EL3 ELMENDORF AFB AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Aircraft Operations

As an active, combat-ready unit, the Initial F-22 Operational Wing would conduct aircraft operations both at Elmendorf AFB's airfield and in the associated training airspace. Within these two areas, aircraft taking off and landing, as well as performing training activities, generate noise and emit exhaust, so they can affect the noise and air quality environment both at the base and in the training airspace. Maintenance activities, construction, and ground vehicles also produce emissions that can affect air quality at the base. All training and other ground-based activities must be performed safely and with regard for all other users at the base as well as in the airspace. Because these activities have the potential to affect safety and airspace management, the Air Force has analyzed them in this Draft Environmental Impact Statement (EIS). Aircraft Operations addresses airspace management and use, noise, air quality, and safety.

The affected environment for aircraft operations at Elmendorf AFB includes the base, the airspace surrounding the airfield, and the associated training airspace. A description of the factors used to define the affected environment is presented in Appendix AO-1. This appendix also presents details on the methods used to perform the analysis. For this Draft EIS, the best available data were used for this new generation of advanced fighter aircraft. However, there are limitations to the extent of the data since this aircraft is new and there are only four prototype aircraft flying. Noise, air quality, and safety data have been collected to the greatest extent possible for F-22 specific aircraft.

Noise data have been collected on these F-22s; however, none of them have flown the full range of maneuvers and engine power settings needed to develop the complete noise database required for noise analysis. Although the Air Force used the current F-22 aircraft for data collection, it is still possible these developmental test engines may be further modified as a result of on-going testing. Therefore, a composite approach was used to model noise for the F-22. Current data on the prototype aircraft were used, as well as information on comparable turbofan engines and other similar fighter aircraft power settings, speed, and maneuvering.

As a new, developing aircraft, the F-22 and its systems (e.g., engines, avionics) have evolved since the first flight in 1997 and will continue to evolve in the future. Acquisition of detailed knowledge of the outputs (such as noise levels and emissions) resulting from F-22 operations has followed a similar evolutionary pattern. Basically, this information will improve in precision the more the F-22 flies and undergoes evaluation.

This evolution in knowledge of F-22 outputs (especially noise) has clearly evolved over the past few years. In the environmental analysis performed on the F-22, *F-22 Force Development Evaluation and Weapons School Beddown, Nellis AFB* (Air Force 1999a), the best available information was used (at the time only one F-22 prototype had been flown). This information indicated that the noise profile of the F-18A Hornet formed the most appropriate surrogate for the F-22 at that time.

By 2000, when the F-22 *Conversion of Two F-15 Fighter Squadrons to F-22 Fighter Squadrons at Tyndall AFB, Florida* (Air Force 2000a) environmental analysis was completed, the Air Force Research Laboratory had collected additional F-22 noise data. Correlating these data to the known noise signatures for other aircraft led the Air Force to continue to use the F-18 as the best available surrogate for the F-22.

As noted above, further actual noise data on the F-22 has been collected. Although these data do not provide a complete noise database, they demonstrate the evolution of information on the aircraft. These data further establish that a composite of comparable engines and fighter aircraft best characterize the noise profile for the F-22.

For air quality, the best available data were also used. The F-22 uses a new propulsion system – the F119-PW-100 – a low-bypass ratio turbofan built by Pratt & Whitney. This engine is still under test and evaluation and may require changes depending on the test program. Many operational parameters of this new engine are classified or competitively sensitive. In an effort to approximate the fuel emissions that would be expected for this F119 engine, the F100 series of engines were evaluated. These series of engines were chosen because they most closely emulate the function of the F119 engine and the power setting anticipated to be used by the F-22.

Safety data are unavailable for the F-22 because there are only four testing and evaluation prototype aircraft flying. There have not been enough flight hours to accurately depict the safety record for this new aircraft. Therefore, similar fighter aircraft safety records have been used and conclusions drawn based on their flight history.

Although some F-22 data for noise, air quality, and safety are currently incomplete or unavailable, this Draft EIS provides a thorough analysis of known parameters. The Council on Environmental Quality (CEQ) Regulations implementing the National Environmental Policy Act (NEPA) recognize that such a situation may occur. This situation is managed in accordance with 40 Code of Federal Regulations (CFR) § 1502.22, *Incomplete or Unavailable Information*, which provides the following guidance.

> When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an Environmental Impact Statement and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking.
>
> (a) If the incomplete information relevant to reasonably foreseeable significant adverse impacts is essential to a reasoned choice among alternatives and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the Environmental Impact Statement.
>
> (b) If the information relevant to reasonably foreseeable significant adverse impacts cannot be obtained because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, the agency shall include within the Environmental Impact Statement the following:
>
> 1. A statement that such information is incomplete or unavailable;

2. A statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment;

3. A summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment; and

4. The agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community. For the purposes of this Section, "reasonably foreseeable" includes impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason.

As indicated above, data for the F-22 aircraft that are necessary to model the aircraft's noise, air quality, and safety are incomplete. While the costs to obtain complete data are not exorbitant, those data cannot be obtained at this time due to limitations on aircraft performance during its development stage, the need for further testing of operational aircraft, analyses during normal (versus developmental) flying conditions and time to develop a flight safety record [40 CFR §§ 1502.22(b); 1502.22(b)1]. The data and factors used in this analysis are presented in the body of this Draft EIS and further detailed in Appendix AO-1 through AO-3.

No-Action Alternative

Under the no-action alternative, ongoing Air Force and interagency programs and activities at Elmendorf AFB would continue operating at planned levels as reflected in current Air Force management plans. These plans include recent activities that have been approved by the Air Force and have existing NEPA documentation.

Under the no-action alternative, Elmendorf AFB would continue to operate and the 3rd Wing would remain the host unit and the largest and principal organization in Eleventh Air Force. Aircraft operations and airspace management and use would continue at current levels. There would be no change in the configuration or use of any existing airspace and no new airspace would be created. Under the no-action alternative, existing noise levels would not change, either in the vicinity of the base, or under the affected airspace. Impacts to air quality would reflect current and ongoing activities in the region; pollutant emissions would stay the same. Elmendorf AFB would continue to operate under conditions in its current air permit and comply with all applicable state and federal laws and regulations. There would be no change in aircraft operations and, therefore, there would be no new or unique safety issues. Operation and maintenance activities conducted at Elmendorf AFB would continue in accordance with all applicable safety directives.

EL3.1 Airspace Management and Use

EL3.1.1 Base

Affected Environment

Airspace currently supporting aircraft operations at Elmendorf AFB includes the airspace surrounding the base itself for sorties and the Anchorage Alaska Terminal Area (AATA) encompassing the base, Anchorage International Airport, Merrill Field, and the Lake Hood Seaplane Base. The Elmendorf AFB control tower provides control of airfield operations to base arriving and departing aircraft within this airspace. The Federal Aviation Administration (FAA)-operated Anchorage Approach Control has responsibility for the AATA. This airspace is extremely congested with all four high-volume airports within 12 miles of each other, making it the most heavily used airspace in the state.

Along with the F-15Es, C-130s, E-3s, and C-12s, Elmendorf AFB has two operational squadrons (42 PAI and 7 BAI aircraft) of F-15Cs. These based aircraft, along with transients, performed a total of 20,025 annual baseline sorties at Elmendorf AFB. Sorties generally can increase during exercises when aircraft from various Pacific Air Force (PACAF) units, Navy/Marine contingents, and allied forces from Great Britain and Canada are represented.

Aircraft operating from Elmendorf AFB use the airfield airspace and the AATA on a daily basis. Transitions from one class of airspace to another are common practice at this airfield and their interactions with the surrounding civilian and commercial aircraft are undertaken effectively every day. Aircraft at Elmendorf AFB have flown in this airspace environment since the 1940s without conflict with civil and commercial aviation. While AATA is congested, Elmendorf AFB/Anchorage Approach Control consistently coordinates with the regional FAA to minimize conflicts.

Environmental Consequences

A 26 percent increase in sorties at Elmendorf AFB would not affect airspace management in the Anchorage area.

Beddown of the Initial F-22 Operational Wing at Elmendorf AFB would not adversely affect air traffic operations or airspace use within the local airfield or AATA airspace. The replacement of F-15C operations by the F-22 would result in about a 26 percent net increase, or 21 additional daily sorties (based on 240 typical flying days at Elmendorf AFB) over baseline conditions. Such an increase would not require airspace modifications or changes to current base arrival or departure procedures, nor would it exceed the Anchorage Approach Control or Elmendorf AFB control tower capabilities for handling air traffic within their respective airspace. Therefore, the overall effect of this alternative on airspace use in the local air traffic environment would be manageable with continued coordination with FAA, as it is for the other alternative bases.

Comparative Summary of the Five Potential Basing Locations

Management of the airspace in the vicinity of Elmendorf, as well as all other bases, is adequate to support the additional sorties associated with the proposed beddown. Increases in annual sorties at

Elmendorf (+26 percent), or at Langley (+7 percent), Eglin (+16 percent), Mountain Home (+58 percent), and Tyndall (+43 percent) would negligibly affect airspace management procedures.

EL3.1.2 Airspace

Affected Environment

The affected airspace units for the Elmendorf AFB alternative consist of seven primary airspace MOAs and nine secondary airspace MOAs (Figure EL3.1-1). ATCAAs overlie all the MOAs except Buffalo and Birch MOAs. The F-15Cs use the primary MOAs: Susitna, Fox, Stony A/B, Naknek 1/2, and Galena. Secondary MOAs (Yukon 1 through 5, Buffalo, Birch, Eielson, and Viper) are used rarely by F-15Cs for routine daily training. Viper MOA is not currently used by F-15Cs. Rather, the F-15Cs fly in the other secondary MOAs during MFEs with aircraft from Eielson AFB and elsewhere. This pattern of airspace use would continue for the F-22s under this alternative. These airspace units all lie within the flight distance available during a standard daily mission. Selected airspace units have seasonal flight restrictions (Air Force 1997).

A number of military training routes (MTRs), which include reciprocal training routes (i.e., the same route but aircraft fly in opposite directions) overlap the primary and secondary airspace associated with this alternative. In the primary airspace units, four MTRs coincide with Fox MOA, four MTRs with the Stony A/B and Naknek ½ MOAs, and three with Galena 1/2 MOA. In the secondary airspace units, 12 MTRs (refer to Appendix AO-1) coincide with Yukon 1, 2, 3, 4, and 5 MOAs, 11 with Buffalo MOA, 6 with Eielson MOA, and 2 with the Birch MOA. Close coordination of scheduling and use of these MOAs and MTRs by the respective scheduling agencies ensure the safety of air traffic throughout this region. However, during scoping many people expressed their concern about smaller, light civil aviation and the conflicts that might occur between these lighter aircraft and military operations.

Civilian aviation is an important mode of transportation in Alaska.

In Alaska, light civil aviation provides the only access to many areas of the state. Much of this aviation occurs off established airways and within or near the MOAs. The Air Force has implemented an aggressive public awareness program to publicize the times and types of military operations being conducted in the MOAs, including use of the Special Use Airspace Information Service for the Yukon, Eielson, Birch, and Buffalo MOAs. Also, a number of flight-avoidance areas have been established around towns, resorts, airports, and other locations beneath or near most of the MOAs that are considered sensitive to aircraft noise and/or overflights (Air Force 1996). These avoidance locations are reviewed annually and revisions may be initiated as a result of state, federal, or public concerns. These initiatives have helped foster the safe joint-use of this airspace by both military and civilian users, such that there have been no midair collisions and few reports of any "close calls" between military and civil aircraft. Aircraft operating along federal airways near or overlying the MOAs are separated both vertically and laterally from MOA military operations to reduce the chance of collision while operating along these routes.

A large number of small, single-engine, general-aviation aircraft operate in Alaska without any radio or transponder equipment. Because they cannot or choose not to communicate with or be radar-monitored by Air Traffic Control agencies or to receive radio advisories on military operations, these

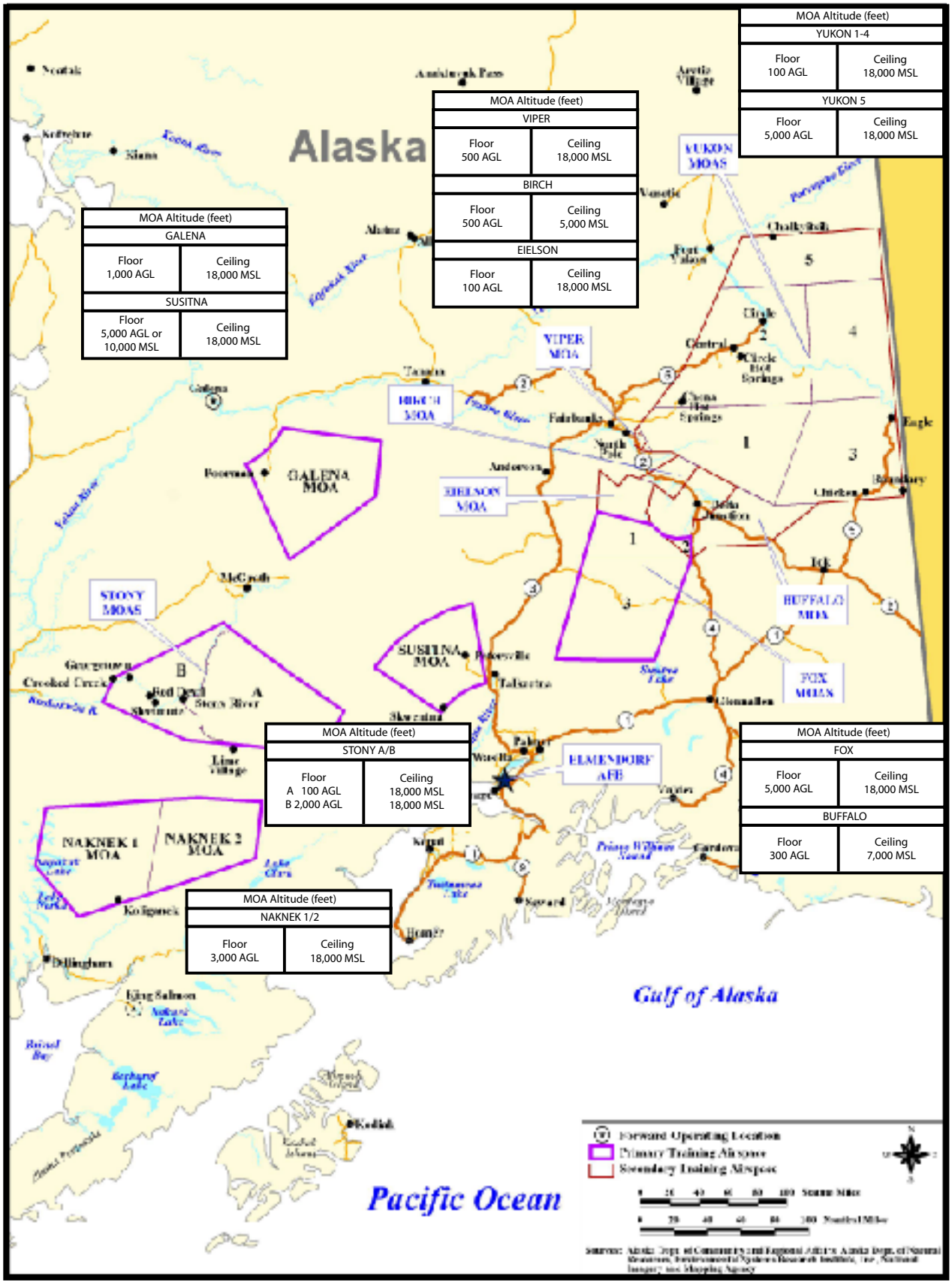


Figure EL3.1-1
Elmendorf AFB Affected Airspace Environment

pilots are particularly concerned with the midair collision potential in MOAs and MTRs where military aircraft can operate as low as 100 to 300 feet AGL. These unequipped aircraft commonly fly at 500 feet AGL, following river and highway corridors, and rely exclusively on "see and avoid" techniques to remain clear of clouds, fog, and other air traffic. Military aircrews are aware of the areas and altitudes commonly flown by general aviation aircraft and are particularly vigilant when operating in these areas.

Environmental Consequences

Selection of Elmendorf AFB as an F-22 basing alternative would have a negligible effect on airspace management within the region encompassing the Alaska special use airspace. This alternative would not require any changes to the current lateral or vertical structure of the Alaska MOAs nor would it alter their normal scheduled times of use. The F-22 would substantially increase airspace use in the primary MOAs (see section EL2.2.1). Based on an average of 240 flight training days per year, the replacement of the F-15C with the F-22 could result in an increase of up to four more sortie-operations per day in the Susitna, Fox, and Stony MOAs. There would be little change (less than one sortie-operation per day) to all the other remaining Alaska MOAs. These operational increases are due to the additional 30 aircraft that would be flying in this airspace. F-22 aircraft would primarily be at higher altitudes and should not adversely affect civil aircraft flights throughout the region or along the visual flight rules (VFR) corridors that have been established within the MOAs for these aircraft. Military aircrews are vigilant of all VFR general aviation aircraft operating within or near these corridors and use "see and avoid" techniques to avoid encountering light civil aviation.

People at scoping expressed concern about potential airspace conflicts between military and civilian aircraft.

Current initiatives to inform civil aircraft pilots of Interior MOA (Yukon, Birch, and Eielson) activities via the Special Use Airspace Information Service and several meeting forums involving general aviation, as well as state and federal agencies, would continue to be an effective means of increasing situational awareness of military flight activities. Air taxi services and other frequent flight operations that transit through or beneath the Alaska MOA airspace would not likely realize any noticeable difference in the level of military aircraft activities normally encountered during these flights. Therefore, since this beddown alternative represents a continuation of current activities with increases in sortie-operations at higher altitudes, no adverse impacts in airspace use and management would be expected.

Alaska Native Concerns

During scoping, Alaska Native members of several villages expressed concerns that replacement of the F-15C with the F-22 would increase the risk of conflicts with small aircraft serving communities under special use airspace. As described above, existing awareness and avoidance procedures implemented by the Air Force, and standard FAA flight rules are designed to prevent airspace conflicts.

The Air Force has established minimum separation distances from airfields and communities under special use airspace to reduce the risk of conflicts.

Several Alaska Native communities were also concerned about ordnance use by the F-22 and whether there would be a requirement for air-to-ground ranges. As described in section EL1, the Initial F-22

Operational Wing would emphasize air-to-air missions. Missions involving ordnance delivery or missile firing would occur at approved ranges such as the Nellis Range Complex in Nevada, the Utah Test and Training Range, or Eglin AFB's over-water ranges in the Gulf of Mexico. Air-to-ground ranges in Alaska would only be used by exception by the F-22.

Comparative Summary of the Five Potential Basing Locations

At Elmendorf AFB, more so than other locations, concerns exist regarding civil aviation that commonly transits the MOAs in Alaska and represents an important transportation mode. However, the F-22s would not alter the management or use of these airspaces. There would be no difference in management of training airspace associated with any of the five installations under consideration for beddown of the F-22s. All the airspace units that the F-22 would use, irrespective of the location, operate under the same basic FAA regulations and procedures.

EL3.2 Noise

Within this Draft EIS, noise is described by the sound level. Sound level is the amplitude (level) of the sound that occurs at any given time. When an aircraft flies by, the level changes continuously, starting at the ambient (background) level, increasing to a maximum as the aircraft passes closest to the receptor, and then decreasing to ambient as the aircraft flies into the distance. Sound levels are on a logarithmic decibel scale; a sound level that is 10 decibels (dB) higher than another will be perceived as twice as loud. More specific noise metrics include Maximum Sound Level (L_{max}), the Sound Exposure Level (SEL), Day-Night Average Sound Level (DNL), and Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}). A-weighted levels are used for subsonic aircraft noise, and C-weighted levels are used for sonic booms and other impulsive noises. A "C" is included in the symbol to denote when C-weighting is used. Each of these metrics is summarized below and discussed in detail in Appendix A0-1.

