Final Environmental Assessment for Force Structure Changes at Langley Air Force Base, VA

October 2011

Prepared by the
Headquarters Air Combat Command
(ACC/A7PS)
Langley AFB, VA

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FINDING OF NO SIGNIFICANT IMPACT FOR FORCE STRUCTURE CHANGES AT LANGLEY AIR FORCE BASE, VA

Pursuant to the Council of Environmental Quality regulations for implementing the procedural provisions of the Nation Environmental Policy Act of 1969, as amended, 40 Code of Federal Regulations (CFR) Parts 1500-1508, and 32 CFR 989, the Sustainable Installations Branch at Headquarters Air Combat Command has conducted an environmental assessment (EA) that determines the impacts of force structure changes that involve bedding down additional aircraft at Langley AFB, VA.

NAME OF PROPOSED ACTION: Force Structure Changes at Langley AFB, VA

DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES:

Proposed Action:

The Proposed Action would increase the number of F-22A aircraft currently assigned to Langley AFB by adding six additional F-22A aircraft to the 1st Fighter Wing (1 FW) at Langley AFB, VA, and also stand up a T-38A aircraft detachment of 14 training aircraft within the 1st Fighter Wing (1 FW) at Langley AFB, VA.

Each F-22A fighter squadron (27 FS and 94 FS) would each receive three Primary Mission Aircraft Inventory (PMAI) F-22As and two Backup Aircraft Inventory (BAI) F-22As with a total of 94 enlisted manpower authorizations from other locations; this would increase the total number of F-22A aircraft from 36 to 46.

The T-38A aircraft would provide Dissimilar Air Combat Training (DACT) for the F-22As in place of the F-15Cs. Currently projected are up to 14 x T-38 Primary Training Aircraft Inventory (PTAI) to support the two F-22A squadrons (27 FS and 94 FS), with 12-14 contract maintenance personnel. The intent is for the total number of T-38s to operate at Langley AFB for approximately 8-10 years (FY11 ~ FY21).

There will be no new facilities required. Facilities have already been completed under the 2002 EIS.

Facility support for the T-38 detachment requires no new facility construction; existing facilities would accommodate the additional aircraft and personnel.

No-Action Alternative:

The No-Action Alternative would not bring additional F-22A aircraft and would not bring 14 T-38A aircraft to Langley AFB.

CONCLUSION:

Based on the analysis in the attached EA, no significant impact is anticipated from implementation of the proposed action. Therefore, issuance of a finding of no significant impact is warranted, and an environmental impact statement is not required. Pursuant to Executive Order 11988, the authority delegated in Secretary of the Air Force Order 791.1, and taking the above information into account, I find that there is no practicable alternative to this action and that the proposed action includes all practicable measures to minimize harm to the environment.

DIMASALANG F. JUNIO, Col, USAF
Chief, Programs Division (HQ ACC/A7P)

26 OCT 2011
Date

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ACRONYMS AND ABBREVIATIONS

46 TW	46th Test Wing
µg/L	Micrograms per Liter
µg/m3	Micrograms per Cubic Meter
1 FW	1st Fighter Wing
27 FS	27th Fighter Squadron
94 FS	94th Fighter Squadron
1 OSS	1st Operations Support Squadron
ACAM	Air Conformity Applicability Model
ACC	Air Combat Command
ACHP	Advisory Council on Historic Preservation
ACM	Asbestos-Containing Material
ACMI	Air Combat Maneuvering Instrumentation
AFB	Air Force Base
AFEPPM	Air Force Energy Program Policy Memorandum
AFFF	Aqueous Film Forming Foam
AFI	Air Force Instruction
AFM	Air Force Manual
AFMC	Air Force Materiel Command
AFOSH	Air Force Office of Safety and Health
AFPD	Air Force Policy Directive
AGL	Above Ground Level
AICUZ	Air Installation Compatible Use Zones
AME	Alternate Mission Equipment
AMO	Asbestos Management and Operations Plan
ANG	Air National Guard
ANSI	American National Standards Institute
APE	Area of Potential Effect
APZ	Accident Potential Zone
AQCR	Air Quality Control Region
AR	Aerial Refueling
ARTCC	Air Route Traffic Control Center
ASA	Acoustical Society of America
ASU	Airspace for Special Use
AT/FP	Anti-Terrorism/Force Protection
ATC	Air Traffic Control
ATCAA	Air Traffic Control Assigned Airspace
AWWTP	Advanced Wastewater Treatment Plant
BA	Biological Assessment
BACT	Best Available Control Technology
BAI	Backup Assigned Inventory
BAM	Bird Avoidance Model
BASH	Bird/Wildlife Aircraft Strike Hazard
BEA	Bureau of Economic Analysis
BMP	Best Management Practice
BRAC	Base Realignment and Closure

CAA	Clean Air Act
CCCL	Coastal Construction Control Line
CEAN	Civil Engineer Environmental Element
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CES	Civil Engineer Squadron
CFA	Controlled Firing Areas
CFR	Code of Federal Regulations
CH4	Methane
CO	Carbon Monoxide
CO2e	Carbon Dioxide Equivalent
CONUS	Continental United States
CRM	Cultural Resource Management
CSAR	Combat Search and Rescue
CSE	Central Scheduling Enterprise
CSEL	C-Weighted Sound Exposure Level
CWA	Clean Water Act
CY	Calendar Year
CZ	Clear Zone
CZMA	Coastal Zone Management Act
dB	Decibel
DDESB	Defense Department Explosives Safety Board
DMM	Discarded Military Munitions
DoD	Department of Defense
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EGTTR	Eglin Gulf Test and Training Range
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EISA	Energy Interdependence and Security Act
EO	Executive Order
ERP	Environmental Restoration Program
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FICON	Federal Interagency Committee on Noise
FICUN	Federal Interagency Committee on Urban Noise
FL	Flight Level
FONPA	Finding of No Practicable Alternative
FTU	Formal Training Unit
FWC	Virginia Fish and Wildlife Conservation Commission
FY	Fiscal Year
GBU	Guided Bomb Unit
GHG	Greenhouse Gases
GIS	Geographic Information System
GPS	Global Positioning System
ha	Hectares
HAP	High Accident Potential
HFCs	Hydrofluorocarbons
HWMP	Hazardous Waste Management Plan

Hz	Hertz
IAP	Initial Accumulation Point
ICRMP	Integrated Cultural Resource Management Plan
IICEP	Intergovernmental and Interagency Coordination for Environmental Planning
INRMP	Integrated Natural Resources Management Plan
IPCC	Intergovernmental Panel on Climate Change
IRP	Installation Restoration Program
ISWMP	Integrated Solid Waste Management Plan
PAA	Primary Aircraft Authorized
SHPO	State Historic Preservation Office
SWPPP	Storm Water Pollution Prevention Plan
TMDLs	Total Maximum Daily Loads
USACE	United States Army Corps of Engineers
USAF	United States Air Force
VDEQ	Virginia Department of Environmental Quality
VDOT	Virginia Department of Transportation
WG	Wing

1.0 PURPOSE AND NEED FOR ACTION

1.1 Background:

Joint Base Langley–Eustis was established in accordance with congressional legislation implementing the recommendations of the 2005 Base Realignment and Closure Commission. The legislation ordered the consolidation of two separate military installations, Langley AFB, VA, and Ft Eustis, VA into a single joint base – one of 12 joint bases formed in the United States as a result of the law. Unlike other joint bases that share common perimeters the two components are geographically separated by 17 miles. In January 2010, the Air Force reactivated the 633d Air Base Wing to assume host unit and installation support functions at each location. The installation assumed its full operational capability (FOC) in October 2010. The proposed action only concerns force structure changes at Langley AFB, so throughout the remainder of the document, the installation will be referred to as "Langley AFB" so as not to confuse the reader.

In January 2002, the Air Force selected Langley AFB, VA as the location for the initial F-22A operational wing beddown, as stated in the Record of Decision (ROD) for the Initial F-22A Operational Wing Beddown. This decision was preceded by an extensive environmental impact analysis, as documented in the *Initial F-22A Operational Wing Beddown Draft Environmental Impact Statement* dated April 2001, and the *Initial F-22A Operational Wing Beddown Final Environmental Impact Statement* dated November 2001. These three documents combined (hereby referred to collectively as the "2002 EIS"), serve as the environmental baseline for the proposed action, and are hereby incorporated by reference into this EA, which only analyzes the resource areas of the 2002 EIS impacted by this proposal, as indicated in the matrix at Table 3-1. These documents are available on-line at the following link:
http://www.accplanning.org/F22BD_EIS.html

With the subsequent decision by the Department of Defense (DoD) to reduce the number of F-22A aircraft manufactured, the third operational squadron planned for Langley AFB and analyzed in the 2002 EIS did not occur. In May 2009, the Air Force announced the drawdown and reassignment of F-15 squadrons, including those assigned at Langley AFB. By this time, the only F-15 aircraft remaining at Langley were within the 71 FS, and all were removed from Langley AFB by September 2010.

On 29 July 2010, the Air Force announced actions to consolidate the F-22A fleet. The Secretary and Chief of Staff of the Air Force determined that the most effective basing for the F-22A required redistributing one operational (or combat-coded) F-22A squadron with 21 Primary Aircraft Authorized (PAA) at Holloman AFB, New Mexico to existing F-22A units at Joint Base Elmendorf-Richardson (JBER), Nellis AFB, NV, Langley AFB, VA, and the other F-22A squadron at Holloman AFB, NM. The second F-22A operational squadron at Holloman AFB would be relocated to Tyndall AFB, FL.

PAA are aircraft authorized to a unit for performance of its operational mission. The primary authorization forms the basis for the allocation of operating resources to include manpower, support equipment, and flying-hour funds. Training flights of the additional F-22A and T-38A

aircraft would be conducted in the same manner as the existing F-22A aircraft, as detailed in the 2002 EIS. The T-38A aircraft would not employ any defensive countermeasures or deploy any air-to-ground or air-to-air munitions.

This EA addresses the potential environmental consequences associated with the beddown of the T-38A detachment and additional F-22As, according to the requirements of the National Environmental Policy Act (NEPA) (42 United States Code [USC] 4321 *et seq*.), the Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] 1500–1508), and the Environmental Impact Analysis Process (EIAP) (Air Force Instruction [AFI] 32-7061 as promulgated in 32 CFR 989). NEPA is the national charter for identifying environmental consequences of major federal actions and ensures that environmental information is available to the public, agencies, and decision-makers before decisions are made and before actions are taken.

1.2 Purpose:

The purpose of the proposed force structure changes of F-22 and T-38A aircraft at Langley AFB would be to provide additional Air Force capabilities at a strategic location to meet mission responsibilities for worldwide deployment. The increase of six F-22 aircraft and beddown of up to fourteen T-38A aircraft would provide enhanced capabilities while efficiently using Langley AFB facilities.

1.3 Need:

The 2002 EIS assessed 48 F-22A aircraft assigned to Langley AFB, yet the base has only received 42 of these. Additional F-22A aircraft are needed at Langley AFB to provide expanded Air Force capability to respond efficiently to national objectives, be available for contingencies, and enhance F-22A operational flexibility. The beddown of a T-38A detachment would provide additional synergies between the training and operational missions while capitalizing on the capacity and strategic assets already existing at Langley AFB. This would also provide a low-cost aggressor force for F-22 training and provide F-22 pilots experience with dissimilar air combat training. T-38A aircraft would operate at Langley AFB for approximately 8-10 years (FY11 ~ FY21) in order to enhance F-22 readiness and longevity.

Air Combat Command desires to improve its current Combat Mission Readiness (CMR) rating of 50%. One factor in the current rating is the current practice of using the F-22A as adversary support for other F-22A aircraft. Unfortunately, this provides negative training due to the aircraft's low observable (LO) characteristics. Other F-22A installations within the Air Force credit an 80% CMR rate directly to utilizing T-38 aircraft in the adversary support role, and the Air Force desires to duplicate these results at Langley. In the adversary support role, T-38A aircraft provide an aggressor for Dissimilar Air Combat Training (DACT), also known as "Red Air" instead of other F-22As, which reduces wear and tear on F-22 aircraft. Furthermore, the flying hour cost of T-38s is ¼ the flying hour cost of F-22As and using the T-38 would support the F-22A training and readiness as an available asset.

The T-38A is designed as an advanced jet pilot trainer and is used by Air Combat Command (ACC) and the Air Education Training Command (AETC) to prepare pilots for frontline fighter aircraft such as the F-15, F-16, and the F-22A. In addition to its use as a training aircraft, it has

also been used as a companion aircraft to the B-2 at Whiteman AFB and to the U-2 aircraft at Beale AFB. The cost per flying hour and ease of maintenance of the T-38A makes it an economical trainer and companion aircraft. The T-38A is a twin engine, two-seat aircraft capable of supersonic speeds and high altitudes. It is approximately 46 feet long with a wingspan of 15 feet and a height of nearly 13 feet.

The characteristics of the F-22A Raptor are adequately outlined in the 2002 EIS.

2.0 DESCRIPTION OF THE PROPOSEDACTION AND NO-ACTION ALTERNATIVE

2.1 Proposed Action:

The Proposed Action would increase the number of F-22 aircraft currently assigned to Langley AFB by adding six additional F-22 aircraft to the 1st Fighter Wing (1 FW) at Langley AFB, VA, and also stand up a T-38A aircraft detachment of 14 training aircraft within the 1st Fighter Wing (1 FW) at Langley AFB, VA. The proposed action brings a total of 94 enlisted manpower authorizations from other locations, conducts flying sorties at the base for training and deployment after beddown, and implements personnel changes to conform to F-22 requirements.

Each F-22 fighter squadron (27 FS and 94 FS) would each receive three Primary Mission Aerospace Vehicle Inventory (PMAI) F-22s which would increase the number of F-22 PMAI aircraft from 36 to 42. PMAI are those aircraft utilized to fly the aircraft's annual flying hours, as established in Program Change Request (PCR) 11-01. Langley would also receive 4 Backup Aerospace Vehicle Inventory (BAI) and 2 Attrition Reserve (AR) aircraft. These do not contribute to flying hours, sorties, or airfield operations, but enable aircraft rotation for maintenance, modifications, and losses.

The 27 FS currently has 18 PMAI F-22A aircraft, 2 Backup Aircraft Inventory (BAI), and 0 Attrition Reserve (AR) aircraft. Under the proposed action, F-22A aircraft assigned to 27 FS would increase to 21 PMAI, 2 BAI, 0 AR. The 94 FS currently has 18 PMAI F-22A aircraft, 2 BAI, and 0 AR aircraft, and the proposed action would also increase their F-22A aircraft to 21 PMAI, 2 BAI, 0 AR.

The proposed Action would also establish a detachment of fourteen T-38A aircraft assigned to the 1 FW, which would be maintained by up to 14 contracted maintenance personnel. Currently projected are up to 14 x T-38 Primary Training Aircraft Inventory (PTAI) to support the two F-22A squadrons with 12-14 contract maintenance personnel. The intent is for the total number of T-38s to operate at Langley AFB for approximately 8-10 years (FY11 ~ FY21) in order to enhance F-22A readiness and longevity. By the end of FY13, the additional fourteen T-38A aircraft would represent a net increase to the number of aircraft at Langley AFB assigned in FY10, but would not exceed the total number of aircraft assessed in the 2002 EIS.

Existing facilities at Langley AFB can accommodate the additional aircraft and personnel

associated with the proposed force structure changes; Langley would not require construction of any new facilities. Langley may install aircraft arresting equipment at the ends of the runway for T-38A aircraft. No airspace modifications are proposed for the additional F-22A or T-38A aircraft.

Table 2-1: Force Structure

Aircraft Type	Sqdn	2002 EIS	FY10 PMAI/ PTAI	FY11 PMAI/ PTAI	FY12 PMAI/ PTAI	FY13 PMAI/ PTAI
F-15	71 FS	24	18	0	0	0
F-22A	27 FS	24	18	18	21	21
F-22A	94 FS	24	18	18	21	21
T-38	TBD*		0	0	14	14
Total		**72**	**54**	**36**	**56**	**56**

*Actual unit designation has not been determined yet.

Table 2-2 below depicts the proposed aircraft movement schedule for aircraft to Langley AFB:

Table 2-2: Aircraft Movement Schedule

Aircraft	FY11	FY12	FY13	Total
F-22A	0	+6	0	+6 PMAI
T-38	0	+7	+7	+14 PTAI

Three terms are used in this document to describe aircraft operations: sortie, airfield operation, and sortie-operation. A sortie consists of a single military aircraft flight from takeoff through landing. An airfield operation represents the single movement or individual portion of a flight in the base airfield airspace environment, such as a takeoff, a landing, or a closed pattern. A sortie-operation is defined as the use of one airspace unit, such as a training route, by one aircraft. Table 2-3 compares the annual sorties assessed in the 2002 EIS with actual sorties flown in FY09-FY10, projections in FY11, and projections for the proposed action in FY12-13. The actual sortie numbers for FY11 will be significantly less because of the Air Force-wide grounding of all F-22 aircraft due to safety problems with onboard oxygen generation systems. This table shows that the annual sorties projected for the proposed action (10,414) are actually 7% less than the annual sorties assessed in the 2002 EIS for F-22A aircraft (11,187).

Table 2-3: Annual Flying Training/Sorties* - Day (D) / Night (N)

Aircraft	2002 EIS	Actual FY09	Actual FY10	Projected FY11 Transition Period 36/42 F-22A 7 T-38	Projected FY12 42 F-22A 7 T-38	Projected FY13 42 F-22A 14 T-38
F-15C	0	3200 D/208 N	1547 D/103 N	0	0	0
F-22A**	10460D/ 727N	5271 D / 247 N	3890 D/ 288 N	6840 D / 360 N	7761 D / 403 N	7761 D / 403 N
T-38***	0	0	0	800 D / 0 N	1125 D / 0 N	2250 D / 0 N

*FY09 sorties (F-15C and F-22A flights); Projected FY10 sorties (F-15C reducing flights and F-22A); Projected FY11/12/13 (F-22A and T-38 operations).
** PCR 11-01 has additional +770 flying hours in FY11, +1570 flying hours in FY12, +1565 flying hours in FY13.
*** PCR 11-04 has +960 flying hours in FY11; +1350 flying hours in FY12; +2700 flying hours in FY13.

Table 2-4 compares training airspace usage of aircraft from Langley AFB as projected in the 2002 EIS with actual sorties in FY09 – FY10 and projections associated with the proposed action. Aircraft from Langley AFB conduct training operations in Military Operations Areas (MOAs) and overlying Air Traffic Control Assigned Airspace (ATCAA), restricted areas, and on Military Training Routes (MTRs). Langley AFB uses Warning Areas: W-72, W-122, W-386; and MOAs.

Table 2-4: Annual Sortie-Operations in Warning Areas*

Area	2002 EIS	FY09	FY10	Projected FY11	Projected FY13
W-72	33,329	1740	857	989	1130
W-122	14,798	12	6	10	10
W-386	11.187	6962	4863	6404	7319
Evers MOA		61	35	42	48
Farmville MOA	849	58	31	20	24
Hatteras B MOA		74	36	40	48
Total	60,163	8907	5828	7505	8579

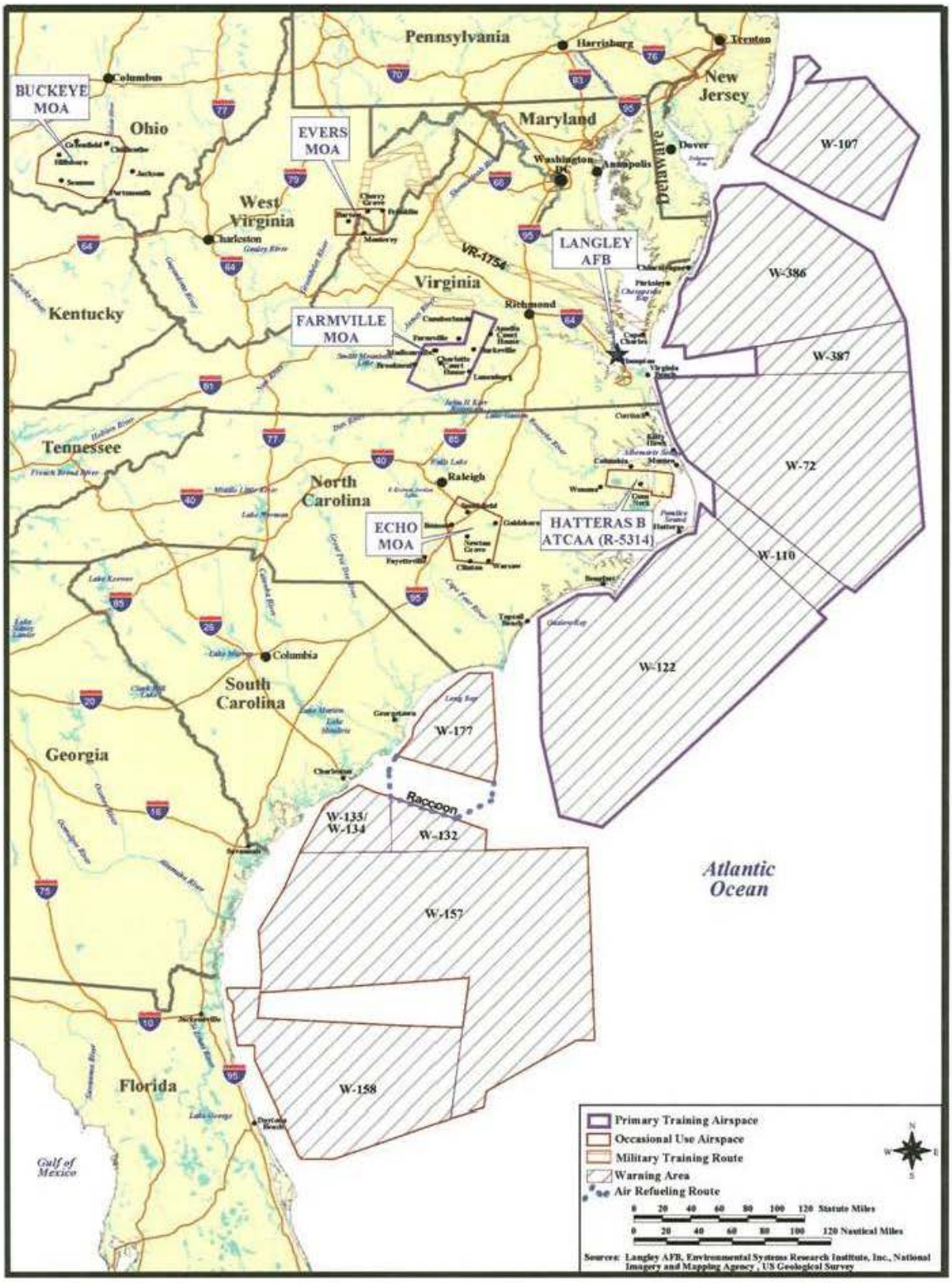
*FY09 sorties (F-15C and F-22A flights); Estimated FY10 sorties (F-15C reducing flights and F-22A); Projected FY11/13 (F-22A and T-38 operations). No T-38 sorties projected in W-122.

Restricted areas separate potentially hazardous military activities, such as air-to-ground training, from other aviation activities. Aircraft must have permission from air traffic control to enter a restricted area when active. There is no restricted air space in the immediate air space around Langley AFB. No local MTRs are affected by the proposed action. Military training route (MTR) Visual Flight Rules route VR-1754 was used by Langley AFB F-15Cs only. Langley AFB F-22As do not fly MTRs.

The 1 FW Unit Manpower Document (UMD) military manpower authorizations would change with the addition of 94 enlisted authorizations which would accompany the additional the six F-22A aircraft. The 1 FW Unit Manpower Document (UMD) military and civilian manpower authorizations would change with the addition of 14 Contract Manpower Equivalents (CMEs) for the T-38 aircraft detachment. Acquisition Management and Integration Center (AMIC) Aircraft Maintenance Division requires a Quality Assurance Evaluator (QAE) manning authorization (government personnel) trained and certified by the Contracting Officer to monitor/inspect the

contractor's work to ensure reliability, safety, and adherence to contract requirements.

Figure 2-1: Warning Areas utilized by Aircraft at Langley AFB (W-72, W-122, W-386 areas over Atlantic Ocean, Due East of Langley AFB)



2.2 No Action Alternative:

Under the No Action Alternative, the proposed plus-up of F-22A aircraft and beddown of T-38A aircraft would not occur.

3.0 AFFECTED ENVIRONMENT

The 2002 EIS serves as the baseline for this Environmental Assessment because this was the last extensive analysis at Langley AFB involving significant aircraft and airspace management impacts. The 2002 EIS is hereby incorporated by reference, and may be viewed online at: http://www.accplanning.org/F22BD_EIS.html. This EA only analyzes the resource areas of the 2002 EIS, which by exception, will be affected by the proposed action as outlined in Table 3-1.

Table 3-1 Resources Analyzed in the Environmental Impact Analysis Process

Resource	***Potentially Affected by Implementation of Proposed Action***	***Analyzed in 2002 F-22A Operational Wing EIS***	***Analyzed in this EA***
Airspace Management and Use	No	Yes	No*
Noise	Yes	Yes	Yes
Air Quality	No	Yes	Yes
Safety	No	Yes	No*
Soil and Water	No	Yes	No*
Terrestrial Communities	No	Yes	No*
Wetland and Freshwater Communities	No	Yes	No*
Natural Resources	No	Yes	No*
Threatened, Endangered and Special Status Species	No	Yes	No*
Marine Communities	No	Yes	No*
Visual Resources	No	Yes	No*
Cultural Resources	No	Yes	No*
Land Use	No	Yes	No*
Socio Economics	No	Yes	No*
Hazardous Materials and Waste	Yes	Yes	Yes
Public Service	No	Yes	No*
Transportation	No	Yes	No*
Environmental Justice	Yes	Yes	Yes

*****The Air Force assessed numerous resources that, in accordance with CEQ regulations, warrant no further examination in this EA.

No new facilities would be required to accommodate these proposed force structure changes. Langley AFB may install a BAK-15 aircraft arresting barrier system and a textile braking system at the end of runways 08 and 26 in the future, in order to improve safety during landing/recovery

of T-38A aircraft. BAK-15 aircraft arresting barrier lies across the runways, and provides support for nylon net barriers. The geo-textile brake system is a modular arresting system intended as emergency backup equipment for standard operational systems. It consists of a fabric that's stretched across the end of a runway and performs the same function as arresting cables on an aircraft carrier flight deck; resistance is created when the geo-textile fabric tears upon engaging a T-38A, thus stopping the aircraft.

3.1 Noise:

Noise is defined simply as unwanted sound. Sound levels are measured on a logarithmic decibel scale and a sound that is 10 decibels (dB) higher than another will be perceived as twice as loud. Examples of typical levels of common sounds are shown in Figure 3-1, *Typical A-Weighted Sound Levels of Common Sounds*. Sound measurements account for the ability of the ear to hear different frequencies (pitches) of sound by applying frequency weighting where A-weighted levels apply to subsonic aircraft noise.

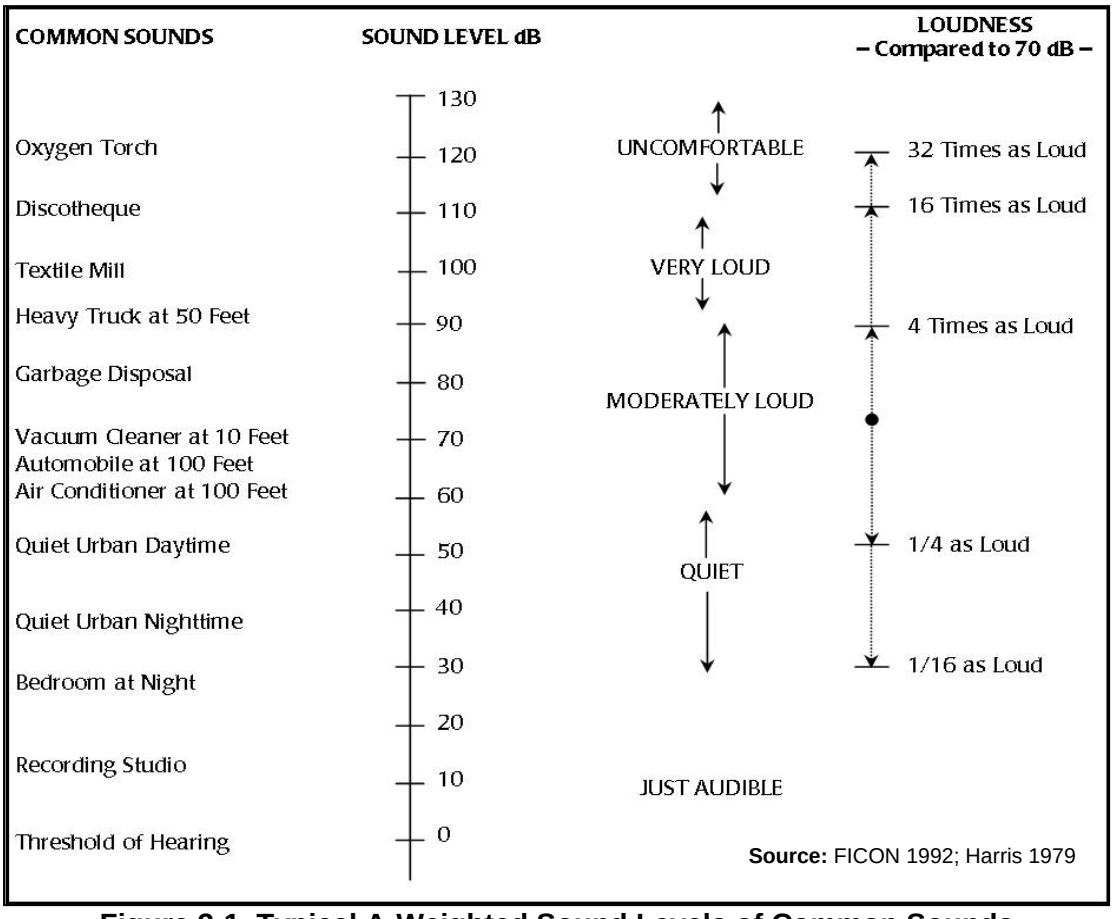


Figure 3-1. Typical A-Weighted Sound Levels of Common Sounds

Several ways of expressing noise levels (known as "metrics") have been developed to describe a particular noise or noise environment quantitatively. Noise metrics used in this analysis are as follows:

- **Day–Night Average Sound Level (DNL) -** A noise metric combining the levels and durations of noise events and the number of events over a 24-hour period. DNL also accounts for more-intrusive nighttime noise, adding a 10 dB penalty for sounds after 10:00 PM and before 7:00 AM.

- **Onset Rate-Adjusted Day–Night Average Sound Level (DNL_{mr}) -** The measure used for subsonic aircraft noise in training airspace. Since the tempo of operations is so variable in airspace units, DNL_{mr} is calculated based on the average number of operations per day in the busiest month of the year. When military aircraft fly low and fast, the sound can rise from ambient to its maximum very quickly and the resulting "startle" effect can make the sound seem louder than its measured onset rate-adjusted sound exposure level would suggest. DNL_{mr} accounts for the surprise effect of aircraft overflights by adding a penalty of 0 to 11 dB based on the onset rate.

- **Sound Exposure Level (SEL) -** Accounts for the maximum sound level and the length of time a sound lasts. SEL does not directly represent the sound level heard at any given time. Rather, it provides a measure of the total sound exposure for an entire event as if it were compressed into a single second. For many types of noise impacts, SEL provides a better measure of intrusiveness of the sound than simply stating the maximum noise level reached during an overflight event.

- **Equivalent Sound Level (L_{eq}) -** Represents aircraft noise levels averaged over a specified period with no weighting for sounds that occur during any particular period. L_{eq} is useful for assessing potential speech and learning interference.

The ROI includes Langley AFB and its vicinity as well as the airspace units proposed for use.

Installation Vicinity - Langley AFB has recently supported operation of several aircraft types including F-15C, F-22A, F-16, and various transient aircraft. Noise levels generated by individual overflights of these aircraft are listed in Table 3-2, *Direct Overflight Noise Levels in dB SEL Generated by F-22A, F-15C, and F-16 Aircraft*.

