4.0 ENVIRONMENTAL CONSEQUENCES

Chapter 4 presents the environmental consequences of the F-22 FDE program and WS beddown at Nellis AFB for each of the 12 resources discussed in Chapter 3. To define the consequences, this chapter overlays the project elements described in Chapter 2 onto the affected environment provided in Chapter 3. A comprehensive matrix comparing the No-Action Alternative and the Proposed Action by resource and the potential impacts is provided in Table 2.6-l. Cumulative effects of the F-22 beddown with other foreseeable future actions are presented in Chapter 5.

The proposed elements of the F-22 beddown would occur in phases over a nine year period. The environmental consequences would also occur incrementally, with fewer impacts early in the period when few aircraft and personnel would be present. At completion of the beddown, with all 17 aircraft and 367 personnel on base, the effects would be greater. The approach used for this impact analysis focuses almost solely on the impacts of the complete action with all project elements considered. One resource, Air Quality (section 4.3) assesses impacts at incremental stages of the proposed beddown. For Air Quality, each stage would result in different emission quantities that require comparison to federal and state standards.

4.1 AIRSPACE

The assessment of airspace use and management includes a discussion of how the No-Action and Proposed Action alternatives would affect air traffic within the airspace of Nellis AFB and the NRC ROIs. Since no modifications or additions are proposed for the current airspace structure in support of this Proposed Action, the impact analysis focuses on changes in airspace use that would result from the addition of nearly 8,900 annual F-22 airfield operations by fiscal year 2008. These sorties would increase current levels by about 13 percent without consideration of the F-15C replacement schedule, budget constraints, changes in the number of exercises or exercise participants, and other such factors that affect yearly cumulative sortie totals. Historic records indicate that total annual NRC use has ranged between 200,000 to 300,000 sortie-operations. See Appendix C for more detailed information on historic NRC sortie use.

The F-22 can be expected to operate within the same NRC airspace subdivisions and perform the same type of air-to-air combat missions as the F-15C. In addition, the F-22 will perform air-to-ground combat missions. The majority of F-22 flight operations would occur during the day at subsonic speeds and altitudes at or above 10,000 feet AGL. Historic range utilization records indicate that nearly one-third of the F-15C annual mission sorties are conducted within the Desert (Caliente, Coyote, and Elgin) and Reveille MOAs where air-to-air combat training maneuvers are performed. The other two-thirds are distributed among 17 subdivisions within restricted airspace where weapons and electronic warfare training is conducted. The average duration of an F-22 air-to-air or air-to-ground mission would be between 1 and 1.4 hours.

4.1.1 No-Action Alternative

Under this alternative, airspace use in the Nellis AFB terminal airspace and arrival and departure routes would remain the same as those described in section 3.1.1. The total number of operations (takeoffs and landings) at Nellis AFB is expected to remain generally the same as recent average levels (about 65,000-70,000) since no significant changes are expected in Air Warfare Center test and training flight mission activities in the foreseeable future. The No-Action Alternative would not change the configuration or management of Class B airspace.

Scheduling and use of the three NRC restricted areas and portions of R-4808N/S (DOE) (R-4806E/W, R-4807A/B, and R-4809) and the Desert and Revellie MOAs would continue as they currently are to support bombing, gunnery, and electronic warfare training, Red and Green Flag exercises, WS mission employment exercises, and other test and training activities. Appendices A and C describe the level of sortie-operations that have historically occurred within the individual MOAs and restricted area subdivisions, respectively. The No-Action Alternative would not change airspace boundaries. Scheduling and use of the Desert and Reveille MOAs would continue as they are currently in support of air-to-air training missions and the Air Combat Maneuvering Instrumentation (ACMI) arena. Appendix C describes the level of sortie-operations that have historically occurred within the individual MOA subdivisions. No changes

to the MOA boundaries or their overlying ATCAAs are anticipated under the No-Action Alternative.

This alternative would have no effect on the areas and altitudes authorized for supersonic flight within the NRC or on the number and frequency of supersonic sorties flown during air-to-air training or other operations where rapid evasion of a simulated threat is necessary. Supersonic flight would continue at the rate discussed in Chapters 2 and 3.

As discussed in section 3.1, Nellis APB and the NRC are situated in an area that has had little effect on commercial and general aviation in the region. This is due primarily to the near-direct routing provided by Federal Airways and Jet Routes for instrument flight rules traffic and the visual routes commonly flown by visual flight rules traffic between most airports through this region. No changes are currently planned for the Airway/Jet Route structure surrounding the NRC. Although commercial and general aviation are expected to increase by 54 and 17 percent, respectively, by 20 15 (Nevada Department of Transportation 1995), such increases would not be affected by Nellis AFB and NRC operations, which are expected to remain at current levels. The interaction of Nellis APB operations and airspace management with state and federal agencies provides avenues for discussing any airspace matters.

4.1.2 Proposed Action

NELLIS AFB

The proposed F-22 beddown would have no effect on the use and management of the Class B airspace surrounding Nellis AFB. This lack of effect is particularly evident in comparisons of operational increases that could result from the Proposed Action with historic operational levels. Large fluctuations in range use over the years have had a corresponding effect on the number of airfield operations conducted. With a nearly 120,000 difference in airfield operations between the low and high years since 1987, the addition of 8,944 F-22 operations at Nellis AFB (a 13% increase) to the recent levels of 65,000 to 70,000 would represent about 40 percent of historic peak operational levels. This increase does not consider reductions or fluctuations that may occur between year groups as a result of budget impacts; aircraft realignments; and changes in the number, composition, and duration of the different exercises. The proposed beddown would not require any modification to the current terminal airspace structure or operational procedures.

The F-22 would not require any changes to the departure and arrival route structures discussed in section 3.1.1. These routes were established based on terrain and obstacle clearance, civil air traffic routes and available airspace, and navigational aid coverage, as well as on aircraft operational characteristics similar to those of the F-22.

NELLIS RANGE COMPLEX

Proposed F-22 activities would not alter the current structure, management, and total use of the NRC restricted areas and MOAs. Varying range operations through the years have resulted in

cumulative total annual use ranging between 200,000 and 300,000 sortie-operations. The F-22 would fly mission profiles within the R-4807A/B tactical and electronic battlefield arena similar to those flown by F-15Cs though generally at higher altitudes. Most training activities would occur throughout the R-4807A.B and R4809 (as shown in Table 2.3-4). The F-22 would primarily use the Caliente, Coyote, and northern Elgin subdivisions of the Desert and Reveille MOAs for air-to-air combat training and staging for range battlefield operations.

The F-22 would not require any changes to the areas currently approved for supersonic operations. See section 4.2 for further discussion of the supersonic noise profile and potential effects associated with the F-22.

CIVIL AND COMMERCIAL AVIATION AIRSPACE USE: The Proposed Actionwouldhaveno impact on civil and commercial aviation airspace use since the F-22 would be operating within the same flight parameters currently used for Nellis AFB terminal and NRC airspace. As discussed in section 3.1.2, civil air traffic operations at the local airports, on the Federal Airways and Jet Routes, and along those highways commonly used as visual references by visual flight rules aircraft are sufficiently clear of and unaffected by Nellis AFB and NRC operations. These operations and the F-22 beddown would not affect future commercial and general aviation growth in Nevada. Ongoing interaction between Nellis AFB and state and federal agencies helps ensure compatibility of military and commercial/civil aviation in the region of influence.