- Maximum Sound Level (L_{max}) is used to define maximum noise levels. L_{max} is the highest sound level measured during a single aircraft overflight. For an observer, the noise level starts at the ambient noise level, rises up to the maximum level as the aircraft flies closest to the observer, and returns to the ambient level as the aircraft recedes into the distance.
- Sound Exposure Level (SEL) accounts for both 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 averaged over 1 second.
- Day-Night Average Sound Level (DNL) is a noise metric combining the levels and durations of noise events and the number of events over an extended time period. It is a cumulative average computed over a 24-hour period to represent total noise exposure. DNL also accounts for more intrusive nighttime noise, adding a 10 dB penalty for sounds after 10:00 pm and before 7:00 pm. DNL is the appropriate measure to account for total noise exposure around airfields such as Elmendorf AFB.
- Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}) is the measure used for subsonic aircraft noise in military airspace (MOAs or Warning Areas). This metric accounts for the fact that when military aircraft fly low and fast, the sound can

rise from ambient to its maximum very quickly. Known as an onset-rate, this effect can make noise seem louder due to added "startle" effects. Penalties of up to 11 dB are added to account for this onset-rate.

- C-Weighted Day-Night Sound Level (CDNL) is day-night sound levels computed for areas subjected to sonic booms. These areas are also subjected to subsonic noise assessed according to L_{dnmr}.

Comments received during scoping placed special emphasis on a comprehensive presentation of noise effects. Aircraft noise effects can be described according to two categories: annoyance and human health considerations. Annoyance, which is based on perception, represents the primary effect associated with aircraft noise. Far less potential exists for effects on human health. Appendices AO-1 and AO-2 provide detail on these effects and the studies used to identify them.

Studies of community annoyance to numerous types of environmental noise show that DNL correlates well with effects, and Schultz (1978) showed a consistent relationship between noise levels and annoyance. A more recent study reaffirmed and updated this relationship (Fidell *et al.* 1991). The updated relationship, which does not differ substantially from the original, is the current preferred form.

In general, there is a high correlation between the percentages of groups of people highly annoyed and the level of average noise exposure measured in DNL. The correlation is lower for the annoyance of individuals. This is not surprising considering the varying personal factors that influence the manner in which individuals react to noise. The inherent variability between individuals makes it impossible to predict accurately how any individual will react to a given noise event. Nevertheless, findings substantiate that community annoyance to aircraft noise is represented quite reliably using DNL.

Relation Between Annoyance and DNL

DNL	***% Population Highly Annoyed***
65	12.3
70	22.1
75	36.5
80	53.7
85	70.2

In addition to annoyance, the effect of noise on human health was raised during the public scoping process for this Draft EIS. Other factors that can be used to evaluate a noise environment are noise-induced hearing loss, speech interference, and sleep disturbance. Effects on speech and sleep also contribute to annoyance.

A considerable amount of data on hearing loss have been collected and analyzed. It has been well established that continuous exposure to high noise levels (like in a factory) will damage human hearing (USEPA 1978). Hearing loss is generally interpreted as the shifting to a higher sound level of the ear's sensitivity to perceive or hear sound (sound must be louder to be heard). This change can be either temporary or permanent. Federal workplace standards for protection from hearing loss allow an A-weighted time-average level of 90 dB over an 8-hour work period, or 85 dB averaged over a 16-hour period. As shown later in this section, noise levels associated with the activities of the F-22s would be more than 30 dB below these standards. In a MOA or Warning Area, the operations are random and widely dispersed. The random nature of operations and the wide altitude structure within the MOA make it unlikely that any one location would be repeatedly overflown over a short duration.

Studies on community hearing loss from exposure to aircraft flyovers near commercial airports showed that there is no danger, under normal circumstances, of hearing loss due to aircraft noise (Newman and Bettie 1985). Commercial airport traffic is much more continuous and frequent than at a military airfield and also commonly lower in altitude than flights in MOAs. In MOAs, military aircraft fly at varied altitudes, rarely fly over the same point on the ground repeatedly during a short period, and occur sporadically over a day. These factors make it unlikely that any hearing loss would occur (Thompson 1997). Other factors, described in Appendix AO-1, demonstrate the lack of potential hearing loss from the F-22 beddown.

Another non-auditory effect of noise is disruption of conversations. Speech interference associated with aircraft noise is a primary cause of annoyance to individuals on the ground. Aircraft noise can also disrupt routine activities, such as radio listening, television watching, or telephone use. The disruption generally lasts only a few seconds, and almost always less than 10 seconds. It is difficult to predict speech intelligibility during an individual event, such as a flyover, because people automatically raise their voices as background noise increases. A study (Pearsons *et al.* 1977) suggests that people can communicate acceptably in background A-weighted noise levels of 80 dB, but some speech interference occurs when background noise levels exceed 65 dB. Typical home insulation reduces the noise levels experienced by 20 dB or more and decreases speech interference.

Noise-related awakenings form another issue associated with aircraft noise. Sleep is not a continuous, uniform condition but a complex series of states through which the brain progresses in a cyclical pattern. Arousal from sleep is a function of a number of factors including age, gender, sleep stage, noise level, frequency of noise occurrences, noise quality, and presleep activity. Quality sleep is recognized as a factor in good health. Although considerable progress has been made in understanding and quantifying noise-induced annoyance in communities, quantitative understanding of noise-induced sleep disturbance is less advanced.

Studies (Fidell *et al.* 1994; Pearsons *et al.* 1995; Kryter 1984) of the effects of nighttime noise exposure on the in-home sleep of residents near military airbases, civil airports, and in several households with negligible nighttime aircraft noise exposure, revealed the SEL as the best noise metric predicting noise-related awakenings and a strong influence of habituation on susceptibility to noise-induced sleep disturbance.

To date, no exact quantitative dose-response relationship exists for noise-related sleep interference; yet, based on studies conducted to date and the United States Environmental Protection Agency (USEPA) guideline of a 45 DNL to protect sleep interference, useful ways to assess sleep interference have emerged. If homes are conservatively estimated to have a 20-dB noise insulation, an average of 65 DNL would produce an indoor level of 45 DNL and would form a reasonable guideline for evaluating sleep interference. This also corresponds well to the general guideline for assessing speech interference.

EL3.2.1 Base

DNL, or Day-Night Average Sound Level, is the most widely accepted metric for evaluation of noise around airfields.

Affected Environment

Elmendorf AFB has supported a variety of aircraft and operations since its inception in the early 1940s. Aircraft and associated missions have ranged from World War II bombers and cargo aircraft to the current suite of 42 PAI F-15Cs, 18 F-15Es, 2 E-3s, 3 C-12s, and 16 C-130s. The variety of missions and aircraft over the years has formed the shape and extent of areas affected by aircraft operations and associated noise.

Baseline noise levels, expressed as Day-Night Average Sound Levels (DNL), were modeled based on aircraft types, runway use patterns, engine power settings, altitude profiles, flight track locations, airspeed, and other factors. Appendices AO-1 and AO-2 detail the methods used for defining airfield noise levels and presents further information on noise metrics.

To identify the areas affected by noise levels around the base, a program known as NOISEMAP is used to generate noise contours that depict noise levels ranging from 65 to 85 DNL or greater, in 5 dB increments. Table EL3.2-1 and Figure EL3.2-1 present the baseline and projected noise conditions for Elmendorf AFB.

Table EL3.2-1. Acreage Under Baseline Noise Contours in the Vicinity of Elmendorf AFB

Noise Contour (DNL)	*Acres Affected: On Base*[1]	*Acres Affected: Off Base*[2]	*Acres Affected: Total*
65-70	4,575	532	5,107
70-75	1,680	129	1,809
75-80	1,017	5	1,022
80-85	568	0	568
>85	672	0	672
Total	8,512	666	9,178

Notes: 1. Includes the adjacent Army installation (Fort Richardson).
2. Acreage off base consists only of water. No noise contours go off the base (i.e., Elmendorf AFB and Fort Richardson overland areas).

Noise levels of 65 DNL or greater mostly (93 percent) affect lands on Elmendorf AFB or Fort Richardson. All off-base areas affected by noise levels of 65 DNL or higher occur over water. Section EL3.12 describes the land use implications of these noise levels.

Aircraft at Elmendorf AFB generally operate according to established flight paths and overfly the same areas surrounding the base. Elmendorf AFB employs a quiet-hours program in which aircraft

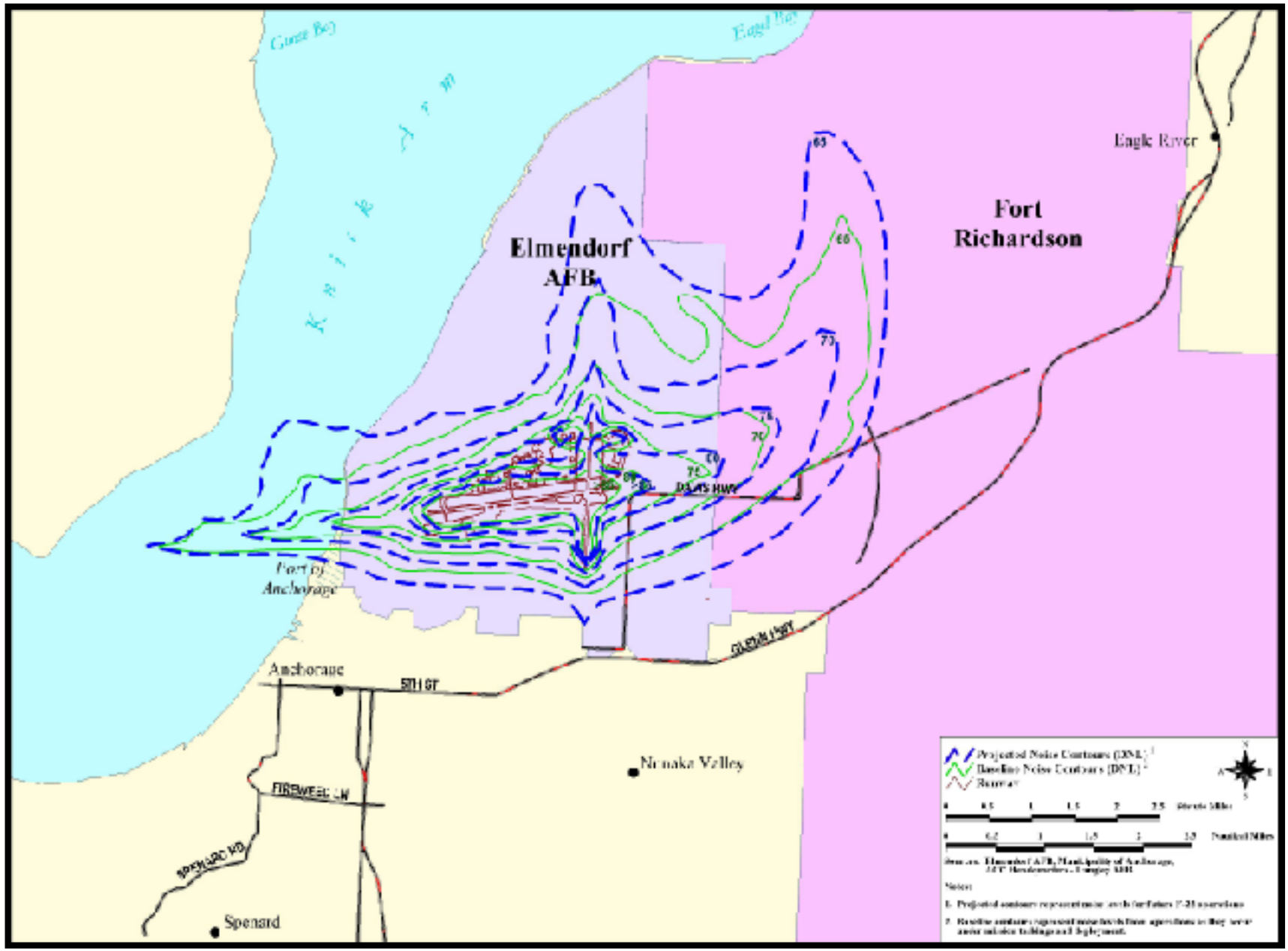


Figure EL3.2-1
Baseline and Projected Noise Contours at Elmendorf AFB

operations (certain take off and landing patterns as well as engine run-ups) are avoided after 10:00 pm and before 7:00 am every day of the week. At Elmendorf AFB, noise exposure from airfield operations typically occur beneath main approach and departure corridors along both runways and in areas immediately adjacent to parking ramps and aircraft staging areas.

Noise due to construction and maintenance equipment, as well as general vehicle traffic is a common, ongoing occurrence in the base environment. Existing, continuing military construction projects are currently in progress at Elmendorf AFB. Trucks, as well as heavy equipment, are usually found in the base environment on a daily basis to support these existing facility and infrastructure upgrades.

Environmental Consequences

Public scoping concerns regarding noise included any difference between noise generation of the F-22 compared to the F-15C.

Under this alternative, the area affected by noise levels of 65 DNL or greater would increase by 4,590 acres. Off-base areas (land and water) affected by noise levels of 65 DNL or greater increases by 607 acres. All increases in noise levels would occur on base, the area affected off base overlies water (Table EL3.2-2 and refer Figure EL3.2-1). Section EL3.12 describes the land use implications for the changes in areas affected by noise.

Table EL3.2-2. Acreage Under Noise Contours in the Vicinity of Elmendorf AFB Comparison of Baseline and Projected Conditions

	BASELINE			PROJECTED			CHANGE		
Noise Contour (DNL)	*Acres Affected: On Base*	*Acres Affected: Off Base[1]*	*Acres Affected: Total*	*Acres Affected: On Base*	*Acres Affected: Off Base[1]*	*Acres Affected: Total*	*Acres Affected: On Base*	*Acres Affected: Off Base[1]*	*Acres Affected: Total*
65-70	4,575	532	5,107	6,230	953	7,183	+1,655	+421	+2,076
70-75	1,680	129	1,809	2,815	296	3,111	+1,135	+167	+1,302
75-80	1,017	5	1,022	1,621	24	1,645	+604	+19	+623
80-85	568	0	568	931	0	931	+363	0	+363
>85	672	0	672	1,898	0	1,898	+226	0	+226
Total	8,512	666	9,178	12,495	1,273	13,768	+3,983	+607	+4,590

Note: 1. Acreage includes only water. No noise contours go off base (i.e., Elmendorf AFB and Fort Richardson) over land areas.

Noise on base would be ameliorated because the F-22's power would allow it to accelerate more quickly to climb speed and reduce power sooner than the F-15C on take off. The F-22 would generate more noise closer to the runway and less noise further from the runway (i.e., over the areas surrounding Elmendorf AFB). In addition, the F-22 (as compared to the F-15C) would need fewer maintenance activities where the engine is run at varying speeds along the flightline.

Short-term noise increases due to construction and renovation, as well as infrastructure (stormwater and electric lines) installment and realignment would occur. Construction occurs in stages, the earlier stage entails trucks, bulldozers, and other heavy construction equipment for the major

construction projects (e.g., hangars, aircraft parking facilities, apron). This stage of construction would be temporary and isolated to those areas where construction would occur. Most of these projects would be undertaken adjacent to the flight line and occupy industrial areas, and would be isolated from any off-base communities. In addition, construction would take place during daylight hours and would follow best management practices to minimize noise to any off-base receptors. Construction noise would be contained within base environs since most heavy construction would occur near the flight line, where noise would be compatible with ongoing activities.

Comparative Summary of the Five Potential Basing Locations

Elmendorf and Langley would have the least potential effects for noise consequences. The off-base area affected by noise levels of 65 DNL or greater would increase by 607 acres at Elmendorf and would decrease by 521 acres at Langley, but these areas would all be over water. At Tyndall, the 2,141 additional off-base acres affected by noise would mostly be over water, but 23 acres of residential land use would be newly subject to 65 DNL or greater. Eglin, with the highest potential for impacts, would experience an increase of 1,623 off-base acres affected by noise, including 123 acres of residential lands. Mountain Home, with an increase of 2,455 acres, would have the most off-base land affected but that area is largely grazing and agricultural land.

EL3.2.2 Airspace

Affected Environment

Within MOAs and overlying ATCAAs, subsonic flight is dispersed and often occurs randomly or, due to either airspace configuration or training scenarios, it may be concentrated or channeled into specific areas or corridors. The Air Force has developed the MR_NMAP (MOA-Range NOISEMAP) computer program (Lucas and Calamia 1996) to calculate subsonic aircraft noise in these areas. MR_NMAP can calculate noise for both random operations and operations channeled into corridors. It is supported by measurements in several military airspaces (Lucas *et al.* 1995). The affected airspace for the Elmendorf AFB alternative includes the MOAs in which random aircraft operation is the norm.

L_{dnmr} is the monthly average of the Onset-Rate Adjusted Day-Night Average Sound Level (DNL). Noise levels are interpreted the same way for both DNL and L_{dnmr}. The annual sortie-operations for a MOA is divided by 12 to define monthly average sortie-operations. For this Draft EIS, all training airspace noise levels were calculated using L_{dnmr}. However, to enhance readability, these noise levels will be referred to as DNL throughout the document.

The primary noise metric calculated by MR_NMAP for this assessment is DNL (also known as L_{dn} or by extension L_{dnmr}). This quantity has been computed for each of the seven primary airspace units potentially affected by the action and no-action alternatives. As discussed in Appendix AO-2, this cumulative metric represents the most widely accepted method of quantifying noise impact. However, it does not provide an intuitive description of the noise environment. People often desire to know what the loudness of an individual aircraft will be; MR_NMAP and its supporting programs can provide the maximum sound level, L_{max}, (Table EL3.2-3) and sound exposure level, SEL, (Table EL3.2-4) that accounts for both the duration and intensity of a noise event for individual aircraft at various distances and altitudes. The L_{max} indicates the noise that would be heard by an individual the instant an aircraft flies overhead. SELs reflect the noise

levels of a flyover, including the maximum level, averaged over 1 second as the aircraft approaches and departs. Both measures are described in Appendix AO-2.

Table EL3.2-3. Representative A-Weighted Instantaneous Maximum (L_{max}) in dB Under the Flight Track for Aircraft at Various Altitudes in the Primary Airspace[1]

			ALTITUDE IN FEET ABOVE GROUND LEVEL						
Aircraft Type	***Airspeed***	***Power Setting[3]***	***300***	***500***	***1,000***	***2,000***	***5,000***	***10,000***	***20,000***
F-15C	520	81% NC	119	114	107	99	86	74	57
F-22[2]	520	70% ETR	120	116	108	99	85	71	54
F-16A	450	87% NC	112	108	101	93	80	67	50
F-18A	500	92% NC	120	116	108	99	85	71	54
F-14A	530	100% NC	115	111	103	94	80	67	51
B-1B	550	101% RPM	117	112	106	98	86	75	61

Notes: 1. Level flight, steady high-speed conditions.
2. Projected based on F-22 composite aircraft.
3. Engine power setting while in a MOA. The type of engine and aircraft determines the power setting: RPM = rotations per minute, NC = percent core RPM, and ETR = engine throttle ratio.