Table 3-2. Direct Overflight Noise Levels in dB SEL Generated by F-22A, F-15C, and F-16 Aircraft

Aircraft Type	Airspeed	Power Setting*	500 AGL	1,000 AGL	2,000 AGL	5,000 AGL	10,000 AGL
F-15C	250	90 %NC	118	113	107	98	89
F-22A	250	100 %ETR	125	120	114	104	96
F-16C	250	90 %NC	113	108	102	93	83

Note: *Typical non-afterburner takeoff configuration

Key:
AGL = Above Ground Level NC = percent core RPM RPM = Rotations Per Minute
ETR = Engine Thrust Request

The noise contours shown in Figure 3-2, *Baseline Noise Contours at Langley AFB* reflect baseline DNL presented in the *2007 Langley AFB Air Installation Compatible Use Zone Study (AICUZ)* (Air Force 2007). These contours were calculated using the NOISEMAP computer program, version 7.3. Approximately 7,782 acres of land off the base and 2,840 acres of land on the base are affected by noise levels exceeding 65 DNL (Table 3-3, *Number of Acres Affected by Greater Than 65 DNL under Baseline Conditions).* Estimated off-base acreage includes NASA Langley Research Center (LaRC), although many of the LaRC land uses are relatively noise insensitive (e.g., wind tunnels). Population estimates were derived based on proportions of 2010 U.S. Census block areas affected by each DNL interval. An estimated 18,070 off-installation residents are affected by greater than 65 DNL, of which 13,541 are exposed to 65-69 DNL, 4,015 are exposed to 70-74 DNL, and 514 are exposed to 75-79 DNL. Six on-base duplex officer's quarters residences are located within the 80-84 DNL noise contour under baseline conditions.

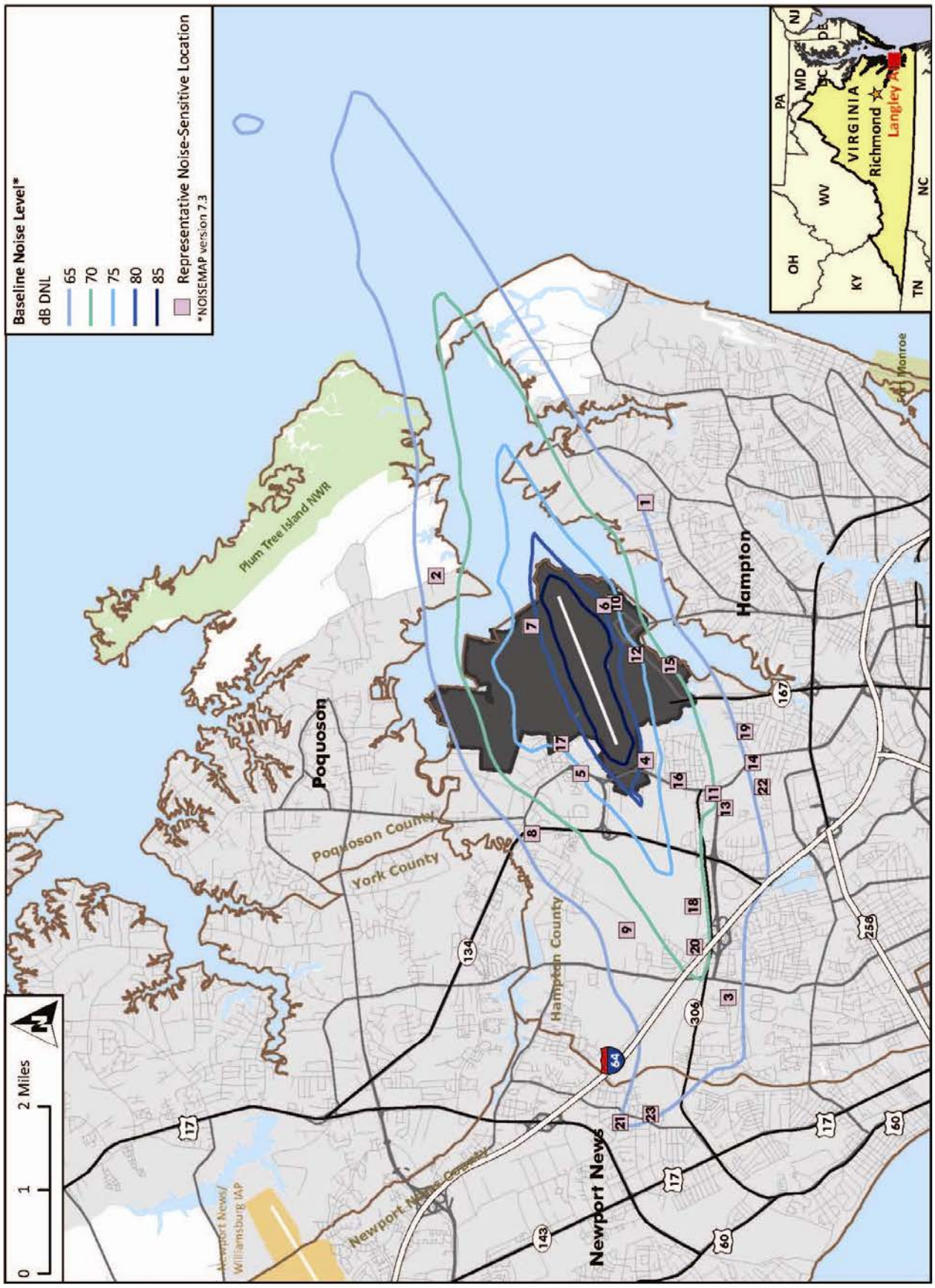


Figure 3-2. Baseline Noise Contours at Langley AFB

Table 3-3. Number of Acres Affected by Greater Than 65 DNL Under Baseline Conditions

Contour Interval decibels (dB) Day-Night Average Sound Level (DNL)	Hampton (Off-Installation)	Poquoson (Off-Installation)	Newport News (Off-Installation)	Langley Air Force Base (AFB)	Open Water	Total Off Base Land
Total ≥ 65	7,034	483	265	2,840	6,021	7,782
65-69	4,261	432	265	227	3,493	4,958
70-74	2,129	51	0	634	1,876	2,180
75-79	608	0	0	858	572	608
80-84	34	0	0	474	80	34
≥85	2	0	0	647	0	2

Noise levels at representative noise sensitive locations are listed in Table 3-4*; Noise Levels at Representative Noise-Sensitive Locations under Baseline Conditions*. DNL at these locations is between 65 and 80 dB and L_{eq} is between 63 and 78 dB.

Table 3-4. Noise Levels at Representative Noise-Sensitive Locations Under Baseline Conditions

ID	Location Description	DNL decibels (dB)	L_{eq} decibels (dB)
Residential Areas			
1	Residential #1 - Fox Hill	65	63
2	Residential #2 - Poquoson	68	67
3	Residential #3 - Michael's Woods	67	67
4	Residential #4 - Mobile Home Park Outside West Gate	78	78
5	Residential #5 - Mobile Home Park Near Langley Speedway	75	74
6	Residential #6 - Langley AFB Officer's Housing	80	77
7	Residential #7 - Langley AFB Enlisted Base Housing	78	77
Places of Worship			
8	Emmanuel Lutheran Church	67	67
9	Faith Baptist Church	68	67
10	Langley AFB Chapel	76	74
11	Sharon Baptist Church	70	70
Hospitals			
12	Langley AFB Hospital	76	74
13	Sentara Hospital	70	69
Schools and Other Educational Facilities			
14	Hampton Christian Academy	64	64
15	Langley AFB CDC	70	69
16	Machen Elementary School	72	72
17	NASA LaRC CDC	75	75
18	New Horizons Regional Education Center	72	72
19	Paul Burbank Elementary School	64	63
20	Thomas Nelson Community College	72	71
21	Watkins Elementary School	65	64
22	William Mason Cooper Elementary School	64	63
23	Peninsula Catholic School	66	65

Key:
AFB = Air Force Base
CDC = Child Development Center
DNL = Day-Night Average Sound Level
LaRC = Langley Research Center
L_{eq} = Equivalent Sound Level

Airspace - Special Use Airspace (SUA) in the ROI has been used for training of military aircraft including F-18E/F, F-15C, and F-22A. Noise levels associated with over flights of these aircraft

types in configurations typically utilized in training airspace are shown in Table 3-5, *Direct Over flight Noise Levels in dB SEL Generated by F-18, F-22A, F-15C, and F-16 Aircraft*. In Fiscal Year (FY) 2009, the First Fighter Wing (1 FW) flew approximately 8,900 sortie-operations in SUA units most of which were conducted in warning areas W-386 (78 percent) and W-72 (20 percent), which are located over the Atlantic Ocean. The remaining two percent of training operations were conducted in Evers Military Operations Area (MOA), Farmville MOA, Hatteras B Air Traffic Control Airspace (ATCAA), and W-72. The 1 FW aircraft operations in these airspace units are relatively infrequent, occurring less than once per four days on average.

Table 3-5. Direct Over flight Noise Levels in dB SEL Generated by F-18, F-22A, F-15C and F-16 Aircraft [1]

Aircraft Type	Airspeed[2]	Power Setting[2]	500 AGL	1,000 AGL	2,000 AGL	5,000 AGL	10,000 AGL
F-18E/F	325	96 %N2	121	116	110	100	91
F-22A	450	70 %ETR	116	111	104	95	86
F-15C	520	81 %NC	112	107	101	90	80
F-16[3]	250	90 %NC	111	106	100	90	81

Notes:
1 Calculated using SEL_Calc under standard acoustical conditions (70° Fahrenheit and 59% relative humidity)
2 Representative aircraft configuration while in training airspace
3 Equipped with Pratt and Whitney 220 engine

Key:
AGL = Above Ground Level N2 = engine speed at indicator #2 NC = percent core RPM
ETR = Engine Thrust Request

3.2 Air Quality:

Air quality is determined by the size and topography of the air basin, the local and regional meteorological influences, and the type and concentration of pollutants in the atmosphere, which are generally expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). The "criteria" pollutants of concern are Ozone (O_3), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Sulfur Dioxide (SO_2), Particulate Matter equal to or less than 10 microns in diameter (PM_{10}), Particulate Matter equal to or less than 2.5 microns in diameter ($PM_{2.5}$), and lead (Pb). One aspect of significance is a pollutant's measured concentration in comparison to a national and/or state Ambient Air Quality Standard (AAQS), which represent the maximum allowable atmospheric concentrations that may occur and still protect public health and welfare; including a reasonable margin of safety to protect the more sensitive individuals in the population.

The Clean Air Act (CAA) (USC 42, Chapter 85, as amended in 1990) is the law that defines the responsibilities of the United States (U.S.) Environmental Protection Agency (EPA) for protecting and improving the nation's air quality and the ozone layer. National standards have been established by the USEPA and are termed the National Ambient Air Quality Standards (NAAQS). They represent the maximum acceptable concentrations that generally may not be exceeded more than once per year, except for the annual standards, which may never be exceeded. The CAA and its subsequent amendments delegate the enforcement of these standards to the states, which may adopt the NAAQS as state standards or establish more stringent acceptable pollutant concentration levels if they deemed them necessary. The federal/state ambient air quality standards are presented in Table 3-6, *National and Virginia State Ambient Air*

Quality Standards (AAQS).

Table 3-6. National and Virginia State Ambient Air Quality Standards (AAQS)

Air Pollutant	Averaging Time	Virginia Ambient Air Quality Standards (AAQS) [a,b]	National AAQS [a,b]	
			Primary [c]	Secondary [d]
Carbon Monoxide (CO)	8-Hour 1-Hour	9 ppm 35 ppm	9 ppm 35 ppm	-- --
Nitrogen Dioxide (NO_2)	Annual 1-Hour	0.053 ppm 0.1 ppm	0.053 ppm 0.1 ppm	0.053 ppm --
Sulfur Dioxide (SO_2)	Annual 24-Hour 3-Hour 1-Hour[e]	0.03 ppm 0.14 ppm 0.50 ppm --	-- -- -- 0.75 ppm	-- -- 0.5 ppm --
Particulate Matter (PM_{10}) [f]	Annual 24-Hour	50 µg/m^3 150 µg/m^3	-- 150 µg/m^3	-- 150 µg/m^3
Particulate Matter ($PM_{2.5}$) [g]	Annual 24-Hour	15 µg/m^3 35 µg/m^3	15 µg/m^3 35 µg/m^3	15 µg/m^3 35 µg/m^3
Ozone (O_3) [h]	8-Hour	0.075 ppm	0.075 ppm	0.075 ppm
Lead and Lead Compounds (Pb)	Calendar Quarter Rolling 3-month [i]	1.5 µg/m^3 0.15 µg/m^3	1.5 µg/m^3 0.15 µg/m^3	1.5 µg/m^3 0.15 µg/m^3

Notes:

a The NAAQS and Virginia State standards are based on standard temperature and pressure of 25ºCelsius and 760 millimeters of mercury, respectively. Units of measurement are ppm and µg/m^3.

b National and Virginia state standards, other than those based on annual or quarterly arithmetic mean, are not to be exceeded more than once per year.

c National Primary Standards: The levels of air quality necessary to protect the public health with an adequate margin of safety. Each state must attain the primary standards no later than three years after the State Implementation Plan (SIP) is approved by the USEPA.

d National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a reasonable time after the SIP is approved by the USEPA.

e Not to be exceeded more than twice in seven consecutive days.

f PM_{10} is particulate matter smaller than 10 microns (also called fugitive dust). The three-year average of the 99th percentile (based on the number of samples taken of the daily concentrations) must not exceed the standard.

g $PM_{2.5}$ is particulate matter smaller than 2.5 microns. The three-year annual average of the daily concentrations must not exceed the standard.

h The three-year average of the fourth highest daily maximum 8-hour average concentration must not exceed the standard. As of June 15, 2005, USEPA revoked the 1-hour ozone standard in all areas except the 8-hour ozone nonattainment Early Action Compact Areas, none of which occur in the Hampton area.

i Final rule on rolling three-month average for lead was signed October 15, 2008.

Key:

ppm = parts per million

µg/m^3 = micrograms per cubic meter

Sources: EPA 2010a; VAC 1990

Langley AFB is located in Hampton, Virginia and is under the jurisdiction of the Virginia Department of Environmental Quality (VDEQ). The State Air Pollution Control Board promulgates Virginia's air regulations, which cover stationary and mobile sources emissions within the state. The Air Quality Division enforcement actions are governed by § 10.1-1186 (10) of the Code of Virginia. Hampton, Virginia, is within the Intrastate Hampton Roads Air Quality Control Region (AQCR) #223, which includes four counties (Isle of Wight, James City, Southampton, and York Counties), as well as ten independent cities (Chesapeake, Franklin, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg). This area includes substantial industry, several military and commercial airfields, and a large population that generates emissions. Table 3-7, *Baseline Emissions for Langley AFB Affected Environment* summarizes the baseline emissions (stationary and mobile) of criteria pollutants and precursor emissions for this AQCR. For each criteria pollutant,

Langley AFB contributes less than 1 percent of the regional emissions. The base has been issued a Synthetic Minor operating permit from VDEQ Title V program.

Table 3-7. Baseline Emissions for Langley AFB Affected Environment

	Total Emissions (tons/year)					
	CO	**NO_X**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**VOC**
Hampton Roads AQCR	98,096	22,687	11,834	5,363	46,085	15,105
Langley AFB						
--Stationary Sources	21.38	28.85	7.70	N/A	1.57	42.73
--Mobile Sources	19.58	13.02	2.13	N/A	0.03	3.83

Key:
AFB = Air Force Base
AQCR = Air Quality Control Region
CO = Carbon Monoxide
NO_x = Nitrogen Oxide
$PM_{2.5}$ = Particulate Matter less than 2.5 microns in diameter
PM_{10} = Particulate Matter less than 10 microns in diameter
SO_x = Sulfur Oxide
VOC = Volatile Organic Compounds

Sources: Langley AFB 2009; EPA 2010a

CAA Section 176(c), General Conformity Rule, requires that federal agency actions be consistent with the CAA and any approved State Implementation Plan (SIP), which are required to help a nonattainment region achieve attainment of the NAAQS. To implement this mandate, EPA promulgated the General Conformity Rule for general federal actions in the November 30, 1993 Federal Register (58 FR 63214-63259), effective on January 31, 1994 (EPA 2010b). In 2006, the EPA revised the General Conformity Rule to include *de minimis* emission levels for $PM_{2.5}$ and its precursors (EPA 2006).

On April 5, 2010, EPA finalized revisions to the General Conformity Rule that improve on the methods federal agencies can use to demonstrate conformity (75 Federal Register [FR] 17253-17279) (EPA 2010b). These revisions took effect on July 6, 2010. Federal activities must not:

1. Cause or contribute to any new violation;
2. Increase the frequency or severity of any existing violation; or
3. Delay timely attainment of any standard, interim emission reductions, or milestones in conformity to a SIP's purpose of eliminating or reducing the severity and number of NAAQS violations or achieving attainment of NAAQS.

The General Conformity Rule applies to federal actions affecting areas that are in nonattainment of a NAAQS and to designated maintenance areas (attainment areas that were reclassified from a previous nonattainment status and are required to prepare a maintenance plan for air quality). Conformity requirements only apply to nonattainment and maintenance pollutants and their precursor emissions. Conformity determinations are required when the annual direct and indirect emissions from a proposed federal action that equal or exceed an applicable annual *de minimis* threshold. These thresholds vary by pollutant and the severity of nonattainment conditions in the region affected by the proposed federal action.

Since the project is located in a maintenance area for ozone, the requirements of EPA's General

Conformity Rule are applicable to ozone precursor (NO_x and Volatile Organic Compounds [VOC]) emissions that would occur from the proposed action within this area. If the emissions from a federal action proposed in such an area exceed annual emission thresholds identified in the rule (*de minimis* levels), 100 tons per year for NO_x or VOCs, a conformity determination is required for that action (40 CFR Ch. I 93.152). If emissions from the Proposed Action exceed the conformity rule *de minimis* thresholds, the Air Force must demonstrate that these emissions would conform to the SIP through application of one or more of the criteria for determining conformity of general federal actions as prescribed in Title 40 of the CFR, Section 93.158, under the procedures prescribed in 40 CFR, Section 93.159, and PCC Title 17, Section 17.12.140(B)(1).

Section 162 of the CAA established the goal of prevention of significant deterioration (PSD) of air quality in all international parks; national parks exceeding 6,000 acres in size; and national wilderness areas exceeding 5,000 acres (if these areas were in existence on or before August 7, 1977). Such areas were defined as mandatory Class I areas, while all other attainment or unclassifiable areas were defined as Class II areas. Under CAA Section 164, states or tribal nations, in addition to the federal government, have the authority to re-designate certain areas as (non-mandatory) PSD Class I areas, i.e., a National Park or national wilderness area established after August 7, 1977 whose area exceeds 10,000 acres. Class I areas are areas where any appreciable deterioration of air quality is considered significant. Class II areas are those where moderate, well-controlled growth could be permitted. The PSD requirements affect construction of new major stationary sources in the Class I, II, and III areas and are a pre-construction permitting system.

The nearest PSD Class I area to the proposed action is Shenandoah National Park, which is more than 100 miles west of the region potentially affected by the Proposed Action.

Climate Change and Greenhouse Gases (GHGs) - Gases that trap heat in the atmosphere. These emissions are generated by both natural processes and human activities. The accumulation of GHGs in the atmosphere regulates the earth's temperature. GHGs include water vapor, Carbon Dioxide (CO_2), methane (CH_4), Nitrous Oxide (N_2O), Ozone (O_3), and several hydrocarbons (HCs) and chlorofluorocarbons (CFCs). Each GHG has an estimated Global Warming Potential (GWP), which is a function of its atmospheric lifetime and its ability to absorb and radiate infrared energy emitted from the Earth's surface. The GWP of a particular gas provides a relative basis for calculating its carbon dioxide equivalent (CO_2e) or the amount of CO_2 that would equal the emissions of that gas. CO_2 has a GWP of one, and is; therefore, the standard by which all other GHGs are measured.

The potential effects of GHG emissions from the Proposed Action 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 climate change or resulting environmental impact. Nonetheless, the GHG emissions from the project alternatives have been quantified to the extent feasible in this document for information and comparison purposes. Following is a summary of the federal and DoD air quality rules and regulations that may apply to GHG emission sources associated with the proposed action and alternative.

The EPA issued the *Final Mandatory Reporting of Greenhouse Gases Rule* on 30 October 2009 (USEPA 2009). This rule does not apply to mobile sources of GHGs and would not apply to the Langley AFB airspace training activities, but would apply to installation and ground-based

emissions. EOs 13423 and 13514, instruct federal agencies to meet specific goals to improve energy efficiency and to track and reduce GHG emissions by annual energy usage reductions of three percent through the end of FY15, or by 30 percent by the end of FY15, relative to the baseline energy use of the agency in FY 2003. In general, EOs 13423 and 13514 apply to activities and operations at the installation rather than to aircraft training activities. Executive Order (EO) 13514 § 19 (h) identifies an exemption for non-road equipment, vehicles and equipment, including aircraft, that are used in combat support or training for such operations. Thus, Langley AFB training activities are exempt from EO 13423.However these exemptions do not apply when it comes to NEPA regulation and the GHG emissions from these operations must be assessed.

On February 18, 2010, the Council on Environmental (CEQ) issued for public comment draft guidance *Consideration of the Effects of Climate Change and Greenhouse Gas Emissions*, the first draft guidance on how federal agencies should evaluate the effects of climate change and GHG emissions for NEPA documentation (CEQ 2010). The proposed guidance did not identify any significance thresholds for NEPA analysis.

3.3 Hazardous Materials and Waste:

The 2002 EIS adequately addresses hazardous materials and wastes associated with maintaining the F-22A aircraft; hazardous materials and waste associated with the proposed action would not exceed projections in the 2002 EIS.

Maintenance of T-38A aircraft differs from the F-22AA in that T-38A aircraft operating in a salt air environment (such as Langley AFB) require an engine wash every seven days, in order to mitigate the corrosive effects on the engines. The engine wash procedure consists of spraying a liquid cleaning solution through the air intake while the engine runs a low speed, increasing engine speed to 50% power to dry the turbine blades, and then spraying the engine with corrosion preventative upon completion.

This engine cleaning process at Langley AFB will utilize Type II and Type III cleaning solutions, which are aqueous-based solvents, and do not contain Volatile Organic Compounds, Semi-Volatile Organic Compounds, or petroleum-based solvents. Type II and III cleaners do not impact air quality; therefore waste water from the engine wash process containing these cleaners can be disposed of in an evaporator. Type I engine cleaners were not selected because they are petroleum based, may adversely affect the installation's air and water permits, and require more expensive waste handling procedures.

Each individual engine washing evolution uses 20 gallons of cleaning solution. Langley AFB is expected to use 280 gallons of engine cleaning solution each week for maintaining the 14 T-38A aircraft. The engine wash cleaning process produces a fine mist spray from the engine exhaust. Langley AFB designed a portable effluent collection cart which captures 100% of the residual engine mist material and waste water during the wash process; waste water is expected to contain oil and grease, Total Suspended Solids (TSS), Biochemical Oxygen Demand/Chemical Oxygen Demand (BOD/COD) and Diesel Range Organics (DRO). This closed-loop waste water capture system allows engine maintenance personnel to drain the effluent into 55 gallon drums and transport the effluent to the base wastewater evaporators for disposal.

3.4 Environmental Justice:

Concern that certain disadvantaged communities may bear a disproportionate share of adverse health and environmental effects compared to the general population led to the enactment in 1994 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 addition, 32 CFR 989.33, addresses the need for consideration of environmental justice issues in compliance with NEPA. EO 12898 applies to federal agencies that conduct activities that could substantially affect human health or the environment.

Environmental justice analysis also addresses the protection of children, as required by EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks* (*Protection of Children*), issued in 1997 to identify and address issues that affect the protection of children. According to the EO, all federal agencies must assign a high priority to addressing health and safety risks to children, to coordinating research priorities on children's health, and to ensuring that their standards take into account special risks to children. The EO states "…environmental health risks and safety risks' mean risks to health or to safety that are attributable to products or substances that the child is likely to come in contact with or ingest (such as the air we breathe, the food we eat, the water we drink or use for recreation, the soil we live on, and the products we use or are exposed to)."

The ROI for the resources supporting environmental justice and protection of children is defined as the region in which there is the potential for adverse impacts from flight operations. This region includes the area potentially impacted by high noise levels. In accordance with the *Guide for Environmental Justice Analysis with the Environmental Impact Analysis Process (EIAP)* (Air Force 1997*)*, the ROI is compared to the community of comparison, which is defined as the combination of the independent cities of Hampton, Poquoson, and Newport News.

Baseline noise levels affect an estimated 18,070 persons with noise levels greater than 65 dB L_{dn}. Of these persons affected, approximately 59.2 percent are minority and 7.6 percent are low-income. As the community of comparison required from environmental justice analysis, Table 3-8, *Community of Comparison Demographics Year 2010* identifies total population and percentage populations of concern in the cities comprising the total community of comparison, the commonwealth of Virginia, and the U.S.

Table 3-8. Community of Comparison Demographics, Year 2010

Region	Total Population	Percent Minority	Percent Low-Income*	Percent Youth
Langley Community of Comparison	330,305	54.3%	13.3%	23.7%
Hampton	137,436	59.0%	13.4%	22.8%
Newport News	180,719	54.0%	13.8%	24.3%
Poquoson	12,150	6.2%	4.5%	24.4%
Virginia	8,001,024	35.2%	9.4%	23.2%
United States	308,745,538	36.3%	13.5%	24.0%

Note: *The 2010 Census did not collect income data. Low-income information is based on 2005-2009 estimates from the American Community Survey.
Sources: Census 2010a, Census 2010b

Minority persons in the Langley Community of Comparison represent a higher proportion of the total population as compared to the state or the nation. Minority persons account for 54.3 percent of the total population, 35.2 percent in the state, and 36.3 percent in the nation. The percentage of persons with incomes below the poverty level was higher in the Langley Community of Comparison compared to the level for the state and nation while the percentage of children under 18 was comparable to the state and nation. There are ten schools and learning centers affected by noise levels of 65 dB L_{dn} and greater under baseline conditions.

The additional F-22As and T-38As would primarily use the offshore warning areas for flight training. Therefore, no populations of concern identified for environmental justice analysis would be affected. The proposed use of the overland MOAs by F-22A aircraft and T-38A aircraft would represent a decrease of the use of those airspace units by Langley-based aircraft. Therefore, it was determined that an environmental justice analysis from noise or other environmental resources under environmental justice is not required for areas under the overland MOAs.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Noise:

Noise, which is defined simply as unwanted sound, has the potential to impact several environmental resource areas. In this section, noise impacts are assessed regarding annoyance, speech/learning interference, potential hearing loss, non-auditory health risk, and potential damage to structures. Noise impacts on biological resources, socioeconomics, environmental justice, land use, and cultural resources are discussed in separate sections dealing with those subjects.

Annoyance represents the most common noise impact. Social surveys have shown a high correlation between the percentages of highly annoyed people and the average noise level measured using the DNL metric (Fidell *et al.* 1991; Schultz 1978). The correlation is lower for predicting the annoyance of individuals, which is not a surprise considering the varying personal factors that influence the manner in which individuals react to noise. Nevertheless, findings substantiate the claim that community annoyance in response to aircraft noise is predicted

reliably using DNL. The findings of these studies are summarized in Table 4-1, *Relation between Noise Level Metrics DNL and Annoyance*.

Table 4-1. Relation between Noise Level Metrics DNL and Annoyance

Day-Night Average Sound Level (DNL)	Average Percentage of Population Highly Annoyed
55	3.3
60	6.5
65	12.3
70	22.1
75	36.5

A primary cause of noise-induced annoyance is interference with activities that involve listening such as conversation, watching television, and listening to the radio. The disruption usually only lasts a few seconds, and usually lasts less than 10 seconds. It is difficult to predict speech intelligibility during a single over flight event, because people naturally raise their voices as background noise increases. In 1974, USEPA identified a goal of an indoor 24-hour average sound level of 45 dB to minimize speech interference based on the intelligibility of sentences in the presence of a steady background noise (USEPA 1974). A noise level of less than 45 dB L_{eq} allows an average adult with normal hearing and fluency in the language 100 percent intelligibility of sentences. Typical home insulation reduces the noise levels experienced indoors by 20 dB or more, reducing speech interference.

While the issue of noise impacts on children's learning is not fully settled, the American National Standards Institute (ANSI) has released a classroom acoustics standard entitled "Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools" (ANSI S12.60-2009). According to the standard, background noise levels in the classroom for intermittent noise from transportation sources such as aircraft operations should not exceed 40 dB L_{eq} during any hour of the school day. To compare the outdoor noise levels to indoor recommended values, outdoor noise levels are adjusted to account for the noise level reduction provided by the structure. Typical noise level reduction values are 15 dB with windows open and 25 dB with windows closed, but vary by structure, climate, and noise sources. It was assumed that each of the schools in the list of sensitive receptors maintains a "windows closed" condition and provides approximately 25 dB of noise level reduction. Therefore, the highest recommended L_{eq} level outside a school would be 64 dB. While this standard is not a requirement for school systems to follow, it is applicable, as a design guideline, to new construction as well as renovations of existing facilities, and is recommended to achieve a high degree of speech intelligibility in learning spaces.

Noise-related hearing loss risk has been studied extensively. As per a DoD policy memorandum published in 2009, populations exposed to noise greater than 80 dB DNL are at the greatest risk of population hearing loss (UDATL 2009). The DoD policy directs that hearing loss risk should be assessed using the methodology described in EPA Report No. 550/9-82-105, *Guidelines for Noise Impact Analysis* (EPA 1982). EPA's *Guidelines for Noise Impact Analysis* quantify hearing loss risk in terms of Noise-Induced Permanent Threshold Shift (NIPTS), a quantity that defines the permanent change in the threshold level below which a sound cannot be heard. NIPTS is stated in terms of the average threshold shift at several frequencies that can be expected from daily exposure to noise over a normal working lifetime of 40 years, with the exposure

beginning at the age of 20 years and with exposure lasting 8 hours per day for 5 days per week. The actual value of NIPTS for any given person would depend on that individual's physical sensitivity to noise—over a 40-year working lifetime, some people would experience more loss of hearing than other people would. Many people would be inside their homes and would, therefore be exposed to lower noise levels due to noise attenuation provided by the house structure. A two-year EPA-sponsored telephone survey of more than 9,000 persons found that the average American spends approximately 87 percent of their time indoors (Klepeis *et al*. 2001). This percentage was found to be fairly constant across the 48 contiguous U.S. Table 4-2, *Estimated Average NIPTS and 10th Percentile NIPTS as a Function of DNL* shows the "average NIPTS" (10th to 90th percentiles of the exposed population) and the "10th percentile" NIPTS (NIPTS for the most sensitive 10 percent of the population) as a function of DNL. The table shows expected impacts if the person were fully exposed to the noise level at their residence (i.e., outdoors 100% of the time) or outdoors for the national average percent of the day. The actual exposure of any given individual to noise depends on factors such as whether a person were at home during the daytime hours when most flying occurs which are not known. For the purposes of this study, it is assumed that persons would be at their residences during these hours.

Table 4-2. Estimated Average NIPTS and 10th Percentile NIPTS as a Function of DNL[1]

DNL	100% of Time Outdoors		National Average % Time Indoors	
	Average NIPTS (dB)[2]	10th Percentile NIPTS (dB)[2]	Average NIPTS (dB)[2]	10th Percentile NIPTS (dB)[2]
80–81	3	7	N/A[3]	N/A[3]
81–82	3.5	8	N/A[3]	N/A[3]
82–83	4	9	1	3.5
83–84	4.5	10	1	4
84–85	5.5	11	1.5	4.5
85–86	6	12	2	5.5
86–87	7	13.5	2.5	6.5
87–88	7.5	15	3	7
88–89	8.5	16.5	3.5	8
89–90	9.5	18	4	9

Notes:
[1] Relationships between DNL and NIPTS were derived from CHABA 1977.
[2] NIPTS values rounded to the nearest 0.5 dB.
[3] Equivalent exposure noise level is less than 75 dB DNL, below the threshold at which NIPTS has been demonstrated to occur

Key:
db = decibels N/A = Not Applicable NIPTS = Noise Induces Permanent Threshold Shift
DNL = Day-Night Average Sound Level

According to the EPA documents titled Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, and Public Health and Welfare Criteria for Noise, changes in hearing levels of less than 5 dB are generally not considered noticeable or significant (USEPA 1974). There is no known evidence that an NIPTS of less than 5 dB is perceptible or has any practical significance for the individual. Furthermore, the variability in audiometric testing is generally assumed to be ± 5 dB. The preponderance of available information on hearing loss risk for the adult working population is provided workplaces with continuous exposure throughout the day for many years. According to a report by Ludlow and Sixsmith, there were no significant differences in audiometric test results between military personnel who, as children, had lived in or near stations where jet operations were based, and a similar group who had no such exposure as children (Ludlow and

Sixsmith 1999). Hence, for the purposes of hearing loss analysis, it could be assumed that the limited data on hearing loss are applicable to the general population, including children, and provide a conservative estimate of hearing loss.