4.2 NOISE AND LAND USE

Proposed additional airfield operations by F-22s would change the shape and extent of the area affected by aircraft noise around Nellis AFB. This section describes the nature of the changes in the noise environment as a result of projected F-22 airfield operations. It also presents a comparison of the projected noise environment relative to baseline and past (i.e., 1981 and 1992) noise conditions. Past conditions provide a context for understanding the trends and variations in the way aircraft noise affects Nellis AFB and its vicinity. Analysis of potential impacts to land use overlays projected noise conditions onto existing land uses and the regulations governing land use in the area. Specifically, the analysis focuses on the compatibility of projected noise levels and Clark County's land use zones.

Within the NRC, F-22s would operate within the same airspace subdivisions and perform similar types of flying activities as F-15Cs have for many years. F-22s would, however, predominantly fly above 10,000 feet AGL. Total activity within the NRC by all aircraft including the F-22s would remain within the historic range of 200,000 to 300,000 sortie-operations annually. Using the same methods as employed to define baseline subsonic and supersonic noise levels, the analysis presented in this section examines how inclusion of F-22 sortie-operations would affect noise conditions within the NRC. The analysis compares baseline noise levels to projected noise levels and uses this comparison to evaluate the Proposed Action's potential effects on land uses within the NRC.

4.2.1 No-Action Alternative

Under the No-Action Alternative, the proposed beddown of F-22 aircraft at Nellis AFB would not occur. Implementation of the No-Action Alternative would not change noise levels from baseline conditions and would create no specific impacts to land use in the vicinity of the base or on the NRC.

4.2.2 Proposed Action

NELLIS AFB

NOISE MODELING: F-22 noise data from overflights was collected by the Air Force Research Laboratory (personal communication, AFRL 1999). These data demonstrate that the F- 18 noise profile represents an appropriate surrogate for F-22 noise. Using these surrogate data, proposed F-22 airfield operations at the base were modeled using NOISEMAP (Version 6.5) to generate noise levels (DNL). The analysis assessed the airfield operations anticipated with complete beddown of all 17 F-22 aircraft plus baseline operations for all other aircraft. The resulting noise values were then expressed as contours and compared to the contours associated with the baseline noise environment.

NOISE ENVIRONMENT: Under the Proposed Action, the area affected by noise levels of 65 DNL or greater would increase by approximately 8,700 acres relative to baseline conditions (Table 4.2- 1 and Figure 4.2-l). Roughly 60 percent of the total increase would apply to open, undeveloped lands northeast of the base. The great majority of these unzoned lands are managed by federal agencies. The remaining 40 percent would cover developed areas southwest and west of the base.

The affected area would remain generally consistent with the pattern of noise around the base for the past 20 years. About 99 percent of the total affected land either overlaps with locations previously exposed to equivalent noise levels or covers open undeveloped lands northeast of the base. The remaining 1 percent extends beyond Clark County's A-E65 zone. No location would be subject to an increase of more than 2 dB relative to baseline (the updated 1997 noise study) conditions.

Compared to 1992 and 1981 noise levels, approximately 7,600 and 1,900, respectively, more acres would be affected by projected noise. Almost all of this additional acreage would lay north and northwest of Nellis AFB and consist of open lands managed by the BLM. In the developed lands southwest and west of the base, more area was affected by higher noise levels in 1992 (Figure 4.2-2). For example, the 65 DNL contour in 1992 extended more than 3 miles beyond the limits of the projected 65 DNL contour. A similar pattern applies to the other noise contours in this area.

Table 4.2-l. Comparison of Past, Baseline, and Proposed Acreage under Noise Contours in the Vicinity of the Nellis AFB Airfield

	NOISE CONTOUR					
	65-70 *DNL*	*70-75 DNL*	*75-80 DNL*	*80-85 DNL*	*>85 DNL*	*Total*
1981 Acreage'	11,736	5,766	2,587	1,290	N/A	21,379
1992 Acreage'	9,217	4,309	1,613	493	N/A	15,632
Baseline Acreage'	9,621	3,400	1,082	391	20	14,514
Projected Acreage'	13,940	6,620	2,004	598	90	23,252
Change: baseline to projected	4,319	3,220	922	201	70	8,738
Increase (%)	45	95	85	53	350	60