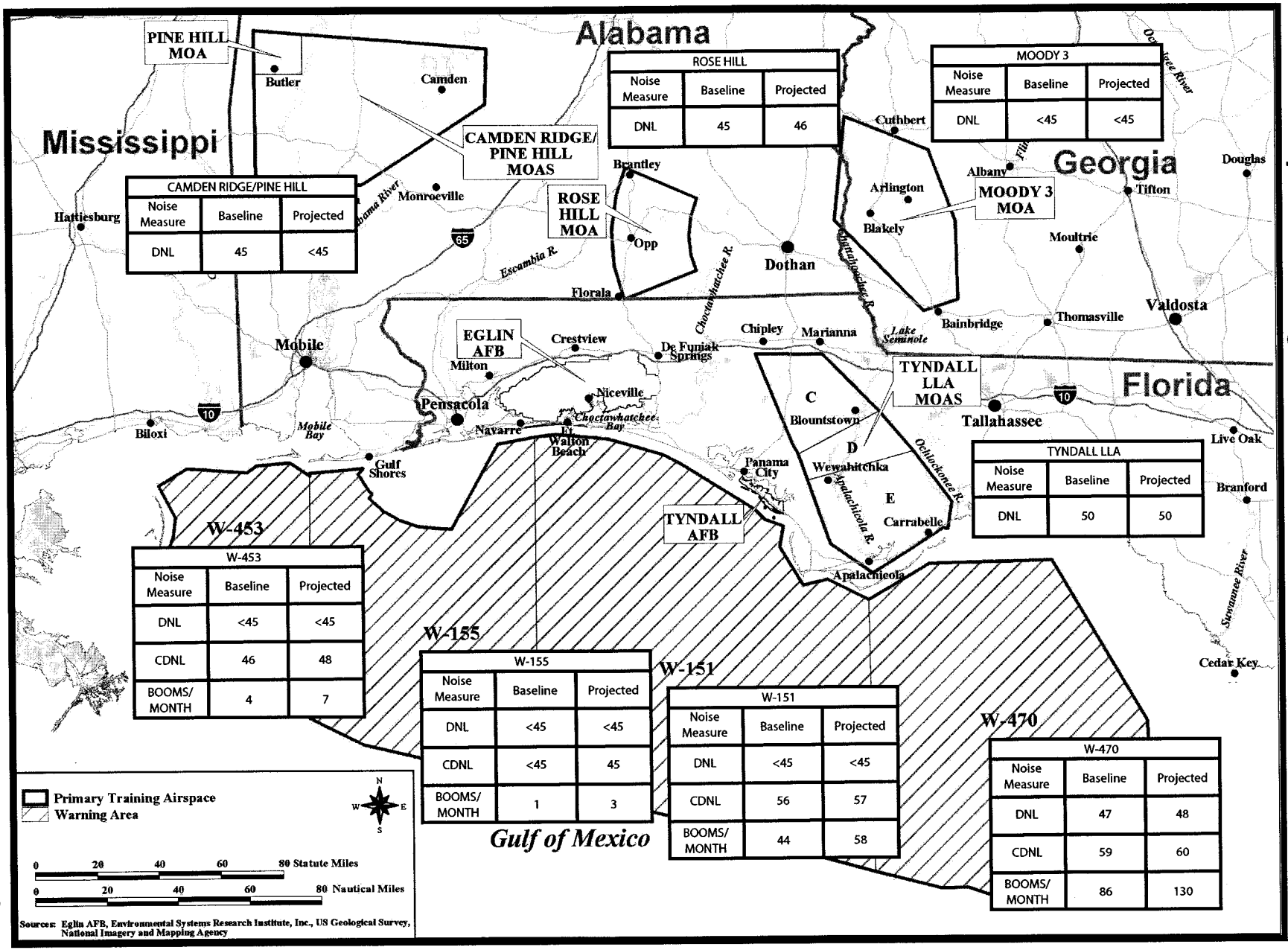
Table EL3.2-4. Sound Exposure Level (SEL) in dB under the Flight Track for Aircraft at Various Altitudes in the Primary Airspace[1]

		ALTITUDE IN FEET ABOVE GROUND LEVEL						
Aircraft Type	***Airspeed***	***300***	***500***	***1,000***	***2,000***	***5,000***	***10,000***	***20,000***
F-15C	520	116	112	107	101	91	80	65
F-22[2]	520	118	114	108	101	89	77	62
F-16A	450	110	107	101	95	85	74	59
F-18A	500	118	114	108	101	89	77	62
F-14A	530	112	109	103	96	84	73	58
B-1B	550	116	112	107	101	92	82	70

Note: 1. Level flight, steady high-speed conditions.
2. Projected based on F-22 composite aircraft.

Figure EL3.2-2 shows the baseline and projected noise levels for the seven primary and nine secondary airspace units. Cumulative noise levels in all airspace units are 59 DNL or less. Subsonic noise levels in all seven primary airspace units are below 45 DNL. Noise levels below 45 DNL are presumed to be at ambient levels. In the secondary MOAs, noise levels tend to be higher than in primary MOAs. This is due to the total number of sortie-operations by all aircraft, but the F-15Cs are minor contributors.

Supersonic flight for fighter aircraft is primarily associated with air combat training. Supersonic activity is authorized in four of the primary MOAs and five of the secondary MOAs (refer to Table EL2.2-2) under specific altitude restrictions. The amplitude of an individual sonic boom is



CAMDEN RIDGE/PINE HILL		
Noise Measure	Baseline	Projected
DNL	45	<45

ROSE HILL		
Noise Measure	Baseline	Projected
DNL	45	46

MOODY 3		
Noise Measure	Baseline	Projected
DNL	<45	<45

TYNDALL LLA		
Noise Measure	Baseline	Projected
DNL	50	50

W-453		
Noise Measure	Baseline	Projected
DNL	<45	<45
CDNL	46	48
BOOMS/ MONTH	4	7

W-155		
Noise Measure	Baseline	Projected
DNL	<45	<45
CDNL	<45	45
BOOMS/ MONTH	1	3

W-151		
Noise Measure	Baseline	Projected
DNL	<45	<45
CDNL	56	57
BOOMS/ MONTH	44	58

W-470		
Noise Measure	Baseline	Projected
DNL	47	48
CDNL	59	60
BOOMS/ MONTH	86	130

Figure EG3.2-2
Baseline and Projected Noise Environment for Eglin AFB Airspace

measured by its peak overpressure, in pounds per square foot (psf) and depends on an aircraft's size, weight, geometry, Mach number, and flight altitude. Table EL3.2-5 shows sonic boom overpressures for the F-15C and F-22 aircraft in level flight at various conditions. The biggest single condition among these is altitude. Maneuvers can also affect boom peak overpressures, increasing or decreasing overpressures from those shown in Table EL3.2-5.

Table EL3.2-5. Sonic Boom Peak Overpressures (psf) for F-15 and F-22 Aircraft at Mach 1.2 Level Flight

	ALTITUDE (FEET)			
Aircraft	*10,000*	*20,000*	*30,000*	*40,000*
F-15C	5.40	2.87	1.90	1.46
F-22	5.68	3.00	1.97	1.50

Aircraft exceeding Mach 1 always create a sonic boom; however, not all supersonic flight activities will cause a boom at the ground. As altitude increases, air temperature decreases, and the resulting layers of temperature change, causing booms to be turned upward as they travel toward the ground.

Depending on the altitude of the aircraft and the Mach number, many sonic booms are bent upward sufficiently that they never reach the ground. This same phenomenon, referred to as "cutoff," also acts to limit the width (area covered) of the sonic booms that reach the ground (Plotkin *et al.* 1989).

When a sonic boom reaches the ground, it impacts an area which is referred to as a "footprint" or (for sustained supersonic flight) a "carpet." The size of the footprint depends on the supersonic flight path and on atmospheric conditions. Sonic booms are loudest near the center of the footprint, with a sharp "bang-bang" sound. Near the edges, they are weak and have a rumbling sounding like distant thunder.

Sonic booms from air combat training activity have an elliptical pattern. Aircraft will set up at positions up to 100 nautical miles apart, before proceeding toward each other for an engagement. The airspace used tends to be aligned, connecting the setup points in an elliptical shape. Aircraft will fly supersonic at various times during an engagement exercise. Supersonic events can occur as the aircraft accelerate toward each other, during dives in the engagement itself, and during disengagement. The long-term average (CDNL) sonic boom patterns also tend to be elliptical.

Long-term sonic boom measurement projects have been conducted in four 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 they 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. Because BOOMAP is directly based on long-term

measurements, it implicitly accounts for maneuvers, statistical variations in operations, atmospheric effects and other factors.

A variety of aircraft conducting training perform flight activities that include supersonic events. Predominantly, these events occur during air-to-air combat, often at high altitudes. Roughly 3 to 10 percent of air combat maneuvering flight activities (depending upon aircraft type) result in supersonic events within the MOAs where these activities are authorized. On average, F-15Cs fly supersonic about 7.5 percent of the time with Mach numbers usually 1.1 or less, but occasionally up to about 1.3. This is typical of all the current-generation supersonic aircraft studied in the development of BOOMAP. Figure EL3.2-2 shows baseline supersonic noise levels and sonic booms, CDNL, in affected airspace. As with subsonic noise, levels below 45 CDNL are not shown.

Figure EL3.2-2 also provides the estimated number of booms per month that would be generated at an average location in each airspace. Individual sonic boom footprints would affect areas from about 10 square miles to 100 square miles, which is a small portion of the area under the airspace.

Environmental Consequences

Despite increases in sortie-operations, proposed F-22 flight activities would not perceptibly increase subsonic noise levels in any of the primary or secondary MOAs. In all seven primary MOAs, noise levels would remain below 45 DNL (refer to Figure EL3.2-2). These levels result from the higher altitudes used by the F-22s in comparison to the F-15Cs. F-22s would fly, on average, 80 percent of the time above 10,000 feet MSL, and 30 percent of the total time would be spent above 30,000 feet MSL. Noise levels in secondary MOAs would not change due to the limited number of additional F-22 sortie-operations and an emphasis on higher altitudes.

Refer to Table EL3.2-3 for SELs for subsonic noise of several aircraft, including the F-22. Current data indicate that F-22 noise levels (SELs) would be lower than the F-15Cs currently common users of the primary MOAs. Given that most F-22 flight activity would occur above 10,000 feet MSL, noise levels from single flyovers should not be as noticeable as those by F-15Cs. No substantive differences exist among the basing alternatives relative to subsonic noise under the training airspace.

The F-22 has enhanced supersonic capability relative to the current generation of fighter aircraft. It is projected that its supersonic time would be more than three times that of aircraft such as the F-15C (25 percent versus 7.5 percent). For example, during a typical 14-minute air-to-air engagement, the F-22 would be supersonic 3 to 4.5 minutes, while the F-15C would be supersonic 1 to 2 minutes. It would also commonly achieve Mach numbers up to about 1.3, versus 1.1 for the F-15C. The combination of more supersonic time and higher Mach number would result in a sonic boom environment six to seven times that of a similar number of F-15Cs. There are, however, two mitigating factors.

First, the majority of F-15C supersonic activity is below 30,000 feet, while 60 percent of F-22 supersonic activity would be above 30,000 feet. Booms generated at high altitude are weaker than those at low altitude. Applying the boom amplitudes shown in Table EL3.2-5 to the altitude distributions for the two aircraft types, impact per boom for the F-22 would be about 60 percent that of the F-15C, for an enhanced boom factor (i.e., potential to generate booms) of about four.

The second mitigating factor is that not all F-22s would fly at full capability. In a typical combat training mission of 2 versus 2 or 4 versus 4, aircraft on one side fly as F-22s, while aircraft on the

other side limit their performance to emulate enemy aircraft, which are current-generation technology. Thus, half of the F-22 sorties would have the enhanced boom factor, while the others would fly as non-F-22s and would not have an enhanced boom factor.

In the analysis of supersonic activity, the enhanced boom factor has been applied to half of the F-22 sorties, while other aircraft follow the BOOMAP model as originally developed. This corresponds to an increase to CDNL of 4 dB. For comparison, if all F-22s fly at full capability, the increase in CDNL would be 6 dB. Individual sonic boom amplitudes would be approximately the same as current fighters such as the F-15C (refer to Figure EL3.2-2 for the F-22 projected CDNL). Applying the enhanced boom factor to one-half the F-22 sorties results in the Yukon MOAs experiencing an increase of 1 to 3 dB, while sonic boom exposure (CDNL) in Fox and Stony would increase by up to 5 dB.

Overall, sonic booms in Stony A/B would increase by 28 booms per month; in Fox MOA, booms would increase by 20. Yukon 1 and 2 would experience an increase of 9 booms per month, while Yukon 3, 4, and 5 would experience an increase of 1, 5, and 2 booms per month, respectively (refer to Figure EL3.2-2).

Alaska Native Concerns

Noise was the single most mentioned concern by Alaska Natives during scoping. Many expressed concerns that the F-22 would disrupt the peacefulness and tranquility associated with their communities, impact wildlife populations, and disrupt traditional cultural practices. Increases in the number of sonic booms generated during training flights were also of concern. As detailed above, subsonic noise would remain below 45 DNL in all primary MOAs and not change in the secondary MOAs. In contrast, supersonic noise levels and the number of sonic booms would increase.

Comparative Summary of the Five Potential Basing Locations

Noise effects from increased flight activities in the training airspace represent the most prominent factor in assessing the differences among the basing locations. Subsonic noise would not change perceptibly as a result of the beddown at Elmendorf or for any of the other basing locations. Emphasis on use of higher altitudes by the F-22 would offset the effects of increases in sortie-operations. Supersonic activity and accompanying sonic booms would increase substantially in some airspace units. In Elmendorf airspace, sonic booms would range from 5 to 42 per month, all over land. Unlike Mountain Home, the increase in sonic booms in any individual airspace unit would be less (1 to 28 per month) and the supersonic activity would be dispersed over several MOAs. At Langley, Eglin, and Tyndall, because all of the activity would occur over water, the effects of these increases would be minor.

EL3.3 Air Quality

Air quality in a given location is described by the atmospheric concentration of six pollutants: 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}), and lead. As part of the Clean Air Act (CAA), the USEPA has established criteria for these pollutants. These criteria, set forth as national ambient air quality standards (NAAQS) represent the maximum levels of background pollution that are

considered safe, with an adequate margin of safety, to protect the public health and welfare. Based on measured ambient criteria pollutant data, the USEPA designates areas of the United States as having air quality better than (attainment) or worse than (nonattainment) the NAAQS. Individual states are delegated the responsibility to regulate air quality in order to achieve or maintain air quality in attainment with these standards. States are required to develop a state implementation plan (SIP) that sets forth how the CAA provisions will be implemented within the state. The SIP is the primary means for the implementation, maintenance, and enforcement of the measures needed to attain and maintain the NAAQS in each state. Details of the NAAQS and specific regulatory requirements for sources of these emissions in attainment and nonattainment areas are included in Appendix AO-1.

The CAA also establishes a national goal of preventing degradation or impairment in federally designated Class I areas. Class I areas are defined as those areas where any appreciable degradation in air quality or associated visibility impairment is considered significant. As a part of the Prevention of Significant Deterioration (PSD) Program, Congress assigned mandatory Class I status to all national parks, national wilderness areas (excluding wilderness study areas or wild and scenic rivers), and memorial parks greater than 5,000 acres. In Class I areas, visibility impairment is defined as atmospheric discoloration (such as from an industrial smokestack) and a reduction in regional visual range. Visibility impairment or haze results from smoke, dust, moisture, and vapor suspended in the air. Very small particles are either formed from gases (sulfates, nitrates) or are emitted directly into the atmosphere from sources like electric utilities, industrial fuel burning processes and vehicle emissions. Stationary sources, such as industrial areas, are typically the issue with impairment of visibility in Class I areas so the permitting process under the PSD program requires a review of all Class I areas within a 62-mile (100-kilometer) radius of a proposed industrial facility. Mobile sources, including aircraft and their operations at Elmendorf AFB, are generally exempt from review under this regulation. While the review under the PSD permit program does not apply directly to base operations at Elmendorf AFB, this analysis assessed a 62-mile radius area as a screening tool for reviewing potential visibility impacts.

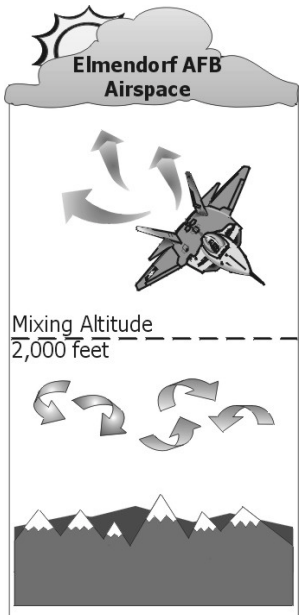
Pollutants considered in this Draft EIS include volatile organic compounds (VOCs), which are precursors to (indicators of) O_3, nitrogen oxides (NO_x), which are also precursors to O_3 as well as CO, SO_2, and PM_{10}. Airborne emissions of lead are not addressed because the affected areas contain no significant sources of this criteria pollutant.

EL3.3.1 Base

Affected Environment

The affected environment varies according to pollutant. For pollutants that do not undergo a chemical reaction after being emitted from a source (PM_{10}, CO, and SO_2), the affected area is generally restricted to a region in the immediate vicinity of the base. However, the region of concern for O_3 and its precursors (NO_x and VOCs) is a larger regional area because they undergo a chemical reaction and change as they disperse from the source. This change can take hours, so depending upon weather conditions, the pollutants could be some distance from the source.

Another factor used in defining the affected environment is mixing height. Mixing height is the upper vertical limit of the volume of air in which emissions may affect air quality. Emissions released above the mixing height become so widely dispersed before reaching ground level that any potential ground-level effects would not be measurable. Emissions of pollutants released below the mixing height may affect ground-level concentrations. The portion of the atmosphere that is completely mixed begins at the earth's surface and may extend up to altitudes of a few thousand feet. Mixing height varies from region to region based on daily temperature changes, amount of sunlight, and other climatic factors. An average mixing height of 2,000 feet conservatively characterizes the conditions at Elmendorf AFB. This mixing height was derived from historical data and a detailed analysis of both morning and afternoon mixing heights at a nearby upper air monitoring station in Anchorage, Alaska (USEPA 2000a). Impacts of the beddown were evaluated in the context of the existing local air quality, the baseline emissions for the base and the region, and the relative contribution of the beddown to regional emissions.



Emissions of pollutants above the atmosphere mixing height do not impact air quality on the ground.

Base Environment

The Alaska Department of Environmental Conservation (ADEC) has primary jurisdiction over air quality and stationary source emissions at Elmendorf AFB. Stationary source emissions at Elmendorf AFB include jet engine testing (off the aircraft), external combustion sources, degreasing operations, storage tanks, fueling operations, heating, solvent usage, surface coating, asphalt production, and miscellaneous general process operations (Table EL3.3-1). The major source of emissions, the central heating and power plant is a permitted Title V source. However, other regulated emission sources are exempt from Title V permitting requirements. The base has opted out of the Title V program for a majority of emission sources by participating in a federally sponsored initiative. Referred to as the ENVEST initiative, this program allows the base to allocate funds set aside for a costly Title V permit and use them instead to implement emissions reducing pollution prevention measures. Some of these measures include installing a compressed natural gas (CNG) fueling station on base, the conversion of certain base fleet vehicles to use CNG, as well as the procurement of dual fuel and dedicated CNG vehicles. These measures will decrease the emissions of CO for which the metropolitan Anchorage area is in nonattainment.