Individuals working in known high noise exposure locations on Langley AFB are subject to the occupational noise regulations in accordance with DoD, Air Force, Occupational Safety, and Health Administration, and National Institute of Occupational Safety and Health regulations. These regulations have been developed to reduce the risk of workers developing noise-induced hearing loss. Compliance with the noise exposure limits stated in the regulations may require workers to wear hearing protection.

Non-auditory health effects of long-term noise exposure where noise may act as a risk factor have not been found to occur at levels below those protective against NIPTS. Most studies attempting to clarify such health effects have found that noise exposure levels established for hearing protection will also protect against any potential non-auditory health effects, at least in workplace conditions. The potential for noise to affect physiological health, such as the cardiovascular system, has been brought up; however, no unequivocal evidence exists to support such claims (Harris 1997). Additional claims that are unsupported include flyover noise producing increased mortality rates, adverse effects on the learning ability of middle and low aptitude students, aggravation of post-traumatic stress disorder, increased stress, increase in admissions to mental hospitals, and adverse effects on pregnant women and fetuses (Harris 1997). Research studies regarding the non-auditory health effects of aircraft noise are ambiguous, at best, and often contradictory.

While certain frequencies may be of more concern than other frequencies, conservatively, only subsonic aircraft noise lasting more than 1 second above a sound level of 130 dB is potentially damaging to structural components (CHABA 1977). Sound levels at damaging frequencies (e.g., 30 hertz for window breakage or 15 to 25 hertz for whole-house response) produced by most military aircraft are rarely above 130 dB. Noise induced structural vibration may also annoy dwelling occupants because of induced secondary vibrations or "rattle" of objects (such as hanging pictures, dishes, plaques, and bric-a-brac) within the dwelling.

Under the Proposed Action, F-22A aircraft sorties per year would decrease from 11,187 (2002 EIS) to 8,064 and T-38A sorties would increase from approximately zero (transient operations only) to 2,250 per year. Based F-15C aircraft operations would not occur under the Proposed Action. For the purposes of noise analysis, incoming F-22A aircraft were assumed to conduct closed pattern flying operations (i.e. repeated practice approaches to the field) at the same frequency as F-22A aircraft currently based at Langley AFB. T-38A aircraft would be expected to conduct an average of a second approach for every ten sorties. Night flying is required to maintain pilot proficiency. Approximately four percent of total F-22A arrivals would be conducted after 10:00 PM or before 7:00 AM, the same percentage of F-22A arrivals conducted after 10:00 PM currently. No departures or second approaches to the airfield would be conducted by F-22A aircraft during this late-night time period. T-38A aircraft would not be expected to conduct operations of any type between 10:00 PM and 7:00 AM.

Noise levels (dB SEL) associated with direct over flight by F-22A, T-38A, F 15C, and F-16 aircraft in typical takeoff configuration are listed in Table 4-3, *Direct Over flight Noise Levels in*

dB SEL Generated by F-22A, T-38A, F-15C, and F-16 Aircraft. Individual over flights of the additional F-22A aircraft would sound the same as over flights of F-22A aircraft currently based at Langley AFB. T-38A aircraft operations are generally less loud than F-22A aircraft operations. T-38 aircraft typically use afterburner during aircraft takeoff rolls, but disengage the afterburner at liftoff. F-22A aircraft, on the other hand, use afterburner during takeoff only very rarely. T-38 aircraft in afterburner power setting generate 117 dB SEL at a distance of 500 feet, which is substantially more noise than a T-38A aircraft in military power generates, but still less noise than is generated by an F-22A in military power.

Table 4-3. Direct Over flight Noise Levels in dB SEL Generated by F-22A, T-38A, F 15C and F-16 Aircraft

Aircraft Type	Airspeed	Power Setting*	500 AGL	1,000 AGL	2,000 AGL	5,000 AGL	10,000 AGL
F-22A (military power)	250	100 %ETR	125	120	114	104	96
T-38A (afterburner power)	250	Afterburner	117	111	105	95	86
T-38A (military power)	250	100 %RPM	112	106	100	89	79
F 15C	250	90 %NC	118	113	107	98	89
F-16C	250	90 %NC	113	108	102	93	83

Note: * Typical non-afterburner takeoff configuration

Key:
AGL = Above Ground Level NC = percent core RPM RPM = rotations Per Minute
ETR = Engine Thrust Request

Noise impacts under the Proposed Action were calculated using the NOISEMAP program, version 7.3 and are shown overlain on baseline noise contours in Figure 4–1, *Noise Contours Under the Proposed Action and Baseline Conditions*. The total off-base land area affected by noise levels greater than or equal to 65 dB DNL would decrease by approximately 57 acres relative to baseline conditions (Table 4-4, *Acres Affected by Noise Level Greater than 65 DNL under the Proposed Action and Baseline Conditions*). In general, noise levels would decrease slightly at greater distances outward from the runway along the extended runway centerline, but would increase laterally near the runway. F 15C aircraft, which were present under baseline conditions, but which are not present under the Proposed Action, climb more slowly than F-22A aircraft, generating noise levels exceeding 65 DNL in areas relatively distant from the runway. F-22A aircraft are slightly louder than F-15C aircraft in takeoff configuration and generate slightly higher noise levels near the runway. The net result of these aircraft operational and noise characteristics is that the more intense F-22A noise is relatively more concentrated near the installation resulting in "shorter and wider" noise contours.

Table 4-4. Acres Affected by Noise Level Greater than 65 DNL under the Proposed Action and Baseline Conditions

Contour Interval (dB DNL)	Hampton (Off-Installation)	Poquoson (Off-Installation)	Newport News (Off-Installation)	Langley AFB	Open Water	Total Off-base Land
Baseline Conditions						
Total ≥ 65	7,034	483	265	2,840	6,021	7,782
65-69	4,261	432	265	227	3,493	4,958
70-74	2,129	51	0	634	1,876	2,180
75-79	608	0	0	858	572	608
80-84	34	0	0	474	80	34
≥85	2	0	0	647	0	2
Proposed Action						
Total ≥ 65	7,119	606	0	2,865	6,135	7,725
65-69	4,269	529	0	176	3,556	4,798
70-74	2,234	77	0	519	1,890	2,311
75-79	583	0	0	981	623	583
80-84	30	0	0	519	65	30
≥85	3	0	0	670	1	3

Key:
AFB = Air Force Base db = decibels DNL = Day-Night Average Sound Level

The estimated number of off-base residents exposed to noise levels greater than or equal to 65 DNL would decrease by 551 from 18,070 to 17,519. Approximately 12,497 residents would be exposed to 65-69 DNL, 4,455 residents would be exposed to 70-74 DNL, and 545 residents would be exposed to 75-79 DNL. The numbers of residents affected by noise greater than 65 DNL were estimated using 2010 U.S. Census data at the block level prorated by area within each block affected by each noise contour interval. Areas exposed to noise levels at or greater than 80 DNL were examined closely using aerial photography and visual survey confirmation and found not to include any residential structures. Residents estimated to live in this area based on the Census block area prorating method were re-assigned to the 75-79 DNL contour intervals, where residential structures are located (Figure 4–2, *Noise Contours Under the Proposed Action and Baseline Conditions*). The total number of persons affected by noise levels greater than or equal to 65 DNL would decrease while the time-averaged noise levels would increase in some areas, such as the Fox Hill area in the City of Hampton and the Messick area in the City of Poquoson. Any persons experiencing an increase in noise level would be more likely to become annoyed by the noise.

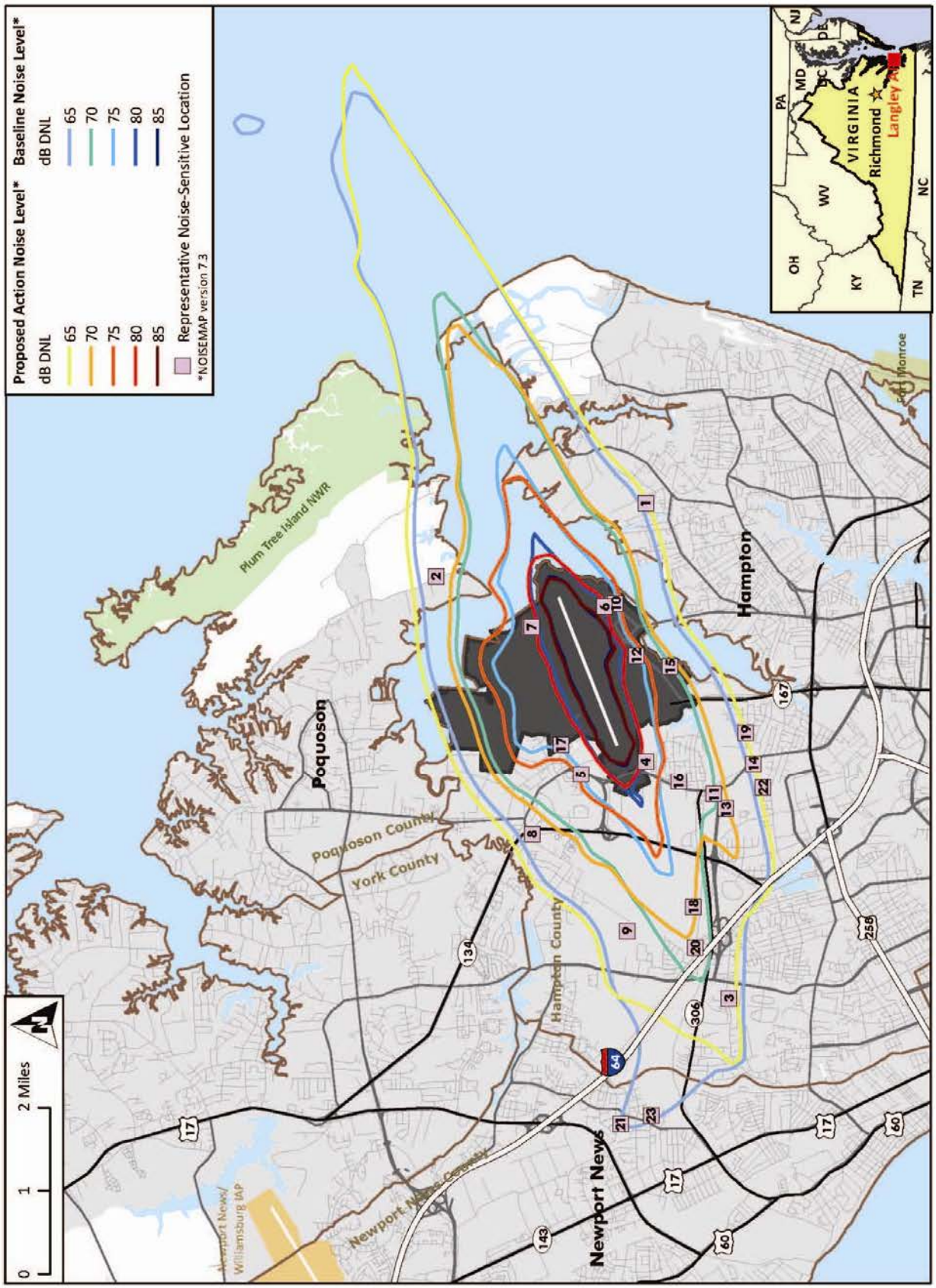


Figure 4-1. Noise Contours Under the Proposed Action and Baseline Conditions

Table 4-5, *Noise Levels at Selected Noise-Sensitive Locations under Baseline Conditions and the Proposed Action* lists noise levels at several representative noise sensitive locations under baseline conditions and the Proposed Action. According to Air Force guidelines published in Air Force Handbook 32-7084, residences, places of worship, and hospitals are not considered compatible at 65 DNL or greater unless special measures are taken to reduce interior noise levels. At 75 DNL and greater, these land uses are never considered to be compatible. All of the residential locations listed in the following table are incompatible (>75 DNL) or conditionally incompatible (65-75 DNL) per AF guidelines under baseline conditions and would continue to be incompatible under the Proposed Action. Changes in DNL under the Proposed Action range from decreases of 3 dB to increases of 1 dB. To put these changes in perspective, changes in instantaneous noise level of less than 3 dB are normally not noticeable except under laboratory conditions. Although unlikely, increases in the frequency of operations could be noticed and could result in additional annoyance for persons at these locations.

Table 4-5. Noise Levels at Selected Noise-Sensitive Locations Under Baseline Conditions and the Proposed Action

ID	Location Description	Baseline DNL (dB)	Proposed DNL (dB)	Baseline L_{eq} (dB)	Proposed L_{eq}
Residential Areas					
1	Residential #1 - Fox Hill	65	66	63	64
2	Residential #2 - Poquoson	68	68	67	68
3	Residential #3 - Michael's Woods	67	66	67	66
4	Residential #4 - Mobile Home Park Outside West Gate	78	78	78	78
5	Residential #5 - Mobile Home Park Near Langley Speedway	75	75	74	75
6	Residential #6 - Langley AFB Officer's Housing	80	81	77	78
7	Residential #7 - Langley AFB Enlisted Base Housing	78	79	77	78
Places of Worship					
8	Emmanuel Lutheran Church	67	68	67	68
9	Faith Baptist Church	68	68	67	67
10	Langley AFB Chapel	76	77	74	75
11	Sharon Baptist Church	70	71	70	71
Hospitals					
12	Langley AFB Hospital	76	77	74	75
13	Sentara Hospital	70	71	69	70
Schools and Other Educational Facilities					
14	Hampton Christian Academy	64	65	64	65
15	Langley AFB CDC	70	71	69	70
16	Machen Elementary School	72	72	72	72
17	NASA LaRC CDC	75	76	75	76
18	New Horizons Regional Education Center	72	70	72	70
19	Paul Burbank Elementary School	64	65	63	64
20	Thomas Nelson Community College	72	70	71	69
21	Watkins Elementary School	65	62	64	62
22	William Mason Cooper Elementary School	64	65	63	64
23	Peninsula Catholic School	66	63	65	62

Key:
AFB = Air Force Base
CDC = Child Development Center
DNL = Day-Night Average Sound Level
LaRC = Langley Research Center
L_{eq} = Equivalent Sound Level

Places of worship, hospitals, and schools are impacted negatively by noise levels that could interrupt speech. At exterior noise levels greater than 65 L_{eq}, noise-related speech interference becomes increasingly problematic. Impacts at places of worship are reduced in instances where the primary worship events occur on weekends when aircraft operations are minimal. Noise-sensitive areas within hospitals (e.g., operating rooms) are often located in the interior of the building, where exterior noise levels are less likely to result in indoor disturbances and speech interference. With the exception of the Hampton Christian Academy, Paul Burbank Elementary School, and William Mason Cooper Elementary School, all of the schools studied exceed 65 L_{eq} under baseline conditions and would continue to do so under the Proposed Action. The Hampton Christian Academy would increase from 64 L_{eq} to 65 L_{eq} and the Peninsula Catholic School would decrease from 65 L_{eq} to 62 L_{eq}. Changes in L_{eq} at all of the places of worship, hospitals, and schools studied would range from increases of 1 dB to decreases of 2 dB.

Potential Hearing Loss risk was assessed using the methodology described in Section 4.2.1.1 above. No off-base residences are exposed to noise at or greater than 80 DNL. Under the Proposed Action, six on-base Officer's Quarters duplex residences would be affected by 80-81 DNL and six of the same type of residences would be affected by 81-82 DNL. Under baseline conditions, six duplex residences were exposed to 80-81 DNL, none to 81-82 DNL. If persons living at these locations were to spend 100 percent of their time outdoors, remain at that location while exposed to the same noise level for eight hours a day for 40 years, they could potentially experience noise induced hearing loss. Under the more likely scenario, the persons living in these structures spend approximately the national average percent of total time indoors or in other areas where they would be exposed to lower noise levels, the threshold for increased risk of hearing loss (80 DNL) would not be exceeded. As the likelihood of the first scenario described is extremely low, the risk of hearing loss is considered minimal. PHL risk among workers on Langley AFB would be managed according to DoD guidelines.

Aircraft noise levels would not be expected to exceed 130 dB at any off-installation location. Therefore, noise associated with proposed aircraft operations would not be expected to result in any damage to structures.

Impacts associated with implementation of the Proposed Action would be expected to be limited to increases in annoyance and potential speech interference in certain locations with concurrent decreases in other locations. Overall, noise impacts under the Proposed Action in the installation vicinity would be considered minor and not significant in nature.

F-22A and T-38A aircraft based at Langley AFB would conduct approximately 98 percent of total training sortie operations in the offshore Warning Areas W-72, W-122, and W-386. The remaining two percent of training operations would be conducted in the Evers and Farmville Military Operations Areas (MOAs) and the Hatteras B Air Traffic Control Assigned Airspace (ATCAA). Under the Proposed Action, total sortie operations conducted annually in the MOAs and ATCAAs would be reduced slightly due to drawdown of F 15C aircraft based at Langley AFB under baseline conditions. Noise levels generated by 1 FW aircraft would remain below 45 dB DNL_{mr}, as calculated using the computer program MR_NMAP. Because the decibel scale is logarithmic, combined decibel noise levels do not add arithmetically. If a noise source is added to another noise source that is greater than 10 dB higher, the combined total noise level will

increase by less than 0.1 dB. Overall DNL_{mr} noise levels in affected airspace units under baseline conditions are not known. If noise levels in these airspace units were below 55 DNL_{mr}, the noise associated with 1 FW aircraft would not result in the level increasing to greater than 55 DNL_{mr}. If, on the other hand, noise levels are currently greater than 55 DNL_{mr}, then the difference between existing and additional noise levels would be greater than 10 dB, and overall noise levels would not change substantially due to additional F-22A and T-38A flying operations. Supersonic aircraft operations are not permitted in the MOAs.

Warning Areas W-72, W-122, and W-386 are located over the Atlantic Ocean several miles east of the Virginia and North Carolina shoreline. Noise generated in these airspace units would be expected to have minimal effects on humans, as the areas overlain are used only intermittently. Sonic booms generated during supersonic training in these airspace units occasionally reach the shore. However, these sonic booms have generally attenuated to the point at which they are not a nuisance. Overall, noise impacts under the Proposed Action in training airspace would be considered minor and not significant in nature.

Under the No Action Alternative, the proposed plus-up of F-22A aircraft and beddown of T-38A aircraft would not occur. Noise levels would decrease slightly relative to baseline conditions in both the base vicinity and in training airspace. Noise impacts under the No Action Alternative would be positive.

4.2 Air Quality:

Air emissions resulting from the Proposed Action were evaluated in accordance with federal, and state, air pollution standards and regulations.

The approach to the air quality analysis was to estimate the increase in emission levels due to the Proposed Action and alternative. As indicated above, the USEPA has classified the Hamptons Roads AQCR as attainment for all CAA standards and it is a maintenance area for ozone.

According to the CAA general conformity rule, a federal agency (in this case, the Air Force) must assess whether their proposed action would contribute to the further degradation of air quality or prevent attainment of air quality standards in areas that are designated as attainment. Conformity determinations are not required for those pollutants that are in attainment. With respect to the conformity rule, for the purposes of the air quality analyses, if the projected emission increases exceeded the applicable conformity *de minimis* thresholds for this region, which are 100 tons per year of NO_x and VOCs, further analysis would be conducted to determine whether impacts would be significant. In such cases, if emissions conform to the approved SIP, then impacts would be less than significant. In the case of criteria pollutants for which the project region is in attainment of the NAAQS, the analysis used the PSD new major source threshold of 250 tons per year for the attainment pollutants (i.e., CO, SO_2, PM_{10}, and $PM_{2.5}$) as an indicator of significance or non-significance of projected air quality impacts. In attainment areas, no conformity analysis or conformity determination is required.

With respect to PSD Class I area impacts, where appreciable deterioration in air quality is

considered significant, the nearest PSD Class I area (Shenandoah National Park) is more than 100 miles west of the region potentially affected by the Proposed Action. There will be an increase in training and operational long-distance flights by aircraft associated with the Proposed Action, but these are flights at high altitudes and the routes extend from over the Atlantic Ocean. The emissions from these flights will be greatly dispersed by the time they reach the ground, such that there should be a negligible impact on any PSD Class I areas that lie along the flight paths.

Based on this information, the size of the project and short-term and intermittent nature of the impacts from aircraft operation, no further analysis regarding impacts to nearby PSD Class I areas is necessary.

Emissions associated with the increase of F-22A and T-38A activities and in personnel generated by the Proposed Action were the focus of the air quality analysis (Table 4-6, *Projected Increases in Emissions From the Proposed Action*). Emissions from the FY13 aircraft operations and personnel increases were used for this analysis. Other assumptions and methodology used for this analysis are included in the Air Quality Appendix, Appendix C.

Table 4-6. Projected Increases in Emissions From the Proposed Action

	Total Emissions (tons/year)[2]					
Emission Activities	NO_2	**VOC**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**
F-22A	20.94	10.04	77.03	5.60	5.04	3.41
T-38A	1.38	4.54	64.61	0.27	0.24	0.71
Personnel Increases	0.10	0.06	0.84	0.00	0.00	0.00
Total Emissions	**22.42**	**14.64**	**142.47**	**5.88**	**5.29**	**4.12**
Significance Thresholds [1]	**100**	**100**	**250**	**250**	**250**	**250**

Note: 1. Conformity rule *de minimis* thresholds were applied to NO_x and VOC emissions and PSD major source thresholds were applied for CO, PM_{10}, $PM_{2.5}$, and SO_2.
2. The emissions from Pb are negligible and therefore not include in the Total Emissions table.

Key:

AFB = Air Force Base
CO = Carbon Monoxide
NO_2 = Nitrogen Oxide
$PM_{2.5}$ = Particulate Matter less than 2.5 microns in diameter
PM_{10} = Particulate Matter less than 10 microns in diameter
PSD = Prevention of Significant Deterioration
SO_x = Sulfur Oxide
VOC = Volatile Organic Compounds

The proposed action increases in emission are below the significance thresholds for all pollutants. As a result, operation of the Proposed Action would produce less than significant air quality impacts within the project region.

Greenhouse Gas (GHGs) Emissions - The potential effects of proposed GHG emissions are by nature global and cumulative impacts, as individual sources of GHG emissions are not large enough to have an appreciable effect on climate change. Therefore, an appreciable impact on global climate change would only occur when proposed GHG emissions combine with GHG emissions from other manmade activities on a global scale.

Table 4-7, *Annual GHG Emissions Associated with the Proposed Action* summarizes the annual GHG emissions from the proposed action. Appendix C presents detailed estimates of GHG emissions associated with the Proposed Action. These data show that the estimated annual CO_2e emissions from the Proposed Action would be quite small in comparison to the annual GHG emissions generated from all sources in the U.S. in 2009 (0.011 million metric tons per year for the Proposed Action compared to 6,663 million metric tons per year for the U.S. GHG inventory [EPA 2011a]). Therefore, CO_2e emissions associated with the Proposed Action would amount to approximately 0.0002 percent of the total CO_2e emissions generated by the U.S. These nominal emission increases from the Proposed Action would produce less than significant impacts to global climate change.

Table 4-7. Annual GHG Emissions Associated with the Proposed Action

Scenario/Activity	**Carbon Dioxide equivalent (CO_2e) Million Metric Tons per Year**
Proposed Action GHG Emissions	0.01
U.S. 2009 Baseline Emissions (EPA 2010a)	6,663
Proposed Action Emissions as a % of U.S. Emissions	0.0002

Under the No Action Alternative, the consolidation of the F-22A fleet would not occur and the cost effective alternative for F-22A adversary training would not take place. No additional impacts to existing air quality would occur under the No Action Alternative.

4.3 Hazardous Material and Waste:

Hazardous materials and wastes associated with the additional F-22AA aircraft within the proposed action will not exceed the amounts projected in the 2002 EIS.

The Langley AFB Storm Water Pollution Prevention Plan was updated in 2011 to include the engine wash process and procedures for the T-38A aircraft. Langley AFB personnel designed the T-38 Engine Wash Containment System (EWCS) to capture the Type II and Type III T-38 engine wash cleaners and residual rinse water. These cleaners do not contain hydrocarbon solvents, and the best disposal method is evaporation. The engine wash will flush through the tailpipe so that all residual material from this process is forced to drain down within the containment cart (280 gal capacity). Once completed, personnel drain the captured effluent into 55 gal drums and transport it to the F.757 evaporator towers for disposal. An estimated 280 gals of effluent will be disposed each week. Prior to disposal in the evaporator towers, the effluent is analyzed for BOD/COD, TSS, DRO, and oil/grease. The evaporation process requires removal of residual sludge every 6 months. Residual sludge will be sampled and then disposed of through the installation's DMRO contractor in accordance with the installation's Hazardous Materials Plan.

Under the No Action Alternative, the consolidation of the F-22A fleet would not occur and the cost effective alternative for F-22A adversary training would not take place. No additional impacts from hazardous materials or waste would occur under the No Action Alternative.

4.4 Environmental Justice:

Population estimates for geographic areas underlying the airfield noise contours (for existing and proposed conditions) were calculated using data from the 2010 Census. Data for variables including total population, race, and ethnicity were developed for block groups beneath the 65-DNL-and-above noise contours. A comparison is then made between these percentages and the ones previously calculated for the community of comparison to determine if there would be a disproportionate effect under the noise contour due to the proposed activity.

The 2010 Census did not collect income information. The latest information available on low-income populations is available in the U.S. Census Bureau's *2005-2009 American Community Survey Five-Year Estimates*. For estimates of the low-income population affected by airfield noise, data from the 2005-2009 American Community Survey at the census tract level was used to estimate the percent of the population living below the poverty thresholds. This percentage of impoverished individuals was then applied to the 2010 affected population to extrapolate the number of low-income persons affected by airfield noise.

In addition, for the analysis of EO 13045, schools within the 65 L_{dn} noise contours were evaluated for compatibility with exposed noise levels. Additional discussion on noise levels and schools is provided in Section 3.3 Noise.

Under the Proposed Action, no disproportionately high and adverse human health or environmental effects have been identified to minority or low-income populations due to activities at Langley AFB.

As shown in Table 4-8, *Affected Populations of Concern*, under the Proposed Action, an estimated 17,498 off base residents would be affected by noise levels greater than 65 dB L_{dn}. Of these affected residents, an estimated 10,378 (59.3 percent) would be minority and an estimated 1,247 (7.1 percent) would be low-income. As described under Section 3.15, in the Langley Community of Comparison (defined as the combination of the independent cities of Hampton, Newport News, and Poquoson), the minority population comprises 54.3 percent of the total population, and the low-income population comprises 13.3 percent. While the affected minority population is higher than the minority population in the community of comparison, it is not high enough to be considered disproportionate to the community of comparison. The affected low-income population is substantially lower than the low-income population in the community of comparison. Therefore, flight operations from the F-22A and T-38AA training missions would not present a disproportionately high and adverse environmental effect to minority or low-income populations.

Under the Proposed Action, a total of 10 schools and educational centers would be exposed to noise levels greater than 65 L_{dn}. Three of these schools were not affected by noise levels under baseline conditions. Two schools affected by the baseline noise levels would experience a decrease in noise and would experience noise levels less than 65 L_{dn}. No schools would be affected by noise levels greater than 75 L_{dn}. Schools and educational centers are considered compatible with noise levels up to 75 L_{dn} with additional noise attenuation. For noise levels above 75 L_{dn}, educational services are not compatible regardless of noise attenuation. As the affected schools and educational centers would be affected by noise levels less than 75 L_{dn} and

would be considered compatible with noise attenuation, no adverse health or environmental impacts are anticipated to children under the Proposed Action.

Table 4-8. Affected Populations of Concern

	Total Affected Population	Number (Percentage) Minority		Number (Percentage) Low-Income*	
Baseline Conditions	18,070	10,691	(59.2%)	1,375	(7.6%)
Proposed Action	17,498	10,378	(59.3%)	1,247	(7.1%)

Note: * The 2010 Census did not collect income data. Low-income information is based on 2005-2009 estimates from the American Community Survey and then applied to the affected Census 2010 population.
Sources: Census 2010a, 2010b; calculated using the Geographic Information System (GIS)

Under the No Action Alternative, noise levels and the populations affected would be the same as those discussed under Section 3.13. No disproportionately high and adverse health or environmental effects to minority, low-income, or children are anticipated.

4.5 COASTAL ZONE MANAGEMENT ACT AND FEDERAL CONSISTENCY

Pursuant to 15 CFR §930.39 of the Coastal Zone Management Act (CZMA), the Air Force is required to provide a consistency determination for proposed activities to ensure they are consistent with the CZMA and the Virginia Coastal Zone Management Program, and would not trigger any enforceable regulatory programs comprising Virginia's Coastal Zone Management Program. The proposed action described in Chapter 2 requires no new facility construction; existing facilities (Building 200/Hangar 753) would accommodate the additional aircraft and personnel.

The Air Force analyzed the proposed action in light of the following Enforceable Policies of the Virginia Coastal Zone Management Program (VCP):

- Fisheries Management/State Tributylin Regulatory Program: The proposed action will not impact finfish or shellfish resources, and will not involve the use of Tributylin.

- Subaqueous Lands Management: The proposed action will not require use of any state-owned bottomlands.

- Wetlands Management: The proposed action will not impact wetlands in the vicinity of Langley AFB.

- Dunes Management: There are no coastal primary sand dunes in the vicinity of the proposed action at Langley AFB.

- Non-Point Source Pollution Control: The proposed action requires no facility construction; no soil disturbance activity is anticipated.

- Point Source Pollution Control: The proposed action will not affect existing

impervious surfaces, underground storage tanks, or discharge pipes at Langley AFB.

- Shoreline Sanitation: The proposed action does not involve or impact septic tanks or septic systems.

- Air Pollution Control: Analysis for increases in air emissions associated with the additional F-22A and T-38A aircraft activities and personnel are covered in section 4.2 and Appendix C. The proposed action is expected to produce less than significant air quality impacts within the project region. Additionally, increases in greenhouse gas emissions would produce less than significant impacts to global climate change. Because the project site is located in a designated ozone maintenance area and emission control area for Nitrogen Oxides (NOx) and volatile organic compounds (VOCs), the Air Force will take all reasonable precautions to limit the emissions of these substances by controlling or limiting the burning of fossil fuels.

- Coastal Lands Management: The VA Department of Conservation and Recreation (DCR) reviewed our proposed action and provided comments on 3 Oct 11 determining that it involves no new land disturbance, development or redevelopment on lands analogous to locally designated Chesapeake Bay Preservation Areas. Per DCR's recommendation, we reviewed the Center for Biology's VA Bald Eagle Information Website, and determined that no bald eagle nests are identified within .25 miles of the proposed action's project area.

Based upon the analysis conducted in the Force Structure Changes EA, as well as analysis completed for similar activities within the 2001 Initial F-22 Operational Wing Beddown Final EIS, which is incorporated by reference, the US Air Force finds that the proposed Force Structure Changes are consistent to the maximum extent practicable with the enforceable policies of the Virginia Coastal Zone Management Program.

5.0 CUMULATIVE EFFECTS AND IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

5.1 Cumulative Effects Analysis

The CEQ regulations stipulate that the cumulative effects analysis in an EA considers the potential environmental consequences resulting from "the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7).

Chapter 3 discusses the baseline conditions for environmental resources at Langley AFB and in the training airspace. Chapter 4 discusses potential consequences at the base and under the training airspace associated with the proposed beddown. Chapter 5 identifies past, present, and reasonably foreseeable projects that could cumulatively affect environmental resources in conjunction with the beddown and the use of the training airspace.

Assessing cumulative effects begins with defining the scope of other project actions and their

potential interrelationship with the Proposed Action and Alternative 1 (CEQ 1997). The scope must consider other projects that coincide with the location and timetable of the Proposed Action. Cumulative effects analyses evaluate the interactions of multiple actions.

The CEQ (1997) identified and defined eight ways in which effects can accumulate: time crowding, time lag, space crowding, cross boundary, fragmentation, compounding effects, indirect effects, and triggers and thresholds. Furthermore, cumulative effects can arise from single or multiple actions, and through additive or interactive processes (CEQ 1997).

Langley AFB is an active military installation that undergoes changes in mission and in training requirements in response to defense policies, current threats, and tactical and technological advances. The base, like any other major institution (e.g., university, industrial complex), may require future construction, facility improvements, infrastructure upgrades, and maintenance and repairs. All of these factors will continue to occur before, during, and after the proposed action if it is selected.