[1]Nellis AFB acreage excluded

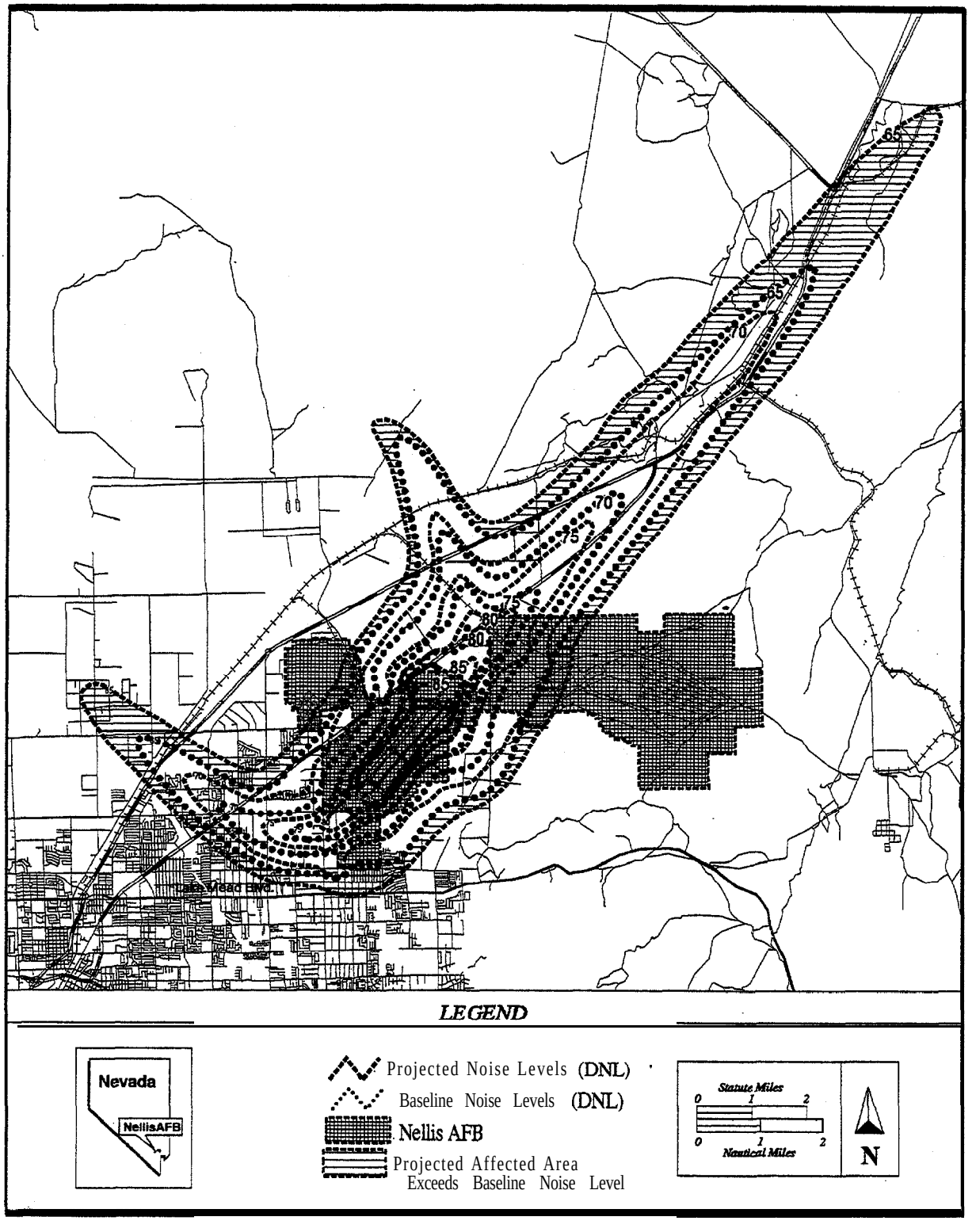

Figure 4.2-1. Baseline and Projected Noise Levels at Nellis AFB

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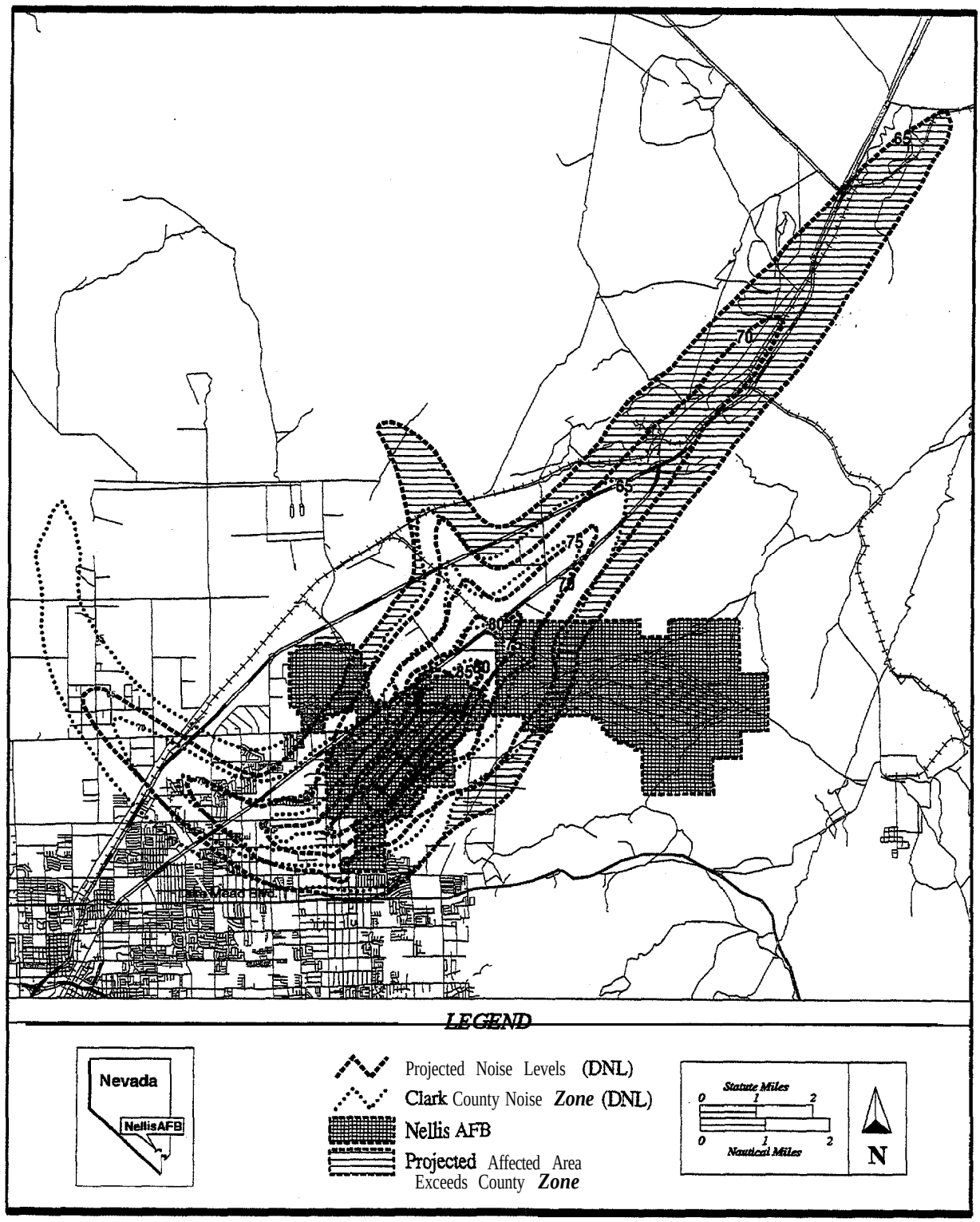

Figure 4.2-2. Projected F-22 Noise Levels and Clark County Noise Zones

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ON-BASE LAND USE: Land use on base would not be negatively impacted by the proposed aircraft beddown. Based on the analysis of proposed aircraft operations, Area I and portions of Areas II and III would be exposed to DNL noise levels of 65 dB or greater. These proposed noise levels are consistent with both past and baseline noise levels on base.

The Proposed Action calls for the construction of new on-base facilities (refer to Figure 2.3-2). These proposed facilities would be sited on previously disturbed land with similar land uses and would be consistent with the present land use and the *Nellis AFB Comprehensive Plan.*

OFF-BASE LAND USE: The Proposed Action would not be expected to alter land ownership or land use in the area surrounding Nellis AFB. Comparison of baseline noise conditions to projected noise conditions shows that the affected area would increase (Figures 4.2-3 and 4.2-4, Table 4.2-2) for each land use category. Despite the increase in noise levels over these areas, the effect of this change would be reduced for several reasons:

- most (85 percent) of the increase in affected acreage would apply to open, undeveloped lands;
- the lands would be subject to increases of 2 dB or less; and
- the lands are located within areas already zoned for the noise levels or previously exposed to similar noise levels.

Table 4.2-2. Comparison of Land Uses Affected By Baseline and Projected Noise Levels

Land Use Category	*Acres within Clark County Zones*[1]	*Baseline Acres Affected by 65 DNL or Greater-1*	*Projected Acres Affected by 65 DNL or Greate*[1]	*Projected Increase from Baseline*
Commercial	1,473	1,239	1,363	124
Industrial	435	226	371	145
Open/Public	11,595	12,204	19,875	7,671
Recreational	72	58	70	12
Residential	2,058	788	1,573	785
TOTAL	15,633	14,514	***23,252***	8,738