Mobile source emissions include aircraft operations (takeoffs and landings), aerospace ground equipment (AGE), ground support equipment (GSE), and maintenance aircraft operations performed with the engines still mounted on the aircraft (engine run-ups and trim checks). Emissions from aircraft takeoffs and landings, as well as other flight operations at the base, considered all based and transient aircraft. Aircraft emissions were calculated for all flight activities below the mixing height (2,000 feet). These emissions, combined with those from the other mobile sources, account for the majority of the emissions from the base.

Table EL3.3-1. Baseline Emissions for Elmendorf AFB Affected Environment

	POLLUTANTS (TONS PER YEAR)				
Source Category	***CO***	***VOCs***	***NO_x***	***SO_2***	***PM_{10}***
Stationary Sources	202.5	81.5	603.2	19.3	184.8
Mobile Sources	905.0	215.7	205.4	12.2	16.8
TOTAL Base Emissions	1,107.5	297.2	808.6	31.5	201.6

Sources: Air Force 1999b.

Regional Environment

Elmendorf AFB is located on the outskirts of the Anchorage metropolitan area within the Cook Inlet Intrastate Interstate Air Quality Control Region, AQCR #8. The AQCR, which was developed for planning purposes, encompasses 44,000 square miles including the municipality of Anchorage, the Kenai Peninsula Borough, and the Matanuska-Susitna Borough. Table EL3.3-2 summarizes the regional criteria pollutant and precursor emissions for the Greater Anchorage Area Borough and for the entire Cook Inlet AQCR. Baseline Elmendorf AFB emissions are incorporated into these totals for the affected environment. For each criteria pollutant (except NO_x and SO_2) Elmendorf AFB contributes less than 1 percent of regional emissions. The base generates less than 3 percent NO_x and less than 2 percent SO_2 of regional emissions.

Table EL3.3-2. Regional Emissions for Elmendorf AFB Affected Environment

	POLLUTANTS (TONS PER YEAR)				
Regional Emissions	***CO***	***VOCs***	***NO_x***	***SO_2***	***PM_{10}***
Greater Anchorage Area Borough	123,883	5,764	10,740	920	19,856
Total Cook Inlet AQCR	332,021	56,708	28,203	1,780	67,013

Source: USEPA 2000b.

Air quality in Cook Inlet Intrastate AQCR has been designated as either in "attainment" or "unclassifiable/attainment" with the NAAQS for all pollutants with the exception of CO and PM_{10}. Elmendorf AFB is located on a bluff above the Anchorage Bowl and the air quality at Elmendorf AFB is in attainment with all ambient air quality standards. Elmendorf AFB is located adjacent to the northern boundary of the Anchorage CO nonattainment area. Increased concentrations of CO in the wintertime are due to low-level inversions and do not impact the higher elevations outside of the Anchorage bowl. Meteorological conditions characterized by cold temperatures and reduced intensity of sunlight due to high latitudes, do not favor ground level O_3 formation. Accordingly, the entire state of Alaska has been proposed as being designated "attainment" status for the new 8-hour O_3 standard (ADEC 2000). However, the metropolitan Anchorage area is currently classified as a serious nonattainment area for CO and Eagle River, a community of about 25,000 people located 10 miles northeast of Anchorage, has been classified as nonattainment for PM_{10}.

The CO problem in Anchorage is due to a combination of low wind speeds coupled with strong ground-level inversions, which persist during the hours of maximum emissions. The pollution problem caused by these meteorological conditions is further exacerbated by high CO emissions emitted during cold starts at low temperatures. Roughly, 80 percent of winter-season CO emissions in Anchorage are from motor vehicles (Department of Health and Human Services [DHHS] 2000). Most of the CO is emitted by motor vehicles in the first 5 to 10 minutes after startup while the engine is cold. Emissions at 20° Fahrenheit have been shown to be three to ten times greater than at 75 degrees (DHHS 2000); therefore, Anchorage's cold winter temperatures increase these cold start emissions. Other sources of CO in Anchorage are commercial, military, and civilian aircraft as well as residential wood burning.

Eagle River is currently designated as nonattainment for PM_{10} but may be redesignated as a maintenance area. Fugitive dust from paved and unpaved roads account for 90 percent of the particulate matter emissions. Implementation of paving and surfacing programs has aggressively addressed this problem and air quality has improved. The Eagle River PM_{10} nonattainment area is localized.

Historical estimates of regional (Cook Inlet AQCR) and Anchorage Borough emissions (USEPA 2000b) include stationary industrial sources of emissions. The majority of emissions from these permitted stationary sources are from two activities: combustion of fuel at power generating facilities and pollutant emissions from industrial processes. Emissions from on-road mobile sources include local roads and roadway networks. Area sources of emissions include off-road mobile sources such as emissions from commercial, civilian, and government aircraft, as well as combustion emissions from heating of industrial, commercial, and residential facilities.

Environmental Consequences

The air quality analysis at Elmendorf AFB quantifies the changes (increases and decreases) due to the Initial F-22 Operational Wing beddown. Since Elmendorf AFB is located in an "attainment" area for all pollutants (the base is located outside the Anchorage CO nonattainment area), the beddown would not interfere with any SIP measures or budgets established in order to achieve or maintain the NAAQS. Thus, there would be no federal conformity requirements associated with the F-22 beddown (see Appendix AO-1).

The F-22 would require fewer maintenance activities than the F-15C wherein engines are run at varying speeds along the flightline, thereby reducing emissions.

Information on projected aircraft operations incorporated F-22-specific data on maintenance run-up procedures, uninstalled engine cell testing, and typical ground run-up times (taxi, idle-in and idle-out times) for each landing-takeoff cycle (personal communication, McGettrick and Myers 2000, 2001). Time-in-modes for take-off, climb-out, and approach were based on default time-in-modes developed for comparable jet aircraft. Modal-specific emission factors and fuel flow rates are not currently available for the F-22 engines. The advanced design of the F-22 includes the development of a new propulsion system, the F119-PW-100, a low bypass turbofan engine. The engine is still under test and evaluation and many operational parameters are classified sensitive. Therefore, according to NEPA guidance, *Incomplete and Unavailable Information* 40 CFR §1502.22, the analysis used the best available data.

A composite set of emission factors and fuel flow rates for each pollutant at each power setting was developed based on recently published modal emission factors for the F100 series of engines (Air Force 1999c) using JP-8 as a fuel. The F100 series engines are the power plants of both the F-15 and F-16 aircraft. Details of the emission factors and time-in-modes used for the analyses are included in Appendix AO-3.

Direct emissions that would be generated by both stationary and mobile sources at Elmendorf AFB are detailed in Table EL3.3-3. Stationary sources include external and internal combustion sources, engine cell testing and other aircraft maintenance operations. Mobile sources include aircraft operations (takeoffs and landings), aircraft maintenance run-ups, and exhaust emissions from aircraft ground support equipment. This analysis reflects the changes associated with drawdown of F-15Cs and the overall increase of aircraft and sorties associated with the beddown of F-22s.

Table EL3.3-3. Projected Direct Emissions for Elmendorf AFB Affected Environment

	POLLUTANTS (TONS PER YEAR)				
Base Emissions Source Category	***CO***	***VOCs***	***NO_x***	***SO_2***	***PM_{10}***
Projected Stationary Sources	201.8	81.4	599.8	19.3	184.8
Projected Mobile Sources	1,121.4	241.4	217.7	17.1	25.9
Baseline Stationary Sources	202.5	81.5	603.2	19.3	184.8
Baseline Mobile Sources	905.0	215.7	205.4	12.2	16.8
Stationary Sources Change	-0.7	-0.1	-3.4	0.0	0.0
Mobile Sources Change	216.4	25.7	12.4	5.0	9.1
TOTAL Change in Base Emissions	215.7	25.6	9.0	5.0	9.1

All criteria pollutant direct emissions would increase as a result of the beddown. Emission increases from the beddown would represent less than a 1 percent contribution to the Greater Anchorage Area. These emission increases would be due to the added takeoff and landing operations at the base, as well as AGE and GSE operations associated with each takeoff and landing operation. Minimal emissions would result from maintenance run-ups since the F-22 has eliminated the need to run these checks (as compared to the many needed for the F-15C).

Indirect emissions are those not generated from sources at the base but which contribute to the regional inventory such as emissions from vehicles from commuting personnel and/or construction workers. Table EL3.3-4 shows the total regional (direct and indirect) contribution from the Initial F-22 Operational Wing beddown at Elmendorf AFB.

Table EL3.3-4. Regional Emissions for Elmendorf AFB Affected Environment

Source Category	POLLUTANTS (TONS PER YEAR)				
	CO	***VOCs***	***NO_x***	***SO_2***	***PM_{10}***
Base Emissions (Direct)	215.7	25.6	9.0	5.0	9.1
F-22 Commuting Contribution (Indirect)	17.1	1.6	1.9	0.1	0.1
TOTAL F-22 Projected Contribution	232.8	27.2	10.9	5.1	9.2
Anchorage Area Emissions (Greater Anchorage Borough Area)	123,883	5,764	10,740	920	19,856
Regional Emissions (Cook Inlet Intrastate AQCR)	332,021	56,708	28,203	1,780	67,013
TOTAL Percent F-22 Projected Regional Emissions Contribution (Area/Region)	<1%	<1%	<1%	<1%	<1%

Increases in emissions or addition of new stationary sources would be subject to air quality regulations and permitting review by ADEC. Due to the base's participation in the ENVEST initiative, the base's major stationary sources of emissions, the central heating and power plant, are permitted as a Title V stationary source. Emissions from all other stationary sources at the base are well below major source status characterized by greater than 100 tons per year. Therefore, increased emissions from stationary sources, such as engine test cells, would not impact the base's status. There would be no new categories of stationary source emissions from the base and increases in the stationary source emissions would not be significant.

Emissions from the F-22 beddown, including indirect commuting emissions, are also evaluated in the context of regional emissions. Emissions from the beddown would be insignificant in relation to regional sources of emissions and would contribute less than 1 percent contribution to both the immediate Greater Anchorage Area Borough and Cook Inlet Intrastate AQCR.

Temporary Construction Emissions

	Tons per year	***% Regional Contribution***
CO	138	0.1
VOCs	21	0.4
NO_x	66	0.6
SO_2	4	0.4
PM_{10}	8	<0.1

While construction activities are of temporary nature and short duration, emissions during the construction period were quantified in order to determine their impacts on regional air quality. The construction phase would span a 3-year period from 2002 to 2004. Construction emissions were calculated for all three years, with the maximum annual emissions occurring in 2002. Sources of emissions considered during the construction phase include exhaust from internal combustion engines, exhaust from diesel-powered construction equipment, fugitive dust from the construction site, as well as indirect emissions from construction worker commuting.

Construction emissions would be negligible compared to base and regional emissions and represent less than 1 percent of the Greater Anchorage Area Borough emissions. While indirect sources of emissions (i.e., construction worker commuting) emissions would have the potential to impact the Anchorage nonattainment area, total CO commuting emissions would be only 120 tons per year.

The portion of these CO emissions generated in the Anchorage air shed would be regionally insignificant. In addition, the CO emissions affecting the designated nonattainment area would be less than the 100 tons per year, the *de minimis* threshold for federal conformity (see Appendix AO-1).

Visibility impairment due to base emissions from the beddown would not be of concern since there are no PSD Class I areas within a 62-mile (standard review distance) radius of Elmendorf AFB.

Comparative Summary of the Five Potential Basing Locations

There would be negligible differences in air quality impacts at any of the five installations. No base would exceed regulatory thresholds. The contribution to annual regional emissions of criteria pollutants would be less than .01 percent at Elmendorf, Langley, and Eglin, and between 0.1 percent and 10 percent at Mountain Home, and between .01 percent and 1 percent at Tyndall.

EL3.3.2 Airspace

Affected Environment

In Alaska, alternative forms of transportation and energy generation are a necessity given the isolated nature of many towns and villages. In terms of transportation, all-terrain vehicles (ATVs or 4-wheelers) replace the automobile in the warmer weather months and snow machines take their place as soon as the snow falls. These engines, as well as diesel generators used to produce electricity, contribute to the air emissions of the region. When reviewing the overall air quality of an area, consideration of these forms of exhaust emissions is important.

The likelihood for air quality impacts associated with airspace use was evaluated based on the floor height of the primary MOAs relative to the mixing height for pollutants. For the area of the primary MOAs, the mixing height is 2,000 feet. The affected environment for Elmendorf AFB training airspace includes two primary MOAs (Stony A and Galena) where flight activities would occur below the average mixing height of 2,000 feet. Table EL3.3-5 summarizes baseline emissions from flight operations in these two MOAs. In these two MOAs, F-15Cs fly approximately 8 percent or less of the time below the mixing height. While the secondary MOAs permit flight below the mixing height, the amount of activity by F-15Cs (or F-22s) is minimal compared to the overall use. Such low levels of sortie-operations would not contribute measurably to overall emissions.

Table EL3.3-5. Baseline and Projected Emissions for Affected Elmendorf AFB Airspace

	BASELINE EMISSIONS (TONS/YEAR)				
Affected Airspace[1]	*CO*	*VOCs*	*NO_x*	*SO_2*	*PM_{10}*
Galena MOA	0.015	0.005	0.60	0.001	0.001
Stony A MOA	1.16	0.35	42.52	0.10	0.14
	PROJECTED EMISSIONS (TONS/YEAR)				
Galena MOA	0.005	0.002	0.19	0.001	0.001
Stony A MOA	0.49	0.13	15.75	0.05	0.13

Note: 1. Airspace units with a floor below 2,000 feet AGL (mixing height).

Environmental Consequences

Emission concentrations associated with F-22 aircraft operations would be minimal due to the large size of the airspace units. Because these emissions would be dispersed over millions of acres, they would not measurably affect air quality (refer to Table EL3.3-5). Emissions would decrease in both of the MOAs with floors below the mixing height (Galena and Stony A MOAs). These decreases would result from the lower amount of flying time F-22s would spend at altitudes below the mixing height compared to F-15Cs. This increase in flight altitude offsets potential emission increases from increased F-22 sortie-operations and higher F-22 aircraft emissions.

Of the seven primary MOAs, only operations within the Susitna MOA overlie a PSD Class I area: the Denali National Park and Preserve, where visibility must be protected and preserved. However, the floor of the Susitna MOA is 5,000 AGL or 10,000 feet MSL (whichever is greater). All operations in this MOA are above the mixing height and, therefore, would not affect air quality.

Comparative Summary of the Five Potential Basing Locations

Emissions from aircraft operations would be transitory and dispersed over extensive areas. Overall emissions in the airspace are minimal and no substantive difference exists among the basing alternatives relative to air quality impacts.

EL3.4 Safety

EL3.4.1 Base

Affected Environment

Aircraft safety concerns typical for all bases include aircraft mishaps and bird-aircraft strikes. Aircraft mishaps and their prevention represent a paramount concern for the Air Force. Class A mishaps, associated with a loss of life, loss of an aircraft, or costs in excess of $1 million, provide an indicator of aircraft safety. The F-15C has a lifetime historical Class A mishap rate of 2.65 or one mishap every 37,736 flying hours (Air Force 2000a). Using this mishap rate and comparing it to the number of annual flying hours logged (59,996) by Elmendorf's F-15Cs in the past five years, a Class A mishap would be predicted to occur once about every three years. In actuality, there has been one Class A accident in the last five years involving F-15C aircraft from Elmendorf AFB. This equates to an accident rate of 1.66 per 100,000 flying hours, significantly less than the F-15C historic lifetime rate (personal communication, Horne 2000).

Data on mishaps within 10 nautical miles of an airfield reveal that 75 percent of aircraft accidents occur on or adjacent to the runway and in a corridor extending out from the end of a runway for 15,000 feet. Three zones within this corridor are established based on aircraft mishap patterns: the Clear Zone (CZ), Accident Potential Zone (APZ) I, and APZ II. Within the CZ, which covers a 3,000-by-3,000-foot area at the end of each runway, the overall accident risk is highest. APZ I, which extends for 5,000 feet beyond the CZ, is an area of reduced accident potential. In APZ II, which is 7,000 feet long, accident potential is the lowest among the three zones. APZs I and II for the approach end of runway 33 curve to the east in a semicircular fashion in order to conform to actual flight tracks. Take-off and approach patterns have been altered to avoid overflight of

Mountain View, an area within the municipality of Anchorage, located directly south of the runway 33 CZ. APZs I and II for the approach end of runway 23 angle to the northeast to avoid overflight of Fort Richardson population centers. Incompatible land uses do exist within the curved APZs at the south end of Runway 15/33, where the zones extend beyond the base boundaries into the municipality of Anchorage (Air Force 2000b). These uses include the community of Mountain View.

Bird-aircraft strike hazard (BASH) is a safety concern for aircraft operations. Bird hazards exist on Elmendorf AFB year round, with peaks in the spring and fall during migration. Several species of birds can be encountered in the base area. Of particular concern are the Canada geese, other waterfowl, gulls, and ravens. Anchorage has a growing number of breeding Canada geese that are causing increasing safety, economic, and nuisance problems. The collision between geese and an Air Force E-3B AWACS aircraft in September 1995, killing 24 people, was the most devastating outcome of these problems to date. In the past 5 years, F-15C aircraft operating from or in the immediate vicinity of Elmendorf AFB have experienced 15 bird strikes.

Elmendorf AFB has an aggressive base program to minimize aircraft exposure to potentially hazardous bird strikes. All base personnel receive mandatory, semiannual BASH training before the start of spring and fall migration, emphasizing individual responsibilities and actions. The base incorporates specific practices into the base land management plan to maintain a flightline habitat less attractive to birds and other wildlife. A warning system established methods to use for the immediate exchange of BASH information between ground agencies and aircrews. During the waterfowl migration season, a United States Department of Agriculture (USDA) wildlife detection and dispersal team operates on the airfield 24 hours a day.

Environmental Consequences

Scoping questions included if there would be expansion of APZs.

Aircraft safety conditions would change as a result of the F-22 beddown, but the existing APZs would not. Historically, when new military aircraft first enter the inventory, the accident rate is higher. However, it is impossible to predict the potential mishap level. Historical trends do, however, show that mishaps of all types decrease the more an aircraft is flown. Over time, operations and maintenance personnel learn more about the aircraft's capabilities and limitations. Some of this experience has already been gained for the F-22.

By the time F-22 operations at Elmendorf AFB would begin, the testing and pilot training phases of the aircraft's integration into the operational force will have progressed substantially. Significant knowledge will have been gained about the aircraft's safest flight regime.

As the overall F-22 program proceeds from 2002 onward, the potential for mishaps would likely decrease to low levels comparable to other fighter aircraft. Since the F-22 design incorporates the most modern technology, knowledge is constantly being gained about the safe operating envelope of the aircraft, and because it will be flown by the most experienced pilots, the F-22 will operate as safely as, or more safely than, other aircraft in the Air Force inventory.

Since the F-22 would operate in the same airfield environment as the F-15C, the overall potential for F-22 bird-aircraft strikes would increase minimally because of the increase in the number of F-22 aircraft assigned compared to the number of F-15C assigned. The potential increase in bird-aircraft

strikes would be mitigated to some degree because the F-22 would more rapidly reach altitudes above where the majority of the strikes occur.

Comparative Summary of the Five Potential Basing Locations

The potential for impacts to safety is low at all bases because of preexisting BASH and other safety programs. No substantive difference exists among the bases relative to safety.

EL3.4.2 Airspace

Affected Environment

As noted for the base, Elmendorf AFB F-15Cs have a low Class A mishap rate (1 per 5 years). Since mishaps tend to occur more frequently around airfields and in low-altitude flight regimes, activities of F-15Cs in the MOAs do not have as high a potential for mishaps. Additionally, the potential for bird-aircraft strikes in the MOAs is negligible because the F-15Cs fly most of the time at altitudes above the zone (0 to 3,000 feet AGL) where 95 percent of strikes occur. Bird hazards may also exist at King Salmon, but the F-22 use of King Salmon will be comparable to the F-15C use and no BASH changes would be anticipated. Defensive countermeasures, such as flares, have the potential for starting fires on lands beneath training airspace. However, Air Force altitude restrictions (above 5,000 feet AGL June - September and above 2,000 feet AGL for the rest of the year) significantly reduce the risk of fires.