It can be expected that any cumulative effects will be associated with aircraft operations as no new construction of facilities is associated with the Proposed Action. The evaluation of the four resource areas included in Section 4 of this EA, reveal a less than significant impact in those areas. Other resource areas were evaluated in the referenced 2002 EIS and impacts associated with those are addressed in that document.

Following completion of the 2002 EIS, the reduction in the number of F-15s assigned to Langley AFB has resulted in a net positive effect on all environmental resource areas associated with aircraft operations. While this net positive effect will be somewhat offset by implementation of the Proposed Action, as can be derived from data presented in Section 4 of this EA, the offset is not anticipated to result in cumulative effects beyond those identified in the 2002 EIS.

5.2 Past, Present, and Reasonably Foreseeable Actions:

This EA provides decision-makers with the cumulative effects of the Proposed Action as well as the incremental contribution of past, present, and reasonably foreseeable actions. Recent past and ongoing military action in the region were considered as part of the baseline or existing condition in Chapter 3.

Langley AFB is an active military installation that experiences continuous and rapid evolution of mission and training requirements. This process of change is consistent with the U.S. defense policy that United States Military Forces must be ready to respond to threats to American interest throughout the world.

Langley AFB, like other major military installations, regularly requires new construction, facility improvements, and infrastructure upgrades. In addition, past, present, and potential future major military projects occurring in the region were reviewed to consider the implication of each action and its synergy with the proposed beddown. No projects were identified as having potential to interact in time or location with the proposed beddown.

With continued funding and implementation of the base's General Plan and Integrated Natural

Resources Management Plan (INRMP) adverse impacts due to future and ongoing projects would be avoided or minimized.

Non-Federal actions include major public and private projects within the ROI. Hampton Roads is a large urban area with multiple construction projects occurring. However, no actions have been identified that would occur near Langley AFB or the underlying training airspace that would be considered a significant cumulative impact.

5.3 Relationship between Short-Term Uses and Long-Term Productivity:

CEQ regulations (Section 1502.16) specify that environmental analysis must address "…the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity". Special attention should be given to impacts that narrow the range of beneficial uses of the environment in the long-term or pose a long-term risk to human health or safety. This section evaluates the short-term benefits of the proposal compared to the long-term productivity derived from not pursuing the proposal.

Short-term effects to the environment are generally defined as a direct consequence of a project in its immediate vicinity. Short-term effects could include localized disruptions and higher noise levels in some areas.

Noise impacts associated with the Proposed Action in the vicinity of Langley AFB were presented in Section 4 of this EA. The military training that occurs in the airspace, as indicated in Section 4, will result in noise effects that are transitory in nature. Such noise effects would be short-term and would not be expected to result in permanent or long-term changes in wildlife or habitat use. Under the proposed action, these short-term changes would have a negligible cumulative effect.

5.4 Irreversible and Irretrievable Commitment of Resources:

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable timeframe. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored due to the action.

For Langley AFB, most impacts are short-term and temporary (such as air emissions from operations) or longer lasting (such as noise). Air Force aircraft and personnel would use fuel, oil, and lubricants in normal activities.

Training operations would involve consumption of nonrenewable resources, such as gasoline used in vehicles, and jet fuel used in aircraft. Training would also involve commitment of chaff and flares. None of these activities would be expected to significantly decrease the availability of minerals or petroleum resources or have cumulative environmental consequences.

6.0 REFERENCES

Air Force 1997. Guide for Environmental Justice Analysis with the Environmental Impact Analysis Process (EIAP).

Air Force 2001. Initial F-22A Operational Wing Beddown Draft Environmental Impact Statement, April 2001.

Air Force 2001. Initial F-22A Operational Wing Beddown Final Environmental Impact Statement, November 2001.
Air Force 2002. Record of Decision (ROD) for Initial F-22A Operational Wing Beddown Final Environmental Impact Statement, January 2002.

Air Force 2007. Langley Air Force Base Air Installation Compatible Use Zone Study. July 2007.

Air Force 2007. Langley Air Force Base Integrated Natural Resource Management Plan. February 2007.

Air Force 2011. Langley Air Force Base Storm Water Pollution Prevention Plan. June 2011.

ANSI (American National Standards Institute) S12.60-2009. American National Standard Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools. ANSI S12.60-2009. Reaffirmed by ANSI 5 May 2009.

Census (United States Census Bureau) 2010a. American Factfinder 2. Census Redistricting Data (Public Law 94-171) Summary File. Table QT-PL. Race, Hispanic or Latino, Age, and Housing Occupancy. Queried for cities of Hampton, Newport News, Poquoson, and Virginia and U.S. Accessed through http://factfinder2.census.gov/faces/nav/ jsf/pages/index.xhtml on May 18, 2011.

Census 2010b. 2005-2009 American Community Survey 5-Year Estimates. Table B10071. Poverty Status in the Past 12 Months by Sex By Age. Queried for cities of Hampton, Newport News, Poquoson, and Virginia and U.S. Accessed through http://factfinder. census.gov/servlet/DatasetMainPageServlet?_program=ACS&_submenuId=datasets_2&_lang=en on May 18, 2011.CHABA (Committee on Hearing, Bioacoustics, and Biomechanics) 1977. Guidelines for Preparing Environmental Impact Statements on Noise. National Research Council/National Academy of Sciences. Washington, DC. EPA (United States Environmental Protection Agency) 1974. 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 1974.

EPA 1982. *Guidelines for Noise Impact Analysis*. Report No. 550/9-82-105. April 1982.

EPA (United States Environmental Protection Agency) 2002. National Emissions Inventory Microsoft Access Database. Accessed May 2011.

EPA 2004. Mobile Source Emission Factor Model Version 6.2 (MOBILE 6.2).

EPA 2006. Final Fine Particle Pollution De Minimis Emission Levels for General Conformity Applicability. July 11.

EPA 2007. The Green Book Nonattainment Areas for Criteria Pollutants. Accessed through http://www.epa.gov/oar/oaqps/greenbk/ on May 6, 2011.2009.

EPA 2009. *Mandatory Reporting of Greenhouse Gases; Final Rule*. Federal Register, Vol. 74, No. 209, Friday, October 30, 2009, Rules and Regulations. Accessed through http://www.epa.gov/climatechange/emissions/ ghgrulemaking.html.

EPA 2010a. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2008*. EPA 430-R-10-006. 15 April 2010.

EPA 2010b. *Determining Conformity of General Federal Actions to State or Federal Implementation Plans*. Federal Code of Regulations, Title 40, Protection of the Environment, Chapter I, Environmental Protection Agency, Subchapter C, Air Programs: Part 50, National Primary and Secondary Ambient Air Quality Standards; and Part 93, Subpart B. 15 April 2010.

FICON (Federal Interagency Committee on Noise) 1992. Federal Agency Review of Selected Airport Noise Analysis Issues.

Fidell, S., D.S.Barber, and T.J.Schultz 1991. Updating a Dosage-Effect Relationship for the Prevalence of Annoyance Due to General Transportation Noise. Journal of the Acoustical Society of America 89 (1) January.

Harris, C.M. 1979. Handbook of Noise Control, 2nd Edition.

Harris, C. S. 1997. The Effects of Noise on Health. Wright-Patterson AFB, Ohio: AL/OETR-1997-0077.

Klepeis, N.E., W.C. Nelson, W.R. Ott, J.P. Robinson, AM Tsang, P. Switzer, J.V. Behar, S.C. Hern, and W.H. Engelmann 2001. The National Human Activity Pattern Survey (NHAPS): A resource for assessing exposure to environmental pollutants. Journal of Analysis and Environmental Epidemiology. Volume 11: 231-252.

Langley AFB 2009. Draft Calendar Year 2009 Air Emissions Inventory. Langley Air Force Base, Virginia. Prepared by URS Group, Inc. 13825 Sunrise Valley Drive, Suite 250 Herndon, VA 20171-4672. July.

Ludlow and Sixsmith 1999. Long Term Effects of Military Jet Aircraft Noise Exposure During Childhood on Hearing Threshold Levels. Noise and Health (5) 33-39.

Schultz, T. J. 1978. Synthesis of Social Surveys on Noise Annoyance. J. Acoust. Soc. Am., 64, 377405. August 1978

UDATL (Undersecretary of Defense for Acquisition Technology and Logistics) 2009. Memorandum on Methodology for Assessing Hearing Loss Risk and Impacts in DoD Environmental Impact Analysis.VAC (Virginia Administrative Code) 1990. Title 9 Environment Agency 5, Chapter 30 (9VAC5-Chapter 30)

7.0 AGENCIES, GOVERNMENTS, AND PUBLICS CONTACTED

City of Hampton
Attn: Office of the City Manager
22 Lincoln Street
Hampton, VA 23669

City of Newport News
Attn: Office of the City Manager
2400 Washington Ave
Newport News, VA 23607

Chesapeake Bay Local Assistance Dept
Attn: Environmental Impact Analysis Reviews
101 N. 14th Street, 17th Floor
Richmond, VA 23219

Hampton City Hall
Attn: City Clerk
22 Lincoln St.
Hampton, VA 23669

Hampton Roads Planning District Commission
Attn: Penninsula Office
2101 Executive Drive, Ste C
Hampton, VA 23666

Headquarters, Hampton Roads Planning District Commission
Attn: Arthur Collins
723 Woodlake Drive
Chesapeake, VA 23220

Poquoson City Hall
Attn: City Clerk
500 City Hall Ave
Poquoson, VA 23662

U.S. Fish and Wildlife Service
Attn: Virginia Field Office
6669 Short Lane
Gloucester, VA 23061

Virginia Dept of Conservation & Recreation
Attn: Environmental Impact Analysis Reviews
203 Governor Street
Richmond, VA 23219

Virginia Department of Forestry
Attn: Environmental Impact Analysis Reviews
900 Natural Resources Drive, Suite 800
Charlottesville, VA 22903

Virginia Dept of Game & Inland Fisheries
Attn: Environmental Impact Analysis Reviews
4010 West Broad Street
Richmond, VA 23230

Virginia Department of Game and Inland Fisheries
Attn: Region 1 Office
3801 John Tyler Memorial Highway
Charles City, VA 23030

Virginia Department of Health
Division of Drinking Water
109 Governor Street, 6th Floor
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Virginia Department of Historic Resources
Attn: Environmental Impact Analysis Reviews
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Virginia Dept of Environmental Quality
Attn: Tidewater Regional Office
5636 Southern Boulevard
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Virginia Dept of Environmental Quality
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629 East Main Street, 8th Floor
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Virginia Dept of Environmental Quality
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Virginia Water Protection Program
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Virginia Dept of Mines, Minerals and Energy
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629 East Main Street, 6th Floor
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Virginia Department of Transportation
Attn: Environmental Division
1401 East Broad Street
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Virginia Marine Resources Commission
Attn: Environmental Impact Analysis Reviews
2600 Washington Avenue, 3rd Floor
Newport News, VA 23607

York County Administrator
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Chesapeake Bay Local Assistance Department
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8.0 EA PREPARATION

This EA was prepared by the Air Combat Command Sustainable Installations Branch (ACC/A7PS).

APPENDIX A: COORDINATION WITH AGENCIES

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
TDD (804) 698-4021
www.deq.virginia.gov

Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

October 12, 2011

Mr. Larry H. Dryden, P.E.
Chief, Sustainable Installations Branch
HQ ACC/A7PS
129 Andrews Street, Suite 102
Langley AFB, Virginia 23665-2769

RE: Environmental Assessment for the Force Structure Changes, Langley Air Force Base, City of Hampton, (DEQ 11-162F).

Dear Mr. Dryden:

The Commonwealth of Virginia has completed its review of the September 2011 Environmental Assessment (EA) (received September 14, 2011) for the above referenced project. The Department of Environmental Quality is responsible for coordinating Virginia's review of federal environmental documents and responding to appropriate federal officials on behalf of the Commonwealth. DEQ is also responsible for coordinating Virginia's review of federal consistency documents submitted pursuant to the Coastal Zone Management Act (CZMA) and providing the state's response. The following agencies and planning district commission participated in the review of this proposal:

Department of Environmental Quality
Department of Conservation and Recreation
Department of Health
Department of Aviation
Hampton Roads Planning District Commission

The Department of Game and Inland Fisheries, Virginia Marine Resources Commission, Department of Historic Resources and City of Hampton were also invited to comment on the proposal.

PROJECT DESCRIPTION

The U.S. Air Force (USAF) intends to increase the number of F-22A aircraft currently assigned to Langley Air Force Base (AFB) by adding six additional F-22A aircraft to the 1st Fighter Wing (1 FW), and stand up a T-38A aircraft detachment of 14 training aircraft within the 1st Fighter Wing. The purpose of the proposed force structure changes of F-22 and T-38A aircraft at Langley AFB would be to provide additional Air Force capabilities at a strategic location to meet mission responsibilities for worldwide deployment. The increase of six F-22 aircraft and beddown of up to fourteen T-38A aircraft would provide enhanced capabilities while efficiently using Langley AFB facilities. Existing facilities at Langley AFB can accommodate the additional aircraft and personnel associated with the proposed force structure changes. Therefore, Langley would not require construction of any new facilities. However, Langley may install aircraft arresting equipment at the ends of the runway for T-38A aircraft. It consists of a fabric that is stretched across the end of a runway and performs the same function as arresting cables on an aircraft carrier flight deck; resistance is created when the geo-textile fabric tears upon engaging a T-38A, thus stopping the aircraft. No airspace modifications are proposed for the additional F-22A or T-38A aircraft.

CONCLUSION

Provided activities are performed in accordance with the recommendations which follow in the Impacts and Mitigation section of this report, this proposal is unlikely to have significant effects on ambient air quality, important farmland, forest resources, surface waters and wetlands. It is unlikely to adversely affect species of plants or insects listed by state agencies as rare, threatened, or endangered.

ENVIRONMENTAL IMPACTS AND MITIGATION

1. Chesapeake Bay Preservation Areas. The EA does not discuss Chesapeake Bay Preservation Areas.

1(a) Agency Jurisdiction. The Department of Conservation and Recreation (DCR), Division of Stormwater Management (DSM), Local Implementation (LI) (previously called the Division of Chesapeake Bay Local Assistance) administers the *Chesapeake Bay Preservation Act* (*Bay Act*) (*Virginia Code* §10.1-2100-10.1-2114) and *Chesapeake Bay Preservation Area Designation and Management Regulations* (*Regulations*) (9 VAC 10-20 *et seq.*).

1(b) Agency Comments. According to DCR-DSM-LI, in the City of Hampton, the areas protected by the *Bay Act*, as locally implemented, require conformance with performance criteria. These areas include Resource Protection Areas (RPAs) and Resource Management Areas (RMAs) as designated by the local government. RPAs include:

- tidal wetlands;
- certain non-tidal wetlands and tidal shores; and
- a minimum 100-foot vegetated buffer area located adjacent to and landward of these features and along both sides of any water body with perennial flow.

RMAs, which require less stringent performance criteria, include those areas of the city within 100 feet of the inland limit of the RPA.

1(d) Agency Findings. DCR-DSM-LI notes that the proposed project consists of an increase in the number and types of aircraft and personnel stationed at Langley Air Force Base, and includes no new land disturbance, development or redevelopment on lands analogous to locally designated Chesapeake Bay Preservation Areas within the City of Hampton. Therefore, there are no comments or requirements under the *Regulations* for this project.

For additional information, contact DCR-DSM-LI, V'lent Lassiter at (804) 371-7500.

2. Air Pollution Control. According to the EA (page 36), increases in air emission as a result of the proposed action are below the significance thresholds for emissions associated with the increase of F-22A and T-38A activities and in personnel. As a result, operation of the proposed action would produce less than significant air quality impacts within the project region. In addition, the document concludes that the nominal greenhouse gas emission increases from the proposed action would produce less than significant impacts to global climate change.

2(a) Agency Jurisdiction. DEQ's Air Quality Division, on behalf of the State Air Pollution Control Board, is responsible to develop regulations that become *Virginia's Air Pollution Control Law*. DEQ is charged to carry out mandates of the state law and related regulations as well as Virginia's federal obligations under the *Clean Air Act* as amended in 1990. The objective is to protect and enhance public health and quality of life through control and mitigation of air pollution. The division ensures the safety and quality of air in Virginia by monitoring and analyzing air quality data, regulating sources of air pollution, and working with local, state and federal agencies to plan and implement strategies to protect Virginia's air quality. The appropriate regional office is directly responsible for the issue of necessary permits to construct and operate all stationary sources in the region as well as to monitor emissions from these sources for compliance. As a part of this mandate, the environmental documents of new projects to be undertaken in the state are also reviewed. In the case of certain projects, additional evaluation and demonstration must be made under the general conformity provisions of state and federal law.

2(b) Agency Findings. According to the DEQ Air Division, the project site is located in a designated ozone maintenance area and emission control area for and oxides of nitrogen (NO_x) and volatile organic compounds (VOCs). Precursors to ozone (O_3)

nitrogen (NO_x) and volatile organic compounds (VOCs). Precursors to ozone (O_3) pollution include VOCs and NO_x.

2(c) Recommendation. The Air Force should take all reasonable precautions to limit emissions of VOCs and NO_x, principally by controlling or limiting the burning of fossil fuels.

For additional information, contact the DEQ-Air Division, Kotur Narasimhan at (804) 698-4415.

3. Solid and Hazardous Wastes and Hazardous Materials. According to the EA (page 37), the engine wash process and procedures for the T-38A aircraft are designed to capture T-38 engine wash cleaners and residual rinse water. These cleaners do not contain hydrocarbon solvents and are disposed of through evaporation. An estimated 280 gallons of effluent will be disposed each week. The evaporation process requires removal of residual sludge every 6 months. Residual sludge will be sampled and then disposed of through the installation's waste contractor in accordance with the installation's Hazardous Materials Plan.

3(a) Agency Jurisdiction. Solid and hazardous wastes in Virginia are regulated by the Virginia Department of Environmental Quality, the Virginia Waste Management Board (VWMB) and the U.S. Environmental Protection Agency. They administer programs created by the federal *Resource Conservation and Recovery Act*, *Comprehensive Environmental Response Compensation and Liability Act*, commonly called Superfund, and the *Virginia Waste Management Act*. DEQ administers regulations established by the VWMB and reviews permit applications for completeness and conformance with facility standards and financial assurance requirements. All Virginia localities are required, under the Solid Waste Management Planning Regulations, to identify the strategies they will follow on the management of their solid wastes to include items such as facility siting, long-term (20-year) use, and alternative programs such as materials recycling and composting.

3(b) Agency Findings. The DEQ Division of Land Protection and Revitalization (DLPR) notes that facility support for the T-38 detachment requires no new facility construction; existing facilities would accommodate the additional aircraft and personnel.

DEQ-DLPR conducted a Geographic Information System (GIS) data base search and a review of Waste Division data files and determined that that there are a number of hazardous waste sites, solid waste sites, Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) site, Formerly Used Defense Sites (FUDS), and petroleum release sites located within the same zip codes as the project site. However, their proximity to the project site is unknown. Additional information regarding these sites is included as an attachment to this response.

3(c) Requirements. This proposed action must be conducted in accordance with applicable federal, state, and local solid and hazardous waste laws and regulations.

3(d) Recommendations.

(i) Hazardous Waste

The Air Force should contact the DEQ Tidewater Regional Office (TRO) Waste Program, Milt Johnston at (757) 518-2151, to review the waste information and waste treatment method proposed for the project. The DEQ waste compliance staff will evaluate the waste generation information associated with the washing of the T-38A aircraft and the proposed method of treatment to establish whether the wastes generated are subject to the Virginia Hazardous Waste Management Regulations (VHWMRs), Resource Conservation and Recovery Act (RCRA) Regulations and/or the Virginia Solid Waste Management Regulations (VSWMRs).

(ii) CERCLA Site

For further information concerning CERCLA sites obligations, the Air Force should contact the Environmental Protection Agency (EPA), Remedial Project Manager (RPM), Jeffrey Boylan at (215) 814-2094. In addition, for further information regarding Superfund Site Listings and progress, access http://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0303768.

(iii) FUDS

If FUDS are in close proximity to the project site, the Air Force should seek additional information from the DLPR Office of Remediation Programs (ORP), Karen Sismour at (804) 698-4421.

(iv) Pollution Prevention

DEQ encourages all construction projects and facilities to implement pollution prevention principles, including the reduction, reuse, and recycling of all solid wastes generated. All generation of hazardous wastes should be minimized and handled appropriately.

Questions or requests for further information may be directed to DEQ-LPRD, Richard Criqui at (804) 698-4013.

4. Natural Heritage Resources. The EA does not discuss natural heritage resources as it was determined that theses resources would not be affected by the proposed action based on a 2002 Environmental Impact Statement for aircraft and airspace management at Langley AFB.

4(a) Agency Jurisdiction The mission of the Virginia Department of Conservation and Recreation is to conserve Virginia's natural and recreational resources. DCR supports a variety of environmental programs organized within seven divisions including the Division of Natural Heritage. The Natural Heritage Program's (DCR-DNH) mission is conserving Virginia's biodiversity through inventory, protection, and stewardship. The *Virginia Natural Area Preserves Act*, 10.1-209 through 217 of the *Code of Virginia*, was passed in 1989 and codified DCR's powers and duties related to statewide biological inventory: maintaining a statewide database for conservation planning and project review, land protection for the conservation of biodiversity, and the protection and ecological management of natural heritage resources (the habitats of rare, threatened, and endangered species, significant natural communities, geologic sites, and other natural features).

4(b) Agency Findings. DCR-DNH searched its Biotics Data System for occurrences of natural heritage resources at the project site.

(i) Bald Eagle

According to DCR-DNH records, the Bald eagle (*Haliaeetus leucocephalus*, G5/S2S3B, S3N/NL/LT) has been documented within the noise contours shown in the EA (Figure LA3.2-1). The bald eagle breeds from Alaska eastward through Canada and the Great Lakes region, along coastal areas off the Pacific and Atlantic Oceans, and the Gulf of Mexico, and in pockets throughout the western United States (NatureServe, 2009). In Virginia, it primarily breeds along the large Atlantic slope rivers (James, Rappahannock, Potomac, etc) with a few records at inland sites near large reservoirs (Byrd, 1991). Bald eagle nest sites are often found in the midst of large wooded areas near marshes or other bodies of water (Byrd, 1991). Bald eagles feed on fish, waterfowl, seabirds (Campbell *et al.*, 1990), various mammals and carrion (Terres, 1980). Please note that this species is currently classified as threatened by the Virginia Department of Game and Inland Fisheries

Threats to this species include human disturbance of nest sites (Byrd, 1991), habitat loss, biocide contamination, decreasing food supply and illegal shooting (Herkert, 1992).

(ii) State-listed Plant and Insect Species

The *Endangered Plant and Insect Species Act* of 1979, Chapter 39 §3.1-1020 through 1030 of the *Code of Virginia*, as amended, authorizes the Virginia Department of Agriculture and Consumer Services (VDACS) to conserve, protect, and manage endangered and threatened species of plants and insects. The VDACS Virginia Endangered Plant and Insect Species Program personnel cooperates with the USFWS, DCR-DNH and other agencies and organizations on the recovery, protection or conservation of listed threatened or endangered species and designated plant and insect species that are rare throughout their worldwide ranges. In those instances

tasks outlined in the plans are followed to the extent possible.

Under a Memorandum of Agreement established between VDACS and DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. DCR finds that the current activity will not affect any documented state-listed threatened or endangered plants or insects.

(iii) State Natural Area Preserves

DCR files do not indicate the presence of any State Natural Area Preserves under the agency's jurisdiction in the project vicinity.

4(c) Recommendations. DCR-DNH recommends the following:

- Utilize the Center for Conservation Biology's Virginia Bald Eagle Information Website at http://www.ccb-wm.org/virginiaeagles/eagleData.php to obtain updated bald eagle information.
- If bald eagle nests are identified within .25 miles of the project area, coordinate with DGIF to ensure compliance with protected species legislation.
- Contact DCR-DNH, Rene Hypes at (804) 371-2708 for an update on natural heritage information if a significant amount of time passes before the project is initiated since new and updated information is continually added to the Biotics Data System.

5. Water Supply. The EA does not discuss potential impacts to water supply sources.

5(a) Agency Jurisdiction. The Virginia Department of Health (VDH), Office of Drinking Water (ODW) reviews projects for the potential to impact public drinking water sources (groundwater wells and surface water intakes).

5(b) Agency Findings. VDH finds that there are no groundwater wells within a one-mile radius of the project site and no surface water intakes within a five-mile radius. The project site does not fall within Zone 1 (up to 5 miles into the watershed) or Zone 2 (greater than 5 miles into the watershed) of any public surface water sources. For public surface water intakes Zone 1 is the area included within a 5-mile radius around the surface water intake and Zone 2 is the entire up-gradient area of the watershed. For public groundwater wells Zone 1 is an area included within a 1,000-foot radius the well and Zone 2 is a radius of one mile.

5(c) Requirements. According to VDH, potential impacts to public water distribution systems must be verified by the local utility.

5(d) Conclusion. VDH-ODW concludes that there are no apparent impacts to public drinking water resources due to this proposed action.

Contact VDH, Diedre Forsgren at (804) 864-7241 for additional information.

6. Historic Structures and Archaeological Resources. The EA does not discuss historic and archaeological resources, as it was determined that theses resources would not be affected by the proposed action based on a 2002 Environmental Impact Statement for aircraft and airspace management at Langley AFB.

6(a) Agency Jurisdiction. The Department of Historic Resources (DHR) conducts reviews of projects to determine their effect on historic structures or cultural resources under its jurisdiction. DHR, as the designated State's Historic Preservation Office, ensures that federal actions comply with Section 106 of the National Historic Preservation Act of 1962 (NHPA), as amended, and its implementing regulation at 36 CFR Part 800. The NHPA requires federal agencies to consider the effects of federal projects on properties that are listed or eligible for listing on the National Register of Historic Places. Section 106 also applies if there are any federal involvements, such as licenses, permits, approvals or funding.

6(b) Agency Comments. DHR did not respond to our request for comments on the proposed action.

6(c) Requirements. The Air Force must contact DHR directly pursuant to Section 106 NHPA, as amended, and its implementing regulations codified at 36 CFR Part 800 which require federal agencies to consider the effects of their undertakings on historic properties.

7. Aviation Impacts.

7(a) Agency Jurisdiction. The Virginia Department of Aviation's Airport Services Division provides airport sponsors and managers with technical assistance on a wide range of projects and issues, including the planning, design, construction and maintenance of airport facilities. The division manages funding programs for capital improvements, facilities and equipment, airport maintenance projects, and airport security; the General Aviation Voluntary Security Certification Program; the licensing program for public-use airports; and the registration program for private-use airports. This division conducts statewide aviation system planning and maintains the Virginia Air Transportation System Plan.

7(b) Agency Comments. The Department of Aviation (DoAv) reviewed the EA and has no comments concerning the project at this time.

For additional information, contact DoAv, Rusty Harrington at (804) 236-3624.

8. Regional Planning Area.

8(a) Agency Jurisdiction. In accordance with the Code of Virginia, Section 15.2-4207, planning district commissions encourage and facilitate local government cooperation and state-local cooperation in addressing, on a regional basis, problems of greater than local significance. The cooperation resulting from this is intended to facilitate the recognition and analysis of regional opportunities and take account of regional influences in planning and implementing public policies and services. Planning district commissions promote the orderly and efficient development of the physical, social and economic elements of the districts by planning, and encouraging and assisting localities to plan, for the future.

8(b) Agency Comments. The Hampton Roads Planning District Commission (HRPDC) reviewed the consistency determination and consulted with the City of Hampton.

8(c) Findings. HRPDC finds the proposal appears to be consistent with local and regional plans and policies. The EA incorporates the issues that HRPDC previously identified in communications with the U.S. Air Force Headquarters Combat Command.

For more information contact HRPDC, John Carlock at (757) 420-8300.

REGULATORY AND COORDINATION NEEDS

1. Air Quality Regulations. This project is subject to air regulations administered by the Department of Environmental Quality. For more information and coordination contact DEQ-TRO, Troy Breathwaite at (757) 518-2006.

2. Solid and Hazardous Wastes. All solid waste, hazardous waste, and hazardous materials must be managed in accordance with all applicable federal, state, and local environmental regulations. Some of the applicable state laws and regulations are:

- *Virginia Waste Management Act* (Code of Virginia Section 10.1-1400 *et seq.*);
- *Virginia Hazardous Waste Management Regulations* (VHWMR) (9VAC 20-60);
- *Virginia Solid Waste Management Regulations* (VSWMR) (9VAC 20-80); and
- *Virginia Regulations for the Transportation of Hazardous Materials* (9VAC 20-110).

Some of the applicable federal laws and regulations are:

- *Resource Conservation and Recovery Act* (*RCRA*) (42 U.S.C. Section 6901 *et seq.*);
- Title 40 of the Code of Federal Regulations; and
- U.S. Department of Transportation Rules for Transportation of Hazardous materials (49 CFR Part 107).

For additional information concerning location and availability of suitable waste management facilities, contact DEQ-TRO, Milt Johnston at (757) 518-2151.

3. Historic Resources. The Air Force must coordinate this proposal with the Department of Historic Resources in accordance with Section 106 NHPA, as amended, and its implementing regulations codified at 36 CFR Part 800. Contact DHR, Roger Kirchen at (804) 482-6091.

4. Coastal Zone Management Act and Federal Consistency. Pursuant to the *Coastal Zone Management Act of 1972*, as amended, federal actions affecting any coastal use or resource must be conducted in a manner consistent, to the maximum extent practicable, with the federally approved Virginia Coastal Zone Management Program (VCP) (see § 307(c)(1)(A) of the *Act* and 15 CFR Part 930, Subpart C, § 930.30 *et seq.*). This involves an analysis of the activity in light of the Enforceable Policies of the VCP (see Attachment 1), and submission of a Federal Consistency Determination (FCD) reflecting that analysis and committing the Air Force to comply with the Enforceable Policies. Section 930.39 gives content requirements for the consistency determination, or you may visit the DEQ Website at, http://www.deq.virginia.gov/eir/federal.html. We encourage the Air Force to consider the Advisory Policies of the VCP (see Attachment 2). The FCD must be submitted and DEQ's concurrence obtained prior to the implementation of the proposed action in the Commonwealth's designated coastal zone.

Thank you for the opportunity to review the Environmental Assessment for the Force Structure Changes at Langley Air Force Base in the City of Hampton. Detailed comments of reviewing agencies are attached for your review. Please contact me at (804) 698-4325 or John Fisher at (804) 698-4339 for clarification of these comments.

Sincerely,

Ellie Irons, Program Manager
Environmental Impact Review

Enclosures

Ec: Cindy Keltner, DEQ-TRO
Richard Criqui, DEQ-DLPR
Kotur Narasimhan, DEQ-Air
Tony Watkinson, VMRC
Robbie Rhur, DCR
Amy Ewing, DGIF
Barry Matthews, VDH

Roger Kirchen, DHR
Rusty Harrington, DoAv
John Carlock, HRPDC
Donald Calder, Langley AFB

Cc: Mary Bunting, City of Hampton

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

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Mailing address: P.O. Box 1105, Richmond, Virginia 23218
TDD (804) 698-4021
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Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

Attachment 1

Enforceable Regulatory Programs comprising Virginia's Coastal Zone Management Program (VCP)

a. Fisheries Management - The program stresses the conservation and enhancement of finfish and shellfish resources and the promotion of commercial and recreational fisheries to maximize food production and recreational opportunities. This program is administered by the Marine Resources Commission (VMRC); Virginia Code 28.2-200 to 28.2-713 and the Department of Game and Inland Fisheries (DGIF); Virginia Code 29.1-100 to 29.1-570.

The State Tributyltin (TBT) Regulatory Program has been added to the Fisheries Management program. The General Assembly amended the Virginia Pesticide Use and Application Act as it related to the possession, sale, or use of marine antifoulant paints containing TBT. The use of TBT in boat paint constitutes a serious threat to important marine animal species. The TBT program monitors boating activities and boat painting activities to ensure compliance with TBT regulations promulgated pursuant to the amendment. The VMRC, DGIF, and Virginia Department of Agriculture Consumer Services (VDACS) share enforcement responsibilities; Virginia Code 3.1-249.59 to 3.1-249.62.

b. Subaqueous Lands Management - The management program for subaqueous lands establishes conditions for granting or denying permits to use state-owned bottomlands based on considerations of potential effects on marine and fisheries resources, tidal wetlands, adjacent or nearby properties, anticipated public and private benefits, and water quality standards established by the Department of Environmental Quality (DEQ). The program is administered by the Marine Resources Commission; Virginia Code 28.2-1200 to 28.2-1213.

c. Wetlands Management - The purpose of the wetlands management program is to preserve wetlands, prevent their despoliation, and accommodate economic development in a manner consistent with wetlands preservation.