1. Nellis AFB excluded from total acres.

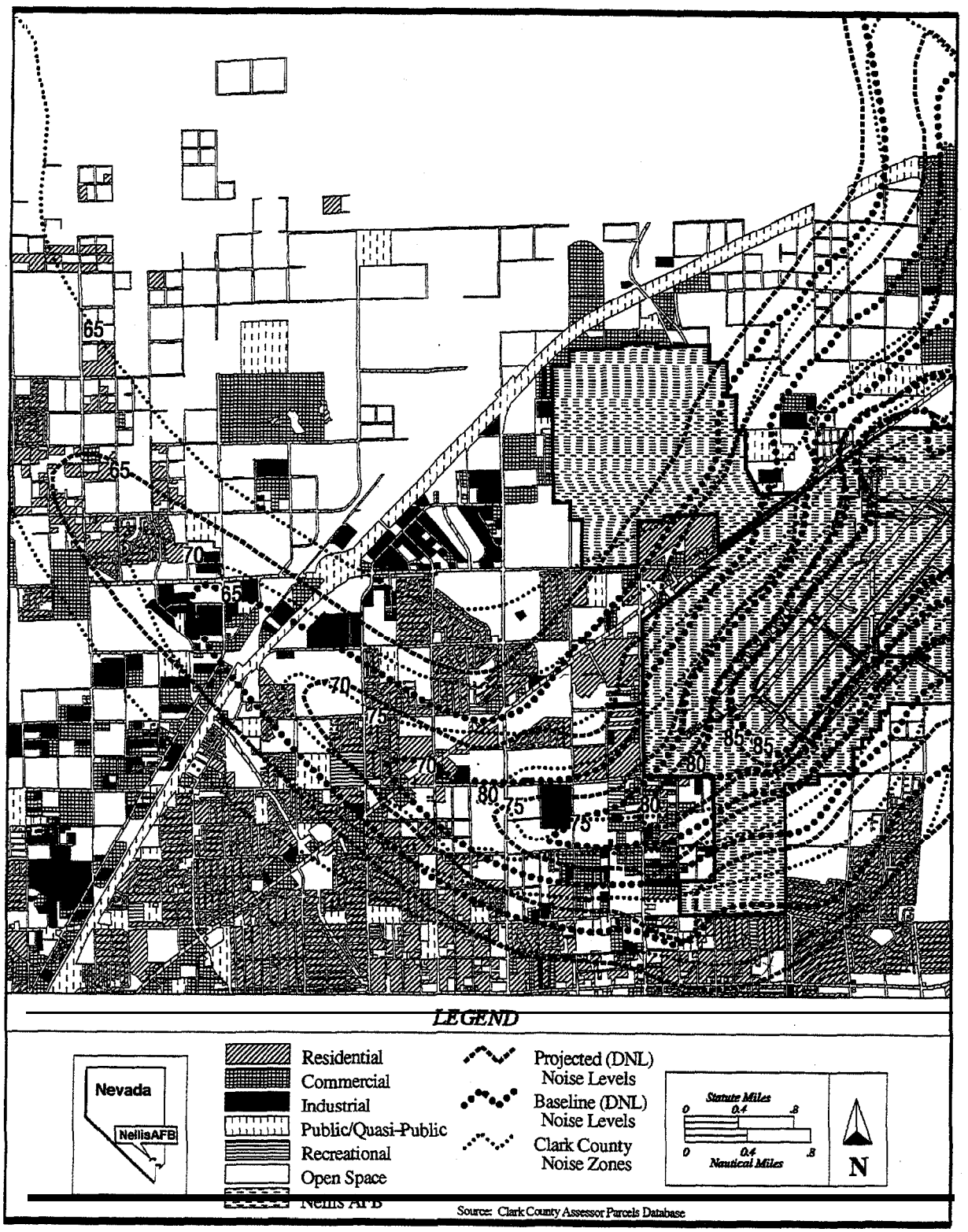

Figure 4.2-3. Land Use and Noise Levels - South and West of Nellis AFB

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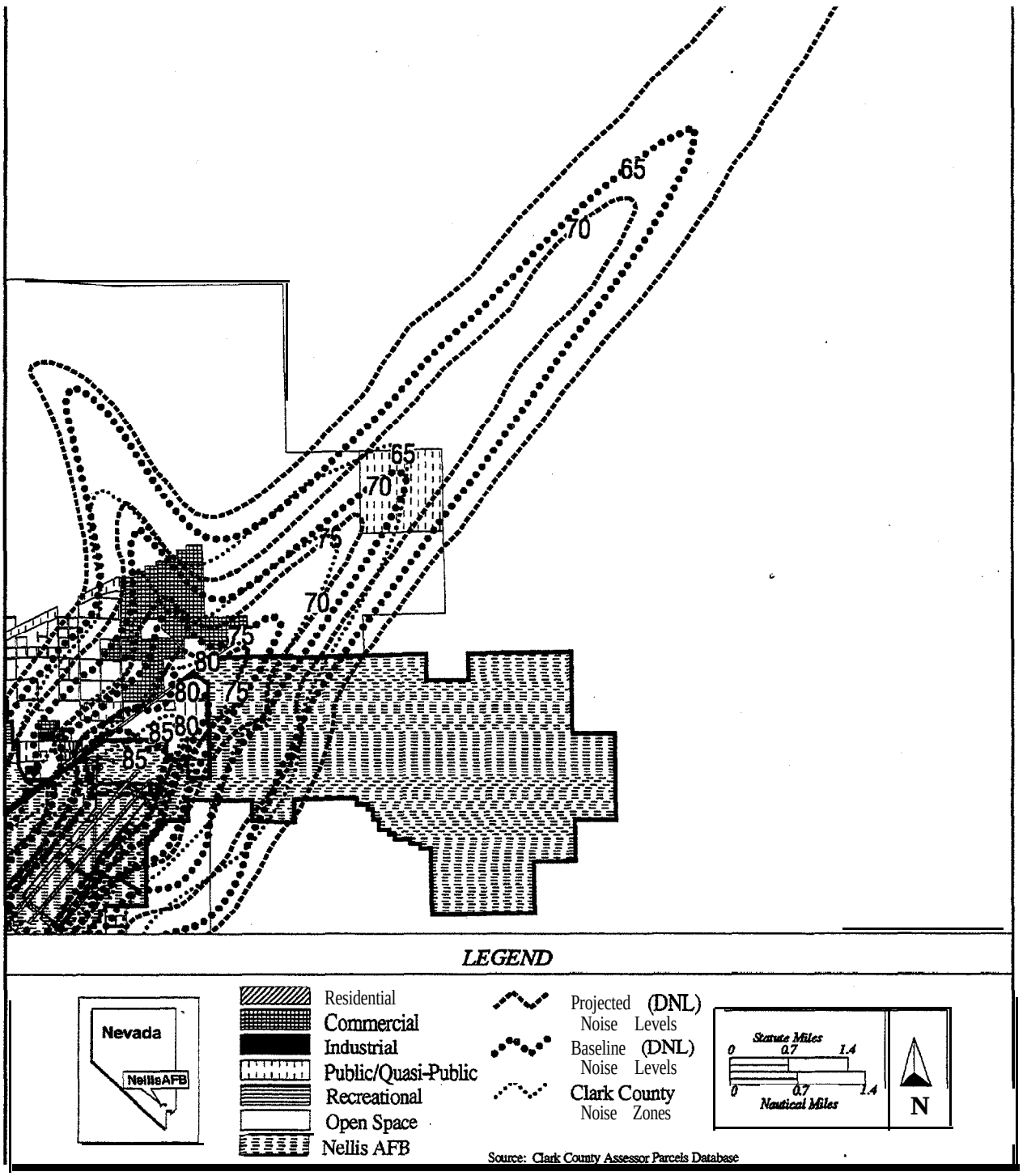

Figure 4.2-4. Land Use and Noise Levels - Northeast of Nellis AFB

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Land Use Regulations and Projected Conditions. Noise from the proposed beddown would affect less commercial, industrial, recreational and residential lands than encompassed by the 1996 Clark County noise zones (Table 4.2-3). The Proposed Action would, however, affect approximately 8,300 acres more open lands than are included in the county noise zones.

Table 4.2-3. Land Use within Projected Noise Levels around Nellis AFB (in acres)'

	PROJECTED NOISE CONTOURS (DNL)							CLARK COUNTY ZONES	
Land- Use Category	*65-*70	*70-*75	75-80	80-85	*>85*	*Total Projected Acres*	*Tota l (%)*	*Total I992 Acres*	*Total (%)*
Commercial	263	568	496	36	0	1,363	6	1,473	9
Industrial	221	89	53	s	0	371	2	435	3
Open/Public	12,262	5,552	1,426	545	90	19,875	85	11,595	63
Recreational	38	17	15	0	0	70	<1	72	1
Residential	1,156	394	14	9	0	1,573	7	2,058	13
TOTAL	13,940	620	2,004	598	90	23,252	100	15,633	100

[1] Excludes Nellis AFB

Commercial and industrial land uses within the affected area would continue to be consistent with the Clark County regulations. Relative to baseline conditions, the amount of commercial and industrial land uses affected by noise levels of 65 DNL or greater would increase by 269 acres (Table 4.2-2). Less than 50 acres of this total would fall outside the area zoned by the county for these noise levels. These land uses would be exposed to 65-70 DNL which HUD considers compatible with commercial and industrial activities (refer to Table 3.2-3). In addition, these areas would experience an imperceptible increase in noise of less than 1 dB.