Environmental Consequences

Aircraft safety and bird-aircraft strikes are not expected to measurably differ from baseline conditions. The factors for this conclusion are presented above in the discussion of base safety.

Scoping concerns in Alaska included the potential for an aircraft mishap at the seismic observatory at Burnt Mountain and the potential of radioactive materials escaping the facility. The likelihood of a Class A mishap at one specific point is extremely low. Unrelated to any F-22 decision, the Air Force entered into a prior agreement with the state of Alaska. The Air Force is planning to remove ten radioisotope thermoelectric generators. The Department of Energy will dispose of these generators and alternative energy sources will be used at the observatory.

Comparative Summary of the Five Potential Basing Locations

Elmendorf AFB, along with Mountain Home, would see a minor increase in flare use in over land areas. Both would continue to implement restrictions on flare use designed to minimize fire risks. Otherwise, no substantive difference exists among the bases or training airspace units relative to potential safety impacts. The potential for impacts to safety in the airspace is low at all bases.

Natural Resources

Natural resources include native and exotic biota, their habitats, and the physical medium necessary for these resources to function. Biota are plant and animal life and are typically referred to as vegetation and wildlife respectively. When groups of plant and animal species in a given area are linked by ecological processes they are referred to as communities. A special community designation discussed in this document is Threatened, Endangered and Special Status Species/Communities. This designation refers to those plant and animal species or areas that are afforded special regulatory status (i.e., Endangered Species Act). The term *habitat* is also used to describe natural resources and refers to the necessary physical and biological features to sustain plant and animal species. Physical medium, as discussed in this section, include the soil and water that provide the foundation for all biota. Description of the components used to define the affected environment and the methods used to evaluate baseline conditions are presented in Appendix NR-1.

Designations of special status species protection are generally in accordance with specific acts (i.e., ESA, Marine Mammal Protection Act [MMPA]) as established by specific agencies (i.e., United States Fish and Wildlife Service, National Marine Fisheries Service). Due to the overlapping jurisdiction of some agencies and acts, individual species often exhibit multiple state and federal status designations. For example, species identified as federal threatened or endangered in accordance with the ESA are often, but not always, also designated as threatened or endangered in accordance with state statutes. To avoid confusion and ensure clarity in the Draft EIS, please refer to Appendix NR-2 when counting special status species or determining the special status designations of species potentially occurring on base and under the affected airspace.

No-Action Alternative

Under the no-action alternative, Elmendorf AFB would continue to manage its natural resources in accordance with state and federal regulations and in accordance with the Elmendorf AFB Integrated Natural Resources Natural Management Plan. Although considered negligible, ongoing impacts to natural resources would continue under the no-action alternative. Under the no-action alternative, threatened, endangered, and special status species/communities, and marine communities would not be impacted. There would be no additional adverse impacts to soil and water resources.

The Knik Arm of the Cook Inlet borders Elmendorf AFB on the west and north. Water is generally shallow and murky, and tides in this area are extreme, creating a tidal zone with minimal vegetation.

EL3.5 Soil and Water

EL3.5.1 Base

Affected Environment

The four major watersheds or drainage systems on Elmendorf, in order of decreasing size, are Ship Creek, Six-Mile Creek, EOD Creek, and the Cherry Hill Ditch. There are also a total of 12 natural and

man-made lakes and ponds on the installation, ranging in size from 1 acre to 123.9 acres in surface area. Elmendorf AFB has 8 miles of saltwater shoreline.

Soils at Elmendorf AFB and the surrounding area are dominated by three types of unconsolidated deposits: coarse-grained, fine-grained, and till (Air Force 2000). Based on grain size and moisture content, these soil types likely have low to moderate potential for erosion by water and wind.

Environmental Consequences

There is little likelihood for soils or water consequences under the airspace.

Construction would disturb 46 acres of soil in a developed area with a history of ground disturbance. The construction site is outside the 100-year floodplain. Approximately 64 tons of soil is expected to erode due to F-22-related construction activities. Since more than 5 acres would be disturbed by construction, a National Pollutant Discharge Elimination System (NPDES) storm water permit would be required. Under the permit, the base must develop a Storm Water Pollution Prevention Plan (SWPPP) that describes best management practices to be implemented to eliminate or reduce sediment and non-storm water discharges. With proper design and implementation of the SWPPP, impacts from erosion and off-site sedimentation would be negligible.

Comparative Summary of the Five Potential Basing Locations

No substantive difference exists among the bases relative to potential impacts to soils and water. Elmendorf would have a negligible potential for consequences and be comparable to Langley and Eglin. Land area disturbed would be approximately 46 acres for Elmendorf; 16 acres for Langley; 10 acres for Eglin; 440 acres for Mountain Home; and 73 acres for Tyndall.

EL3.6 Terrestrial Communities (Wildlife and Vegetation)

EL3.6.1 Base

Affected Environment

In presettlement times, land that now encompasses Elmendorf AFB was a spruce hardwood forest. Much of the area was logged in the early 1900s; however, fire, wind, insects, disease, and herbivores have also greatly influenced current terrestrial communities.

Elmendorf AFB is situated across rolling upland plains near the head of Cook Inlet (Knik Arm) in southcentral Alaska within the Coastal Trough Humid Tayga Province (Bailey 1995). The area is characterized by spruce-hardwood forests, bottomlands of spruce-poplar forest along major drainages, and dense stands of alder and willow along riparian corridors. Wet tundra communities bracket the coast.

Approximately 4,202 acres of Elmendorf AFB's 13,103 acres are either improved or semi-improved. Vegetation covers 96 percent of undeveloped portions of Elmendorf AFB and the remaining 4 percent is open water or tidal flats (Air Force 1991). The affected environment, although vegetated now, previously supported World War II-era structures. Wildlife communities on base are

dominated by large mammals, furbearers, and migratory waterfowl. Common plant and animal species and habitats characteristic of the base are summarized in Appendix NR-3.

Environmental Consequences

Construction and ground-disturbing activities would affect about 46 acres. On-base construction would occur in both improved areas and undeveloped areas, including fragmented and second growth forest. Some temporary displacement of disturbance-tolerant wildlife species on base is anticipated due to noise and ground disturbance associated with construction in natural habitats; however, impacts to overall biodiversity would be negligible and limited due to the relatively small disturbance envelope.

Much of the undeveloped 46 acres affected by construction consists of locations of now-demolished World War II structures that support secondary growth.

An increase of 4,590 acres would occur under the projected noise contours (i.e., above 65 DNL) with the Elmendorf AFB alternative. Wildlife species inhabiting the area under noise contours associated with the base have likely habituated to aircraft noise, and the proposed changes in noise levels would not represent biologically significant changes for these species (see Appendix NR-4 for a discussion of the effects of noise on wildlife).

Comparative Summary of the Five Potential Basing Locations

Impacts to the terrestrial community on base were determined from an analysis of the quantity and diversity of habitat and species in the proposed construction zone and under the noise contours for the F-22. Construction at Elmendorf would affect a larger (46 acres), more naturally diverse area than either Langley or Eglin. Mountain Home would affect disturbed habitat dominated by exotic species; however, the sheer size (440 acres) of the construction area would have an effect greater than Langley or Eglin and similar to Elmendorf. Construction at Tyndall would affect 73 acres of habitat supporting a diversity of species; areas adjacent to the construction area and under the base noise contours support the highest diversity of habitat and species relative to any of the base alternatives. Construction at Langley would affect 16 acres of previously developed area; much of the remaining base is similarly developed and exhibits marginal habitat and relatively low species diversity. The amount (10 acres) and quality of habitat in the construction area at Eglin is similar to Langley.

EL3.6.2 Airspace

Affected Environment

As shown in Figure EL3.1-1, overland airspace includes 18 MOAs over 38.5 million acres in Alaska (see Appendix NR-3). This airspace overlies the Upland Tundra and Boreal Forest ecoregions (Bailey 1995) and the predominant land cover types are forests (60.1 percent), fields (16.8 percent), and tundra (15.3 percent) (see Appendix NR-3). Evergreen and mixed conifer/deciduous forests are the predominant types. Over 8.1 million acres of special use areas (21 percent of the area) occur under the MOAs. National Wildlife Refuges occur under the Galena and Yukon 2, 4, and 5 MOAs and Denali National Park and Preserve occurs under the Susitna MOA (see Appendix NR-3).

Regionally important game species were described in detail in the *Final Environmental Impact Statement Alaska Military Operations Areas* (Air Force 1995). These important game species have critical nursery (lambing and calving), wintering, and rutting areas underneath all of the airspaces included in this alternative. Existing airspace restrictions have been designed to prevent potential overflight effects on wildlife.

Environmental Consequences

Based on projected subsonic aircraft operations and review of the literature on the effects of noise on wildlife (see Appendix NR-4), impacts to wildlife under airspace used by Elmendorf AFB, including along the Naknek drainage near King Salmon, will not be significantly different from baseline conditions and are not expected to adversely affect populations for the following reasons: (1) many wildlife species have habituated to (become used to) subsonic noise associated with jet aircraft, and there would be no perceptible increase in subsonic noise levels; (2) the percent of F-22 flight time (5 percent) below 5,000 feet AGL would be less than half the current F-15C use (11 percent); (3) existing airspace restrictions over certain sensitive areas, such as wildlife refuges and sensitive habitats, would continue; and (4) use of chaff and flares in the airspace would continue at rates similar to baseline.

Alaska Native concerns at scoping meetings included how F-22 noise and sonic booms would impact migratory waterfowl, fish, and wildlife, particularly moose and caribou.

Supersonic flights would increase in Fox; Stony A/B; and Yukon 1, 2, 3, 4, and 5 MOAs. The F-22 would not conduct any supersonic overflight lower than 5,000 feet AGL, or 12,000 feet above MSL, whichever is higher. Sonic booms can startle wildlife, although the effect, if any, is of short duration. There is little evidence that wildlife habituate to sonic booms. Because the F-22 would fly the majority of supersonic operations above 10,000 feet AGL, sonic booms are expected to have no adverse effect on wildlife populations. Appendix NR-4 summarizes the effects of jet aircraft overflight noise and sonic booms on wildlife.

Alaska Native Concerns

The local economy in many of the villages is dependent on the resources of terrestrial communities described above. Based on past indications and scoping comments for the present project, Alaska Natives are concerned that existing and projected noise levels and sonic booms could affect game species in traditional hunting areas. Terrestrial resources under the Elmendorf AFB airspace that are used by a number of Alaska Native villages in traditional subsistence activities are not expected to be adversely affected for the reasons described above under environmental consequences.

Scoping revealed concerns from Alaska Natives that F-22 noise could affect subsistence hunting.

Comparative Summary of the Five Potential Basing Locations

Because proposed differences in subsonic noise levels under airspace are not expected to be biologically significant, impacts to the terrestrial community were primarily determined from an analysis of the number and altitude of sonic booms relative to the size, type, and diversity of habitat underneath airspace. Elmendorf overland airspace includes a diversity of species and special habitat

areas that would be subject to sonic booms. Impacts at Elmendorf would be similar to Eglin and Tyndall where airspace covers a larger, more biologically diverse area. Increases in sonic booms in the airspace associated with Mountain Home would be substantial. Supersonic activity would occur only in over-water Warning Areas for Langley, Eglin, and Tyndall and only above 10,000 feet MSL.

EL3.7 Wetland and Freshwater Aquatic Communities

EL3.7.1 Base

Affected Environment

Based on a 1995 survey by the United States Fish and Wildlife Service, there are 1,534 acres of wetlands identified on Elmendorf AFB (Bostick and Wilcox n.d.). The majority of wetlands are found along the EOD, Six-mile, and Ship Creek drainages. Some wetlands are also found in association with glacial kettle features. However, no wetlands have been identified in the proposed construction area. Three base streams support anadromous fisheries of all five Pacific salmon species. Elmendorf AFB has 15 ponds, as well as lakes and creeks that support rainbow trout fisheries. Dolly varden, arctic blackfish, slimy sculpin, and land-locked salmon also occur on base (Air Force 1991).

Environmental Consequences

No streams, creeks, or ponds/lakes occur in the proposed construction area; therefore, fish and freshwater aquatic communities would not be affected. Wetlands on Elmendorf AFB are not expected to be directly impacted by construction activities related to the F-22 beddown. Best management practices would be applied to control sedimentation and erosion during construction, thereby avoiding secondary impacts to wetlands.

Activities to ensure compliance with Executive Order 11990 *Protection of Wetlands* would be developed and implemented. Prior to any ground-disturbing activities, a delineation of potential wetlands in the construction area would be performed; however, requirements of a Section 404 permit of the Clean Water Act for discharges to waters of the United States is not anticipated. As may be required by Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands), the appropriate designee of the Secretary of the Air Force will publish a "finding of no practicable alternative" for any activities impacting floodplains and wetlands, respectively.

Comparative Summary of the Five Potential Basing Locations

Impacts to wetlands and freshwater aquatic communities were determined from the extent of filling, draining, and sedimentation anticipated during construction. Direct impacts to wetlands would not occur at Elmendorf, Langley, or Eglin. Construction at Mountain Home could impact aquatic communities (including wetlands) although a jurisdictional wetland delineation would be required to make a final determination. Potential impacts to wetlands (26 acres) and the need for a Section 404 permit are greatest at Tyndall although a jurisdictional wetland delineation would be required to determine the precise acreage of wetland impact.

EL3.7.2 Airspace

Affected Environment

Wetlands in Alaska cover over 43 percent of the state's area, in contrast to the contiguous United States where they occupy 5.2 percent. Expansive mosaics of wet and dry tundra form important habitat complexes for waterfowl and caribou. Almost 1,952,000 acres of aquatic habitats and wetlands occur under MOAs affected by this alternative. Essentially, all these wetlands are deciduous, evergreen, and mixed forest (see Appendix NR-3).

Many lakes and rivers are located under the airspaces including a Wild and Scenic River under the Fox MOA, and a Wild River under Galena and Yukon 1, 2, 3, and 4 MOAs.

Environmental Consequences

The Elmendorf AFB alternative would not fill or otherwise directly impact wetlands under the training airspace. F-22 flights over Wild and Scenic Rivers, Wild Rivers, and other sensitive aquatic areas would be conducted in accordance with existing airspace restrictions (Air Force 2000a). Impacts to wildlife that use these habitats are discussed under section EL3.6.

Comparative Summary of the Five Potential Basing Locations

Direct impacts to wetlands and freshwater aquatic communities underlying airspace are not anticipated as a result of the proposed action and alternatives. Indirect impacts to species comprising these communities would not be appreciably different among locations and are expected to be negligible.

EL3.8 Threatened, Endangered, and Special Status Species/Communities

EL3.8.1 Base

Affected Environment

Because a small portion of a noise contour associated with airfield sorties extends over the Knik Arm of Cook Inlet, this area is included in base analysis. Seven special status species occur or have the potential to occur on Elmendorf AFB. These include one species with federal status under the Marine Mammal Protection Act (MMPA) (Cook Inlet sub-population of beluga whale) and six state species of concern (American peregrine falcon, blackpoll warbler, grey-cheeked thrush, northern goshawk, olive-sided flycatcher, and Townsend's warbler). Scientific names and areas of occurrence for each special status species and communities are provided in Appendix NR-2.

Environmental Consequences

No federally listed threatened or endangered species or their critical habitat occur in the proposed construction zone and, therefore, these resources would not be adversely affected. A survey for special status species would be conducted of the proposed construction zone prior to any ground disturbance. Background information on the effects of noise on wildlife are summarized in Appendix NR-4 and suggest that special status species would not be adversely affected by base construction and aircraft operations under this alternative.

Bald eagles are frequently seen near freshwater habitats on Elmendorf AFB.

Comparative Summary of the Five Potential Basing Locations

Impacts to threatened, endangered, and special status species/communities were determined by the potential of these species/communities to be impacted during construction or from aircraft operations under the base noise contours. Construction and aircraft operations at Elmendorf and Eglin are unlikely to affect special status species/communities; however, the proximity of protected species (Beluga whale and six state species at Elmendorf and least tern at Eglin) result in a potential for impacts. Additional surveys and species information at Elmendorf and Eglin could result in a no effect determination for these species. Mountain Home has a slightly greater potential for impacts because habitat of the burrowing owl, a special status species, may be affected. Tyndall has the greatest potential for impacts because the threatened flatwoods salamander uses habitat similar to that found in the construction zone. Langley has the lowest potential for adverse consequences because construction and aircraft operations would have no effect on special status species/communities.

EL3.8.2 Airspace

Affected Environment

No federally listed threatened and endangered species or their habitat occur under the Elmendorf AFB training airspace. Appendix NR-2 identifies eight special status species occurring in the training airspace. The American peregrine falcon was removed from the list of threatened species in 1999; however, monitoring of this species is ongoing and the United States Fish and Wildlife Service recommends avoiding impacts. Mitigation in place for the falcon occurs in the Yukon MOAs (personal communication, Rolf 2001). Thus, this species is considered to have a special status.

Environmental Consequences

Impacts to special status species under Elmendorf AFB MOAs would not be significantly different relative to baseline conditions. Effects of noise on wildlife literature is summarized in Appendix NR-4 and suggest that special status species under the training airspace would not be adversely affected by aircraft operations.

Comparative Summary of the Five Potential Basing Locations

The bases with only overland airspace, Elmendorf and Mountain Home, tend to have a greater potential for impacts to special status species due to supersonic activity and associated increases in sonic booms. Because the Mountain Home airspace is essentially one unit, the effects of sonic booms would be less dispersed, and the potential for impact greater, than at Elmendorf. Training airspace associated with Langley, Eglin, and Tyndall that is used for supersonic activity consists entirely of over-water Warning Areas and therefore the potential for impacts to special status species/communities at these bases are lowest for the five locations.

EL3.9 Marine Communities

EL3.9.1 Base

Although Elmendorf AFB property does not include marine habitats, the Knik Arm of Cook Inlet forms the western margin of the base and noise contours associated with this alternative extend over marine habitat. Base activities associated with this alternative would not adversely affect marine communities.

Populations of Cook Inlet beluga whales have been identified as depleted by the National Marine Fisheries Service. These whales occur in Knik Arm and often move through the shallows of tidal zones in the Anchorage area. Thus, they have the potential to occur beneath noise contours associated with this alternative. Noise exposure levels would not be expected to affect these whales (see review of effects of noise on wildlife Appendix NR-4). Beluga whales are often observed beneath approach corridors for Anchorage International Airport, Merrill Field, and Elmendorf AFB. No effect on this species is anticipated.

Comparative Summary of the Five Potential Basing Locations

Because training airspace for Elmendorf and Mountain Home do not overlie marine communities, there would be no potential for impacts. Relatively small components of Langley, Eglin, and Tyndall include marine communities; however, the lack of physical disturbance to the marine environment and the lack of biologically significant changes in noise conditions on base are expected to result in negligible affect to the marine community.

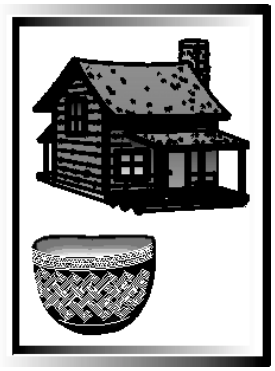
EL3.9.2 Airspace

No marine communities occur within Elmendorf AFB affected airspace for this action and, therefore, no impacts to this resource are anticipated.