(1) The tidal wetlands program is administered by the Marine Resources Commission; Virginia Code 28.2-1301 through 28.2-1320.

(2) The Virginia Water Protection Permit program administered by DEQ includes protection of wetlands --both tidal and non-tidal; Virginia Code §62.1-44.15:5 and Water Quality Certification pursuant to Section 401 of the Clean Water Act.

d. Dunes Management - Dune protection is carried out pursuant to The Coastal Primary Sand Dune Protection Act and is intended to prevent destruction or alteration of primary dunes. This program is administered by the Marine Resources Commission; Virginia Code 28.2-1400 through 28.2-1420.

e. Non-point Source Pollution Control – (1) Virginia's Erosion and Sediment Control Law requires soil-disturbing projects to be designed to reduce soil erosion and to decrease inputs of chemical nutrients and sediments to the Chesapeake Bay, its tributaries, and other rivers and waters of the Commonwealth. This program is administered by the Department of Conservation and Recreation; Virginia Code 10.1-560 et.seq.).

(2) Coastal Lands Management is a state-local cooperative program administered by the DCR's Division of Chesapeake Bay Local Assistance and 84 localities in Tidewater (see i) Virginia; Virginia Code §10.1-2100 –10.1-2114 and 9 VAC10-20 et seq.

f. Point Source Pollution Control - The point source program is administered by the State Water Control Board (DEQ) pursuant to Virginia Code 62.1-44.15. Point source pollution control is accomplished through the implementation of:

(1) the National Pollutant Discharge Elimination System (NPDES) permit program established pursuant to Section 402 of the federal Clean Water Act and administered in Virginia as the Virginia Pollutant Discharge Elimination System (VPDES) permit program.

(2) The Virginia Water Protection Permit (VWPP) program administered by DEQ; Virginia Code §62.1-44.15:5 and Water Quality Certification pursuant to Section 401 of the Clean Water Act.

g. Shoreline Sanitation - The purpose of this program is to regulate the installation of septic tanks, set standards concerning soil types suitable for septic tanks, and specify minimum distances that tanks must be placed away from streams, rivers, and other waters of the Commonwealth. This program is administered by the Department of Health (Virginia Code 32.1-164 through 32.1-165).

h. Air Pollution Control - The program implements the federal Clean Air Act to provide a legally enforceable State Implementation Plan for the attainment and maintenance of the National Ambient Air Quality Standards. This program is administered by the State Air Pollution Control Board (Virginia Code 10-1.1300 through §10.1-1320).

(i) Coastal Lands Management is a state-local cooperative program administered by the DCR's Division of Chesapeake Bay Local Assistance and 84 localities in Tidewater, Virginia established pursuant to the Chesapeake Bay Preservation Act; Virginia Code §10.1-2100 –10.1-2114 and Chesapeake Bay Preservation Area Designation and Management Regulations; Virginia Administrative Code 9 VAC10-20 et seq.

Attachment 2

Advisory Policies for Geographic Areas of Particular Concern

a. Coastal Natural Resource Areas - These areas are vital to estuarine and marine ecosystems and/or are of great importance to areas immediately inland of the shoreline. Such areas receive special attention from the Commonwealth because of their conservation, recreational, ecological, and aesthetic values. These areas are worthy of special consideration in any planning or resources management process and include the following resources:

a) Wetlands
b) Aquatic Spawning, Nursery, and Feeding Grounds
c) Coastal Primary Sand Dunes
d) Barrier Islands
e) Significant Wildlife Habitat Areas
f) Public Recreation Areas
g) Sand and Gravel Resources
h) Underwater Historic Sites.

b. Coastal Natural Hazard Areas - This policy covers areas vulnerable to continuing and severe erosion and areas susceptible to potential damage from wind, tidal, and storm related events including flooding. New buildings and other structures should be designed and sited to minimize the potential for property damage due to storms or shoreline erosion. The areas of concern are as follows:

i) Highly Erodible Areas
ii) Coastal High Hazard Areas, including flood plains.

c. Waterfront Development Areas - These areas are vital to the Commonwealth because of the limited number of areas suitable for waterfront activities. The areas of concern are as follows:

i) Commercial Ports
ii) Commercial Fishing Piers
iii) Community Waterfronts

Although the management of such areas is the responsibility of local government and some regional authorities, designation of these areas as Waterfront Development Areas of Particular Concern (APC) under the VCRMP is encouraged. Designation will allow the use of federal CZMA funds to be used to assist planning for such areas and the implementation of such plans. The VCRMP recognizes two broad classes of priority uses for waterfront development APC:

i) water access dependent activities;
ii) activities significantly enhanced by the waterfront location and complementary to other existing and/or planned activities in a given waterfront area.

Advisory Policies for Shorefront Access Planning and Protection

a. Virginia Public Beaches - Approximately 25 miles of public beaches are located in the cities, counties, and towns of Virginia exclusive of public beaches on state and federal land. These public shoreline areas will be maintained to allow public access to recreational resources.

b. Virginia Outdoors Plan - Planning for coastal access is provided by the Department of Conservation and Recreation in cooperation with other state and local government agencies. The Virginia Outdoors Plan (VOP), which is published by the Department, identifies recreational facilities in the Commonwealth that provide recreational access. The VOP also serves to identify future needs of the Commonwealth in relation to the provision of recreational opportunities and shoreline access. Prior to initiating any project, consideration should be given to the proximity of the project site to recreational resources identified in the VOP.

c. Parks, Natural Areas, and Wildlife Management Areas - Parks, Wildlife Management Areas, and Natural Areas are provided for the recreational pleasure of the citizens of the Commonwealth and the nation by local, state, and federal agencies. The recreational values of these areas should be protected and maintained.

d. Waterfront Recreational Land Acquisition - It is the policy of the Commonwealth to protect areas, properties, lands, or any estate or interest therein, of scenic beauty, recreational utility, historical interest, or unusual features which may be acquired, preserved, and maintained for the citizens of the Commonwealth.

e. Waterfront Recreational Facilities - This policy applies to the provision of boat ramps, public landings, and bridges which provide water access to the citizens of the Commonwealth. These facilities shall be designed, constructed, and maintained to provide points of water access when and where practicable.

f. Waterfront Historic Properties - The Commonwealth has a long history of settlement and development, and much of that history has involved both shorelines and near-shore areas. The protection and preservation of historic shorefront properties is primarily the responsibility of the Department of Historic Resources. Buildings, structures, and sites of historical, architectural, and/or archaeological interest are significant resources for the citizens of the Commonwealth. It is the policy of the Commonwealth and the VCRMP to enhance the protection of buildings, structures, and sites of historical, architectural, and archaeological significance from damage or destruction when practicable.

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DEPARTMENT OF ENVIRONMENTAL QUALITY
TIDEWATER REGIONAL OFFICE
ENVIRONMENTAL IMPACT REVIEW COMMENTS

October 4, 2011

PROJECT NUMBER: 11-162F

PROJECT TITLE: Force Structure Changes at Langley Air Force Base

As Requested, TRO staff has reviewed the supplied information and has the following comments:

Petroleum Storage Tank Cleanups:
There have been a number of petroleum releases reported at Langley Air Force Base. The reports reviewed did not indicate specific construction projects so specific releases at or nearthe project area were not able to be identified. If evidence of a petroleum release is discovered during construction associated with this project, it must be reported to DEQ, as authorized by Virginia CODE # 62.1-44.34.8 through 9 and 9 VAC 25-580-10 et seq. Contact Ms. Rebecca Gehring at (757) 518-2190 or Mr. Gene Siudyla at (757) 518-2117. Petroleum-contaminated soils and ground water generated associated with construction associated with this project must be properly characterized and disposed of properly.

Petroleum Storage Tank Compliance/Inspections:
Installation and operation of any regulated petroleum storage tank(s) either AST or UST must also be conducted in accordance with the Virginia Regulations 9 VAC 25-91-10 et seq and / or 9 VAC 25-580-10 et seq. Please contact Tom Madigan (757) 518-2115 for additional details.
The installation or use of any portable aboveground petroleum storage tank (>660 gallons – 9 VAC 25-91-10 et seq.) for more than 120 days for this project must be reported to the DEQ Tidewater Regional Office Petroleum Storage Tank Program attn: Tom Madigan – DEQ Tidewater Regional Office – 5636 Southern Blvd., Virginia Beach, VA 23462. Phone (757) 518-2115.

Virginia Water Protection Permit Program (VWPP):
No comments.

Air Permit Program :
No comments.

Water Permit Program :
Water Permits – no comments

Ground Water – No comments

DEPARTMENT OF ENVIRONMENTAL QUALITY
TIDEWATER REGIONAL OFFICE
ENVIRONMENTAL IMPACT REVIEW COMMENTS

October 4, 2011

PROJECT NUMBER: 11-162F

PROJECT TITLE: Force Structure Changes at Langley Air Force Base

Waste Permit Program :
All solid wastes generated must be characterized in accordance with the requirements of the Virginia Hazardous Waste Management Regulations prior to disposal at an appropriate facility. The treatment of solid waste in a tank or container (engine wash wastewater) is conditionally exempt from the Virginia Solid Waste Management Regulations per 9 VAC 20-81-95.D.10 provided no open dump, hazard or public nuisance is created and the treatment is conducted in accordance with a waste analysis plan that contains detailed chemical and physical characteristics of the waste, testing frequency, is kept on file at the facility and notification is made to any waste facility receiving the residual that the waste has been treated.

The staff from the Tidewater Regional Office thanks you for the opportunity to provide comments.

Sincerely,

Cindy Keltner
Environmental Specialist II
5636 Southern Blvd.
VA Beach, VA 23462
(757) 518-2167
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David A. Johnson
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OCT 11 2011
DEQ-Office of Environmental Impact Review

MEMORANDUM

DATE: October 3, 2011

TO: Julia Wellman, DEQ

FROM: Roberta Rhur, Environmental Impact Review Coordinator

SUBJECT: DEQ 11-162F, Department of Defense, Langley Force Structure Changes, City of Hampton

Division of Natural Heritage

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information in our files, Bald eagles (*Haliaeetus leucocephalus*, G5/S2S3B,S3N/NL/LT) have been documented within the noise contours shown on Figure LA3.2-1 of the Draft EA. The Bald eagle breeds from Alaska eastward through Canada and the Great Lakes region, along coastal areas off the Pacific and Atlantic Oceans, and the Gulf of Mexico, and in pockets throughout the western United States (NatureServe, 2009). In Virginia, it primarily breeds along the large Atlantic slope rivers (James, Rappahannock, Potomac, etc) with a few records at inland sites near large reservoirs (Byrd, 1991). Bald eagle nest sites are often found in the midst of large wooded areas near marshes or other bodies of water (Byrd, 1991). Bald eagles feed on fish, waterfowl, seabirds (Campbell et. al., 1990), various mammals and carrion (Terres, 1980). Please note that this species is currently classified as threatened by the Virginia Department of Game and Inland Fisheries (VDGIF).

Threats to this species include human disturbance of nest sites (Byrd, 1991), habitat loss, biocide contamination, decreasing food supply and illegal shooting (Herkert, 1992).

DCR recommends utilizing the Center for Conservation Biology's Virginia Bald Eagle Information Website at http://www.ccb-wm.org/virginiaeagles/eagleData.php to obtain updated Bald eagle information. If Bald eagle nests are identified within .25 miles of the project area, DCR also recommends coordination with VDGIF to ensure compliance with protected species legislation.

There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the Virginia Department of Conservation and Recreation (DCR), DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

New and updated information is continually added to Biotics. Please contact DCR for an update on this natural heritage information if a significant amount of time passes before it is utilized.

The Virginia Department of Game and Inland Fisheries maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from http://vafwis.org/fwis/ or contact Shirl Dressler at (804) 367-6913.

Division of Stormwater Management

Chesapeake Bay Local Assistance:
In the City of Hampton, the areas protected by the *Chesapeake Bay Preservation Act*, as locally implemented, require conformance with performance criteria. These areas include Resource Protection Areas (RPAs) and Resource Management Areas (RMAs) as designated by the local government. RPAs include tidal wetlands, certain non-tidal wetlands and tidal shores, and a minimum 100-foot vegetated buffer area located adjacent to and landward of these features and along both sides of any water body with perennial flow. RMAs, which require less stringent performance criteria, include those areas of the City within 100 feet of the inland limit of the RPA.

The proposed project consists of an increase in the number and types of aircraft and personnel stationed at Langley Air Force Base, and includes no new land disturbance, development or redevelopment on lands analogous to locally designated Chesapeake Bay Preservation Areas within the City of Hampton. Therefore, there are no comments or requirements under the Regulations for this project.

The remaining DCR divisions have no comments regarding the scope of this project. Thank you for the opportunity to comment.

CC: Amy Ewing, VDGIF

Literature Cited

Byrd, M.A. 1991. Bald eagle. In Virginia's Endangered Species: Proceedings of a Symposium. K. Terwilliger ed. The McDonald and Woodward Publishing Company, Blacksburg, Virginia. Pp. 499-501.

Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser, and M.C.E. McNall. 1990. The Birds of British Columbia. Vol. 1. Nonpasserines: Introduction and loons through waterfowl. Royal British Columbia Museum, Victoria, British Columbia, Canada.

Herkert, J. R., editor. 1992. Endangered and threatened species of Illinois: status and distribution. Vol. 2: Animals. Illinois Endangered Species Protection Board. iv + 142 pp.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: June 24, 2010)

Terres, J.K. 1980. The Audubon Society encyclopedia of North American birds. Alfred A. Knopf, New York.

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DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR PROGRAM COORDINATION

ENVIRONMENTAL REVIEW COMMENTS APPLICABLE TO AIR QUALITY

TO: John E. Fisher **DEQ - OEIA PROJECT NUMBER: 11 – 162F**

PROJECT TYPE: ☐ STATE EA / EIR **X FEDERAL EA / EIS** ☐ SCC

☐ CONSISTENCY DETERMINATION

PROJECT TITLE: FORCE STRUCTURE CHANGES AT LANGLEY AIRFORCE BASE

PROJECT SPONSOR: DOD / U. S. AIR FORCE

PROJECT LOCATION: **X OZONE MAINTENANCE AND EMISSION CONTROL AREA FOR NOX & VOC**

REGULATORY REQUIREMENTSMAY BE APPLICABLE TO:
☐ CONSTRUCTION
X OPERATION

STATE AIR POLLUTION CONTROL BOARD REGULATIONS THAT MAY APPLY:

1. ☐ 9 VAC 5-40-5200 C & 9 VAC 5-40-5220 E – STAGE I
2. ☐ 9 VAC 5-40-5200 C & 9 VAC 5-40-5220 F – STAGE II Vapor Recovery
3. ☐ 9 VAC 5-40-5490 et seq. – Asphalt Paving operations
4. ☐ 9 VAC 5-130 et seq. – Open Burning
5. ☐ 9 VAC 5-50-60 et seq. Fugitive Dust Emissions
6. ☐ 9 VAC 5-50-130 et seq. - Odorous Emissions; Applicable to_____
7. ☐ 9 VAC 5-50-160 et seq. – Standards of Performance for Toxic Pollutants
8. ☐ 9 VAC 5-50-400 Subpart_____, Standards of Performance for New Stationary Sources, designates standards of performance for the_____
9. ☐ 9 VAC 5-80-10 et seq. of the regulations – Permits for Stationary Sources
10. ☐ 9 VAC 5-80-1700 et seq. Of the regulations – Major or Modified Sources located in PSD areas. This rule may be applicable to the _____
11. ☐ 9 VAC 5-80-2000 et seq. of the regulations – New and modified sources located in non-attainment areas
12. ☐ 9 VAC 5-80-800 et seq. Of the regulations – Operating Permits and exemptions. This rule may be applicable to _____

COMMENTS SPECIFIC TO THE PROJECT:

All precautions are necessary to restrict the emissions of volatile organic compounds (VOC) and oxides of nitrogen (NO_X).

K. S. Narasimhan

(Kotur S. Narasimhan)
Office of Air Data Analysis **DATE: October 12, 2011**

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VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

MEMORANDUM

TO: John E. Fisher, Environmental Program Planner

FROM: Richard J. Criqui, Jr., C.P.S.S., DLPR Review Coordinator

DATE: October 4, 2011

COPIES: Leslie A. Romanchik, Hazardous Waste Program Manager
EIR File

SUBJECT: Environmental Assessment Report - Force Structure Changes at Langley Air Force Base, Langley, VA – DEQ Project No. 11-162F – Review

The Division of Land Protection and Revitalization (DLPR) (former Waste Division) has completed its review of the Draft Environmental Assessment Report (Report) entitled *Draft Environmental Assessment for Force Structure Changes of Langley Air Force Base, Virginia*, dated September 2011. The project site is located in zip code 23665, and is adjacent to zip code 23666. The project is under the Department of Defense (DOD) and the U.S. Air Force, and the project is described at the following internet site under: http://www.accplanning.org/dea_struct_change.html.

The proposed action would increase the number of F-22A aircraft currently assigned to Langley Air Force Base (AFB) by adding six additional F-22A aircraft to the 1st Fighter Wing (I FW) at Langley AFB, VA, and also stand up a T-38A aircraft detachment of 14 training aircraft within the 1st Fighter Wing (1 FW) at Langley AFB, VA.

Each F-22A fighter squadron (27 FS and 94 FS) would each receive three Primary Mission Aircraft Inventory (PMAI) F-22As and two Backup Aircraft Inventory (BAI) F-22As with a total of 94 enlisted manpower authorizations from other locations; this would increase the total number of F-22A aircraft from 36 to 46.

The T-38A aircraft would provide Dissimilar Air Combat Training (DACT) for the F-22As in place of the F-15Cs. Currently projected are up to 14 x T-38 Primary Training Aircraft Inventory (PTAI) to support the two F-22A squadrons (27 FS and 94 FS), with 12-14 contract maintenance personnel. The intent is to operate the total number of T-38s at Langley AFB for approximately 8 – 10 years (FY11 – FY-21).

There will be no new facilities required. Facilities have already been completed under the 2002 EIS.

Facility support for the T-38 detachment requires no new facility construction; existing facilities would accommodate the additional aircraft and personnel.

We have the following comments concerning the Report and provide the following related waste information and issues associated with this project:

Section 3.3, Affected Environment - Hazardous Materials and Waste, of the EA Report specified the following:

> The 2002 EIS adequately addresses hazardous materials and wastes associated with maintaining the F-22A aircraft; hazardous materials and waste associated with the proposed action would not exceed projections in the 2002 EIS.
>
> Maintenance of T-38A aircraft differs from the F-22A in that T-38A aircraft operating in a salt air environment (such as Langley AFB) require an engine wash every seven days, in order to mitigate the corrosive effects on the engines. The engine wash procedure consists of spraying a liquid cleaning solution through the air intake while the engine runs at low speed, increasing engine speed to 50 % power to dry the turbine blades, and then spraying the engine with corrosion preventative upon completion.
>
> This engine cleaning process at Langley AFB will utilize Type II and Type III cleaning solutions, which are aqueous-based solvents, and do not contain Volatile Organic compounds, Semi-Volatile Organic Compound, or petroleum-based solvents. Type II and III cleaners do not impact air quality; therefore waste water from the engine wash process containing these cleaners can be disposed of in an evaporator. Type I engine cleaners were not selected because they are petroleum based, may adversely affect the installations air and water permits, and require more expensive waste handling procedures.
>
> Each individual engine washing evolution uses 20 gallons of cleaning solution. Langley AFB is expected to use 280 gallons of engine cleaning solution each week for maintaining the 14 T-38A aircraft. The engine wash cleaning process produces a fine mist spray from the engine exhaust. Langley AFB designed a portable effluent collection cart which captures 100 % of the residual engine mist material and waste water during the wash process; wastewater is expect to contain oil and grease, total suspended solids (TSS), Biochemical Oxygen Demand/Chemical Oxygen Demand (BOC/COD) and Diesel Range Organics (DRO). This closed-loop waste water capture system allows engine maintenance personnel to drain the effluent into 55 gallon drums and transport the effluent to the base wastewater evaporators for disposal.

Section 4.3, Environmental Consequences - Hazardous Materials and Waste, of the EA Report specified the following:

> Hazardous materials and wastes associated with the additional F-22A Aircraft within the proposed action will not exceed the amounts projected in the 2002 EIS.
>
> The Langley AFT Storm Water Pollution Prevention Plan was updated in 2011 to include the engine wash process and procedures for the T-38A aircraft. Langley AFB personnel designed the T-38 engine Wash Containment System (EWCS) to capture the Type II and Type III T-38 engine wash cleaners and residual rinse water. These cleaners do not contain hydrocarbon solvents, and the best disposal method is evaporation. The engine wash will flush through the tailpipe so that all residual material from this process is forced to drain down within the containment cart (280 gal capacity). Once completed, personnel drain the captured effluent into 55 gal drums and transport it to the F.757 evaporator towers for disposal. An estimated 280 gals of effluent will be disposed each week. Prior to disposal in the evaporator towers, the effluent is analyzed for BOD/COC, TSS, DRO, and oil/grease. The evaporation process requires removal of residual sludge every 6 months. Residual sludge will be sampled and then disposed of through the installation's DMRO contractor in accordance with the installation's hazardous Materials Plan.

The Initial F-22 Operational Wing Beddown, Draft Environmental Impact Statement (EIS), Volume I, dated April 2001, under Section LA3, Langley AFB Affected Environment and Environmental Consequences, Sub-Section LA3.17, Hazardous Materials and Waste, provides information regarding

non-weapon hazardous materials and the process of management of these wastes. The above EIS provided the following basic information:

> The majority of non-weapon hazardous materials used by the Air Force and contractor personnel on Langley AFB are controlled through an Air Force pollution prevention process called HAZMART. This process provides centralized management of the procurement, handling, storage, and issuing of hazardous materials, and the turn-in, recovery, reuse, recycling, or disposal of hazardous wastes. The HAZAMART process includes review and approval by Air Force personnel to ensure users are aware of exposure and safety risks.
>
> This above Sub-Section also provides information on the Langley AFB management of hazardous wastes and the process of management of these generated hazardous wastes. Langley AFB is a large-quantity generator of hazardous wastes. Hazardous wastes are managed in accordance with the Langley AFB Hazardous Waste Management Plan, dated July 31 1997. Hazardous wastes are initially stored at approximately 45 Waste Accumulation Areas at various work locations. A licensed contractor transports the waste from the Accumulation Areas to the 90-day hazardous waste storage facility at the Langley AFB. A licensed disposal contractor picks up the hazardous wastes and transports it off-base for treatment and/or disposal at a licensed Facility. In FY1998, Langley generated 52,500 lbs of hazardous waste from aircraft maintenance.
>
> Langley also has a Spill Prevention and Facility Response Plan (certified in September 2000) and an asbestos management plan.
>
> The above Sub-Section of the EIS also provides minimal information regarding the identification, investigation, and cleanup or remediation of potential hazardous material disposal sites on the DOD property (Langley AFB), which is being addressed under the Comprehensive Environmental Response Compensations and Liability Act (CERCLA) and is subject to a Federal Facility Agreement that is under the EPA Region III. As of 2001, seventeen sites were classified as petroleum sites and are regulated under the Virginia Underground Storage Tank Regulations.

This Report under Project No. 11-162F did partially address potential solid waste and/or hazardous waste issues based on the proposed action. However, the extent of the review and research of both solid and hazardous waste issues at the site is unclear. This Report, under DEQ Project No. 11-162F, does not state that DEQ's databases were searched, nor does it indicate that information was obtained from the DEQ's DLPR files.

The DLPR staff has conducted a cursory review of its database files under zip code 23665 including a GIS database search (within 0.25 to 0.5 mile radius) of the project site and determined the information below.

A few facility waste sites were located within the same zip codes of 23665 and/or within the 0.25 to 0.5 mile radius from the project site; however, their proximity to the project site and potential impact to the project is unknown.

The staff's summary comments are as follows:

Hazardous Waste Facilities

Search of the RCRAInfo database under zip code 23665 and within the project site found the following large quantity generator (LQG) and permitted treatment, storage, disposal (TSD) facility under the RCRA:

- Langley Air force Base Joint Base Langley- Eustis, 37 Sweeney Boulevard, Langley Air Force Base, VA, 23665, EPA ID No. VA4570024477. The Facility is a LQG. The Facility is listed

subject to Full Enforcement and subject to TSD discretionary authority by the EPA under the RCRA Regulations.

Facility contact is Kenneth Parker (757-764-1132). Regarding RCRA, see:
http://iaspub.epa.gov/enviro/efsystemquery.rcrainfo?fac_search=primary_name&fac_value=&fac_search_type=Beginning+With&postal_code=23665&location_address=&add_search_type=Beginning+With&city_name=&county_name=&state_code=&naics_type=Equal+to&naics_to=&univ_search=1&univA=FULL_ENFORCEMENT&univB=LQG&LIBS=&proc_group=0&procname=&program_search=2&report=1&page_no=1&output_sql_switch=TRUE&database_type=RCRAINFO

http://oaspub.epa.gov/enviro/fii_query_dtl.disp_program_facility?pgm_sys_id_in=VA4570024477&pgm_sys_acrnm_in=BR

It is suggested that the Langley AFB contact the DEQ's staff at the Tidewater Regional Office, Waste Program, to enable the DEQ regional waste compliance staff to review the waste information and waste treatment method which is proposed for the project. The DEQ waste compliance staff should evaluate the waste generation information that is associated with the washing of the T-38A aircraft and the proposed method of treatment (use of evaporation units) to establish if the wastes generated are subject to the Virginia Hazardous Waste Management Regulations (VHWMRs) and the RCRA Regulations, and/or the Virginia Solid Waste Management Regulations (VSWMRs). (See: http://www.deq.virginia.gov/regions/tidewater.html.)

Solid Waste Facilities

Search of the DEQ's Solid Waste Sites Inventory under zip code 23665 and/or within 0.5 miles of the project site found the following facilities:

- Hampton City – NASA Steam Plant, 50 Wythe Creek Road, Hampton, VA, 23669, Energy Recovery/Incineration Solid Waste Facility, Solid Waste Unit Status – Active, Solid Waste Permit Status – Permitted, SWP No. SWP 297.

PBR – Permit-by-Rule
RMW – Regulated Medical Waste
SWP- Solid Waste Permit

CERCLA Sites

The following CERCLA facility site was found on the CERCLIS database under zip code 23665 and within the project site:

- Langley Air Force Base and NASA Langley Research Center, Hampton VA, EPA ID No. VA2800005033, Listed as a Final NPL Site, Federal Facility, Federal Facility-Lead Cleanup.

  The EPA Remedial Project Manager (RPM) for the site is Jeffrey Boylan, 215-814-2094.

  For further information regarding this Superfund Site Listing and Progress, see:
  http://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0303768

FUDs Sites

The following FUDS facility sites were found on DEQ's FUDs Sites Inventory under zip code 23665, the location of the project site.

- Langley AFB, Langley AFB, Hampton, VA, 23665, FUDS No. C03VA1039, FFID No. VA 9799F8457.

- Langley MIL AF, NewPort News, VA, 23665, FUDS No. C03VA0006, FFID No. VA 9799F1562.

- Langley AFB – ADC MSL FA, Langley AFB, Hampton, VA, 23665, FUDS No. C03VA0111, FFID No. VA 9799F1590.

For the location and further information regarding the above FUDs sites, please contact Karen Sismour, Federal Facilities Program Manager, Office of Remediation Programs (ORP), DEQ (804-698-4421).

VRP Sites

No DEQ Voluntary Remediation Program (VRP) facility sites were found on DEQ's VRP Sites Inventory under zip code 23665, the zip code of the project site.

Petroleum Release Sites

The following petroleum release sites were found on the DEQ's Inventory under zip code 23655 and/or within 0.25 miles of the project site.

- Langley Air Force Base, Building 843, 355 Harris Avenue, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No. 20005194 , PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base – Building 949, DeFord Avenue, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No. 20005167, PC Case Status – Release Suspected, Case Closed.

- Langley Air Force Base, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No.19972338, PC Case Status – Release Suspected, Case Closed.

- Langley Air Force Base, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No.19932358, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No.19972338, PC Case Status – Release Suspected, Case Closed.

- Langley Air Force Base, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No.19952355, PC Case Status – Release Suspected, Case Closed.

- Langley Air Force Base, Building 869, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No. 20005166, PC Case Status – Release Suspected, Case Closed.

- Langley Air Force Base, Buildings 818-819, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No.19932357, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base, Building 856, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No.19943576, PC Case Status – Release Suspected, Case Closed.

- Langley Air Force Base, Building 926, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No.19982207, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base, Building 926, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No.19982207, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base, Buildings 974, 986-987, & 991, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No.19943574, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base, N Roma Road, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No. 20025099, PC Case Status – Release Suspected, Case Closed.

- Langley Air Force Base, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No. 19962397, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No. 19992245, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No. 19952367, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No. 19952356, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base – Bldg 1303 - Oil-Water Separator, Weyland Road, Hampton, VA, 23665, DEQ PC No. 20015125, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base – Bldg 1316 –Golf Course, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No. 20055145, PC Case Status – Release Confirmed, Case Closed.

- National Aeronautics & Space Administration, 1 Langley Boulevard, Hampton, VA, 23665, DEQ PC No. 19930148, PC Case Status – Release Suspected, Case Closed.

- Langley Air Force Base, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No.19952363, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No.19982240, PC Case Status – Release Suspected, Case Closed.

- Langley Air Force Base, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No.19982223, PC Case Status – Release Confirmed, Case Closed.

- National Aeronautics & Space Administration, 1 Langley Boulevard, Hampton, VA, 23665, DEQ PC No.19930160, PC Case Status – Release Suspected, Case Closed.

- Langley Research Center – Building 1215, 14 West Taylor Street, Hampton, VA, 23665, DEQ PC No. 20025015, PC Case Status – Release Suspected, Case Closed.

- National Aeronautics & Space Administration, 1 Langley Boulevard, Hampton, VA, 23665, DEQ PC No.19910926, PC Case Status – Release Confirmed, Case Closed.

- National Aeronautics & Space Administration, 1 Langley Boulevard, Hampton, VA, 23665, DEQ PC No.19930147, PC Case Status – Release Confirmed, Case Closed.

- Metals of Virginia, 28 Research Drive, Hampton, VA, 23666, DEQ PC No. 19931474, PC Status – Release Confirmed, Case Closed.

- National Aeronautics & Space Administration, 1 Langley Boulevard, Hampton, VA, 23665, DEQ PC No.1990644, PC Case Status – Release Confirmed, Case Closed.

- National Aeronautics & Space Administration, 1 Langley Boulevard, Hampton, VA, 23665, DEQ PC No.19910926, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base – Building 1362, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No.20055077, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base – Williams Holding Corp., 2972 N. Armistead, Hampton, VA, 23665, DEQ PC No.20115070, PC Case Status – Release Confirmed, Case Open.

- Langley Air Force Base – Williams Holding Corp., 2972 N. Armistead, Hampton, VA, 23665, DEQ PC No. 19992338, PC Case Status – Release Confirmed, Case Closed.

- Wythe Creek, 3351 Commander Shepard Blvd, Hampton, VA, 23665, DEQ PC No. 20095002, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base – Building 333, 90 Oak Street, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No.20005232, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base – Building 338, 50 W Flightline, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No.20005233, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base – Building 369 - 74, W Flightline, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No.20005231, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No. 19911697, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No. 19962320, PC Case Status – Release Suspected, Case Closed.

- Langley Air Force Base, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No. 19952351, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No. 19952352, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No. 19952348, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No. 19952366, PC Case Status – Release Confirmed, Case Closed.

- Langley Air Force Base, 37 Sweeney Boulevard, Langley AFB, VA, 23665, DEQ PC No. 199523 35, PC Case Status – Release Suspected, Case Closed.

Note: Please go to the DEQ's VEGIS Database to complete the search of Petroleum Release Sites at the South end of the Langley Air Force Base to establish the complete inventory of PC Case Nos. and

Petroleum Release Sites at this Facility. (Over 120 more Petroleum Release sites at the Langley Air Force Base exist based upon the VEGIS Database.)

See: http://www.deq.virginia.gov/mapper_ext/Index.aspx

Please note that the DEQ's PC case files of the PC Case Nos., identified above should be evaluated by the project engineer or manager to establish the exact location of the petroleum release, the nature and extent of the release and the potential to impact the proposed project. The facility representative should contact the DEQ's Tidewater Regional Office (TRO) for further information and the administrative records of the PC cases which may be in close proximity to the proposed project.

(See: http://www.deq.virginia.gov/regions/tidewater.html.)