Approximately 85 percent of the lands affected by projected noise levels would consist of open, undeveloped land. Almost all of these lands lie northeast of the base and are used for grazing under the management of the BLM. Although the area affected by noise extends beyond the limits of the county zones, the projected noise levels would not be inconsistent with either the actual land use or the principles behind Clark County's regulations.

Projected noise levels of 65 DNL or greater would encompass about 12 acres more of recreational land use than under baseline conditions. All of these lands are included within the Clark County zones. The Proposed Action would expose approximately 15 acres of recreational land to 75-80 DNL and none to higher noise levels. This land is currently zoned for 80 DNL or greater.

Projected aircraft noise would also affect residential land uses south and west of Nellis AFB. Residential land use within Clark County noise zones A-E70 through A-E 80 are already inconsistent with the county regulations. Roughly 790 acres more residential lands would be subject to noise levels of 65 DNL or greater than under baseline. Except for 200 acres, all of these lands fall within areas already exposed to these noise levels. This would not result in a significant impact to land use, including the 200 acres, for three reasons. First, the change in noise levels resulting from the proposed beddown would be 2 dB or less. Second, basic construction practices for these residences would attenuate noise, reducing indoor noise levels to 45-50 DNL. Third, these lands have been previously exposed to similar or higher noise levels between 1981 and 1992.

Affected Population and Annoyance. The projected noise of 65 DNL or greater could affect about 38,000 people (Table 4.2-4). Almost 15,000 people more would be affected than under baseline conditions. The total population living within areas zoned for noise levels of 65 DNL or greater is approximately 45,000.

Table 4.2-4. Baseline and Projected Affected Population and Annoyance

Noise DNL	*Percentage of People Potentially Highly Annoyed]*	*Baseline Population Affected²*	*Baseline Number of People Potentially Highly*	*Projected Population Affected²*	*Projected Number of People Highly Annoyed2*	*Population within Clark County Zones2*
65-70	12	21,276	2,553	27,556	3,307	26,005
70-75	22	1,404	309	10,074	2,216	11,482
75-80	37	121	45	30	11	6,357
80-85	54	0	0	90	48	764
>85	70	0	0	0	0	0
TOTAL		22,801	2,907	37,750[1]	5,582	44,608

[1] Percent reflects low end of noise level range.
[2] Nellis AFB excluded.

A total of approximately 5,600 people could be highly annoyed by noise from the proposed beddown. This could comprise an increase of 2,700 people over baseline. People within these areas are already exposed to noise levels within 2 dB of projected levels.

Sensitive Receptors. Six schools, churches, and parks lie within areas where baseline noise is greater than 65 DNL. Under the Proposed Action, 15 additional noise-sensitive receptors would be affected (Figure 4.2-5 and Table 4.2-5). The increase in projected noise levels would be less than 2 dB for all receptors, and the change in noise would not be perceptible to people.

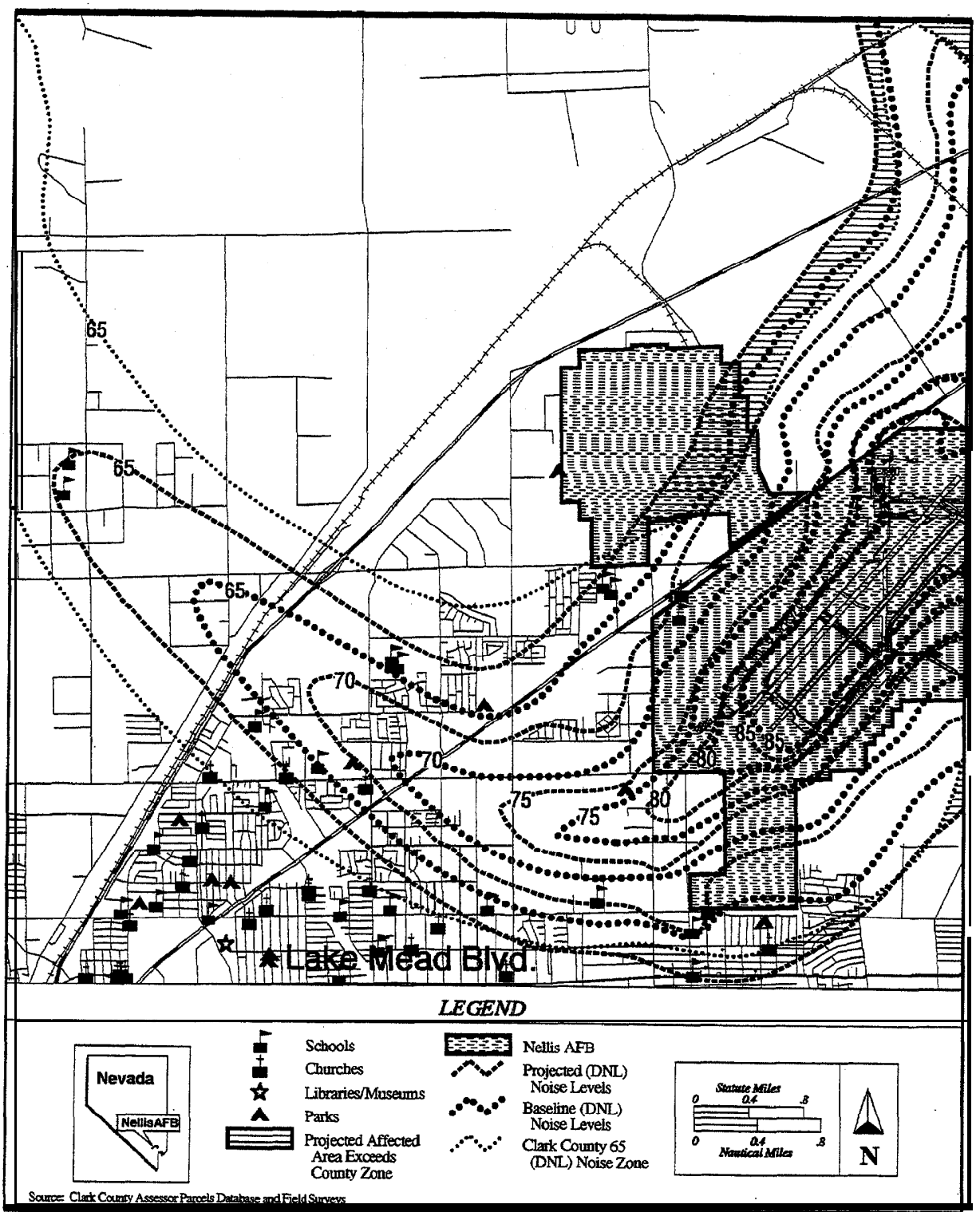

Figure 4.2-5. Noise-Sensitive Receptors and Noise Levels around Nellis AFB

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Table 4.2-5. Noise-Sensitive Receptors within Baseline' and Projected Noise Contours'

Noise	65-70 *DNL*		70-75 *DNL*		*75-80 DNL*		80-85 *DNL*		*>85 DNL*	
Receptor	Baseline	Projected	Baseline	Projected	Baseline	Projected	Baseline	Projected	Baseline	Projected
Schools	2	11[3]	0	1[6]	0	0	0	0	0	0
Churches	2	3[4]	0	1[7]	0	0	0	0	0	0
Parks	1	3[5]	1	0	0	1[8]	0	0	0	0
TOTAL	5	17	1	2	0	1	0	0	0	0

[1] Actual noise levels, not Clark County zones

[2] Excludes Nellis AFB

[3] Cheyenne Campus Community College High School, Cox Elementary, Craig Elementary, Elizondo Elementary, Lowman Elementary, Manch Elementary, Martin Luther King Jr. Elementary, Mojave High School, Mountain View Elementary, Tate Elementary, Woolley Elementary

[4] Frontier Community Baptist Church, St. Michaels Orthodox, Salvation Army

[5] Alexander Villas, Cheyenne Sports Complex, Sunrise Park and Recreation Center

[6] Von Toble Middle School

[7] Palestine Baptist Church

[8] Nellis Meadows

Noise Abatement Procedures. Nellis AFB already employs measures to reduce aircraft noise effects and would continue them under the Proposed Action. In the 1992 AICUZ report (Air Force 1992a), Air Force responsibilities for flight activities include the following: flight safety, noise abatement, and participation in the land-use planning process. These measures are detailed in Section 3.2. To reduce noise around Nellis AFB, the Air Force has restricted and would continue restrict nighttime flying activities. Flights would be routed to have the least effect on populated areas changes in flight altitude would be employed. These procedures would remain in effect under the proposed beddown.

