds	**250**	**250**	**250**	**250**	**250**	**250**	**NA**	**NA**
Kent County Year 2014 Emissions	**4,856**	**30,135**	**5,968**	**477**	**5,187**	**1,116**		**1,044,552**
Project Fraction of Kent County Year 2014 Emissions	**0.004**	**0.01**	**0.04**	**0.04**	**0.002**	**0.01**		**0.03**