GENERAL COMMENTS

Soil, Sediment, and Waste Management

Any soil that is suspected of contamination or wastes that are generated must be tested and disposed of in accordance with applicable Federal, State, and local laws and regulations. Some of the applicable state laws and regulations are: Virginia Waste Management Act, Code of Virginia Section 10.1-1400 *et seq.*; Virginia Hazardous Waste Management Regulations (VHWMR) (9VAC 20-60); Virginia Solid Waste Management Regulations (VSWMR) (9VAC 20-81); Virginia Regulations for the Transportation of Hazardous Materials (9VAC 20-110). Some of the applicable Federal laws and regulations are: the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. Section 6901 *et seq.*, and the applicable regulations contained in Title 40 of the Code of Federal Regulations; and the U.S. Department of Transportation Rules for Transportation of Hazardous Materials, 49 CFR Part 107.

Pollution Prevention – Reuse - Recycling

Please note that DEQ encourages all construction projects and facilities to implement pollution prevention principles, including the reduction, reuse, and recycling of all solid wastes generated. All generation of hazardous wastes should be minimized and handled appropriately.

If you have any questions or need further information, please contact Richard Criqui at (804) 698-4013.

Fisher, John (DEQ)

From: Forsgren, Diedre (VDH)
Sent: Monday, October 03, 2011 3:09 PM
To: Fisher, John (DEQ)
Cc: Matthews, Barry (VDH)
Subject: (11-162F EA: Force Structure Changes at Langley Air Force Base

DEQ Project #: 11-162F
Name: Force Structure Changes at Langley Air Force Base
Sponsor: DOD/U. S. Air Force
Location: City of Hampton

VDH – Office of Drinking Water has reviewed DEQ Project Number 11-162F. Below are our comments as they relate to proximity to **public drinking water** sources (groundwater wells, springs and surface water intakes). Potential impacts to public water distribution systems or sanitary sewage collection systems must be verified by the local utility.

No groundwater wells are within a 1 mile radius of the project site.

No surface water intakes are located within a 5 mile radius of the project site.

Project does not fall within Zone 1 (up to 5 miles into the watershed) or Zone 2 (greater than 5 miles into the watershed) of any public surface water sources.

There are no apparent impacts to public drinking water sources due to this project.

Diedre Forsgren
Office Services Specialist
VIRGINIA DEPARTMENT OF HEALTH
Office of Drinking Water, Room 622-A
109 Governor Street
Richmond, VA 23219
Phone: (804) 864-7241
email: diedre.forsgren@vdh.virginia.gov

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
STAN D. CLARK, CHAIRMAN • THOMAS G. SHEPPERD, JR., VICE CHAIR • JAMES O. McREYNOLDS, TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

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MEMBER JURISDICTIONS

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PORTSMOUTH

SOUTHAMPTON

SUFFOLK

SURRY

VIRGINIA BEACH

WILLIAMSBURG

YORK

October 4, 2011

Mr. John E. Fisher
Virginia Department of Environmental Quality
Office of Environmental Impact Review
629 East Main Street, Sixth Floor
Richmond, VA 23219

Re: DEQ #11-162F, Force Structure Changes at Langley Air Force Base (ENV:GEN)

Dear Mr. Fisher:

Pursuant to your request, the staff of the Hampton Roads Planning District Commission has reviewed the environmental assessment for the proposed project, Force Structure Changes at Langley Air Force Base, in the City of Hampton. We have consulted with city staff regarding this project.

Based on this review, the proposal appears to be consistent with local and regional plans and policies. The draft environmental assessment incorporates the issues that we previously identified in our communications with U.S. Air Force Headquarters Air Combat Command.

We appreciate the opportunity to review this project. If you have any questions, please do not hesitate to call.

Sincerely,

John M. Carlock, AICP
Deputy Executive Director

BJM/fh

Copy: Keith Cannady, HA

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COMMONWEALTH of VIRGINIA

Randall P Burdette
Director

Department of Aviation
5702 Gulfstream Road
Richmond, Virginia 23250-2422

V/TDD • (804) 236-3624
FAX • (804) 236-3635

September 22, 2011

Mr. John E. Fisher
Department of Environmental Quality
Office of Environmental Impact Review
629 East Main Street, 6th Floor
Richmond, Virginia 23219

Re: DOD/ U. S. Air Force
Force Structure Changes at Langley Air Force Base
Environmental Assessment (11-162F)

Dear Mr. Fisher:

Thank you for requesting our comments on the Project concerning the Force Structure Changes at Langley Air Force Base, Project Number 11-162F.

The Virginia Department of Aviation has reviewed the document and does not have any comments concerning this project at this time. The Department of Aviation appreciates the opportunity to comment on this project.

Sincerely,

R. N. (Rusty) Harrington
Manager, Planning and Environmental Section
Airport Services Division

tbm/

100 DOAVAS 20110922 Langley Force Structure Changes EA.doc

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
6669 Short Lane
Gloucester, Virginia 23061

SEP 02 2010

Greetings:

Due to increases in workload and refinement of our priorities in Virginia, this office will no longer provide individual responses to requests for environmental reviews. However, we want to ensure that U.S. Fish and Wildlife Service (Service) trust resources continue to be conserved. When that is not possible, we want to ensure that impacts to these important natural resources are minimized and appropriate permits are applied for and received. We have developed a website, http://www.fws.gov/northeast/virginiafield/endspecies/Project_Reviews.html, that provides the steps and information necessary to allow landowners, applicants, consultants, agency personnel, and any other individual or entity requiring Service review / approval of their project to complete a review and come to the appropriate conclusion.

The website will be frequently updated to provide new species / trust resource information and methods to review projects, so refer to the website for each project review to ensure that current information is utilized.

If you have any questions about project reviews or need assistance, please contact Tylan Dean of this office at (804) 693-6694, extension 166, or tylan_dean @fws.gov. For problems with the website, please contact Mike Drummond of this office at mike_drummond@fws.gov.

Sincerely,

Cindy Schulz
Supervisor
Virginia Field Office

COMMONWEALTH of VIRGINIA

Department of Historic Resources

Douglas W. Domenech
Secretary of Natural Resources

2801 Kensington Avenue, Richmond, Virginia 23221

Kathleen S. Kilpatrick
Director

Tel: (804) 367-2323
Fax: (804) 367-2391
TDD: (804) 367-2386
www.dhr.virginia.gov

17 October 2011

Mr. Larry H. Dryden
Department of the Air Force
Headquarters Air Combat Command/A7PS
129 Andrews Street, Suite 102
Langley AFB Virginia 23665-2769

Re: Draft EA for proposed Force Structure Changes
Langley Air Force Base, Virginia
DHR File No. 2011-0579

Dear Mr. Dryden:

The Department of Historic Resources (DHR) has received your request for our review and comment regarding the draft Environmental Assessment (EA) for the above referenced project. We apologize that our comments are coming after the expiration of our 30-day review period. It is our understanding that the Air Force proposes to increase the number of F-22A aircraft station at Langley Air Force Base from 36 to 42, and to establish a T-38A aircraft detachment on base. It is further our understanding that there will be no new construction or demolition is associated with the aircraft beddown or associated increase in personnel. As such, we do not believe this undertaking will adversely affect the Langley Field Historic District, a property eligible for listing in the National Register of Historic Places.

It should be noted that the draft EA did not address effects to historic properties as part of its EA analysis. Even though no new construction or demolition are required for this undertaking, we would still have expected a discussion regarding impacts to historic properties in the draft EA.

If you have any questions about our comments, please call me at (804) 482-6090.

Sincerely,

Marc Holma, Architectural Historian
Office of Compliance and Review

C: Mr. John E. Fisher, DEQ

Douglas W. Domenech
Secretary of Natural Resources

David A. Johnson
Director

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION
203 Governor Street
Richmond, Virginia 23219-2010
(804) 786-1712

MEMORANDUM

DATE: October 12, 2011

TO: Mr. Donald Calder, Langley AFB

FROM: Roberta Rhur, Environmental Impact Review Coordinator

SUBJECT: DCR 11-081, Langley Air Force Base F-22 Operational Wing Beddown Draft EIS

Division of Natural Heritage

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information in our files, Bald eagles (*Haliaeetus leucocephalus*, G5/S2S3B,S3N/NL/LT) have been documented within the noise contours shown on Figure LA3.2-1 of the Draft EA. The Bald eagle breeds from Alaska eastward through Canada and the Great Lakes region, along coastal areas off the Pacific and Atlantic Oceans, and the Gulf of Mexico, and in pockets throughout the western United States (NatureServe, 2009). In Virginia, it primarily breeds along the large Atlantic slope rivers (James, Rappahannock, Potomac, etc) with a few records at inland sites near large reservoirs (Byrd, 1991). Bald eagle nest sites are often found in the midst of large wooded areas near marshes or other bodies of water (Byrd, 1991). Bald eagles feed on fish, waterfowl, seabirds (Campbell et. al., 1990), various mammals and carrion (Terres, 1980). Please note that this species is currently classified as threatened by the Virginia Department of Game and Inland Fisheries (VDGIF).

Threats to this species include human disturbance of nest sites (Byrd, 1991), habitat loss, biocide contamination, decreasing food supply and illegal shooting (Herkert, 1992).

DCR recommends utilizing the Center for Conservation Biology's Virginia Bald Eagle Information Website at http://www.ccb-wm.org/virginiaeagles/eagleData.php to obtain updated Bald eagle information. If Bald eagle nests are identified within .25 miles of the project area, DCR also recommends coordination with VDGIF to ensure compliance with protected species legislation.

There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the Virginia Department of Conservation and Recreation (DCR), DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

New and updated information is continually added to Biotics. Please contact DCR for an update on this natural heritage information if a significant amount of time passes before it is utilized.

The Virginia Department of Game and Inland Fisheries maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from http://vafwis.org/fwis/ or contact Shirl Dressler at (804) 367-6913.

Division of Stormwater Management

Stormwater Management:
Projects involving land-disturbing activities equal to or greater than 10,000 square feet, or equal to or greater than 2,500 square feet in all areas subject to the Chesapeake Bay Preservation Act, must comply with the Virginia Erosion and Sediment Control Law and all applicable regulations adopted in accordance with that law. Projects involving land-disturbing activities equal to or greater than one acre, or equal to or greater than 2,500 square feet in all areas of the jurisdictions designated as subject to the Chesapeake Bay Preservation Area Designation and Management Regulations adopted pursuant to the Chesapeake Bay Preservation Act, must comply with the Virginia Stormwater Management Act and the Virginia Stormwater Management Program (VSMP) Permit Regulations adopted in accordance with the Act. If you have project specific questions please contact the Virginia Department of Conservation and Recreation Suffolk Regional Office.
http://www.dcr.virginia.gov/soil_&_water/swintro.shtml

Virginia Erosion and Sediment Control Law and Regulations:
http://www.dcr.virginia.gov/soil_&_water/documents/eslawrgs.pdf

Virginia Stormwater Management Act:
http://www.dcr.virginia.gov/soil_&_water/documents/vaswmlaw.pdf

Virginia Stormwater Management Program (VSMP) Permit Regulations:
http://www.dcr.virginia.gov/soil_&_water/documents/vaswmregs.pdf

Virginia Stormwater Program Permits
http://www.dcr.virginia.gov/soil_&_water/vsmp.shtml

The remaining DCR divisions have no comments regarding the scope of this project. Thank you for the opportunity to comment.

CC: Amy Ewing, VDGIF

Literature Cited

Byrd, M.A. 1991. Bald eagle. In Virginia's Endangered Species: Proceedings of a Symposium. K. Terwilliger ed. The McDonald and Woodward Publishing Company, Blacksburg, Virginia. Pp. 499-501.

Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser, and M.C.E. McNall. 1990. The Birds of British Columbia. Vol. 1. Nonpasserines: Introduction and loons through waterfowl. Royal British Columbia Museum, Victoria, British Columbia, Canada.

Herkert, J. R., editor. 1992. Endangered and threatened species of Illinois: status and distribution. Vol. 2: Animals. Illinois Endangered Species Protection Board. iv + 142 pp.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: June 24, 2010)

Terres, J.K. 1980. The Audubon Society encyclopedia of North American birds. Alfred A. Knopf, New York.

COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION
1700 North Main Street

Greg A. Whirley
Commissioner

October 14, 2011

Mr. Larry H. Dryden, P.E.
Chief Sustainable Installations Branch (A7PS)
Headquarters Air Combat Command
129 Andrews Street, Suite 102
Langley AFB, VA 23665-2769

Dear Mr. Dryden:

The Hampton Roads District Planning and Land Development Office has completed a courtesy review of the Draft Environmental Assessment (EA) for the proposed force structure changes at Langley AFB, VA. The primary focus of this review is to identify any major transportation issues that should be included or further explored in the document. As such, the comments identified below are preliminary in nature and provided for your review or revision as deemed appropriate.

Based on your environmental review, the structural changes at Langley Air Force Base will involve the placement of six (6) additional F-22 aircraft and 14 T-38A training aircraft on base which will not require the construction of any additional on base facilities or modifications to your federally approved airspace. The review also states that impacts to noise and air quality to the surrounding community will be comparable and in some cases less than to the baseline averages analyzed in the initial *F-22A Operation Wing Draft Environmental Impact Statement (2002)*. Based on this assumption, your environmental review does not address any land use or transportation impacts resulting from the recent structural changes on base.

We would suggest that this environmental review be used to re-address the transportation challenges that may or may not have been resolved in the 2002 EIS, including revised traffic counts on primary roadways (the previous counts are from 1999-2000) and signal improvements to major intersections including Sweeney Boulevard and Elm Street and at Sweeney Boulevard and Nealy/Hammond Avenues. Parking lot restriping, bike-pedestrian connections and transit improvements were also discussed in the previous study and should be reexamined in the current environmental document.

The environmental review goes on to state that the structural changes will involve "a total of 94 enlisted manpower authorizations from other locations". If this authorization will result in additional personnel working on base, it is important to determine how many more vehicles trips will be created and what new transportation improvements will be needed to accommodate the new vehicles. A travel demand analysis and detailed traffic study should also be incorporated into the environmental assessment.

Without a further study of the transportation impacts associated with the proposed force structure changes, there is not a sufficient amount of information to make a thorough review of the environmental assessment at this time. Please notify Mr. Carl Jackson at 757-925-6739, should you have any questions.

Sincerely,

Eric L. Stringfield
Hampton Roads Transportation Planning and Land Use Director

ELS/cej

cc: Tom Fahrney, Commonwealth BRAC Coordinator
Christopher D. Atkins, Environmental Program Planner

Appendix B Aircraft Noise

Noise is generally described as unwanted sound. Unwanted sound can be based on objective effects (such as hearing loss or damage to structures) or subjective judgments (community annoyance). Noise analysis requires a combination of physical measurement of sound, physical and physiological effects, plus psycho- and socio-acoustic effects.

Section B.1 of this appendix describes how sound is measured and summarizes noise impact in terms of community acceptability and land use compatibility. Section B.2 gives detailed descriptions of the effects of noise that lead to the impact guidelines presented in Section 1. Section B.3 provides a description of the specific methods used to predict aircraft noise including a detailed description of sonic booms.

B.1 Noise Descriptors and Impact

Aircraft operating in the Military Operations Areas (MOAs) and warning areas generate two types of sound. One is "subsonic" noise, which is continuous sound generated by the aircraft's engines and by air flowing over the aircraft itself. The other is sonic booms (only in MOAs and warning areas authorized for supersonic flight), which are transient impulsive sounds generated during supersonic flight. These are quantified in different ways.

Section B.1 describes the characteristics that are used to describe sound. Section B.2 describes the specific noise metrics used for noise impact analysis. Section B.3 describes how environmental impact and land use compatibility are judged in terms of these quantities.

B.1.1 Quantifying Sound

Measurement and perception of sound involves two basic physical characteristics: amplitude and frequency. Amplitude is a measure of the strength of the sound and is directly measured in terms of the pressure of a sound wave. Since sound pressure varies in time, various types of pressure averages are usually used. Frequency, commonly perceived as pitch, is the number of times per second the sound causes air molecules to oscillate. Frequency is measured in units of cycles per second, or hertz (Hz).

Amplitude - The loudest sounds the human ear can comfortably hear have acoustic energy one-trillion times the acoustic energy of sounds the ear can barely detect. Due to this vast range, attempts to represent sound amplitude by pressure are generally unwieldy. Sound is therefore, usually represented on a logarithmic scale with a unit called the decibel (dB). Sound on the decibel scale is referred to as a sound level. The threshold of human hearing is approximately 0 dB and the threshold of discomfort or pain is around 120 dB.

Due to the logarithmic nature of the decibel scale, sounds levels do not add and subtract directly and are somewhat cumbersome to handle mathematically. However, some simple rules of thumb are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level for example:

60 dB + 60 dB = 63 dB
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

Since the addition of sound levels behaves differently than that of ordinary numbers, such addition is often referred to as "decibel addition" or "energy addition". The latter term arises from the fact that combination of decibel values consists of first converting each decibel value to its corresponding acoustic energy, then adding the energies using the normal rules of addition, and finally converting the total energy back to its decibel equivalent.

The difference in dB between two sounds represents the ratio of the amplitudes of those two sounds. Since human senses tend to be proportional (i.e., detect whether one sound is twice as big as another is) rather than absolute (i.e., detect whether one sound is a given number of pressure units bigger than another is), the decibel scale correlates well with human response.

Under laboratory conditions, differences in sound level of 1 dB can be detected by the human ear. In the community, the smallest change in average noise level that can be detected is about 3 dB. A change in sound level of about 10 dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness and this relationship holds true for loud sounds and for quieter sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound *intensity* but only a 50 percent decrease in perceived *loudness* because of the nonlinear response of the human ear (similar to most human senses).

The one exception to the exclusive use of levels, rather than physical pressure units, to quantify sound is in the case of sonic booms. As described in Section B.3, sonic booms are coherent waves with specific characteristics. There is a long-standing tradition of describing individual sonic booms by the amplitude of the shock waves in pounds per square foot (psf). This is particularly relevant when assessing structural effects as opposed to loudness or cumulative community response. In this study, sonic booms are quantified by either dB or psf as appropriate for the particular impact being assessed.

Frequency - The normal human ear can hear frequencies from about 20 Hz to about 20,000 Hz. It is most sensitive to sounds in the 1,000 to 4,000 Hz range. When measuring community response to noise, it is common to adjust the frequency content of the measured sound to correspond to the frequency sensitivity of the human ear. This adjustment is called A-weighting (ANSI 1988). Sound levels that have been so adjusted are referred to as A-weighted sound levels.

The spectral content of the F-22A is somewhat different from other aircraft including (at high throttle settings) the characteristic nonlinear crackle of high thrust engines. The spectral characteristics of various noises are accounted for by A-weighting, which approximates the response of the human ear. There are other, more detailed, weighting factors that have been applied to sounds. In the 1950s and 1960s, when noise from civilian jet aircraft became an issue, substantial research was performed to determine what characteristics of jet noise was the problem. The metrics Perceived Noise Level and Effective Perceived Noise Level were developed. These accounted for nonlinear behavior of hearing and the importance of low frequencies at high levels and for many years airport/airbase noise contours were presented in

terms of Noise Exposure Forecast, which was based on Perceived Noise Level and Effective Perceived Noise Level. In the 1970s, it was realized that the primary intrusive aspect of aircraft noise was the high noise level, a factor that is well represented by A-weighted levels and L_{dn}. The refinement of Perceived Noise Level, Effective Perceived Noise Level, and Noise Exposure Forecast was not significant in protecting the public from noise.

There has been continuing research on noise metrics and the importance of sound quality sponsored by the Department of Defense (DoD) for military aircraft noise and by the Federal Aviation Administration (FAA) for civil aircraft noise. The metric L_{dnmr}, which accounts for the increased annoyance of rapid onset rate of sound, is a product of this long-term research. DoD is sponsoring the development of NoiseRunner, which will calculate noise in a more sophisticated manner than done by NOISEMAP and MR_NMAP. At present, NOISEMAP, MR_NMAP, and the metrics L_{dn} and L_{dnmr} represent the best current science for analysis of military aircraft.

The amplitude of A-weighted sound levels is measured in dB. It is common for some noise analysts to denote the unit of A-weighted sounds by dBA. As long as the use of A-weighting is understood, there is no difference between dB and dBA. It is only important that the use of A-weighting be made clear. In this Environmental Assessment (EA), sound levels are reported in dB and are A-weighted unless otherwise specified.

A-weighting is appropriate for continuous sounds, which are perceived by the ear. Impulsive sounds, such as sonic booms, are perceived by more than just the ear. When experienced indoors, there can be secondary noise from rattling of the building and vibrations may be felt. C-weighting (ANSI 1988) is applied to such sounds. This is a frequency weighting that is flat over the range of human hearing (about 20 Hz to 20,000 Hz) and rolls off above and below that range. In this study, C-weighted sound levels are used for the assessment of sonic booms and other impulsive sounds. As with A-weighting, the unit is dB, but dBC is sometimes used for clarity. In this study, sound levels are reported in dB, and C-weighting is specified as necessary.

Time Averaging - Sound pressure of a continuous sound varies greatly with time so it is customary to deal with sound levels that represent averages over time. Levels presented as instantaneous (i.e., as might be read from the dial of a sound level meter) are based on averages of sound energy over either 1/8 second (fast) or 1 second (slow). The formal definitions of fast and slow levels are somewhat complex, with details that are important to the makers and users of instrumentation. They may be thought of as levels corresponding to the root mean-square sound pressure measured over the 1/8-second or 1-second periods.

The most common uses of the fast or slow sound level in environmental analysis is in the discussion of the maximum sound level that occurs from the action and in discussions of typical sound levels. Figure B 1 is a chart of A-weighted sound levels from typical sounds. Some (air conditioner, vacuum cleaner) are continuous sounds whose levels are constant for some time. Some (automobile, heavy truck) are the maximum sound during a vehicle pass by. Some (urban daytime, urban nighttime) are averages over some extended period. A variety of noise metrics has been developed to describe noise over different periods. These are described in Section B.2.

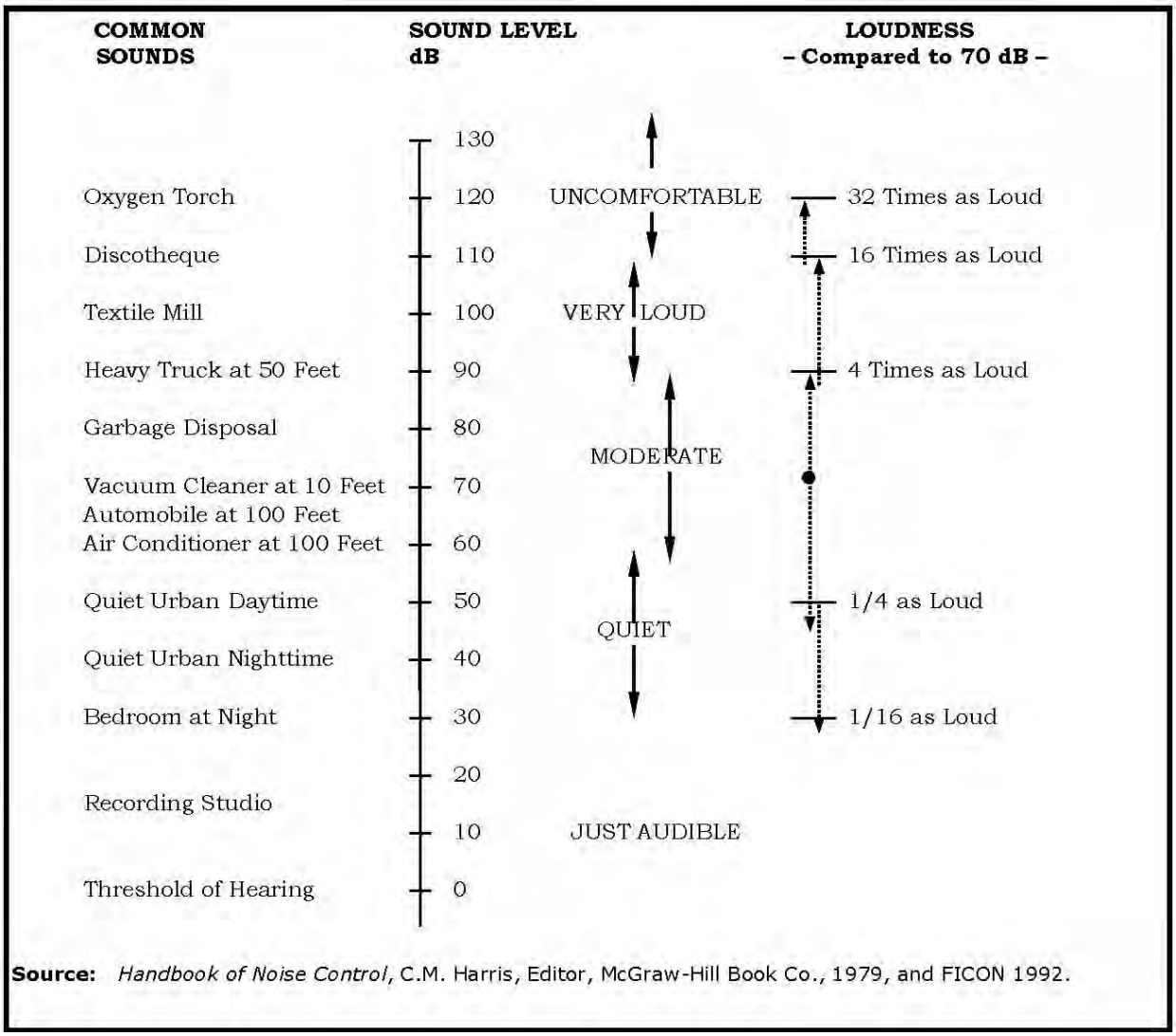


Figure B 1. Typical A-Weighted Sound Levels of Common Sounds

B.2 Noise Metrics

B.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 ALM, L_{max}, or L_{Amax}. The maximum sound level is important in judging the interference caused by a noise event with conversation, listening to the TV or radio, sleeping, or other common activities.

B.2.2 Peak Sound Level

For impulsive sounds, the true instantaneous sound pressure is of interest. For sonic booms, this is the peak pressure of the shock wave as described in Section 3.2 of this appendix. This pressure is usually presented in physical units of psf. Sometimes it is represented on the decibel scale, with symbol L_{pk}. Peak sound levels do not use either A or C weighting.

B.2.3 Sound Exposure Level

Individual time-varying noise events have two main characteristics: a sound level that 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} for A-weighted sounds) combines both of these characteristics into a single metric.

SEL is a composite metric that represents both the intensity of a sound and its duration. Mathematically, the mean square sound pressure is computed over the duration of the event and then multiplied by the duration in seconds and the resultant product is turned into a sound level. 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 has been well established in the scientific community that SEL measures this impact much more reliably than just the maximum sound level.

Since the SEL and the maximum sound level are both used to describe single events, there is sometimes confusion between the two, so the specific metric used should be clearly stated.

SEL can be computed for C-weighted levels (appropriate for impulsive sounds) and the results denoted CSEL or L_{CE}. SEL for A-weighted sound is sometimes denoted ASEL. Within this study, SEL is used for A-weighted sounds and CSEL for C-weighted.

B.2.4 Equivalent Sound Level

For longer periods, total sound is represented by the equivalent continuous sound pressure level (L_{eq}). L_{eq} is the average sound level over some period (often an hour or a day, but any explicit time span can be specified), with the averaging being done on the same energy basis as used for SEL. SEL and L_{eq} are closely related, differing by (a) whether they are applied over a specific period or over an event, and (b) whether the duration of the event is included or divided out.

Just as SEL has proven to be a good measure of the noise impact of a single event, L_{eq} has been established to be a good measure of the impact of a series of events during a given period. In addition, while L_{eq} is defined as an average, it is effectively a sum over that period and is, thus, a measure of the cumulative impact of noise.

B.2.5 Day-Night Average Sound Level

Noise tends to be more intrusive at night than during the day. This effect is accounted for by applying a 10-dB penalty to events that occur after 10 PM and before 7 AM. If L_{eq} is computed over a 24-hour period with this nighttime penalty applied, the result is the day-night average sound level (L_{dn}). L_{dn} is the community noise metric recommended by the U.S. Environmental Protection Agency (USEPA 1974) and adopted by most federal agencies (FICON 1992). It has been well established that L_{dn} correlates well with community response to noise (Schultz 1978; Finegold *et al.* 1994). This correlation is presented in Section B.3.1 of this appendix.

While L_{dn} carries the nomenclature "average", it incorporates all of the noise at a given location. For this reason, L_{dn} is often referred to as a "cumulative" metric. It accounts for the total, or cumulative, noise impact.

It was noted earlier that, for impulsive sounds, C-weighting is more appropriate than A-weighting. The day-night average sound level can be computed for C-weighted noise and is denoted L_{cdn} or L_{Cdn}. This procedure has been standardized and impact interpretive criteria similar to those for L_{dn} have been developed (CHABA 1981).

B.2.6 Onset-Adjusted Monthly Day-Night Average Sound Level

Aircraft operations in military airspace, such as MOAs and warning areas, generate a noise environment somewhat different from other community noise environments. Overflights are sporadic, occur randomly, and vary from day to day and week to week. This situation differs from most community-type noise environments where noise tends to be continuous or patterned. Individual military overflight events also differ from typical community noise events in that noise from a low-altitude, high-airspeed flyover can have a rather sudden onset.

To represent these differences, the conventional L_{dn} metric is adjusted to account for the "surprise" effect of the sudden onset of aircraft noise events on humans (Plotkin *et al.* 1987; Stusnick *et al.* 1992; Stusnick *et al.* 1993). For aircraft exhibiting a rate of increase in sound level (called onset rate) of from 15 to 150 dB per second, an adjustment or penalty ranging from 0 to 11 dB is added to the normal SEL. Onset rates above 150 dB per second require an 11 dB penalty, while onset rates below 15 dB per second require no adjustment. The L_{dn} is then determined in the same manner as for conventional aircraft noise events. It is then designated as Onset-Rate Adjusted Day-Night Average Sound Level (abbreviated L_{dnmr}). Due to the irregular occurrences of aircraft operations, the number of average daily operations is determined by using the calendar month with the highest number of operations. The monthly average is denoted L_{dnmr}. Noise levels are calculated the same way for both L_{dn} and L_{dnmr}. L_{dnmr} is interpreted by the same criteria as used for L_{dn}.

B.3 Noise Impact

B.3.1 Community Reaction

Studies of community annoyance to numerous types of environmental noise show that L_{dn} correlates well with impact. Schultz (1978) showed a consistent relationship between L_{dn} and annoyance. Shultz's original curve fit (Figure B 2) shows there is a remarkable consistency in results of attitudinal surveys, which relates the percentages of groups of people who express various degrees of annoyance when exposed to different L_{dn}.