The Air Force would continue to participate in land-use discussions with governmental parties and make recommendations to city and county planning and zoning organizations on the types of land uses that are compatible.

NELLIS RANGE COMPLEX

NOISE MODELING: Assessment of the effect of F-22 sortie-operations on noise within the NRC involved incorporating surrogate noise data and flight profiles for the F-22 with the baseline data for all other aircraft. The same models (MR_NMAP and BOOMAP) were used to model subsonic and supersonic noise in the affected airspace. Operations within subdivisions of the airspace were distributed according to the pattern of use of F- 15Cs.

NOISE ENVIRONMENT: Table 4.2-6 shows SELs for subsonic noise for several aircraft, including the F-22. They are the same data as shown in Table 3.2-9 but with the F-22 projections added. Current data indicated that F-22 noise levels (SELs) would be higher at altitudes below 5,000 feet AGL than most other aircraft commonly using the NRC. Given that most F-22 flight activity would occur above 10,000 feet AGL, no noticeable difference is expected. Table 4.2-7 and Figure 4.2-6 show L_{dnmr} for the 21 airspace units described in section 3.2. Projected noise levels would not measurably differ from baseline conditions. Two factors account for this lack of change. First, the sortie-operations projected for the F-22 would represent 13 and 9 percent of total sortie-operations in the NRC under low- and high-use conditions, respectively. Second, the F-22s would operate predominantly (89 percent) at altitudes above 10,000 feet AGL. At these altitudes, neither the noise level nor the startle effect would be noticeably different from existing conditions.

Table 4.2-6. Sound Exposure Levels (SEL) in dB at Various Altitudes in the NRC*

	ALTITUDE IN FEET ABOVE GROUND LEVEL						
Aircraft Type	300	500	1,000	2,000	5,000	10,000	20,000
B-1B	115	112	107	101	92	82	69
F-15C	116	112	107	101	90	80	6.5
F-16	106	103	98	91	81	70	56
A-10	99	95	89	82	72	63	53
c-130	99	96	91	85	77	69	61
F-22**	118	114	108	102	92	83	73

* Level flight, steady high-speed conditions
* * Projected based on F-1 8 aircraft

During air combat maneuvering, the F-22 is estimated to be supersonic approximately 10 percent of the time. Figure 4.2-7 and Table 4.2-S show CDNL for the Proposed Action. Airspace units not shown are subject to CDNL of less than 45 dB or not authorized for supersonic flight. Sonic boom levels and frequency of occurrence would be slightly higher than baseline conditions. Coyote and Elgin would experience the largest change, with a l-3 CDNL increase and 4 to 6 additional sonic booms per month. All other affected airspace would be subject to increases of less than 1 CDNL and less than 1 sonic boom per month. Combined subsonic and supersonic noise is present in Table 4.2-9. Combined noise would increase at most by 1 DNL. In most areas, noise would not increase at all.

LAND USE AND MANAGEMENT: Under the Proposed Action, land status and land-use patterns within the NRC would not be altered. Since land uses in this area have remained the same for many years and have been exposed to aircraft operations since the formation of Nellis AFB in 1940s, the changes in use associated with the proposed beddown have a negligible potential to impact land use. Furthermore, subsonic noise levels would not change under the Proposed Action.

Table 4.2-7. Baseline and Projected Subsonic Noise Levels in the Nellis Range Complex

	200,000 SORTIE-OPERATIONS		300,000 SORTIE-OPERATIONS	
Airspace	*Baseline L_{dnmr}*	*projected L_{dnmr}*	*Baseline L_{dnmr}*	*Projected L_{dnmr}*
Caliente	54	54	56	56
Coyote	57	57	59	59
Elgin	46	46	47	47
Reveille	54	54	56	56
R61	53	53	55	55
R62	53	53	55	55
R63	53	53	55	55
R64	53	53	55	55
R65	53	53	55	55
Alamo	53	53	55	55
EC South	52	52	54	54
Pahute Mesa	53	53	54	54
R71	53	53	55	55
R74	60	60	62	62
R75	61	61	63	63
R76	58	58	60	60
R4808W[1]	46	46	47	47
R4808E[1]	<45	<45	<45	<45
R4809A	49	49	51	51
EC East	55	55	57	57
EC West	56	56	57	57