Comparative Summary of the Five Potential Basing Locations

Because training airspace for Elmendorf and Mountain Home do not overlie marine communities there would be no potential for impacts. The potential for impacts to the marine community under Langley, Eglin, and Tyndall airspace is low due to current restrictions on flying below 5,000 feet MSL and the absence of supersonic flight below 10,000 feet MSL.

Cultural and Traditional Resources



This section identifies the affected environment and environmental consequences for both cultural and visual resources. Cultural and visual resources are grouped for this analysis because they often address similar visual landscape issues.

Cultural resources are any prehistoric or historic district, site, or building, structure, or object considered important to a culture, subculture, or community for scientific, traditional, religious, or other purposes. Cultural resources include archaeological resources (both prehistoric and historic), historic architectural resources, and traditional resources. Significant cultural resources are considered for potential adverse impacts. Significant resources are those that are eligible for inclusion in the National Register of Historic Places (NRHP) or that are identified as important to traditional groups. Significant traditional resources are identified by Native American, Alaska Native groups, or other traditional groups. DoD *American Indian and Alaska Native Policy* (November 21, 1999) requires an assessment, through consultation, of the effect of proposed DoD actions that may have the potential to significantly affect protected tribal resources, tribal rights, and Indian lands, before decisions are made by the services.

Visual resources are usually defined as areas with unique features that are a result of the combined characteristics of the natural and human aspects of land use. Examples of the natural aspects of land include wild and scenic rivers, topography, and geologic landforms. Examples of human aspects of land use include scenic highways and historic districts. The assessment of visual and aesthetic value involves a characterization of visual features in the study area.

The area of analysis for cultural resources considers both the immediate location of ground actions on base, as well as areas under airspace. For visual resources, analysis focuses on construction-related visual impacts within the base itself. Outside the base, aircraft are visually common and this action would not represent a change. A detailed description of impact analysis methods for cultural and visual resources is provided in Appendix CR-1.

No-Action Alternative

The no-action alternative would have low to negligible impacts to cultural or traditional resources because of the nature of the ongoing activities at Elmendorf AFB. In the event that features are discovered during any activity on Elmendorf AFB, the standard Air Force procedures in Air Force Instruction 32-7065 for unanticipated archaeological discoveries would be followed to maintain compliance with applicable regulations and established procedures for the protection and conservation of cultural resources. Alaska Native concerns about supersonic impacts to traditional pursuits under training airspace would continue.

Under the no-action alternative, visual resources would not be impacted. Elmendorf AFB would continue to operate as an active air base. There would be no change in the overall scenic

perspectives on base or any changes that would obscure views of the base. Military aircraft would continue to be a part of the visual setting under training airspace.

EL3.10 Visual

EL3.10.1 Base

Affected Environment

Most of the structures currently in place on Elmendorf AFB are one- and two-story structures. The tallest structure on base is the aircraft control tower, which stands taller than the many trees on base.

Elmendorf AFB covers 13,103 acres of land and water. The base is bordered on the east by Fort Richardson (Army Reservation), on the south by residential, industrial, and business districts of Anchorage, and on the north and west by the Knik Arm of Cook Inlet. The base is located in the Cook Inlet-Susitna Lowlands, a physiographic province of the Pacific Mountain System. The cantonment area and the flightline at Elmendorf AFB are built on the outwash plain, a landform composed of sand and deep gravel deposits.

Three NRHP-eligible historic districts have been identified: the Flightline Historic District, the Alaska Air Depot Historic District, and the Generals' Quad Historic District. The Flightline Historic District consists of four hangars and associated aircraft maintenance and testing structures that abut Elmendorf AFB's two runways. These structures are all constructed of wood, concrete, and steel. The Alaska Air Depot Historic District, located on the western portion of the base, consists of 28 buildings and taxiways. Many of these structures are constructed of sheet steel on concrete footings. The Generals Quad consists of six surviving structures that were all originally intended for high-ranking officer use. The buildings are all blocky rectangular two- or three-story wood structures that have been extensively remodeled with new roofs, windows, and vinyl siding.

Elmendorf AFB is located in a densely forested area dominated by spruce, birch, and aspen trees. The trees give the base a rural character and conceal the presence of many low-lying structures and facilities. Very little of the base is visible from off base due to this dense curtain of trees.

Environmental Consequences

Determination of the significance of the impact on visual resources is based on the level of visual sensitivity in the area (refer to Appendix CR-1).

The proposed deployment of the F-22 to Elmendorf AFB would involve the construction of a number of support facilities that would be located in an area east of the current facilities and runways.

The transitory nature of an aircraft and the accompanying noise make impacts on the visual environment difficult to identify. A military aircraft moves very quickly and would not be visually evident for more than a minute; therefore, the visual impact would be very short in duration, especially when natural screening landscapes, such as mountains and wooded areas are present.

Elmendorf AFB and the surrounding area is currently exposed to military aircraft overflights. As a result of using the base daily for takeoffs and landings, military aircraft have become a common and

expected aspect of the visual environment. Although the use of the F-22 aircraft would increase overall aircraft sorties by 26 percent, this increase would not likely affect visual resources as visual sensitivity on base is low and aircraft overflights are common.

Construction projects included in this alternative would be designed and constructed to be visually consistent with the existing environments and compatible with existing facilities and structures. The addition of new structures to previously undeveloped areas would not alter the visual character of the area, because these types of buildings would be expected in an airfield environment.

Elmendorf AFB would coordinate and consult with the Alaska State Historic Preservation Office (SHPO) regarding historic buildings and effects of the visual changes caused by proposed construction of the F-22 facilities.

Comparative Summary of the Five Potential Basing Locations

The potential for visual impacts is low at all bases because of the preexisting military character and industrial uses. Buildings at Elmendorf would be constructed in a similar architectural manner. Elmendorf has a somewhat greater potential for impacts to buildings than Tyndall or Mountain Home, and somewhat less than Langley.

EL3.11 Cultural

The Flightline Historic District includes 13 buildings associated with the development of the base as a World War II airfield (NPS 1999).

EL3.11.1 Base

Affected Environment

Archaeological Resources

A number of archaeological resources, ranging from Alaska Native sites to historic settlement and military features, have been reported on base. Alaska Native sites include cache pits, stone tools, and other evidence of occupation (McMahan and Holmes 1996)**.** The remains of homestead activity are identified at 10 sites on the base. Four sites are potentially eligible for the NRHP (Daugherty and Saleeby 1998). There are no NRHP-listed archaeological resources at Elmendorf AFB (NRIS 2000). No archaeological sites have been identified within the area of affected environment of the Elmendorf AFB alternative.

Architectural Resources

Three NRHP-eligible historic districts associated with military use have been identified at the base: the Flightline Historic District, the Alaska Air Depot Historic District, and the Generals' Quad Historic District (NPS 1999) (Figure EL3.11-1). The Alaska Air Depot Historic District consists of 27 buildings that housed maintenance activities for the 11th Air Force during World War II. The Generals' Quadrangle includes six residences. Other NRHP-eligible buildings at the base include ammunition storage igloos, recreational buildings, a chapel, and four Cold War-era buildings or facilities (NPS 1999). Appendix CR-2 lists historic district buildings at Elmendorf AFB.

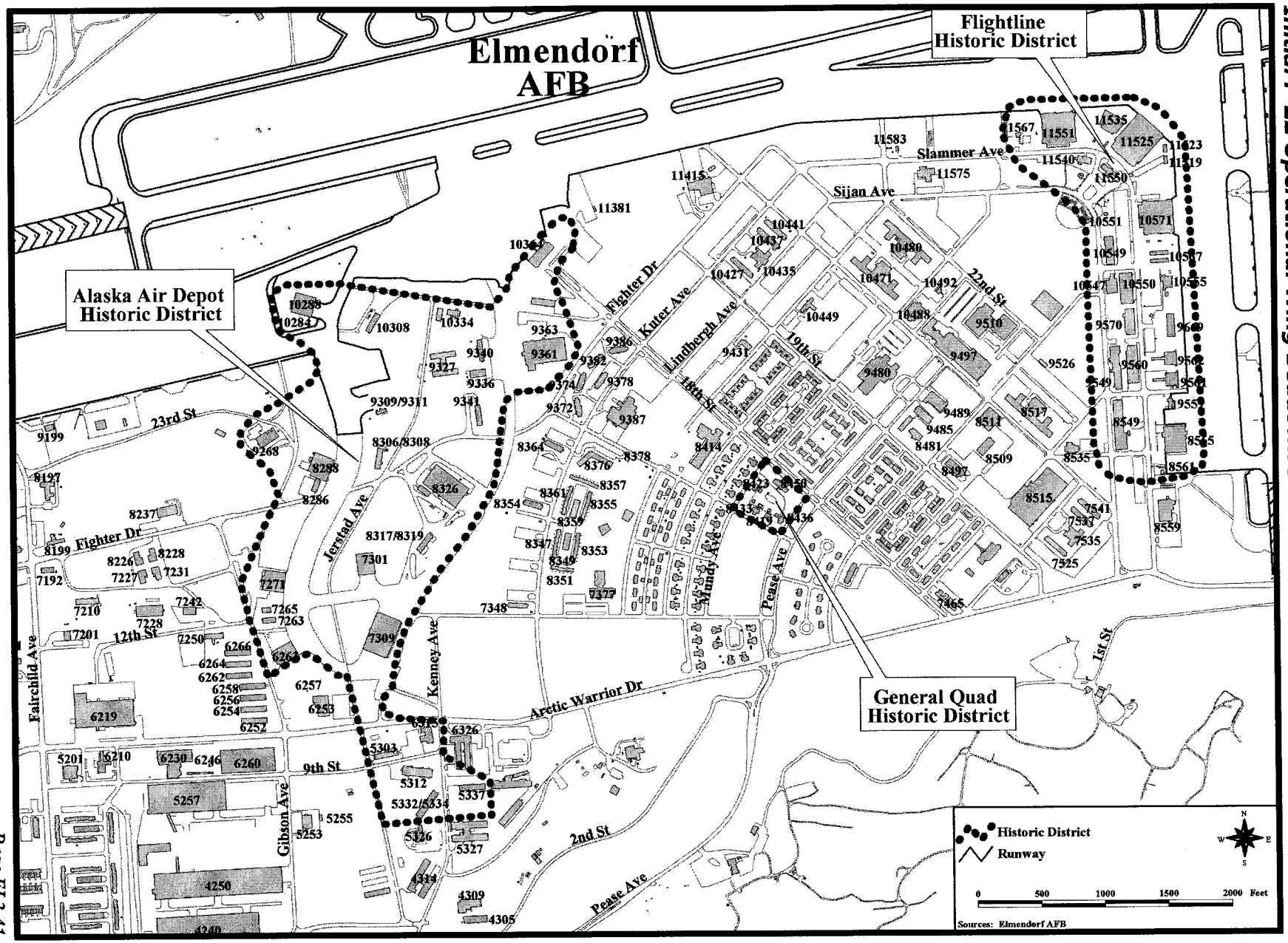


Figure EL3.11-1
Elmendorf AFB Historic Districts

Traditional Cultural Resources

One traditional resource has been identified to date on base. It is located outside the affected area for construction. The nearest federally recognized Alaska Native villages are located along Cook Inlet to the north of the base at Knik and Eklutna (Figure EL3.11-2). The Knik Arm Dena'ina once claimed the area occupied by Elmendorf AFB (Daugherty and Saleeby 1998). Consultation with the Knik and Eklutna people regarding cultural resource issues at the base is ongoing.

Environmental Consequences

This alternative would include construction of 15 new buildings or facilities and associated infrastructure, as well as additions or alterations to three buildings (Hangar 5, Building 6230, and the Engine Shop). New construction would take place to the east of, and outside, the Flightline Historic District.

Section 106 consultation with the SHPO would take place regarding visual and other impacts to the District. Impacts to archaeological resources are not expected under this alternative. Unsurveyed portions of the project area would be addressed in compliance with Section 106 of the NRHP prior to construction.

Impacts to architectural resources could occur under this alternative. Hangar 5 (Building 7309) is within the NRHP-eligible Alaska Air Depot Historic District. It was built in 1944 and is considered eligible for the NRHP (NPS 1999). Exterior renovation designs within the viewshed of the historic district would conform to the base architectural, landscape, interior design, and engineering standards, and to the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings* (Weeks and Grimmer 1995). Exterior renovation designs also would be submitted to the Alaska SHPO for review.

No building demolitions are planned as a result of the F-22 beddown. Two buildings planned for additions or alterations (Engine Shop, Building 6230) are not included on the base list of NRHP-eligible military buildings (NPS 1999). Additions or alterations would be coordinated with the base cultural resources manager to ensure that significant resources are not affected.

Impacts to traditional resources are unlikely under this alternative. The one traditional resource identified to date on base is located outside the area of affected environment for this action. Consultation with the Knik and Eklutna people regarding traditional resources at the base is ongoing.

Comparative Summary of the Five Potential Basing Locations

Due to construction in a historic district, there is a somewhat greater potential for impacts to architectural resources at Elmendorf AFB than at Tyndall or Mountain Home; and is comparable to Eglin. The potential for impacts to archaeological and traditional resources is low at all bases.

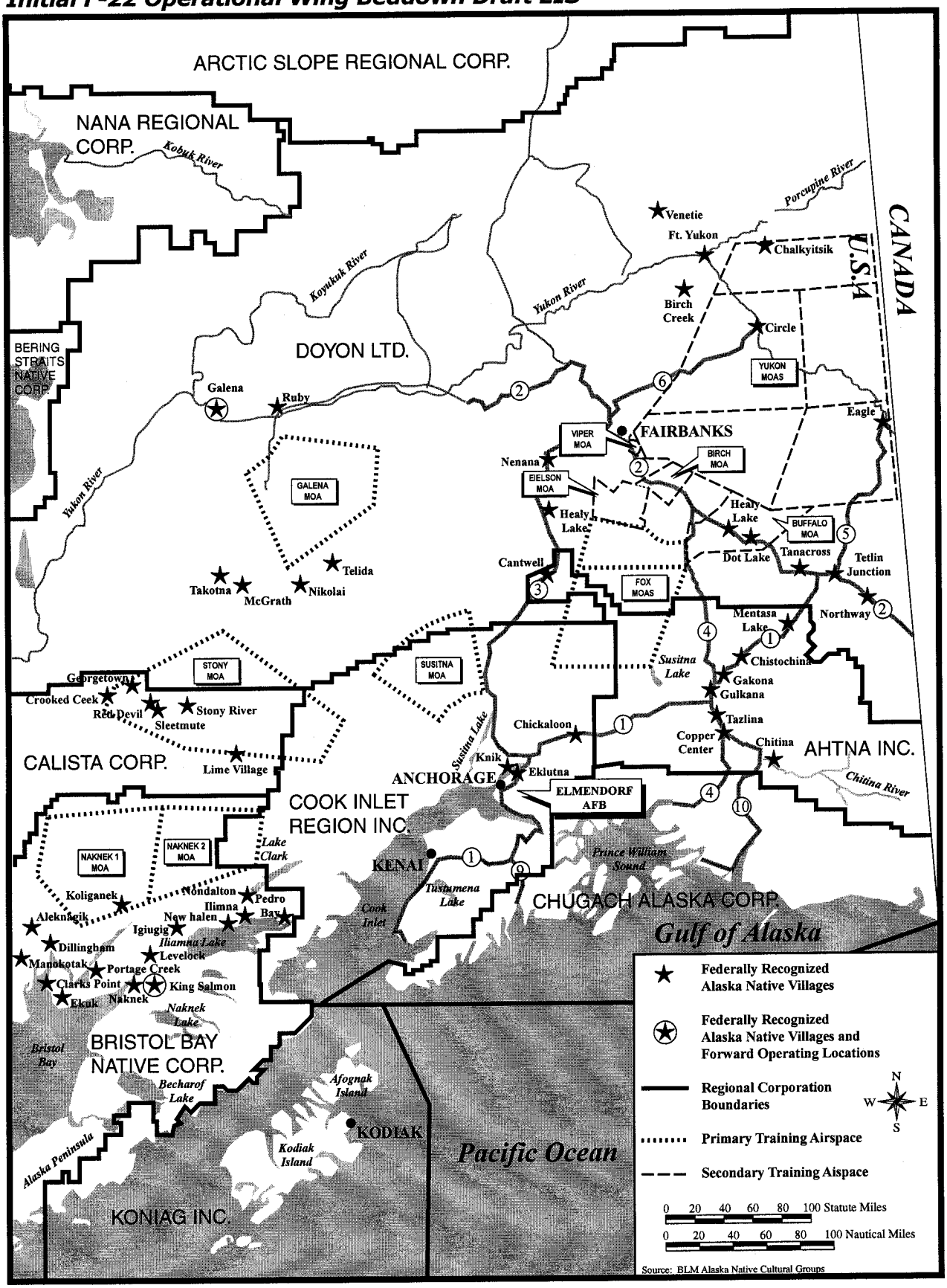


Figure EL3.11-2
Alaska Native Villages in the Airspace Environment

EL3.11.2 Airspace

Affected Environment

Nine NRHP-listed properties have been identified under Elmendorf AFB airspace (Appendix CR-2). In addition to NRHP-listed resources, there are likely to be additional cultural resources that are either eligible or potentially eligible for NRHP listing because of their association with the history of the region.

Primary Airspace

Fox MOA. This airspace is above southeastern interior Alaska. There are no NRHP-listed historic properties under this MOA (NRIS 2000) and no federally recognized Alaska Native groups underlie Fox MOA (BIA 1998).

Galena MOA. This airspace is above southcentral Alaska. There are no NRHP-listed historic properties under Galena MOA. Two segments of the Iditarod National Historic Trail underlie the northwestern corner of this MOA (Air Force 1995). There are no federally recognized Alaska Native groups under the Galena MOA (BIA 2000).

Naknek 1 and 2 MOAs. This airspace is above southwestern Alaska. There are no NRHP-listed historic properties under the Naknek MOAs (NRIS 2000). One federally recognized Alaska Native village, Koliganek, lies under the edge of Naknek 1 airspace (BIA 2000). Koliganek's economy is primarily dependent on the Bristol Bay commercial salmon fishery, with income supplemented by fur trapping (BBNA 2000).

Stony A and B MOAs. Stony A and B MOAs lie above southcentral Alaska. One NRHP-listed historic property lies under Stony B MOA: the Kolmakov Redoubt Site in the Sleetmute area (NRIS 2000). Federally recognized Alaska Native villages under airspace are Crooked Creek, Georgetown, Lime Village, Red Devil, Sleetmute, and Stony River (BIA 2000). Native lifestyle at Crooked Creek is based on subsistence activities including salmon, moose, caribou, and waterfowl (DCED 2000). Georgetown is presently used as a seasonal fishing camp. It has no year-round residents (DCED 2000). Lime Village practices a subsistence lifestyle based on salmon, moose, bear, waterfowl, and berries (DCED 2000). Red Devil village inhabitants supplement their income with subsistence activities. At Sleetmute, subsistence activities contribute substantially to local diets (DCED 2000). Stony River inhabitants depend heavily on a subsistence economy (DCED 2000).

Susitna MOA. This airspace is above southcentral Alaska**.** No NRHP-listed historic properties are under Susitna MOA (NRIS 2000). Approximately 6 miles of the Iditarod National Historic Trail cross under the southern corner of Susitna MOA through the community of Skwentna (Air Force 1995). A small part of Denali State Park and more than 900,000 acres of Denali National Park and Preserve also underlie this MOA. No federally recognized Alaska Native groups are located under Susitna airspace (BIA 2000).