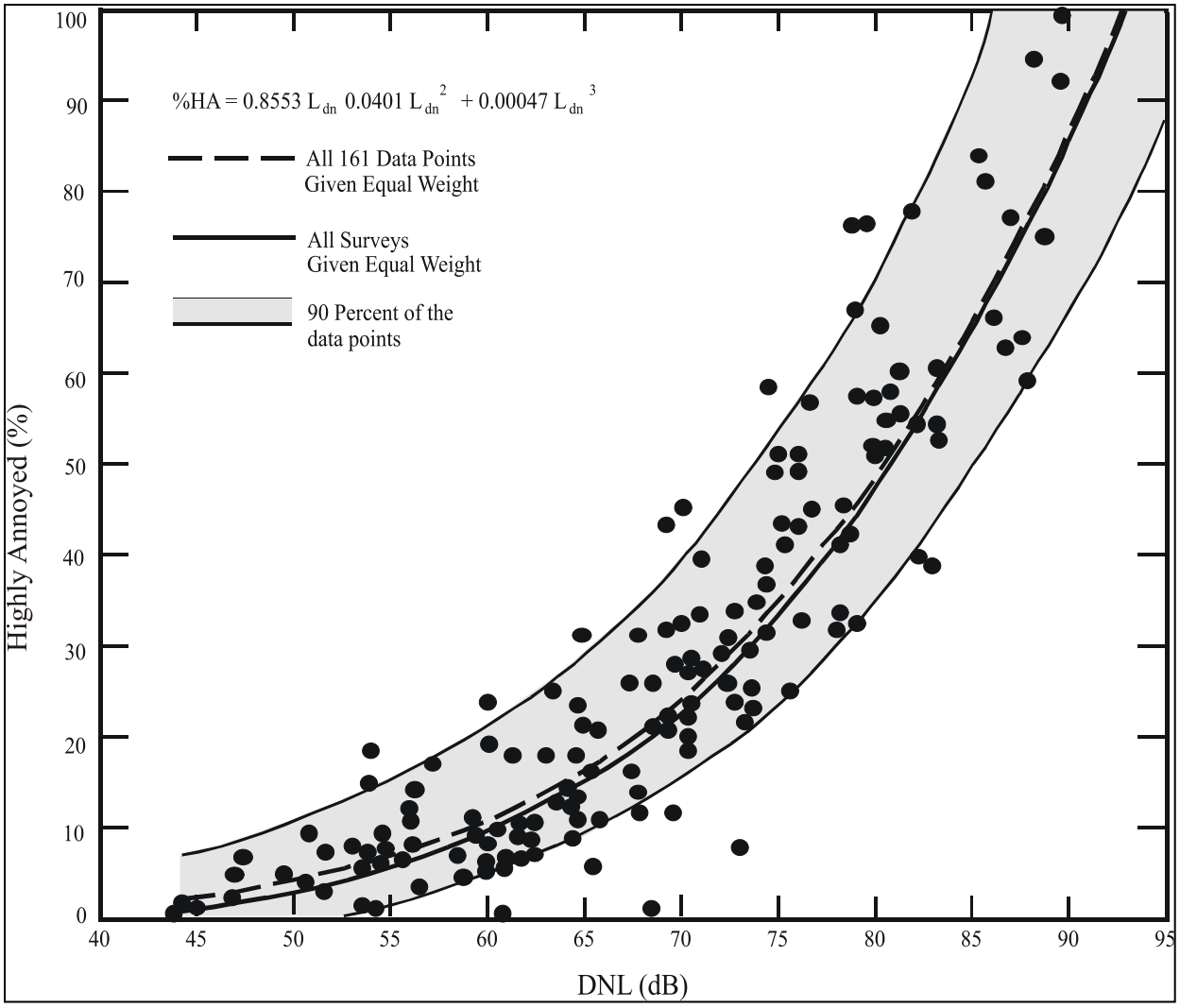
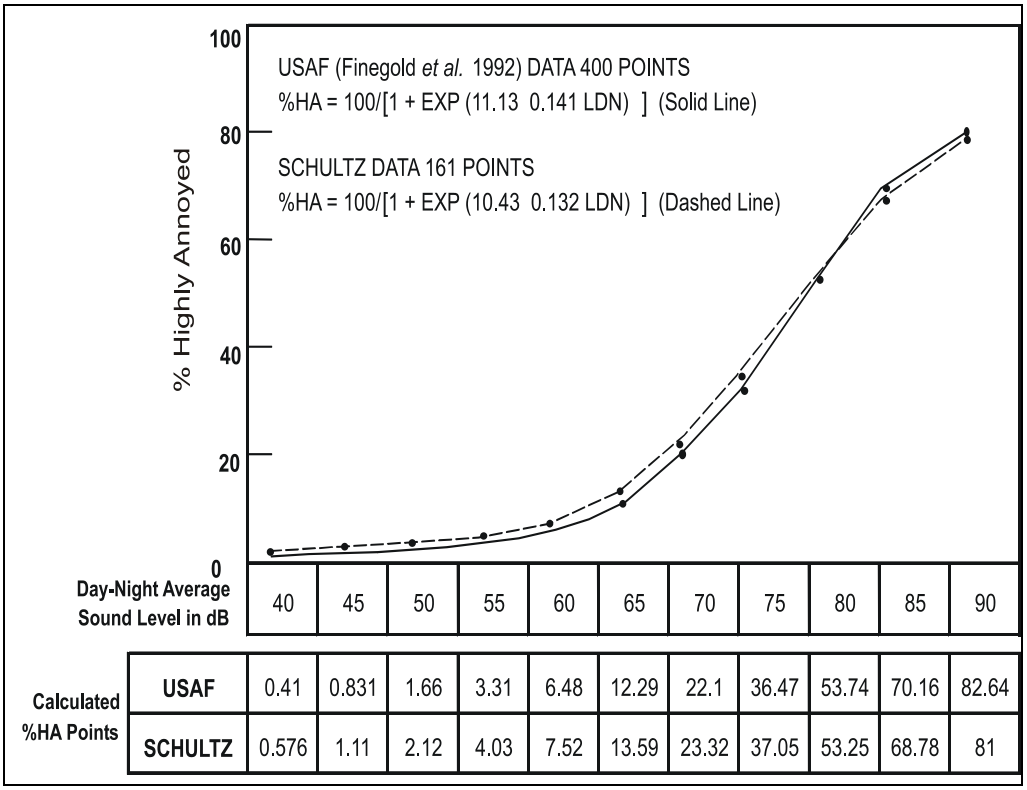


Figure B 2. Community Surveys of Noise Annoyance (Source: Schultz 1978)

A more recent study has reaffirmed this relationship (Fidell *et al.* 1991). Figure B 3 (FICON 1992) shows an updated form of the curve fit (Finegold *et al.* 1994) in comparison with the original. The updated fit, which does not differ substantially from the original, is the current preferred form. 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, 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 is represented quite reliably using L_{dn}.

As noted earlier for SEL, L_{dn} does not represent the sound level heard at any particular time, but rather represents the total sound exposure. L_{dn} accounts for the sound level of individual noise events, the duration of those events, and the number of events. Its use is endorsed by the scientific community (ANSI 1980, 1988; USEPA 1974; FICON 1980, 1992).



Day-Night Average Sound Level in dB		40	45	50	55	60	65	70	75	80	85	90
Calculated %HA Points	USAF	0.41	0.831	1.66	3.31	6.48	12.29	22.1	36.47	53.74	70.16	82.64
	SCHULTZ	0.576	1.11	2.12	4.03	7.52	13.59	23.32	37.05	53.25	68.78	81

Figure B 3. Response of Communities to Noise
Comparison of Original (Schultz 1978) and Current (Finegold *et al*. 1994) Curve Fits

While L_{dn} is the best metric for quantitatively assessing cumulative noise impact, it does not lend itself to intuitive interpretation by non-experts. Accordingly, it is common for environmental noise analyses to include other metrics for illustrative purposes. A general indication of the noise environment can be presented by noting the maximum sound levels that can occur and the number of times per day noise events would be loud enough to be heard. Use of other metrics as supplements to L_{dn} has been endorsed by federal agencies (FICON 1992).

The Schultz curve is generally applied to annual average L_{dn}. In Section B.2, L_{dnmr} was described and presented as being appropriate for quantifying noise in military airspace. In the current study, the Schultz curve is used with L_{dnmr} as the noise metric. L_{dnmr} is always equal to or greater than L_{dn}, so the impact of L_{dnmr} is generally higher than predicted if the onset rate and busiest-month adjustments were not taken into account.

There are several points of interest in the noise-annoyance relationship. The first is L_{dn} of 65 dB. This is a level most commonly used for noise planning purposes and represents a compromise between community impact and the need for activities like aviation, which do cause noise. Areas exposed to L_{dn} above 65 dB are generally not considered suitable for residential use. The second is L_{dn} of 55 dB, which was identified by USEPA as a level"...requisite to protect the public health and welfare with an adequate margin of safety" (USEPA 1974) which is essentially a level below which adverse impact is not expected. The third is L_{dn} of 75 dB. This is the lowest level at which adverse health effects could be credible (USEPA 1974). The very high annoyance levels correlated with L_{dn} of 75 dB make such areas unsuitable for residential land use.

Sonic boom exposure is measured by C-weighting, with the corresponding cumulative metric being L_{cdn}. Correlation between L_{cdn} and annoyance has been established based on community reaction to impulsive sounds (CHABA 1981). Values of the C-weighted equivalent to the Schultz curve are different from those of the Schultz curve itself. Table B 1 shows the relationship between annoyance, L_{dn}, and L_{cdn}. Interpretation of L_{cdn} from impulsive noise is accomplished by using the L_{cdn} versus annoyance values in Table B 1. L_{cdn} can be interpreted in terms of an "equivalent annoyance" L_{dn}. For example, L_{cdn} of 52, 61, and 69 dB are equivalent to L_{dn} of 55, 65, and 75 dB, respectively. If both continuous and impulsive noise occurs in the same area, impacts are assessed separately for each.

Table B 1. Relationship Between Annoyance, L_{dn}, and L_{cdn}

C-Weighted Day–Night Average Sound Level (L_{cdn})	% Highly Annoyed	Day-Night Average Sound Levels (L_{dn})
48	2	50
52	4	55
57	8	60
61	14	65
65	23	70
69	35	75

B.4 Land Use Compatibility

The inherent variability between individuals makes it impossible to predict accurately how any individual would react to a given noise event. Nevertheless, when a community is considered as a whole, its overall reaction to noise can be represented with a high degree of confidence. The best noise exposure metric for this correlation is the L_{dn} or L_{dnmr} for military overflights. Impulsive noise can be assessed by relating L_{cdn} to an "equivalent annoyance" L_{dn}, as outlined in Section B.3.1.

In June 1980, an ad hoc Federal Interagency Committee on Urban Noise (FICON) published guidelines (FICON 1980) relating L_{dn} to compatible land uses. This committee was composed of representatives from DoD, Transportation, Housing and Urban Development, USEPA, and the Veterans Administration. Federal agencies have generally adopted these guidelines for their noise analyses.

Following the lead of the committee, DoD and FAA adopted the concept of land-use compatibility as the accepted measure of aircraft noise effect. The FAA included the committee's guidelines in the Federal Aviation Regulations (USDOT 1984). These guidelines are reprinted in Table B 2, along with the explanatory notes included in the regulation. Although these guidelines are not mandatory (note the footnote "*" in the table), they provide the best means for determining noise impact in airport communities. In general, residential land uses normally are not compatible with outdoor L_{dn} values above 65 dB and the extent of land areas and populations exposed to L_{dn} of 65 dB and higher provides the best means for assessing the noise impacts of alternative aircraft actions. In some cases, where noise change exceeds 3 dB, the 1992 FICON indicates the 60 dB L_{dn} may be a more appropriate incompatibility level for densely populated areas.

Table B 2. Land-Use Compatibility with Yearly Day-Night Average Sound Levels

Land Use	Yearly Day-Night Average Sound Level (L_{dn}) in Decibels (dB)					
	Below 65	65–70	70–75	75–80	80–85	Over 85
Residential						
Residential (other than mobile homes and transient lodgings)	Y	N(1)	N(1)	N	N	N
Mobile Home Parks	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
Public Use						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and Nursing Homes	Y	25	30	N	N	N
Churches, Auditoria, and Concert Halls	Y	25	30	N	N	N
Government Services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use						
Offices, Business and Professional	Y	Y	25	30	N	N
Wholesale and Retail (Building Materials, Hardware, and Farm Equipment)	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail Trade (General)	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing, General	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and Optical	Y	Y	25	30	N	N
Agriculture (except livestock) and Forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock Farming and Breeding	Y	Y(6)	Y(7)	N	N	N
Mining and Fishing, Resource Production and Extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor Sports Arenas and Spectator Sports	Y	Y(5)	Y(5)	N	N	N
Outdoor Music Shells, Amphitheaters	Y	N	N	N	N	N
Nature exhibits and Zoos	Y	Y	N	N	N	N
Amusements, Parks, Resorts, and Camps	Y	Y	Y	N	N	N
Golf Courses, Riding Stables, and Water Recreation	Y	Y	25	30	N	N

Notes:

*The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable or unacceptable under federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise-compatible land uses.

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor-to-indoor NLR of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide an NLR of 20 dB; thus, the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year-round. However, the use of NLR criteria would not eliminate outdoor noise problems.

(2) Measures to achieve NLR 25 dB must be incorporated into the design and construction of the portions of these buildings where the public is received such as office areas, noise-sensitive areas, or where the normal noise level is low.

(3) Measures to achieve NLR 30 dB must be incorporated into the design and construction of the portions of these buildings where the public is received such as office areas, noise-sensitive areas, or where the normal noise level is low.

(4) Measures to achieve NLR 35 dB must be incorporated into the design and construction of the portions of these buildings where the public is received such as office areas, noise-sensitive areas, or where the normal noise level is low.

(5) Land-use compatible provided special sound reinforcement systems are installed.

(6) Residential buildings require an NLR of 25.

(7) Residential buildings require an NLR of 30.

(8) Residential buildings not permitted.

Key:

Y (YES) = Land Use and related structures compatible without restrictions.

N (No) = Land Use and related structures are not compatible and should be prohibited.

NLR = Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.

25, 30, or 35 = Land Use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structures.

B.5 NOISE EFFECTS

The discussion in Section B.3 presents the global effect of noise on communities. The following sections describe particular noise effects.

B.5.1 Hearing Loss

There are situations where noise in and around airbases may exceed levels at which long-term noise-induced hearing loss is possible. The first of these situations results from exposure to occupational noise by individuals working in known high noise exposure locations such as jet engine maintenance facilities or aircraft maintenance hangars. Table B 2 provides details of the L_{dn} levels for various types of land use.

In this case, exposure of workers inside the base boundary area should be considered occupational, which is excluded from the DoD Noise Program by DoD Instruction 4715.13 and should be evaluated using the appropriate DoD component regulations for occupational noise exposure. The DoD, Air Force, and the National Institute of Occupational Safety and Health (NIOSH) have all established occupational risk criteria for noise exposure damage (or "standard") for hearing loss to not exceed 85 dB as an 8-hour time weighted average with a 3 dB exchange rate in a work environment. The exchange rate is an increment of decibels that requires the halving of exposure time or a decrement of decibels that requires the doubling of exposure time. For example, a 3 dB exchange rate requires that noise exposure time be halved for each 3 dB increase in noise level. Therefore, an individual would achieve the limit for risk criteria at 88 dB for a period of four hours and at 91 dB, for a period of two hours. The standard assumes "quiet" (where an individual remains in an environment with noise levels less than 72 dB) for the balance of the 24-hour period. Also, Air Force and Occupational Safety and Health Administration (OSHA) occupational standards prohibit any unprotected worker exposure to a continuous (i.e., of a duration greater than one second) noise exceeding a 115 dB sound level. OSHA established this additional standard to reduce the risk of workers developing noise-induced hearing loss.

The second situation where individuals may be exposed to high noise levels is when noise contours resulting from flight operations in and around the installation reach or exceed 80 dB L_{dn} both on- and off-base. To access the potential impacts of this situation, the DoD published a policy for assessing hearing loss risk (UDATL 2009). The policy defines the conditions under which assessments are required, references the methodology from a 1982 USEPA report, and describes how the assessments are to be calculated (USEPA 1982). The policy reads as follows, "Current and future high performance aircraft create a noise environment in which the current impact analysis based primarily on annoyance may be insufficient to capture the full range of impacts on humans. As part of the noise analysis in all future environmental impact statements, DoD components would use the 80 Day-Night A-Weighted (L_{dn}) noise contour to identify populations at the most risk of potential hearing loss. DoD components would use as part of the analysis, as appropriate, a calculation of the Potential Hearing Loss (PHL) of the at risk population. The PHL (sometimes referred to as Population Hearing Loss) methodology is defined in USEPA Report No. 550/9-82-105, *Guidelines for Noise Impact Analysis*."

The USEPA *Guidelines for Noise Impact Analysis* (hereafter referred to as "USEPA Guidelines") specifically addresses the criteria and procedures for assessing the noise-induced hearing loss in

terms of the Noise-Induced Permanent Threshold Shift (NIPTS), a quantity that defines the permanent change in hearing level, or threshold, caused by exposure to noise (USEPA 1982). Numerically, the NIPTS is the change in threshold averaged over the frequencies 0.5, 1, 2, and 4 kilohertz (kHz) that can be expected from daily exposure to noise over a normal working lifetime of 40 years, with the exposure beginning at an age of 20 years. A grand average of the NIPTS over time (40 years) and hearing sensitivity (10 to 90 percentiles of the exposed population) is termed the Average NIPTS. The Average NIPTS attributable to noise exposure for ranges of noise level in terms of L_{dn} is given in Table B 3.

Table B 3. Average Noise-Induced Permanent Threshold Shift (NIPTS) and 10th Percentile NIPTS as a Function of L_{dn}*

Day-night Average Sound Level (L_{dn})	Average NIPTS in decibels (dB)**	10th Percentile NIPTS in decibels (dB)**
80-81	3.0	7.0
81-82	3.5	8.0
82-83	4.0	9.0
83-84	4.5	10.0
84-85	5.5	11.0
85-86	6.0	12.0
86-87	7.0	13.5
87-88	7.5	15.0
88-89	8.5	16.5
89-90	9.5	18.0

Notes:
*Relationships between L_{dn} and NIPTS were derived from CHABA 1977.
**NIPTS values rounded to the nearest 0.5 dB.

For a noise exposure within the 80-81 L_{dn} contour, the expected lifetime average value of NIPTS (hearing loss) is 3.0 dB. The Average NIPTS is estimated as an average over all people included in the at risk population. The actual value of NIPTS for any given person would depend on the person's physical sensitivity to noise. Some people would experience more loss of hearing than other people would. The USEPA Guidelines provide information on this variation in sensitivity in the form of the NIPTS exceeded by 10 percent of the population, which is included in Table B 3 in the "10th Percentile NIPTS" column. As in the example above, for individuals within the 80-81 L_{dn} contour band, the most sensitive of the population, would be expected to show no more degradation to their hearing than experiencing a 7.0 dB Average NIPTS hearing loss. And while the DoD policy requires that hearing loss risk is estimated for the population exposed to 80 dB L_{dn} or greater, this does not preclude populations outside the 80 L_{dn} contour (i.e. at lower exposure levels) from being at some degree of risk of hearing loss.

The actual noise exposure for any person living in the at-risk area is determined by the time that person is outdoors and directly exposed to the noise. Many of the people living within the applicable L_{dn} contour would not be present during the daytime hours; they may be at work, at school, or involved in other activities outside the at-risk area. Many would be inside their homes and thereby exposed to lower noise levels and benefitting from the noise attenuation provided by the house structure. The actual activity profile is usually impossible to generalize. For the purposes of this analysis, it was assumed that residents are fully exposed to the L_{dn} level of noise appropriate for their residence location and the Average NIPTS taken from Table B 3.

The quantity to be reported is the number of people living within each 1 dB contour band inside the 80 dB L_{dn} contour who are at risk for hearing loss given by the Average NIPTS for that band.

The average nature of Average NIPTS means that it underestimates the magnitude of the potential hearing loss for the population most sensitive to noise. Therefore, in the interest of disclosure, the information to be reported includes both the Average NIPTS and the 10th percentile NIPTS (Table B 3) for each 1 dB contour band inside the 80 L_{dn} contour.

According to the USEPA documents titled *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, and Public Health and Welfare Criteria for Noise*, changes in hearing levels of less than 5 dB are generally not considered noticeable or significant. There is no known evidence that a NIPTS of less than 5 dB is perceptible or has any practical significance for the individual. Furthermore, the variability in audiometric testing is generally assumed to be ± 5 dB. The preponderance of available information on hearing loss risk is collected from workplaces where there is continuous exposure throughout the day for many years. Clearly, this data is applicable to the adult working population. According to a report by Ludlow and Sixsmith, there were no significant differences in audiometric test results between military personnel who, as children, lived in or near stations where jet operations were based and a similar group who had no such exposure as children (Ludlow and Sixsmith 1999). Hence, for the purposes of PHL analysis, it can be assumed that the limited data on hearing loss is applicable to the general population including children, and provides a conservative estimate of hearing loss.

B.5.2 Nonauditory Health Effects

Nonauditory health effects of long-term noise exposure, where noise may act as a risk factor, have not been found to occur at levels below those protective against noise-induced hearing loss, described above. Most studies attempting to clarify such health effects have found that noise exposure levels established for hearing protection would also protect against any potential nonauditory health effects, at least in workplace conditions. The best scientific summary of these findings is contained in the lead paper at the National Institutes of Health Conference on Noise and Hearing Loss that was held on January 22–24, 1990 in Washington, DC. This paper states "The nonauditory effects of chronic noise exposure, when noise is suspected to act as one of the risk factors in the development of hypertension, cardiovascular disease, and other nervous disorders, have never been proven to occur as chronic manifestations at levels below these criteria (an average of 75 dBA for complete protection against hearing loss for an eight-hour day)" (von Gierke 1990; parenthetical wording added for clarification). At the International Congress (1988) on Noise as a Public Health Problem, most studies attempting to clarify such health effects did not find them at levels below the criteria protective of noise-induced hearing loss; and even above these criteria, results regarding such health effects were ambiguous.

It can be concluded that establishing and enforcing exposure levels protecting against noise-induced hearing loss would not only solve the noise-induced hearing loss problem but also any potential nonauditory health effects in the work place. Although these findings were directed specifically at noise effects in the work place, they are equally applicable to aircraft noise effects in the community environment. Research studies regarding the nonauditory health effects of aircraft noise are ambiguous at best, and often contradictory. Yet, even those studies that purport to find such health effects use time average noise levels of 75 dB and higher for their research.

For example, in an often-quoted paper, two University of California at Los Angeles researchers found a 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 level of noise exposure that was greater than 75 dB for the "noise-exposed" population (Meecham and Shaw 1979). Nevertheless, three other University of California at Los Angeles professors analyzed those same data and found no relationship between noise exposure and mortality rates (Frerichs *et al*. 1980).

As a second example, two other University of California at Los Angeles researchers used this same population near Los Angeles International Airport to show a higher rate of birth defects during the period of 1970 to 1972 when compared with a control group residing away from the airport (Jones and Tauscher 1978). Based on this report, a separate group at the United States Centers for Disease Control performed a more thorough study of populations near Atlanta's Hartsfield International Airport for 1970 to 1972 and found no relationship in their study of 17 identified categories of birth defects to aircraft noise levels above 65 dB (Edmonds 1979).

A recent review of health effects, prepared by a Committee of the Health Council of The Netherlands analyzed currently available published information on this topic (CHCN 1996). The committee concluded that the threshold for possible long-term health effects was a 16-hour (6:00 AM to 10:00 PM) L_{eq} of 70 dB. Projecting this to 24 hours and applying the 10 dB nighttime penalty used with L_{dn}, this corresponds to L_{dn} of about 75 dB. The study also affirmed the risk threshold for hearing loss, as discussed earlier.

In summary, there is no scientific basis to claim that potential health effects exist for aircraft time-average sound levels below 75 dB.

B.5.3 Annoyance

The primary effect of aircraft noise on exposed communities is one of annoyance. Noise annoyance is defined by the USEPA as any negative subjective reaction on the part of an individual or group (USEPA 1974). As noted in the discussion of L_{dn} above, community annoyance is best measured by that metric.

Since the USEPA Levels Document (USEPA 1974) identified L_{dn} of 55 dB as ". . . requisite to protect public health and welfare with an adequate margin of safety", it is commonly assumed that 55 dB should be adopted as a criterion for community noise analysis. From a noise exposure perspective, that would be an ideal selection. However, financial and technical resources are generally not available to achieve that goal. Most agencies have identified L_{dn} of 65 dB as a criterion, which protects those most impacted by noise, and which can often be achieved on a practical basis (FICON 1992). This corresponds to about 13 percent of the exposed population being highly annoyed.

Although L_{dn} of 65 dB is widely used as a benchmark for significant noise impact, and is often an acceptable compromise, it is not a statutory limit, and it is appropriate to consider other thresholds in particular cases.

In this Draft EA, no specific threshold is used. The noise in the affected environment is evaluated based on the information presented in this appendix and in the body of the Draft EA.

Community annoyance from sonic booms is based on L_{cdn}, as discussed in Section B.3. These effects are implicitly included in the "equivalent annoyance" L_{cdn} values in Table B 1, since those were developed from actual community noise impact.

B.5.4 Speech Interference

Speech interference associated with aircraft noise is a primary cause of annoyance to individuals on the ground. The disruption of routine activities in the home, 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, for speakers talking with a casual vocal effort, 95% intelligibility would be achieved when indoor L_{max} values did not exceed 50 dB.

B.5.5 Sleep Interference

Sleep interference is another source of annoyance associated with aircraft noise. This is especially true because of the intermittent nature and content of aircraft noise, which is more disturbing than continuous noise of equal energy and neutral meaning.

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 higher noise level than does a change in sleep stage.

An analysis sponsored by the Air Force summarized 21 published studies concerning the effects of noise on sleep (Pearsons *et al*. 1989). The analysis concluded that a lack of reliable in-home studies, combined with large differences among the results from the various laboratory studies, did not permit development of an acceptably 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. None of the laboratory studies was sufficiently long in duration to determine any effects of habituation, such as that which would occur under normal community conditions. A recent extensive study of sleep interference in people's own homes (Ollerhead 1992) showed very little disturbance from aircraft noise.

There is some controversy associated with the recent studies, so a conservative approach should be taken in judging sleep interference. Based on older data, the USEPA identified an indoor L_{dn} of 45 dB as necessary to protect against sleep interference (USEPA 1974). Assuming a very conservative structural noise insulation of 20 dB for typical dwelling units, this corresponds to an outdoor L_{dn} of 65 dB as minimizing sleep interference.

A 1984 publication reviewed the probability of arousal or behavioral awakening in terms of SEL (Kryter 1984). Figure B 4, extracted from Figure 10.37 of Kryter (1984), indicates that an indoor SEL of 65 dB or lower should awaken less than 5 percent of those exposed. These results do not include any habituation over time by sleeping subjects. Nevertheless, this provides a reasonable guideline for assessing sleep interference and corresponds to similar guidance for speech interference, as noted above.

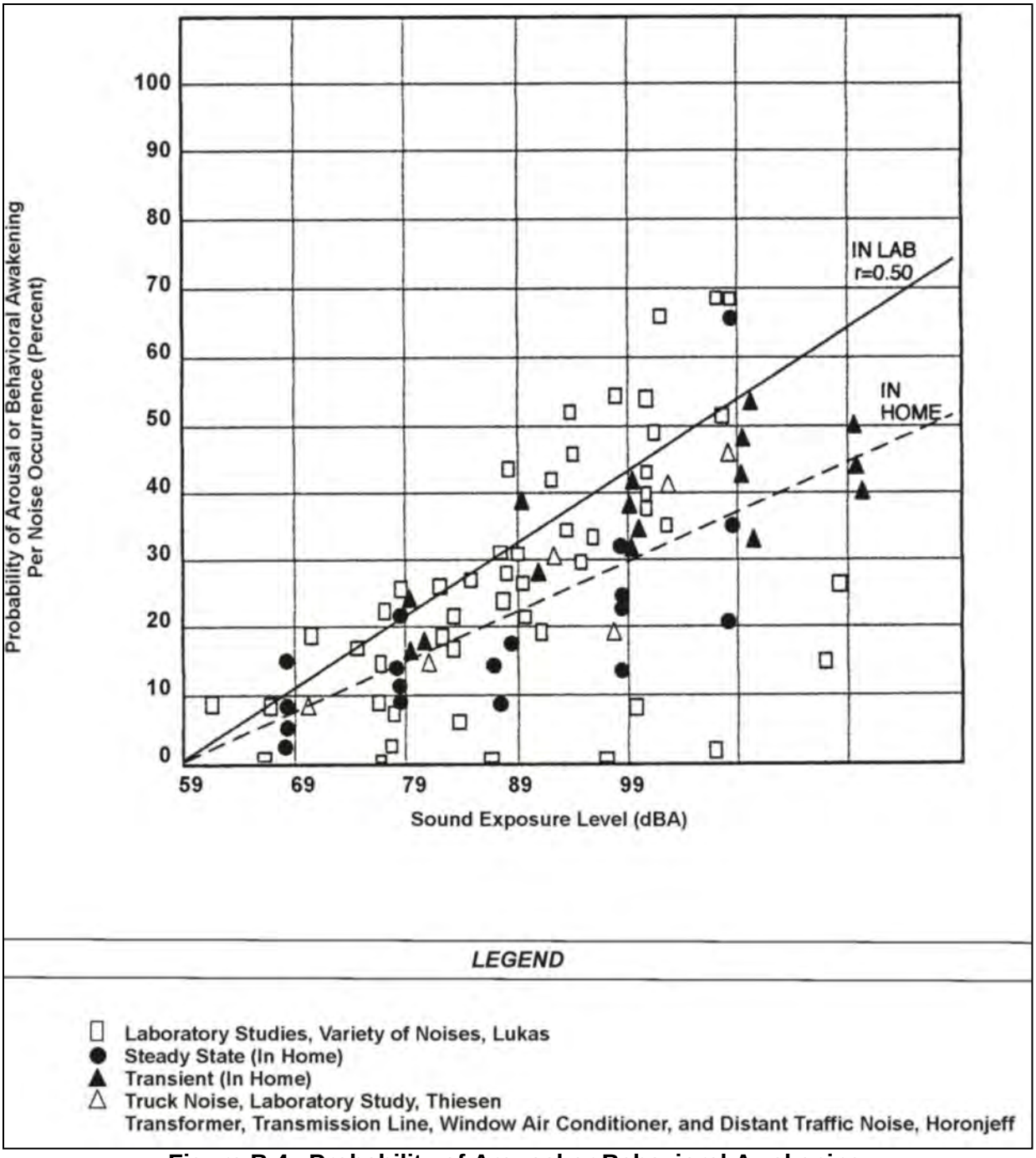


Figure B 4. Probability of Arousal or Behavioral Awakening in Terms of Sound Exposure Level

B.5.6 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.

B.5.7 Noise Effects on Structures

Subsonic Aircraft Noise - Normally, the most sensitive components of a structure to airborne noise are the windows and, infrequently, the plastered walls and ceilings. An evaluation of the peak sound pressures impinging on the structure is normally sufficient to determine the possibility of damage. In general, at sound levels above 130 dB, there is the possibility of the excitation of structural component resonance. While certain frequencies (such as 30 Hz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than one second above a sound level of 130 dB are potentially damaging to structural components (NRC/NAS 1977).

A study directed specifically at low-altitude, high-speed aircraft showed that there is little probability of structural damage from such operations (Sutherland 1989). One finding in that study is that sound levels at damaging frequencies (e.g., 30 Hz for window breakage or 15 to 25 Hz for whole-house response) are rarely above 130 dB.

Noise-induced structural vibration may also cause annoyance to dwelling occupants because of induced secondary vibrations, or "rattle", of objects within the dwelling, such as hanging pictures, dishes, plaques, and bric-a-brac. Windowpanes may also vibrate noticeably when exposed to high levels of airborne noise, causing homeowners to fear breakage. In general, such noise-induced vibrations occur at sound levels above those considered normally incompatible with residential land use. Thus, assessments of noise exposure levels for compatible land use should also be protective of noise-induced secondary vibrations.

Sonic Booms - Sonic booms are commonly associated with structural damage. Most damage claims are for brittle objects, such as glass and plaster. Table B 4 summarizes the threshold of damage that might be expected at various overpressures. There is a large degree of variability in damage experience, and much damage depends on the pre-existing condition of a structure. Breakage data for glass, for example, spans a range of two to three orders of magnitude at a given overpressure. At 1 psf, the probability of a window breaking would range from one in a billion (Sutherland 1990) to one in a million (Hershey and Higgins 1976). These damage rates are associated with a combination of boom load and glass condition. At 10 psf, the probability of breakage is from one in one hundred and one in one thousand.

Table B 4. Possible Damage to Structures from Sonic Booms

Sonic Boom Overpressure Nominal (psf)	Item Affected	Type of Damage
0.5 - 2	Plaster	Fine cracks; extension of existing cracks with more in ceilings, over doorframes, and between some plasterboard.
	Glass	Rarely shattered, either partial or extension of existing cracks.
	Roof	Slippage of existing loose tiles/slates and sometimes new cracking of old slates at nail hole.
	Damage to outside walls	Existing cracks in stucco extended.
	Bric-a-brac	Those carefully balanced or on edges can fall; fine glass, such as large goblets, can fall and break.
	Other	Dust falls in chimneys.
2 - 4	Glass, plaster, roofs, ceilings	For elements nominally in good condition, failures show that would have been difficult to forecast in terms of their existing localized condition.
4 - 10	Glass	Regular failures within a population of well-installed glass; industrial as well as domestic greenhouses.
	Plaster	Partial ceiling collapse of good plaster; complete collapse of very new, incompletely cured, or very old plaster.
	Roofs	High probability rate of failure in slurry wash in nominally good state; some chance of failures in tiles on modern roofs; light roofs (bungalow) or large area can move bodily.
	Walls (out)	Old, free standing, in fairly good condition can collapse.
	Walls (in)	Internal ("party") walls known to move at 10 psf.
Greater than 10	Glass	Some good window glass would fail when exposed to regular sonic booms from the same direction. Glass with existing faults could shatter and fly. Large window frames move.
	Plaster	Most plaster affected.
	Ceilings	Plasterboards displaced by nail popping.
	Roofs	Most slate/slurry roofs affected, some badly; large roofs having good tile can be affected; some roofs bodily displaced causing gale-end and wall plate cracks; domestic chimneys dislodged if not in good condition.
	Walls	Internal party walls can move even if carrying fittings such as hand basins or taps; secondary damage due to water leakage.
	Bric-a-brac	Some nominally secure items can fall; e.g., large pictures, especially if fixed to party walls.