[1] Not part of NRC airspace; DoE airspace over the NTS

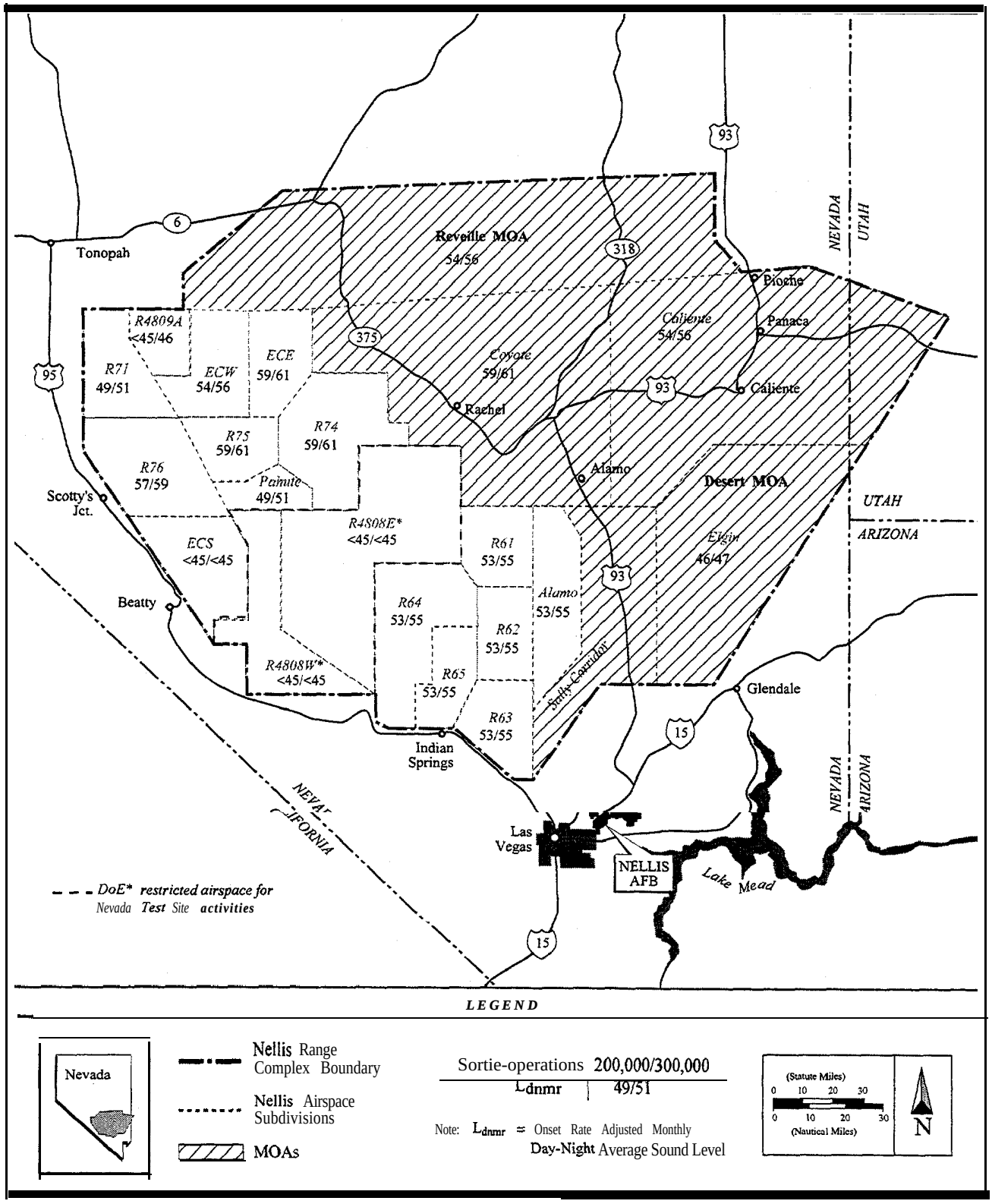

Figure 4.2-6. Proposed Noise Levels within the Nellis Range Complex

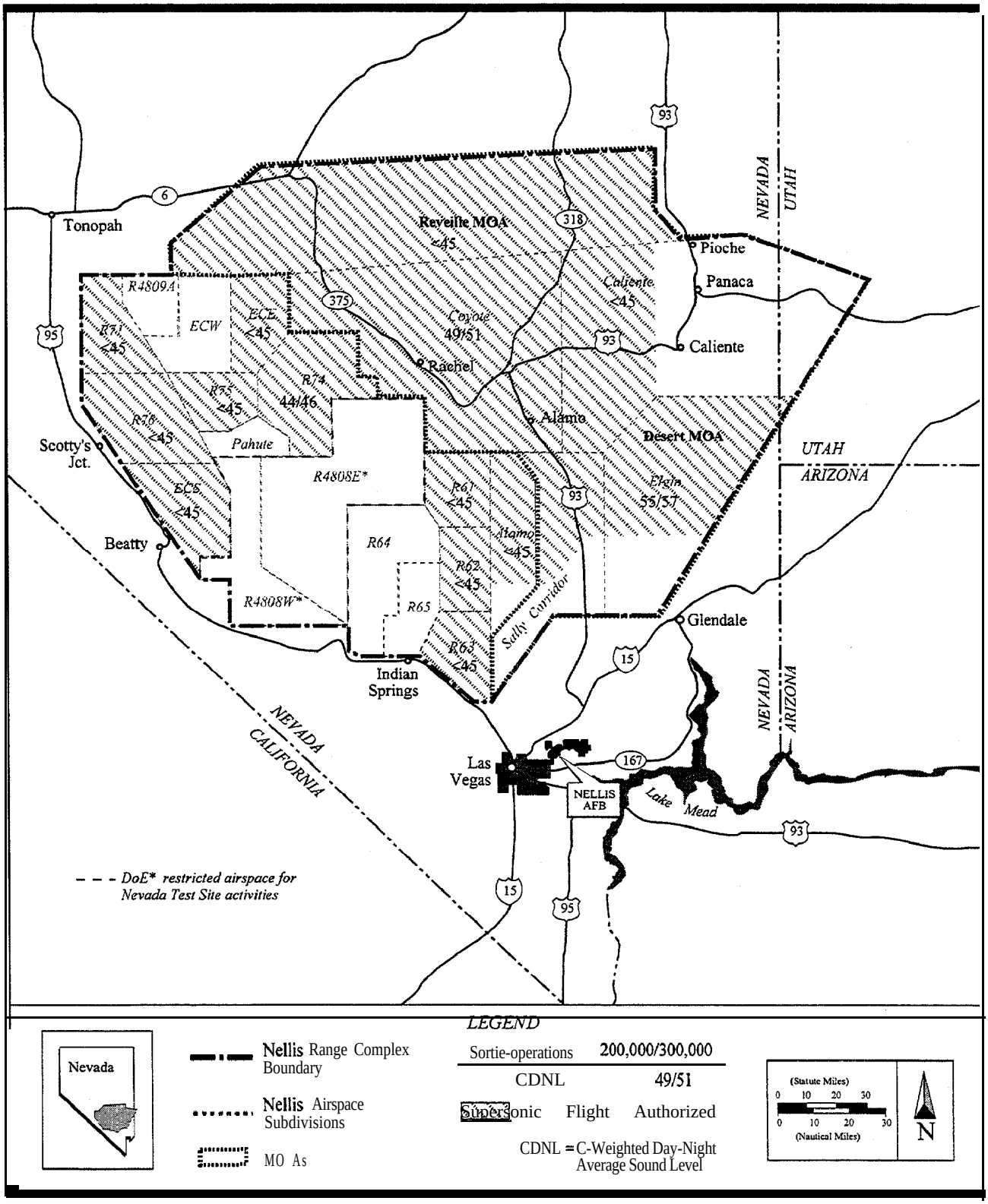

Figure 4.2-7. Proposed Action Sonic Boom Levels within Nellis the Range Complex

Table 4.2-8. Projected Sonic Boom Levels and Frequency under the Proposed Action

	200,000 SORTIE-OPERATIONS				300,000 SORTIE-OPERATIONS			
	Baseline		*Projected*		*Baseline*		*Projected*	
Airspace	*CDNL*	*Booms per Month*	*CDNL*	*Booms per Month*	*CDNL*	*Booms per Month*	*CDNL*	*Booms per Month*
Elgin	54	20	55	24	56	30	57	35
Coyote	48	4	51	10	50	7	52	12
Reveille	<45	<2	45	2	<45	<2	45	2
EC East*	<45	<2	45	2	<45	<2	46	2
R74*	<45	<2	45	2	<45	<2	46	2

* Restricted access

Table 4.2-9. Combined DNL and CDNL' Noise Levels under Baseline and Proposed Action

	200,000 SORTIE-OPERATIONS		300,000 SORTIE-OPERATIONS	
Airspace	*Baseline DNL*	*Projected DNL*	*Baseline DNL*	*Projected DNL*
Elgin	58	59	60	60
Coyote	58	59	60	60
R74	60	60	62	62
Reveille	54	54	56	57
EC West	56	56	57	58

[1] L_{dnmr} equivalents for CDNL calculated by correlating CDNL values to Schultz Curve (see Appendix D).

Increases in supersonic flight activity would result in a minimal increase in the number of sonic booms experienced at ground level. Increases in sonic booms in Range 74 would not affect land use because the area is already restricted from public access. Since the increase in sonic booms beneath portions of the Desert MOA are minimal, and since the intensity of booms reaching the ground would be similar to the intensity under existing conditions, impacts to land use resulting from sonic boom exposure would be insignificant.

Similarly, management plans for the lands underlying the NRC should not require amendment. Current land management plans and practices recognize the military activities associated with NAFR. The nature and extent of those activities will not be altered substantially under the Proposed Action.

Potential effects to special-use areas such as the DNWR are of particular concern to the public. As presented above, noise levels over these areas will not change.

4.3 AIR QUALITY

Emission of air pollutants into the Nellis AFB ROI would increase under implementation of the Proposed Action. These increases would remain below *de minimis* levels and would not delay attainment of the National Ambient Air Quality Standards (NAAQS). Potential sources of emissions include facility construction, maintenance activities, vehicle and diesel-powered electric generator operations, vehicle travel, and aircraft operations. Aside from aircraft emissions, the primary pollutants from other operations would be exhausts from ground-based internal combustion engines and fugitive dust. Overall aircraft operations within the NRC would remain within the current range (200,000 to 300,000 sortie-operations per year), and F-22 aircraft operations would not cause total emissions and air quality to vary significantly from the current range.