Secondary Airspace

The Yukon MOAs and the adjacent Viper MOA are above eastern Alaska. One National Historic Landmark, Eagle Historic District, underlies the Yukon 3 MOA. There are eight NRHP-listed historic properties under Yukon airspace, including historic districts, roadhouses, a fish camp, a mission, and a cabin, as well as other properties that are eligible to the NRHP. The three federally recognized Alaska Native groups under airspace are Eagle, Circle, and Chalkyitsik.

Buffalo MOA is south of the Yukon MOAs. NRHP-listed or eligible properties associated with the Delta Junction area and Alaska Native use of the region may underlie this MOA. Two federally recognized Alaska Native groups (Dot Lake and Healy Lake) lie under or near Buffalo MOA.

Viper, Birch, and Eielson MOAs are southeast of Fairbanks. NRHP-eligible properties associated with regional settlement and use are likely to underlie these MOAs. Eielson AFB and Fort Greely, military installations activated for World War II, are located in this area. There are no federally recognized Alaska Native groups under these MOAs.

Environmental Consequences

Projected F-22 primary airspace use under this alternative would increase by about 26 percent over existing F-15C use (refer to Table EL2.2-1). All supersonic actions are expected to take place above 10,000 feet MSL. Because F-22s would typically operate at higher altitudes than F-15Cs, subsonic noise would decrease slightly, on average, over F-15C use. Supersonic activity (sonic booms) would generally increase from about two booms per month under Yukon 5 MOA, to 28 booms per month under Stony A and B MOAs. Overpressures from sonic booms would be insufficient to affect the integrity of structures.

No impacts to historic properties under airspace are expected under this alternative. F-22s would typically operate at higher altitudes than the current F-15Cs, and impacts to historic properties from increased airspace use are not expected. Chaff and flare use is not expected to impact significant historic properties under airspace. Previous and existing use of chaff and flares by F-15C aircraft is not known to have impacted such resources. Increased use by F-22 aircraft also is not expected to result in impacts. About 80 percent of flare release by F-22 aircraft is expected to occur above 10,000 feet MSL, much higher than the altitude required (700 feet) to ensure complete combustion of the flare before it hits the surface.

Alaska Native Concerns

A number of federally recognized Alaska Native villages and traditional subsistence areas underlie the training airspace. Based on past experience and scoping comments, Alaska Natives feel that both existing and projected noise levels and sonic booms represent an impact to traditional resources. Alaska Native groups also have expressed concern that traditional hunting areas are being affected by F-15C overflights and could be affected by F-22 overflights. Potential impacts to subsistence resources are presented in section EL3.6, and environmental justice is discussed in section EL3.14.

Comparative Summary of the Five Potential Basing Locations

The potential for impacts to architectural and archaeological resources under airspace is low for all installations. The potential for impacts to traditional resources under Elmendorf airspace may be slightly less than for Mountain Home. Langley, Eglin, and Tyndall have the least potential for impacts to traditional resources under airspace.

Human Resources

Human Resources include land use, socioeconomics, and environmental justice. Appendix HR-1 contains the methodological approach for the analysis presented below. The proposed Initial F-22 Operational Wing beddown and related training activities would create changes in aircraft sorties and overflights, which would in turn affect noise levels associated with Elmendorf AFB. Proposed activities that could potentially affect existing human resources also include construction of new facilities on base.

The affected environment for human resources includes areas on base and the surrounding vicinity, specifically those jurisdictions whose economies are closely associated with activities at the base. For land use and environmental justice resources, the effects on areas underlying the airspace are also presented.

No-Action Alternative

The no-action alternative would have no negative impacts on land use, socioeconomics, or environmental justice. Land use and existing land use patterns would remain the same. Elmendorf AFB would continue to cooperate with the local communities in developing its Air Installation Compatible Use Zones (AICUZ) programs. Elmendorf AFB would continue to operate and contribute to the economic health of the region. Under the no-action alternative, there would be no impacts to any resource area, therefore, there would be no negative or disproportionate impacts to minority or low-income populations, and environmental justice conditions would remain the same.

EL3.12 Land Use

EL3.12.1 Base

Affected Environment

Elmendorf AFB is located at the head of Cook Inlet within the municipality of Anchorage. The installation comprises 13,103 acres of land directly north of the municipality of Anchorage in the southcentral portion of the state of Alaska.

The southwest corner of the base has housing developments, community services, and offices.

Land uses on base are varied throughout the southern portion of the installation. The airfield and related operation functions

dominate this area. However, a variety of other land uses may be found along the southern tier of the base. A large industrial area forms a boundary between the central mixed-use area of the base and the housing and services area in the base's southwest corner. Medical facilities, recreational and open space areas, and some housing are also located in the southeast corner of the base. The Base General Plan 2000 presents a comprehensive planning strategy to support military missions assigned to the installation. The future land use plan depicts opportunities for a more functional grouping of land use types (Air Force 2000b).

The base is bordered by Fort Richardson Army Reservation to the east. There are various ranges within the military reservation areas, including maneuver areas, impact areas, and training areas. To the west of Elmendorf AFB are the Cook Inlet/Knik Arm and the Port of Anchorage. Privately held lands in the vicinity of the base are located primarily south and southeast of the base (Air Force 1991).

Table 3.12-1 presents a list of land uses within the vicinity of the installation situated within the baseline 65 DNL noise contour line depicted on Figure EL3.2-1.

Table EL3.12-1. Land Uses within the Elmendorf AFB Baseline 65 DNL Noise Contour

Land Use	*Percent*
Elmendorf AFB	72
Other Military Land	28

Source: Municipality of Anchorage 1994.

Base plans and studies present factors affecting both on- and off-base land use and include recommendations to assist on-base officials and local community leaders in ensuring compatible development. In general, land use recommendations are made for areas affected by both the potential for aircraft accidents (refer to section EL3.4, Safety) and aircraft noise (refer to section EL3.2, Noise). There are safety zones defined for each end of the runway based on the analysis of historic mishap data that defines where most aircraft accidents occur. At Elmendorf AFB, incompatible residential uses in the community of Mountain View exist within the safety zones at the end of runway 15/33 (Air Force 2000b).

Noise contours in these plans are generated by the modeling program NOISEMAP. These noise contours are used to describe noise exposure around the base and support compatible land use recommendations. Noise is one of the major factors used in determining appropriate land uses since elevated sound levels are incompatible with certain land uses. When noise levels exceed a DNL of 65 dB, residential land uses are normally considered incompatible. Further, the percentage of persons highly annoyed by noise can be estimated based upon varying noise levels. Noise exposure (depicted with contours) from operations occurring today at Elmendorf AFB are shown in Figure EL3.2-1. These contours provide the baseline against which to measure the projected change should the F-22 be based at Elmendorf AFB.

As presented in Figure EL3.2-1 and Table EL3.12-1, only a very small area that is not military land underlies the existing contours. No noise sensitive receptors (hospitals, schools, and churches) occur within the noise contours associated with Elmendorf AFB.

Environmental Consequences

The Initial F-22 Operational Wing beddown would require construction and modification of facilities on base, an increase in personnel, and an increase in flight operations. However, this should not adversely affect on-base land uses. Proposed development should be consistent with the Base General Plan's future land use plan, particularly since new construction would occur in proximity to other similar land uses. No changes to the safety zones are anticipated under the proposed action.

The area affected by noise anticipated under this alternative is presented on Figure EL3.2-1. For areas in the vicinity of the Elmendorf AFB airfield, the amount of acreage exposed to 65 DNL or higher would increase by about 4,590 acres. However these areas would be located within the base, over water (Knik Arm), and on Fort Richardson. No change is expected in the number of persons highly annoyed at Elmendorf AFB since the 65 DNL and above noise contours occur over military lands or over water. Should the decision be made to place the Initial F-22 Operational Wing at Elmendorf AFB, and once flying operations have commenced, a detailed data collection effort would occur and existing noise studies and land use recommendations would be updated.

Comparative Summary of the Five Potential Basing Locations

The potential for impacts to on-base land use is low at all installations. At Elmendorf, no off-base land areas would be affected by noise levels of 65 DNL or greater. Therefore, Elmendorf has the least potential for land use impacts. Although about 2,500 acres will be newly affected by noise, the off-base land uses at Mountain Home consist of grazing/agricultural. Consequently, potential impacts would be less than at Eglin and Tyndall where noise would affect 123 and 23 acres of residential land use, respectively. Impacts at Langley, where the off-base area affected by noise would decrease with beddown of the F-22, would still be greater than at Elmendorf or Mountain Home because residential lands and sensitive uses would continue to be affected.

EL3.12.2 Airspace

Affected Environment

The general land use patterns underlying this airspace may be characterized as rural. There are large public land areas as well as infrequent agricultural areas. There are also a number of small towns and villages throughout the area that occur along roads and highways, as well as in remote areas accessible only by waterways or small planes. Within populated areas, a variety of land use types occur, including residential, commercial, industrial, and public lands. Areas of cultural significance also occur under the airspace; Appendix CR-2 identifies properties that have been placed on the NHRP. An analysis of these cultural resources is provided in section EL3.11.

Special use areas have been identified under the MOAs. Appendix HR-2 contains tables summarizing special use areas under airspace units. They are considered special use areas because they provide recreational opportunities (trails and parks) and/or provide solitude or wilderness

experience (parks, forests, and wilderness areas). Recreational areas include large public land areas such as state or national parks, forests, and reserves, which may include individual campgrounds, trails, and visitor centers.

Special use areas of note underlying the Alaskan airspace include designated wildlife areas, trails, and parks. The Nowitna National Wildlife Refuge, managed by the United States Fish and Wildlife Service, encompasses forested lowlands, hills, lakes, marshes, ponds, and streams and the nationally designated Nowitna River. Situated under the Galena MOA, the refuge was established to protect waterfowl and their habitat. Hunting, fishing, and river floating are recreational activities available on the refuge.

Segments of the Iditarod National Historic Trail underlie the Galena and Susitna MOAs (Air Force 1995). The Iditarod Trail is a network of more than 2,300 trails that takes its name from an Athabascan Indian village.

A portion of Denali State Park, about 550,000 acres of Denali National Park, and about 400,000 acres of Denali National Preserve also underlie the northern portion of the Susitna MOA. Denali National Park, managed by the National Park Service, was established in 1917 as Mount McKinley National Park. In 1980, the Alaska National Interest Lands Conservation Act expanded the boundary by 4 million acres and re-named it Denali National Park and Preserve. Denali is currently 6 million acres in size. There are three distinct units that make up Denali National Park and Preserve: Denali Wilderness, Denali National Preserve, and Denali National Park. The Susitna MOA does not overlie the Denali Wilderness.

Lands underlying the Fox MOA include the Tangle Lakes, Tangle River, Delta River, Gulkana River, components of the National Wild and Scenic River System, Tangle Lakes Archaeological District, and Nelchina Public Use Area. Although there are no communities within this area, there are scattered remote residences. The Fox MOA overlies areas frequently used for recreational use hunting, including BLM-managed recreation areas.

Stony A and B MOAs overlie a number of small communities including Georgetown, Crooked Creek, Red Devil, Sleetmute, and Stony River.

The Yukon MOAs overlie remote residences or parcels along the Salcha River, the communities of Circle, Central, Circle Hot Springs, Chena Hot Springs, Eagle, Chicken, Eagle Village, Boundary, and Chalkyitsik. Some of the special use areas within this area include the Yukon-Charley Rivers National Preserve, Charley National Wild River, and Fortymile National Wild, Scenic, and Recreational River.

Environmental Consequences

An increase in sortie-operations represents the element of this alternative with a potential to affect land use within and under the airspace. Such impacts would be indirect, stemming from aircraft overflights and aircraft noise.

Under this alternative, subsonic noise would either decrease very slightly or remain the same as under baseline conditions (refer to section EL3.2). Most noise levels are expected to remain below 45 DNL. Where noise levels are higher than 45 DNL, they are expected to remain the same under

this alternative as under existing conditions. Therefore, it is unlikely the land use patterns, ownership, or management practices would be affected by the use of the airspace by the F-22 aircraft.

Supersonic activity would increase noticeably within the Fox, Stony A/B, and Yukon MOAs. In these areas, flight activities would increase sonic booms by 1 to 28 booms (depending on the MOA) per month relative to what is currently experienced. This shift would cause a perceptible change in the noise environment in remote areas. Residents and hunters in isolated areas, as well as visitors to primitive areas, may experience sonic booms as a result of the increase in supersonic activities. It is possible that the new level of supersonic activity will be perceived by some as an unwanted intrusion that may impede management goals for special use areas under the MOAs.

Sonic booms in recreational, hunting, or fishing areas have the potential to cause some annoyance. It is unlikely that any occasional visitor or hunter would discern the difference between the current number of sonic booms and the increased number associated with an F-22 beddown. Alaskan Natives who spend extensive time subsistence hunting and fishing in these areas are likely to discern an increase.

Comparative Summary of the Five Potential Basing Locations

The potential for impacts to land use as a result of airspace use would be greater for Elmendorf and Mountain Home, because supersonic activity would increase noticeably, and all supersonic activity occurs over land. The potential for impacts to land use for Langley, Eglin, and Tyndall would be negligible, because supersonic activity would occur mainly over water.

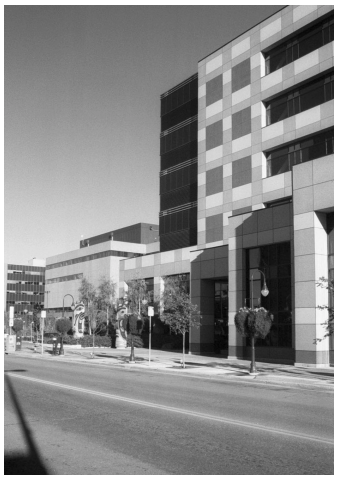
EL3.13 Socioeconomics

EL3.13.1 Base

Affected Environment

Employment and Earnings

In the region, total full- and part-time employment increased from 157,120 jobs in 1990 to 171,168 in 1997, at an average rate of 1.2 percent annually. The largest contributions to employment in 1997 were made by services (29.9 percent), retail trade (17.7 percent), and state and local government (10.1 percent). For the years 1980, 1990, and 1997, the contribution of the military decreased from 11.0 percent to 8.5 percent and 6.4 percent, respectively. The sectors of the economy exhibiting the greatest addition of jobs over the period 1990-1997 were services and retail trade (United States Department of Commerce, Economics, and Statistics Administration [USDCESA] 2000).



Employment and earnings are presented for the municipality of Anchorage whose economy is closely associated with activities at Elmendorf AFB.

The military accounts for about 6 percent of total employment in Alaska.

In Alaska, military employment declined from 10.8 percent of total employment in 1980, to 8.8 percent in 1990, and 6.2 percent in 1997.

The sectors of the economy exhibiting the greatest addition of jobs in the state over the period 1990 to 1997 were services and retail trade. The number of military personnel stationed at Elmendorf AFB stood at about 6,700, with an additional 1,990 civilian workers in 1999 (Air Force 1999e).

The value of payroll associated with government personnel at Elmendorf AFB reached over $275 million in 1999. Over 80 percent of these funds were wages and salaries paid to appropriated fund military personnel (Air Force 1999e).

Elmendorf AFB also purchases significant quantities of goods and services from local and regional firms. In 1999, annual expenditures by the base totaled over $137 million. The Air Force estimates that the economic stimulus of Elmendorf AFB created approximately 3,232 secondary jobs in the civilian economy (Air Force 1999e).

Non-farm earnings in the region totaled over $6.2 billion in 1997. The major contributions were made by services (23.4 percent), state and local government (13.4 percent), and transportation and public utilities (10.6 percent). In Alaska, non-farm earnings totaled over $12.6 billion in 1995, with the major contributions made by services (20.1 percent), and state and local government (18.5 percent) (USDCESA 2000).

Population

The population of the municipality of Anchorage increased by almost 13 percent between 1990-1999, reaching 257,808 in 1999. This increase took place at an average annual rate of 1.4 percent. By comparison, the population of Alaska increased by 12 percent during the same period, reaching 619,500 in 1999 at an average annual rate of 1.3 percent (U.S. Census Bureau 2000a).

Military retirees in the vicinity of Elmendorf AFB comprise 1.6 percent of the total regional population.

The population of the municipality of Anchorage is projected to increase from 257,808 in 1999, to 298,875 by the year 2018, at an average annual rate of 0.8 percent.

Based on information provided by Elmendorf AFB concerning the place of residence (by zip code) of personnel assigned to the installation, it is possible to derive an estimate of the number of personnel residing in communities in the vicinity of the base. Virtually all military personnel reside in the municipality of Anchorage. However, it is possible to estimate the number residing north of the installation in the communities of Chugiak and Eagle River (both of which comprise a part of the municipality of Anchorage). Compared to the general population, military personnel have a greater than average propensity to reside in these two communities.

Housing

Detailed information describing the housing contained in the municipality of Anchorage is presented in the 1990 United States Census of Population and Housing, which is the most comprehensive source of information describing housing in detail. Although somewhat dated, it still presents a reasonably accurate description of the housing (U.S. Census Bureau 1991).

There were a total of 94,153 housing units in the region in 1990, with a vacancy rate of about 12.2 percent. Of the vacant units, 8.8 percent were for seasonal and recreational use. Of the total number of housing units, 7.2 percent were mobile homes.

Over the period 1990 to 1999, an average of 1,046 building permits for residential units was issued annually. The number of units permitted on an annual basis varied from a high of 1,701 units in 1998 to a low of 399 units in 1990. The majority (76 percent) of these units were composed of single-family homes. The proportion of units contained in structures with five or more units comprised 13 percent of new units. The number of such multi-family units permitted varied from a high of 327 in 1996 to a low of zero in 1990, 1991, and 1992 (U.S. Census Bureau 2000b).

Of the active-duty personnel assigned to Elmendorf AFB in fiscal year (FY) 1999, just over 38 percent resided on base in government family and unaccompanied housing.

Environmental Consequences

At scoping, people wanted to know how the beddown will affect local economies.

Construction activity associated with the F-22 would peak in 2002 with the expenditure of over $149 million. It is estimated that these expenditures would support 1,468 construction jobs and 1,805 secondary jobs for a total employment effect of 3,273. This number of jobs comprises 1.9 percent of the 1997 level of regional employment. Earnings associated with both the direct and secondary jobs would total over $124 million or about 2 percent of total non-farm earnings in the region in 1997. It is estimated that a total of 328 workers could temporarily relocate and take up residency in the region during the construction phase.

Construction associated with the F-22 beddown would yield a total of almost 3,300 jobs and $270 million.

The operations phase would see an increase in base personnel of 286 (250 active-duty personnel and 36 civilian/contractor personnel) and a secondary employment of 104 jobs. Total employment in the region would increase by 390 jobs by FY 2007. Such increases comprise 3.3 percent of the 1999 base personnel and 0.2 percent of regional employment. The increase in earnings associated with the personnel buildup is estimated at over $13 million or about 0.2 percent of the total regional non-farm earnings in 1997.

Alaska Natives have expressed concern that their subsistence economy would be impacted by overflights. This is addressed in sections EL3.6 and EL3.14.

The arrival of active-duty personnel and their dependents (555 persons), civilian workers and contractors (80 persons), and those associated with secondary jobs (23 persons) would result in a net addition of 658 persons to the region by FY 2007. This increase represents 0.3 percent of the regional population total in 1999. Of the 250 military personnel estimated to move to the region, 74 would be unaccompanied personnel, the remaining 176 would have family members.