Key:
psf = pounds per square foot
Source: Haber and Nakaki 1989

Laboratory tests of glass (White 1972) have shown that properly installed window glass would not break at overpressures below 10 psf, even when subjected to repeated booms, but in the real world, glass is not in pristine condition.

Damage to plaster occurs at similar ranges to glass damage. Plaster has a compounding issue in that it would often crack due to shrinkage while curing or from stresses as a structure settles, even in the absence of outside loads. Sonic boom damage to plaster often occurs when internal stresses are high from these factors.

Some degree of damage to glass and plaster should thus be expected whenever there are sonic booms, but usually at the low rates noted above. In general, structural damage from sonic booms should be expected only for overpressures above 10 psf.

B.5.8 Noise Effects on Terrain

Subsonic Aircraft Noise - Members of the public often believe that noise from low-flying aircraft can cause avalanches or landslides by disturbing fragile soil or snow structures in mountainous areas. There are no known instances of such effects, and it is considered improbable that such effects would result from routine, subsonic aircraft operations**.**

Sonic Booms - In contrast to subsonic noise, sonic booms are considered a potential trigger for snow avalanches. Avalanches are highly dependent on the physical status of the snow, and do occur spontaneously. They can be triggered by minor disturbances, and there are documented accounts of sonic booms triggering avalanches. Switzerland routinely restricts supersonic flight during avalanche season.

Landslides are not an issue for sonic booms. There was one anecdotal report of a minor landslide from a sonic boom generated by the Space Shuttle during landing, but there is no credible mechanism or consistent pattern of reports.

B.5.9 Noise Effects on Historical and Archaeological Sites

Due to 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 (Wesler 1977). There was special concern for the building's windows, since roughly half of the 324 windowpanes 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 within the building itself.

As noted above for the noise effects of noise-induced vibrations on normal structures, assessments of noise exposure levels for normally compatible land uses should also be protective of historic and archaeological sites.

B.6 Noise Modeling

B.6.1 Subsonic Aircraft Noise

An aircraft in subsonic flight generally emits noise from two sources: the engines and flow noise around the airframe. Noise generation mechanisms are complex and, in practical models, the noise sources must be based on measured data. The Air Force has developed a series of computer models and aircraft noise databases for this purpose. The models include NOISEMAP (Moulton 1992) for noise around airbases, ROUTEMAP (Lucas and Plotkin 1988) for noise associated with low-level training routes, and MR_NMAP (Lucas and Calamia 1996)

for use in MOAs and ranges. These models use the NOISEFILE database developed by the Air Force. NOISEFILE data includes SEL and L_{Amax} as a function of speed and power setting for aircraft in straight flight.

Noise from an individual aircraft is a time-varying continuous sound. It is first audible as the aircraft approaches, increases to a maximum when the aircraft is near its closest point, and then diminishes as it departs. The noise depends on the speed and power setting of the aircraft and its trajectory. The models noted above divide the trajectory into segments whose noise can be computed from the data in NOISEFILE. The contributions from these segments are summed.

MR_NMAP was used to compute noise levels in the airspace. The primary noise metric computed by MR_NMAP was L_{dnmr}, which was averaged over the airspace. Supporting routines from NOISEMAP were used to calculate SEL and L_{Amax} for various flight altitudes and lateral offsets from a ground receiver position.

B.6.2 Sonic Booms

When an aircraft moves through the air, it pushes the air out of its way. At subsonic speeds, the displaced air forms a pressure wave that disperses rapidly. At supersonic speeds, the aircraft is moving too quickly for the wave to disperse, so it remains as a coherent wave. This wave is a sonic boom. When heard at the ground, a sonic boom consists of two shock waves (one associated with the forward part of the aircraft, the other with the rear part) of approximately equal strength and (for fighter aircraft) separated by 100 to 200 milliseconds. When plotted, the pair of shock waves and the expanding flow between the shockwaves has the appearance of a capital letter "N", so a sonic boom pressure wave is usually called an "N-wave". An N-wave has a characteristic "bang-bang" sound that can be startling. Figure B 5 shows the generation and evolution of a sonic boom N-wave under the aircraft. Figure B 6 shows the sonic boom pattern for an aircraft in steady supersonic flight. The boom forms a cone that is said to sweep out a "carpet" under the flight track.

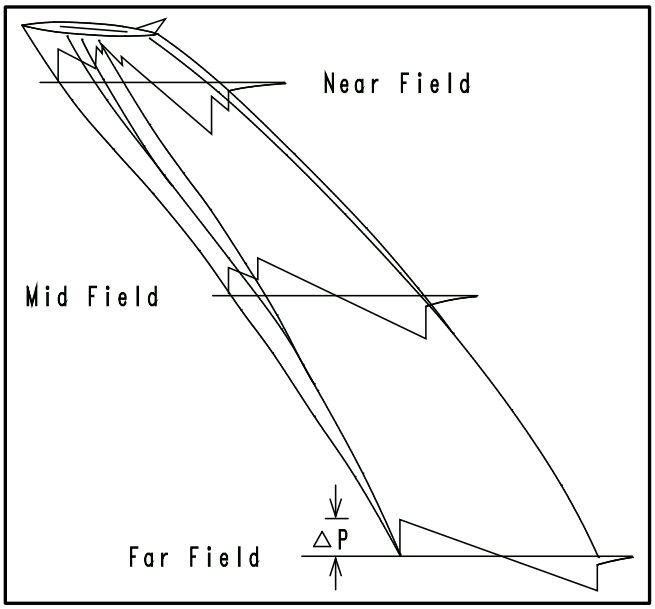


Figure B 5. Sonic Boom Generation and Evolution to N-wave

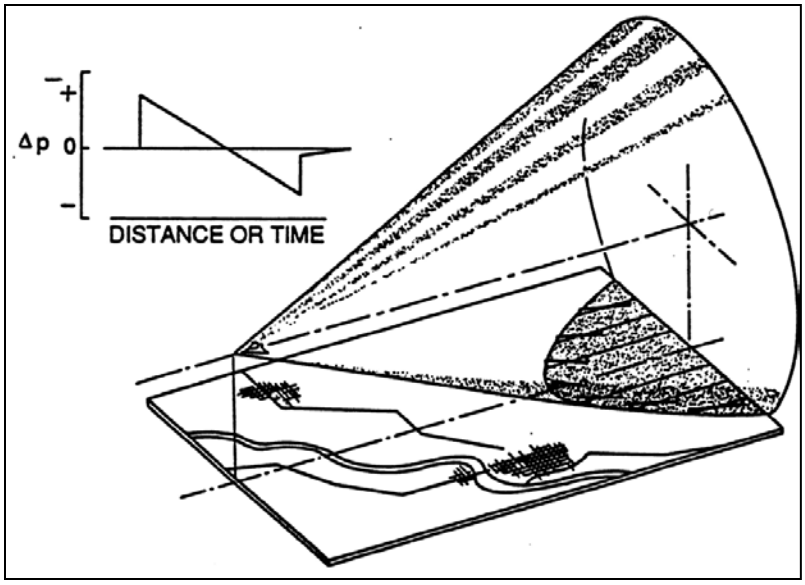


Figure B 6. Sonic Boom Carpet in Steady Flight

The complete ground pattern of a sonic boom depends on the size, shape, speed, and trajectory of the aircraft. Even for a nominally steady mission, the aircraft must accelerate to supersonic speed at the start, decelerate back to subsonic speed at the end, and usually change altitude. Figure B 7 illustrates the complexity of a nominal full mission.

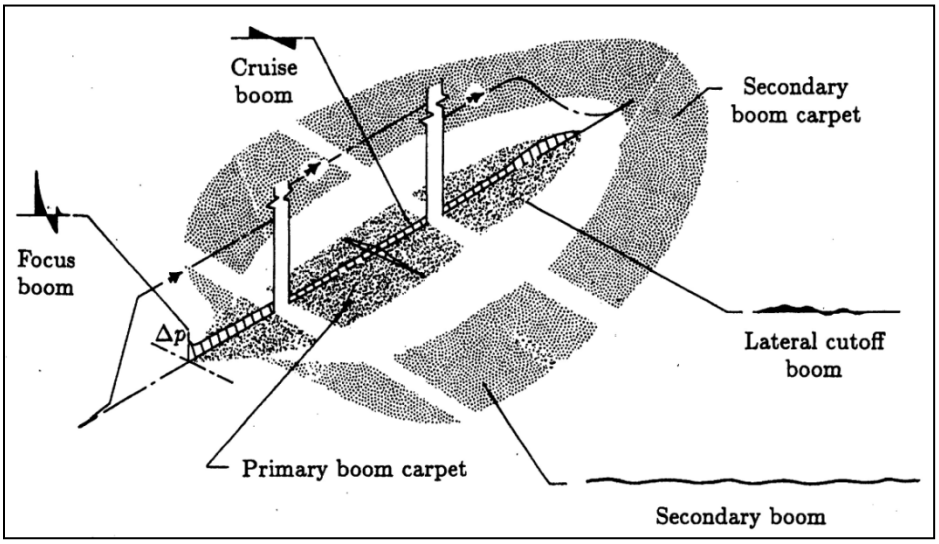


Figure B 7. Complex Sonic Boom Pattern for Full Mission

The Air Force's PCBoom4 computer program (Plotkin and Grandi 2002) can be used to compute the complete sonic boom footprint for a given single event, accounting for details of a particular maneuver.

Supersonic operations for the Proposed Action and alternatives are, however, associated with air combat training, which cannot be described in the deterministic manner that PCBoom4 requires. Supersonic events occur as aircraft approach an engagement, break at the end, and

maneuver for advantage during the engagement. Long time cumulative sonic boom exposure, L_{cdn}, is meaningful for this kind of environment.

Long-term sonic boom measurement projects have been conducted in four supersonic air combat training airspaces: White Sands, New Mexico (Plotkin *et al.* 1989); the eastern portion of the Goldwater Range, Arizona (Plotkin *et al.* 1992); the Elgin MOA at Nellis AFB, Nevada (Frampton *et al.* 1993); and the western portion of the Goldwater Range (Page *et al.* 1994). These studies included analysis of schedule and air combat maneuvering instrumentation data and supported development of the 1992 BOOMAP model (Plotkin *et al.* 1992). The current version of BOOMAP (Frampton *et al.* 1993; Plotkin 1996) incorporates results from all four studies. Since BOOMAP is directly based on long-term measurements, it implicitly accounts for such variables as maneuvers, statistical variations in operations, atmosphere effects, and other factors.

Figure B 8 shows a sample of supersonic flight tracks measured in the air combat training airspace at White Sands (Plotkin *et al.* 1989). The tracks fall into an elliptical pattern aligned with preferred engagement directions in the airspace. Figure B 9 shows the L_{cdn} contours that were fit to six months of measured booms in that airspace.

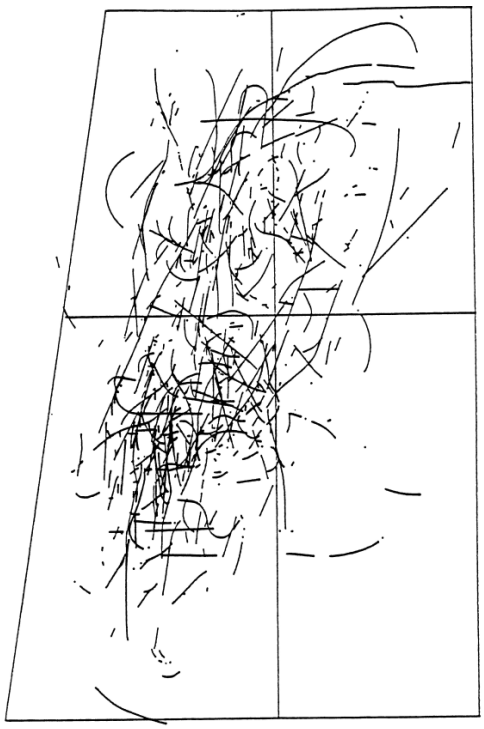


Figure B 8. Supersonic Flight Tracks in Supersonic Air Combat Training Airspace

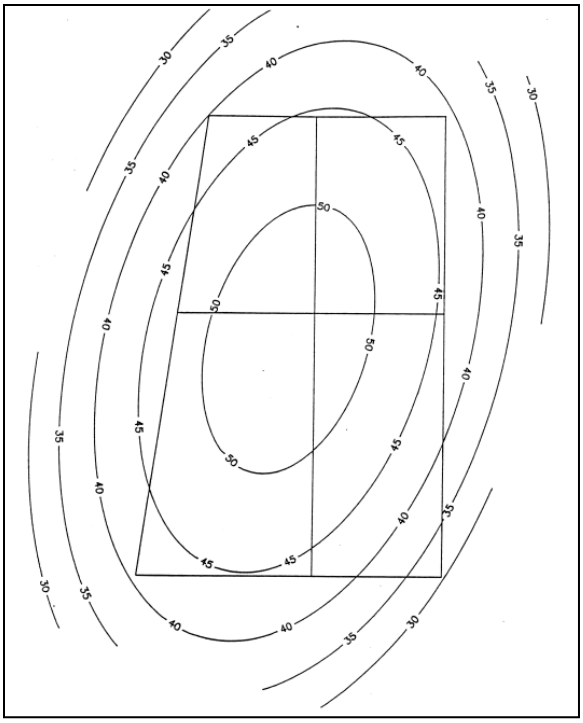


Figure B 9. Elliptical L_{cdn} Contours in Supersonic Air Combat Training Airspace

The subsequent measurement programs refined the fit, and demonstrated that the elliptical maneuver area is related to the size and shape of the airspace (Frampton *et al*. 1993). BOOMAP quantifies the size and shape of L_{cdn} contours, and numbers of booms per day, in air combat training airspaces. That model was used for prediction of cumulative sonic boom exposure in the study area.

B.7 References

ANSI (American National Standards Institute) 1980. Sound Level Descriptors for Determination of Compatible Land Use. ANSI S3.23-1980.

ANSI 1988. Quantities and Procedures for Description and Measurement of Environmental Sound, Part 1. ANSI S12.9-1988.

CHABA (Committee on Hearing, Bioacoustics and Biomechanics) 1977. Guidelines for Preparing Environmental Impact Statements. The National Research Council

CHABA 1981. Assessment of Community Noise Response to High-Energy Impulsive Sounds. Report of Working Group 84, Committee on Hearing, Bioacoustics and Biomechanics, Assembly of Behavioral and Social Sciences. National Research Council, National Academy of Sciences. Washington, DC.

CHCN (Committee of the Health Council of the Netherlands) 1996. Effects of Noise on Health. Noise/News International 4. September.

Edmonds, L.D., P.M. Layde, and J.D. Erickson 1979. Airport Noise and Teratogenesis. Archives of Environmental Health, 243-247. July/August.

FICON (Federal Interagency Committee on Noise) 1980. Guidelines for Considering Noise in Land-Use Planning and Control. Federal Interagency Committee on Urban Noise. June.

FICON 1992. Federal Agency Review of Selected Airport Noise Analysis Issues. Federal Interagency Committee on Noise. August.

Fidell, S., D.S. Barger, and T.J. Schultz 1991. Updating a Dosage-Effect Relationship for the Prevalence of Annoyance Due to General Transportation Noise. J. Acoust. Soc. Am., 89, 221-233. January.

Finegold, L.S., C.S. Harris, and H.E. von Gierke 1994. Community Annoyance and Sleep Disturbance: Updated Criteria for Assessing the Impacts of General Transportation Noise on People. In Noise Control Engineering Journal, Volume 42, Number 1. pp. 25-30. January-February.

Frampton, K.D., M.J. Lucas, and B. Cook 1993. Modeling the Sonic Boom Noise Environment in Military Operating Areas. AIAA Paper 93-4432.

Frerichs, R.R., B.L. Beeman, and A.H. Coulson 1980. Los Angeles Airport Noise and Mortality: Faulty Analysis and Public Policy. Am. J. Public Health, 357-362. April.

Haber, J. and D. Nakaki 1989. Sonic Boom Damage to Conventional Structures. HSD-TR-89-001. April.

Harris, C.M. (editor) 1979. Handbook of Noise Control. McGraw-Hill.

Hershey, R.L. and T.H. Higgins 1976. Statistical Model of Sonic Boom Structural Damage. FAA-RD-76-87. July.

Jones, F.N. and J. Tauscher 1978. Residence Under an Airport Landing Pattern as a Factor in Teratism. Archives of Environmental Health, 10-12. January/February.

Kryter, K.D. 1984. Physiological, Psychological, and Social Effects of Noise. NASA Reference Publication 1115, 446. July.

Lucas, M.J. and P.T. Calamia 1996. Military Operations Area and Range Noise Model: NRNMAP User's Manual. Final. Wright-Patterson AFB, Ohio: AAMRL. A1/OE-MN-1996-0001.

Lucas, M.J. and K. Plotkin 1988. ROUTEMAP Model for Predicting Noise Exposure From Aircraft Operations on Military Training Routes. Final, Wright-Patterson AFB, Ohio. AAMRL. AAMRL-TR-88-060.

Ludlow and Sixsmith 1999. Long Term Effects of Military Jet Aircraft Noise Exposure During Childhood on Hearing Threshold Levels. Noise and Health (5) 33-39.

Meecham, W.C. and N. Shaw. 1979. Effects of Jet Noise on Mortality Rates. British J. Audiology, 77-80. August.

Moulton, C.L. 1992. Air Force Procedure for Predicting Noise Around Airbases: Noise Exposure Model (NOISEMAP). Technical Report AL-TR-1992-59.

NRC/NAS (National Research Council/National Academy of Sciences) 1977. Guidelines for Preparing Environmental Impact Statements on Noise. Committee on Hearing, Bioacoustics, and Biomechanics.

Ollerhead, J.B., C.J. Jones, R.E. Cadoux, A. Woodley, B.J. Atkinson, J.A. Horne, F. Pankhurst, L. Reyner, K.I. Hume, F. Van, A. Watson, I.D. Diamond, P. Egger, D. Holmes, and J. McKean 1992. Report of a Field Study of Aircraft Noise and Sleep Disturbance. The Department of Transport, Department of Safety, Environment, and Engineering. Civil Aviation Authority, London. December.

Page, J.A., B.D. Schantz, R. Brown, K.J. Plotkin, and C.L. Moulton 1994. Measurements of Sonic Booms Due to ACM Training in R2301 W of the Barry Goldwater Air Force Range. Wyle Research Report WR 94-11.

Pearsons, K.S., D.S. Barber, and B.G. Tabachick 1989. Analyses of the Predictability of Noise-Induced Sleep Disturbance. USAF Report HSD-TR-89-029. October.

Plotkin, K.J., L.C. Sutherland, and J.A. Molino 1987. Environmental Noise Assessment for Military Aircraft Training Routes, Volume II: Recommended Noise Metric. Wyle Research Report WR 86-21. January.

Plotkin, K.J., V.R. Desai, C.L. Moulton, M.J. Lucas, and R. Brown 1989. Measurements of Sonic Booms due to ACM Training at White Sands Missile Range. Wyle Research Report WR 89-18.

Plotkin, K.J., C.L. Moulton, V.R. Desai, and M.J. Lucas 1992. Sonic Boom Environment under a Supersonic Military Operations Area. Journal of Aircraft 29(6): 1069-1072.

Plotkin, K.J. 1996. PCBoom3 Sonic Boom Prediction Model: Version 1.0c. Wyle Research Report WR 95-22C. May.

Plotkin, K.J. and F. Grandi 2002. Computer Models for Sonic Boom Analysis: PCBoom4, CABoom, BooMap, CORBoom. Wyle Research Report WR 02-11, June 2002.

Schultz, T.J. 1978. Synthesis of Social Surveys on Noise Annoyance. J. Acoust. Soc. Am., 64, 377-405. August.

Stusnick, E., K.A. Bradley, J.A. Molino, and G. DeMiranda 1992. The Effect of Onset Rate on Aircraft Noise Annoyance. Volume 2: Rented Own-Home Experiment. Wyle Laboratories Research Report WR 92-3. March.

Stusnick, E., K.A. Bradley, M.A. Bossi, and D.G. Rickert 1993. The Effect of Onset Rate on Aircraft Noise Annoyance. Volume 3: Hybrid Own-Home Experiment. Wyle Laboratories Research Report WR 93-22. December.

Sutherland, L. 1989. Assessment of Potential Structural Damage from Low Altitude Subsonic Aircraft. Wyle Laboratories Research Report WR 89-16. El Segundo, CA.

Sutherland, L.C. 1990. Effects of Sonic Boom on Structures" Lecture 3 of Sonic Boom: Prediction and Effects, AIAA Short Course. October.

USDOT (United States Department of Transportation) 1984. Airport Noise Compatibility Planning; Development of Submission of Airport Operator's Noise Exposure Map and Noise Compatibility Program; Final Rule and Request for Comments. 14 CFR Parts 11 and 150, Federal Register 49(244): 18 December.

UDATL (Undersecretary of Defense for Acquisition, Technology, and Logistics) 2009. Methodology for Assessing Hearing Loss Risk and Impacts in DoD Environmental Impact Analysis. June 16.

USEPA (United States Environmental Protection Agency) 1974. 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.

USEPA 1982. Guidelines for Noise Impact Analysis. Report No. 550/9-82-105. April.

von Gierke, H.R. 1990. The Noise-Induced Hearing Loss Problem. NIH Consensus Development Conference on Noise and Hearing Loss. Washington, D.C. January 22 through 24.

Wesler, J.E. 1977. Concorde Operations At Dulles International Airport. NOISEXPO '77, Chicago, IL. March.

White, R. 1972. Effects of Repetitive Sonic Booms on Glass Breakage. FAA Report FAA-RD-72-43. April.

APPENDIX C: AIR EMISSIONS CALCULATIONS

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SAMPLE CALCULATIONS

Flying Operations

Detailed calculations of the emissions from LTOs and TGOs are presented in Appendix C, Tables 6 and 8, respectively. An LTO cycle includes taxiing between the hangar and the runway, taking off and climbing out, approach and descent from the local pattern, followed by a touchdown and taxiing in. TGOs include only a takeoff, climbout, and an approach. Composite emission factors were developed for the LTO and TGO cycles based on the time-in-mode information for each applicable power setting as shown in Table 1A (LTO)(and 1B (TGO). For example, the annual emissions from an LTO were calculated as follows:

$$\textit{Emissions (lbs/yr)} = \frac{\textit{EF (lbs)}}{\textit{1,000 lb fuel}} \times \textit{Fuel flow rate} \left(\frac{\textit{lbs}}{\textit{hr}}\right) \times \textit{Duration in mode (hrs)} \times \frac{\textit{\# Engines}}{\textit{Aircraft}}$$

Where: "EF" represents the pollutant emission factor for the aircraft engine at a particular power setting.

As an example, CO emissions during the taxiing out mode for F-22 aircraft during an LTO are calculated as follows:

$$CO\ Idle\ Emissions = \frac{48.20 lb\ CO}{1{,}000\ lb\ fuel} \times 1{,}377 \frac{(lbs)}{hr} \times 0.4967(hr) \times \frac{2\ Engines}{Aircraft} = 65.93 \frac{lbs\ CO}{Idle}$$

Emissions from the three remaining operating modes in an F-22 LTO cycle were calculated similarly and added together to obtain total emissions from an F-22 LTO cycle. For example, the CO emissions from an F-22 LTO cycle are estimated as follows:

$$CO\ Emissions\ per\ LTO\ cycle \left(\frac{lbs}{LTO}\right) = \frac{65.93\ lb\ CO}{Idle} + \frac{2.53\ lb\ CO}{Approach} + \frac{0.57\ lb\ CO}{Interm.\ 70\%} + \frac{0.20\ lb\ CO}{Intermediate}$$
$$= 69.22 \frac{lbs\ CO}{LTO\ Cycle}$$

Total annual emissions of from all F-22 LTO cycles are calculated as follows using the CO emissions as an example:

$$Annual\ CO\ Emissions\ from\ LTOs = \frac{69.22\ lb\ CO}{LTO\ cycle} \times 2{,}193\ LTOs = 151{,}7999 \frac{lbs\ CO}{yr}$$
$$= 75.90 \frac{tons\ CO}{yr}$$

Emissions from F-22 TGOs were calculated similarly to the calculations for an LTOs, except that there are only three operating modes in the TGO cycle. The following shows how emissions from TGOs were calculating using CO as an example:

$$CO\ Emissions\ per\ TGO\ cycle\left(\frac{lbs}{LTO}\right) = \frac{2.53\ lb\ CO}{Approach} + \frac{0.57\ lb\ CO}{Interm.\ 70\%} + \frac{0.20\ lb\ CO}{Intermediate}$$
$$= 3.29\frac{lbs\ CO}{TGO\ Cycle}$$

$$Annual\ CO\ Emissions\ from\ TGOs = \frac{3.29\ lb\ CO}{TGO\ cycle} \times 691\ TGOs\ = 2{,}273\frac{lbs\ CO}{yr}\ = 1.14\frac{tons\ CO}{yr}$$

Total Annual Emissions from F-22 Training operations are calculated by summing the emissions from LTO and TGO operations as follows using CO as an example:

$$CO\ Emissions\ from\ F-22\ Operations\ \left(\frac{tons}{yr}\right) = 75.90\frac{tons\ CO}{yr} + 1.14\frac{tons\ CO}{yr}$$
$$= 77.04\frac{tons\ CO}{yr}$$

Personal Vehicles

Actual criteria pollutant emissions were calculated based on the total commuter mileage traveled and applicable emission factors from Mobile 6.2, which are shown in Appendix C, Table 3. Composite emission factors were developed to address emissions during various modes of vehicle operations as shown in Appendix C, Table 3.

Detailed calculations for emissions from increases in personal vehicle uasges are shown in Appendix C, Table 4. For example, the total annual commuter mileage of 14 additional personnel traveling 20 miles per day for 250 days per year was 70,000 miles. Therefore, actual annual emissions are estimated as follows using the CO emissions as an examples:

$$70{,}000\frac{miles}{yr} \times 10.843\frac{g\ CO}{mile} \times 0.002204\frac{lbs}{g} = 1{,}673\frac{lbs\ CO}{yr} = 0.836\frac{tons\ CO}{yr}$$

Table 1 - Aircraft Emission Factors

			Emission Factors in lb/1000 lb fuel burned (lb/1000 lb)						
F-22A	**Power Setting**	**Fuel Flowrate (lb/hr)**	**VOC**	**CO**	**NO_X**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
F119-PW-100 (2)	Idle	1,377	6.48	48.20	4.00	1.26	2.49	2.24	3,130
	Approach	2,740	0.29	7.90	6.60	1.26	2.00	1.80	3,130
	Intermediate 70%	10,100	0.48	2.10	12.40	1.26	1.41	1.27	3,130
	Intermediate	18,612	0.01	0.80	19.80	1.26	1.12	1.01	3,130
	AB-5	50,170	0.19	16.10	7.40	1.26	1.12	1.01	3,130

Source: Table 1-4. Criteria Pollutant Emission Factors for Aircraft Engines

SOX - 0.21% East Coast Region

			Emission Factors in lb/1000 lb fuel burned (lb/1000 lb)						
T-38	**Power Setting**	**Fuel Flowrate (lb/hr)**	**NO_X**	**CO**	**VOC**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
J85-GE-5H	Idle	556.00	2.11	157.90	14.63	1.26	0.41	0.37	3,130
	Approach	1,091.71	2.85	93.48	2.90	1.26	0.65	0.59	3,130
	Intermediate	2,182.10	1.40	54.52	1.40	1.26	0.37	0.33	3,130
	Military	2,842.36	4.65	44.38	0.55	1.26	0.39	0.35	3,130
	AB	8,213.74	2.09	21.24	1.40	1.26	1.27	1.14	3,130

Source: Table 1-4. Criteria Pollutant Emission Factors for Aircraft Engines

SOX - 0.21% East Coast Region

Table 1A - Aircraft Emission Factors for Typical LTO

F-22A - LTO (Pounds)							
TIM (hrs)	**VOC**	**CO**	**NO_X**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
0.4967	8.86	65.93	5.47	1.72	3.41	3.06	4,282
0.06	0.09	2.53	2.11	0.40	0.64	0.58	1,001
0.01	0.13	0.57	3.34	0.34	0.38	0.34	843
0.01	0.00	0.20	4.91	0.31	0.28	0.25	777
-							
EF/LTO	9.09	69.22	15.83	2.78	4.70	4.23	6,903

Source: TIM from Table 1-8 (AFCEE 2009).

T-38 - LTO (Pounds)							
TIM (hrs)	**VOC**	**CO**	**NO_X**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
0.21	3.47	37.46	0.50	0.30	0.10	0.09	743
0.06	0.40	12.93	0.39	0.17	0.09	0.08	433
0.02	0.09	3.57	0.09	0.08	0.02	0.02	205
0.01	0.02	1.68	0.18	0.05	0.01	0.01	119
-							
EF/LTO	3.98	55.64	1.16	0.60	0.23	0.20	1,499

Source: TIM from Table 1-8 (AFCEE 2009).

Table 1B - Aircraft Emission Factors for Typical TGO

F22A - TGO (Pounds)							
TIM (hrs)	**VOC**	**CO**	**NO_X**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
	-	-	-	-	-	-	-
0.06	0.09	2.53	2.11	0.40	0.64	0.58	1,001
0.01	0.13	0.57	3.34	0.34	0.38	0.34	843
0.01	0.00	0.20	4.91	0.31	0.28	0.25	777
EF/LTO	0.22	3.29	10.36	1.05	1.30	1.17	2,621

T-38 - TGO (Pounds)							
TIM (hrs)	**VOC**	**CO**	**NO_X**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
	-	-	-	-	-	-	-
0.06	0.40	12.93	0.39	0.17	0.09	0.08	433
0.02	0.09	3.57	0.09	0.08	0.02	0.02	205
0.01	0.02	1.68	0.18	0.05	0.01	0.01	119
EF/LTO	0.51	18.18	0.66	0.30	0.13	0.12	756

Table 2. Increase in Personnel /Manpower

Number of Workers	*Workers*	*Miles/Day*	*# of Days*	*Annual Miles*
Personnel (14)	14	20	250	70,000

Table 3. Emission Factors for the Commuter Vehicles

	grams/mile							
Project Year/Source Type	VOC	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$	CO_2	*Notes*
Year 2010								
On-road Vehicles - 10 mph	1.22	14.15	1.72	0.01	0.04	0.03	702	(1), (2), (3)
On-road Vehicles - 25 mph	0.87	11.27	1.38	0.01	0.04	0.03	702	(1), (2), (3)
On-road Vehicles - 55 mph	0.76	10.51	1.26	0.01	0.04	0.03	702	(1), (2), (3)
On-Road Vehicles - Composite	0.80	10.843	1.31	0.01	0.04	0.03	702	

Note: 1. Emission factors from Mobile6 for CY2010

2. GHG EF from AFIERA - Air Emission Factor Guide to Air Force Mobile Sources 12/2009

3. Composite factors based on a round trip of 75% at 55 mph, 20% at 25 mph, and 5% at 5 mph. Units in grams/mile.

Table 4. Air Emission for the Increase in Personnel

Activity	*Tons/year*							
	VOC	CO	NO_X	SO_2	PM10	$PM_{2.5}$	CO_2	CO_2e
Proposed Action								
Personnel	0.06	0.837	0.10	0.00	0.00	0.00	54.19	54.19
Total	*0.06*	*0.84*	*0.10*	*0.00*	*0.00*	*0.00*	*54.19*	*54.19*

Proposed Action

Table 5. F-22 and T-38A Increase in Sorties

Activity	F-22	T-38A
LTOs	2193	2249
TGOs	691	225

Note: Operating 260 days per year

Table 6. Proposed Action Increase in Emissions (tons/year)

	VOC	**CO**	**NO_2**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**	**CO_{2e}**
F-22	10.04	77.03	20.94	3.41	5.60	5.04	8,474
T-38	4.54	64.61	1.38	0.71	0.27	0.24	1,771
Personnel	0.06	0.837	0.10	0.00	0.00	0.00	54
Total	**14.64**	**142.47**	**22.42**	**4.12**	**5.88**	**5.29**	**10,299**