Of the just over 650 persons expected to relocate to the region by FY 2007, the largest number (almost 500 persons) are expected to reside in the municipality of Anchorage, with about an additional 150 persons in the Chugiak/Eagle River area.

As personnel influxes occur, there could be an impact on the housing market, including a cumulative demand for 240 off-base housing units (both owner-occupied and rented) over the period 2002

through 2007. The maximum annual increase in demand would be for 80 units. Assuming that all housing is found in the communities off the base, demand for 80 housing units in one year comprises 7.7 percent of recent annual regional residential construction. It is possible that the added demand for housing units could decrease the vacancy rate in the region but not by a substantial degree.

Alaska Native Concerns

A number of Alaska Native villages and traditional subsistence areas underlie Elmendorf AFB airspace. The local economy in many of these villages is based primarily on subsistence activities that occur under airspace. Based on past indications and scoping comments for this Draft EIS, Alaska Natives are concerned that existing and projected noise levels and sonic booms could affect game in traditional hunting areas, presenting potential impacts to a local economy dependent on these resources.

Projected socioeconomic impacts associated with the beddown of the F-22 are further described in Appendix HR-3.

Comparative Summary of the Five Potential Basing Locations

Based on differences in both personnel changes and construction projects, the socioeconomics influence of the F-22 would vary among bases. Elmendorf, with an increase of 390 direct and secondary jobs and earnings by $13 million, would experience a greater increase in operations employment and earnings than Eglin. Eglin would create the smallest increase in operations employment and earnings and no substantive socioeconomic impacts. Operations employment at Eglin would increase by 325 direct and secondary jobs and earnings by $10 million. Mountain Home would increase employment by 1,560 direct and secondary jobs and earnings by $57 million. Tyndall would have the greatest increase in operations employment and earnings, creating 2,392 direct and secondary jobs and earnings of $80 million. Langley is the only base that would create a decrease in operations employment and earnings. Operations employment would decrease by 358 direct and secondary jobs and earnings would decrease by $12 million. It is also the only base that would create a reduction in project-related population and housing demand.

EL3.14 Environmental Justice

EL3.14.1 Base

Affected Environment

Executive Order 12898, *Environmental Justice*, requires analysis of the potential for federal actions to cause disproportionate health and environmental impacts on minority and low-income populations. Alaska has no counties; the county equivalents are organized as “boroughs” and “census areas” that are delineated for statistical purposes by the state of Alaska and the Census Bureau. The municipality of Anchorage, which coincides with Anchorage Borough, comprises the region of comparison for the Elmendorf AFB alternative. As of 1990 (the latest date for which detailed information regarding minority and low-income populations is available), the region of comparison contains 226,338 persons, of whom 21.3 percent are minority, 7.1 percent are low income, and 29.6

percent are children. Baseline noise levels of 65 DNL or greater do not affect any communities or off-base populations.

To satisfy the requirements of Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, locations of off-base schools exposed to aircraft noise levels of 65 DNL or above were identified. Currently, no off-base schools in the vicinity of Elmendorf AFB are exposed to noise levels of 65 DNL or greater.

Environmental Consequences

Increases in the areas affected by noise levels of 65 DNL or greater would not extend over any populated areas off base. Therefore, beddown of the F-22s at Elmendorf AFB would not disproportionately affect minority or low-income populations.

Under this alternative, no off-base schools would be exposed to aircraft noise levels of 65 dB or above and therefore, there would be no change in exposure of school children to noise impacts as a result of the project.

Comparative Summary of the Five Potential Basing Locations

The potential for disproportionate impacts to minority or low-income populations is low at all bases. No substantive difference exists among the bases relative to environmental justice. Increases in the areas exposed to 65 DNL or greater would not extend over any populated areas.

EL3.14.2 Airspace

Affected Environment

Alaska Natives live under many of the affected MOAs (refer to Figure EL3.11-2 in section EL3.11, Cultural Resources). Federally recognized Alaska Native groups under the airspace include Crooked Creek, settled by Eskimo and Ingalik people; Georgetown, a seasonal fishing village; Lime Village, a Denaina Athabascan Indian settlement; Red Devil, a village populated by a mix of Eskimo, Athabascan, and non-native inhabitants; Sleetmute, founded by Ingalik Indians; Stony River, a mix of Indian and Eskimo people; and Koliganek. Other federally recognized Alaska Native groups in the area include Eagle, Circle, Chalkyitsik, Dot Lake, and Healy Lake. Native lifestyle in many of these villages is based on subsistence activities. Alaska Native Corporations in the region are Cook Inlet, Calista, Doyon, and Bristol Bay. Additional baseline data on minority populations and low-income populations in areas under the airspace are presented in Appendix HR-4.

Environmental Consequences

Projected subsonic noise levels within the MOAs for the Elmendorf AFB alternative would be less than 65 DNL. In fact, all primary airspace units are less than 45 DNL. Use of this 65 DNL guideline for the evaluation of environmental justice issues in relation to sporadic military overflights is consistent with the intent of Executive Order 12898 (related to minority populations and low-income populations) and Executive Order 13045 (protection of children). For this reason, subsonic noise would not generate environmental justice issues under the airspace.

Increases in supersonic flight would increase the number of sonic booms per month in the Fox, Stony A/B, and Yukon MOAs, relative to what is currently experienced. The increase would be between 1 and 28 booms per month in an individual airspace unit, varying by unit (refer to Figure EL3.2-2). Alaska Natives are primary users of the resources under the airspace. They have expressed concerns related to aircraft noise impacts on their villages and on subsistence hunting under the airspace. These individuals would likely be annoyed by any additional sonic booms.

Comparative Summary of the Five Potential Basing Locations

The potential for disproportionate impacts to minority or low-income populations is low at all bases relative to airspace. No substantive difference exists among the bases relative to environmental justice. However, at Elmendorf both subsonic and supersonic noise would increase. There would be continued exposure of Alaska Native populations. Impacts are similar to Mountain Home and the potential for impacts at Langley, Eglin, and Tyndall are relatively lower.

Community and Infrastructure

Community and infrastructure resources include public services such as potable water, wastewater treatment, electric and natural gas utilities, solid waste management, and hazardous materials and waste. It also includes public schools and transportation. These resources are typically impacted by fluctuations in population and generally occur at the base and environs. Training airspace is not addressed for community and infrastructure, as it is not applicable to this resource. However, civil aviation, an important transportation mode in Alaska, is discussed in section EL3.1, Airspace Management and Use. Regulatory and methodological information pertinent to community and infrastructure resources can be found in Appendix CI-1. Additional technical information can be found in Appendix CI-2.

No-Action Alternative

The no-action alternative would not affect current demands on public services or infrastructure. There would be no change in base population and, therefore, no changes to demands on schools and other social services. Under the no-action alternative, hazardous material use and waste generation at Elmendorf AFB would continue at current trends. Current Environmental Restoration Programs (ERP) at the base would continue and Elmendorf AFB would continue to manage its hazardous materials and wastes in accordance with all applicable laws and regulations.

EL3.15 Public Services

EL3.15.1 Base

Affected Environment

Potable Water

Elmendorf AFB receives its water from the Army at Fort Richardson. The Army, in turn, receives its water from a dam and reservoir system located on Ship Creek. This system once served the municipality of Anchorage in addition to Fort Richardson and Elmendorf AFB. Anchorage has since built its own dam and relies on the Ship Creek dam for backup supply only. For this reason, the present capacity of the Ship Creek system is substantial. The Fort Richardson treatment plant's capacity is 7 million gallons per day (mgd) with a peak system demand of 5.5 mgd in summer. Elmendorf AFB's average daily consumption is approximately 3.5 mgd. Anchorage's system has a capacity of 24 mgd (Air Force 2000b).

Elmendorf AFB is equipped with water connections to Anchorage for emergency purposes. The potable water system currently in place ensures provision of safe, high-quality potable water supply without limitations to future development (Air Force 2000b).

Wastewater Treatment

Elmendorf AFB discharges its sanitary wastewater into Anchorage's wastewater treatment system. As of 1991, the average flow was 2 mgd, with a peak flow of 2.40 mgd. The treatment plant has a capacity of 58 mgd and is currently running at half capacity (29 mgd). Facilities located on the north side of the runway are not connected to the base sewer system. These facilities, which include Hangar 15 and surrounding maintenance facilities for the F-15E, are on a septic tank system with leach fields. There is sufficient capacity for domestic waste in these septic tanks but the system is not designed for industrial waste (Air Force 1991).

Electric Power and Natural Gas

The Elmendorf Central Heat and Power Plant is the main source of electrical power for Elmendorf AFB. The output of the power plant is 17,000 kilowatts (kw). Due to the demand of the AFB, the power plant is augmented by tie-in lines to Anchorage Municipal Light and Power. The summer peak loads on the Elmendorf power plant per 24 hours are approximately 17,500 kw at maximum and 7,500 kw at minimum. Winter demands reach a maximum of 20,000 kw and a minimum of 10,000 kw. Average daily demands are estimated at 14 megawatts and 17.5 megawatts for the summer and winter seasons, respectively.

A power study is being conducted to examine the electrical system's capacity and alternatives for supplying Elmendorf with adequate power supplies. The electrical system, in its present condition, is nearing capacity. Improvements to the system or alternative sources of power will, therefore, be an issue in the future.

Natural gas is provided to Elmendorf AFB through the local distribution company, Enstar Natural Gas, Inc. Enstar provides uninterrupted service to the base, and Enstar representatives indicate

there are no capacity or supply hindrances within the system. Elmendorf's existing system is adequate to support existing and future requirements. Enstar further confirms that that the system maintains excess capacity for present and future needs.

Solid Waste Management

Elmendorf AFB's solid waste is collected by an independent contractor and transported off site to the Anchorage Regional Landfill. According to the *Elmendorf Base General Plan Update*, there are no active landfills at Elmendorf AFB. The capacity of the Anchorage Regional Landfill is 20 years in the present cell with expansion being currently designed for 60 to 100 years (Air Force 1991).

Schools

Public education for dependent children living on base is provided by six Anchorage School District institutions. Elementary schools include Aurora, Mount Spurr, and Orion and serve children in kindergarten through sixth grade. There is also one Special Education pre-school facility called Mount Iliamna. All junior high level students (grades 7-8) residing on base attend Central Middle School of Science. High school students (grades 9-12) residing on base attend one of two senior high schools, depending on their base address. The senior high schools serving on-base students are Bartlett High School and West High School.

Children living off base attend one of the district's 55 elementary schools, 9 middle schools, and 6 senior high schools (Air Force 1999d).

Environmental Consequences

Potable Water and Wastewater Treatment

Under this alternative, an off-base population increase of 658 over three years would occur in Anchorage. The additional demand on Anchorage's municipal water supply is estimated at 0.13 mgd (assuming 200 gallons/capita/day). Given that Anchorage's system has a capacity of 24 mgd and is currently operating well within its capacity, the impact associated with the beddown would be insignificant.

For the F-22 beddown, it is expected that the population impact would be realized off base. Given an off-base population increase of 658 over 3 years, the additional demand on Anchorage's wastewater treatment system is estimated to be 0.13 mgd (assuming 200 gallons/capita/day). The city treatment plant has a capacity of 58 mgd and is currently operating at approximately half capacity. The additional 0.13 mgd associated with the Elmendorf AFB alternative is, therefore, insignificant. Although it is understood that 286 additional personnel would work on base during the day, it is assumed that the majority of their consumptive use would occur at their place of residence. Therefore, environmental consequences of on-base water and wastewater impacts are considered insignificant.

Electric Power and Natural Gas

The capacities of Anchorage's Municipal Light and Power and Enstar Natural Gas, Inc. are more than sufficient to accommodate an influx of 658 persons over the course of the beddown. No substantive impact is expected for these community-based resources. However, Elmendorf AFB's electrical system capacity may need to be upgraded in order to accommodate the increased demand associated with construction efforts and long-term beddown operational requirements.

There is little likelihood for consequences to schools or other public services under the airspace.

Schools

As a result of implementing the beddown at Elmendorf AFB, school-age dependents would attend one of the Anchorage School District institutions. It is estimated that an additional 161 school age children would be introduced into the district over the course of three years. The district's current enrollment is 49,520 students, as of September 2000, and its capacity is 50,660 (personal communication, Arnold 2000). Given the current capacity and planned expansion, the Anchorage School District would be able to accommodate the projected influx of students.

Comparative Summary of the Five Potential Basing Locations

The potential for impacts to public services is low for all installations. Elmendorf would increase school students by 161; comparatively, Eglin would increase school enrollment by 121 students and Mountain Home would increase school enrollment by 686 students. Tyndall would have the largest increase in student population, estimated to be 1,063 new students. Impacts associated with demand for other public services such as water would be the greatest at Mountain Home. At Langley there would be no increased demand for public services. There would be a decrease in demand for utilities and a reduction in number of students by 150 in local schools.

EL3.16 Transportation

EL3.16.1 Base

Affected Environment

Regional and Local Circulation

Elmendorf AFB is accessed by Davis Highway and Glenn Highway from the east, and 5th Avenue from the south. Davis Highway extends northward from the main gate (Boniface Gate) about 1.5 miles before turning eastward and then northwestward to Fort Richardson.

Circulation at Elmendorf AFB

Through a 1998 traffic study, Elmendorf AFB has identified measures to reduce congestion and increase traffic flow.

Elmendorf AFB has recently been the subject of a traffic study due to concern for the effect of the development of a new community center and deployments at the Joint Mobility Center (Military Traffic Management Command Transportation Engineering Agency 1998). The Military Traffic Management Command Transportation Engineering Agency, in cooperation with the Air Force Center for Environmental Excellence, conducted a traffic engineering study at Elmendorf AFB from 14 to 25 September 1998. The study team collected intersection directional turning movement volumes at numerous locations. Turning movement data were collected during the morning (6:30 to 8:30 am), during the noon (11:00 am to 1:30 pm), and during the afternoon (3:00 to 5:00 pm) peak periods. The study provides detailed information on the capacity of priority intersections on the installation and makes recommendations for improvements. The results of the study indicate that three intersections (Oil Well Road and Davis Highway, Davis Highway and 2nd Street, and Oil Well Road and Community Center Road East) pose traffic congestion problems (see Appendix CI-2).

Environmental Consequences

The Elmendorf AFB alternative is expected to increase on-base employment by 286 jobs, with the potential to generate up to 286 vehicle trips to and from the installation each work day during the morning and evening peak travel periods. Current employment on the installation is 8,698 jobs, with the potential for approximately 4,500 vehicle trips during the peak travel periods.

The increase in employment and associated travel demand would increase peak period travel demand by 6.3 percent. The anticipated 6.3 percent increase in traffic volumes does not exceed the primary (11.1 percent) capacity screening criterion (see Appendix CI-3). For adjacent intersections and access gates, the increase would not have the potential to degrade service levels or increase congestion.

There is little likelihood for transportation consequences under the airspace.

Comparative Summary of the Five Potential Basing Locations

The potential for impacts to transportation is low for all installations. Elmendorf would have an approximate 6 percent increase in traffic. Langley would have a decrease of 243 peak hour vehicle trips and an approximate 2.7 percent decrease in travel demand. Eglin would have an increase of 218 peak hour trips but this would have little impact on congestion. Mountain Home would have an approximate 9.2 percent increase. Tyndall would have the highest potential impact with an increase of 1,500 peak hour trips and one-third increase in base worker travel.

EL3.17 Hazardous Materials and Waste

EL3.17.1 Base

Affected Environment

The majority of the non-weapon hazardous materials used by Air Force and contractor personnel on Elmendorf AFB are controlled through the Air Force pollution prevention HAZMART process. HAZMART 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 process includes review and approval by Air Force personnel to ensure users are aware of exposure and safety risks (Air Force 2000c).

Existing Elmendorf AFB hazardous materials and hazardous waste management programs would be retained and used to manage F-22 hazardous materials and wastes. Refer to Appendix CI-1 for more information on these materials and wastes.

The Elmendorf AFB Spill Prevention Control and Countermeasures Plan addresses on-base storage locations and proper handling procedures of all hazardous materials to minimize potential spills and releases. The plan further outlines activities to be undertaken to minimize the adverse effects of a spill, including notification, containment, decontamination, and cleanup of spilled materials (Air Force 2000d).

The Elmendorf AFB Asbestos Management Plan provides guidance on the management of asbestos. An asbestos facility register is maintained by Civil Engineering. Persons inspecting, designing, or conducting asbestos response actions in public or commercial buildings must be properly trained and accredited through an applicable asbestos training program. The design of building alteration projects and requests for self-help projects are reviewed to determine if asbestos contaminated materials are present in the proposed work area and, if so, are disposed of in an off-base permitted landfill.

Elmendorf AFB is a large-quantity hazardous waste generator. Hazardous wastes are generated during operations and maintenance activities. Types of waste include combustible solvents from parts washers, inorganic paint chips from lead abatement projects, fuel filters, metal-contaminated spent acids from aircraft corrosion control, painting wastes, battery acid, spent x-ray fixer, corrosive liquids from boiler operations, toxic sludge from washracks, aviation fuel from tank cleanouts, and pesticides. Hazardous wastes are managed in accordance with the Elmendorf AFB Hazardous Waste Management Plan. Hazardous wastes are initially stored at approximately 50 Satellite accumulation areas. Satellite accumulation areas allow for the accumulation of up to 55 gallons of hazardous waste (or one quart of an acute hazardous waste) to be stored at or near the point of waste generation. There are two 90-day waste accumulation sites on Elmendorf AFB. In 1997, slightly over 215,000 pounds of hazardous waste were removed from Elmendorf AFB and disposed of in off-base permitted disposal facilities. In 1998 and 1999, the amount of hazardous waste removed from the base and subsequently disposed of was approximately 175,000 and 100,000 pounds, respectively (BLM 2000).

The DoD developed the ERP to identify, investigate, and remediate potentially hazardous material disposal sites on DoD property prior to 1984. Since 1984, 150 sites have been identified since the ERP began at Elmendorf AFB.

Environmental Consequences

The amount of hazardous and toxic materials used to support aircraft operations would increase by approximately 40 percent compared to the amount used in support of the F-15C. F-22 materials that are hazardous would require special handling procedures. The impact on other base operations that use hazardous materials, such as vehicle maintenance, would be very slight. Existing procedures for the centralized management of the procurement, handling, storage, and issuing of hazardous materials through the HAZMART are adequate to handle the changes, but would be expanded to meet the increased use. The increased use of hazardous materials would not cause adverse impacts.

There was concern at scoping meetings about the management of hazardous materials associated with the F-22.

Elmendorf AFB would continue to generate hazardous wastes during various operations and maintenance activities. Only a small increase of hazardous waste would be generated by other activities such as vehicle maintenance. Hazardous waste disposal procedures, including off-base disposal procedures, are adequate to handle the changes and would remain the same. The base Hazardous Waste Management Plan would be updated to reflect any changes of hazardous waste generators and waste accumulation point monitors. The number of hazardous waste accumulation sites would be increased to handle the increase and there would be no adverse impacts. In the event that any hazardous waste are generated as a result of F-22 maintenance activities that present any unique hazards over those generated by the F-15Cs, Elmendorf AFB would implement appropriate hazardous waste control procedures to minimize potential risks to personnel and the environment.

There is little likelihood for hazardous materials or waste consequences under the airspace.

Comparative Summary of the Five Potential Basing Locations

The potential for impacts to hazardous waste management is low for all installations. Elmendorf would increase hazardous waste generation by 40 percent over baseline; Langley would generate the smallest increase in hazardous waste. Eglin would increase by 30 percent over baseline; Mountain Home would increase hazardous waste by 50 percent; and Tyndall would have a 100 percent increase in hazardous waste. No change in current operations would be required for any of the bases.