Criteria to determine the significance of these changes are based on federal, state, and local air pollution standards and regulations. The changes would be significant if the emissions from the Proposed Action alternative (1) increase ambient pollution concentrations from below to above any NAAQS, (2) contribute to an existing violation of any NAAQS, (3) impair visibility within federally mandated Prevention of Significant Deterioration (PSD) Class I areas, or (4) result in non-conformance with the Clean Air Act or any State Implementation Plan.

4.3.1 No-Action Alternative

Under the No-Action Alternative, none of the construction activities, personnel relocations, or aircraft operations proposed for the F-22 aircraft beddown would occur at Nellis AFB, and no proposed F-22 aircraft operations would occur in NRC airspace. Air pollutant emissions would remain unchanged from baseline conditions under the No-Action Alternative.

4.3.2 Proposed Action

NELLIS AFB

Changes in air emissions at Nellis AFB as a result of the Proposed Action were calculated using the same methods and types of input used to determine baseline emissions. All ground-based emission sources associated with the Proposed Action were assessed, including construction of facilities, vehicle travel by new personnel, maintenance, testing, refueling, and emissions from ground equipment supporting the F-22. Emissions associated with airfield operations accounted for taxi, takeoffs, and landings by F-22 within the Nellis AFB airfield environment. The methods for calculating the air quality analysis are presented in detail in Appendix E.

Emissions were calculated for aircraft operations associated with the F-22, including power setting, minutes at taxi/idle, takeoff, climbout, and approach. CO, NO_x, PM_{10}, and SO_x were obtained from the Special Project Office for the F-22 aircraft (personal communication, Captain R. Reed 1998, 1999). VOC rates were derived from the Aircraft Engine Emissions Factors for

the F119 engine (Air Force 1978), an existing, related, high-performance engine with a combustion system similar to the production engine for the F-22 (personal communication, M. Wade 1998).

Since the Proposed Action is scheduled to take several years, emissions impacts were calculated for each year leading up to completion of the aircraft beddown. Table 4.3-l provides a summary

Table 4.3-l. Estimated Additional Annual Emissions for F-22 at Nellis AFB under the Proposed Action (Tons/Year)

Calendar Year	*CO*	*NO_X*	*VOC*	*SO_X*	*PM_{10}*
2000	6	27	1	2	5[1]
2001	<1	<1	<1	<1	<1
2002	32	17	4	1	2
2003	42	59	6	3	3
2004	42	59	6	3	3
2005	44	67	6	4	4
2006	42	59	6	3	3
2007	53	60	11	4	3
2008+	89	124	1 3	7	6

[1] Some variation in construction dates may occur. The PM_{10} estimated emissions from construction at 2008 represent the maximum amount under the Proposed Action. Aircraft emissions are based on 1,878 annual sorties in 2002; 2,140 annual sorties in 2003-2007; and 4,472 annual sorties in 2008.

of the annual additional emissions estimated to occur through 2008 as a result of the F-22 beddown. CO and PM_{10} emissions are especially important because Las Vegas Metropolitan Area and Clark County are not in attainment for these criteria pollutants.

Fluctuations in annual emissions would occur as various phases of the Proposed Action would be completed. Short-term increases in air emissions would result primarily from construction activities and vehicle commuting associated with construction personnel. Long-term increases in emissions would result from commuting by permanently assigned personnel, aircraft operations, and facility space heating. All new point sources of emissions such as hangars or other buildings would be subject to existing permitting requirements. The base air emissions inventories would require updates to reflect new point sources of emissions. Modifications to the current basewide Title V Permit would be required if equipment other than mobile aircraft maintenance equipment was added or replaced. No modification to the Title V Permit is required for changes or additions to mobile equipment used to maintain or service aircraft on the ground. However,

Clark County air quality operating permits for individual pieces of equipment would have to be modified for any change to that equipment. Nellis AFB would apply for all modifications to the Title V Permit and the Clark County air quality operating permits after finalization of equipment needs.

Beddown of the F-22 and its associated actions would result in an overall increase in emissions at Nellis AFB (Table 4.3-2). NO, would increase by the greatest percentage (19 percent) due to the nature of the F-22 engine. PM,, would increase by 11 percent. Increases for all other criteria pollutants would be less than 4 percent. Beddown of the F-22 would increase Nellis AFB's contribution to the overall CO budget for the Las Vegas Metropolitan Area from 2.1 to 2.2 percent. To put this change in perspective, the total annual CO emissions for the F-22 beddown in 2008 would represent only about 0.1 percent of the annual CO budget for the Las Vegas Metropolitan Area. In 2008, all PM,, emissions from Nellis AFB would represent 0.068 percent of the 1995 Las Vegas Valley total, an increase of 0.006 percent over baseline. Emissions associated with F-22 construction projects in 2000 would be expected to account for less than 0.057 percent of all PM,, emissions in the Las Vegas Metropolitan Area.

Table 4.3-2. Summary of Projected Total Emissions at Nellis AFB (Tons/Year)

	CO	NO_X	VOC	SO_X	PM_{10}
Baseline Total	2,644	659	533	372	54
F-22 Projected 2008+	89	124	13	7	6
Post-2008 Total	2,733	783	546	379	60
Percent Change	3.4%	19.1%	2.4%	1.9%	11.1%

Compliance with the Final Conformity Rule is presumed if the emissions associated with a federal action like the F-22 beddown are below the relevant *de minimis* threshold and are regionally insignificant. Since Clark County is designated by the EPA as being in serious nonattainment for CO and PM,, the *de minimis* levels are 100 and 70 tons per year, respectively. Regional significance thresholds for CO and PM,, in Clark County are higher than the *de minimis* thresholds. None of the activities associated with the Proposed Action exceeds the CO or PM,, *de minimis* or regional significance thresholds. Maximum PM,, emissions would be 6 tons per *year* in 2008, or 64 tons below *de minimis*; in all other years, PM,, emissions would range from less than 1 ton per year to 5 tons. Differences in the proposed construction program account for this variation. Maximum CO emissions would be 89 tons per year, or 11 tons below the *de minimis* threshold. Neither CO nor PM,, emissions associated with the Proposed Action would contribute to exceedences or delay achieving attainment in Clark County or exceed regional significance; a conformity determination is not required.

NELLIS RANGE COMPLEX

Total operational activities in the NRC would not differ from those now occurring in the NRC. Under the Proposed Action, F-22 aircraft would conduct approximately 26,000 sortie-operations in the NRC per year after 2007. These F-22 activities would represent 13 percent of total sortie-operations in low-use years (200,000 sortie-operations per year) and 9 percent of total sortie-operations in high-use years (300,000 sortie-operations per year). Since the Air Force anticipates that the F-22 would operate like the existing F-15Cs in the NRC, the distribution of total sortie-operations among the various airspace units would match that of the F-15Cs.

Because the total sortie-operations in the NRC would not change, inclusion of sortie-operations by F-22s would not noticeably alter the emissions for any pollutant. Table 4.3-3 presents the estimated quantities (tons per year) of emissions that the 26,000 F-22 sortie-operations would generate in the different airspace units comprising the NRC. Overall, air quality conditions would remain very similar to those found now, although variations could occur in the totals of different criteria pollutants. Such variation would depend on the total number of sortie-operations and mix of aircraft using the NRC in a given year. Variation in mix and number of aircraft occurs consistently within the NRC so emissions also vary accordingly. Inclusion of F-22 activities would represent just another part of this variation.

Table 4.3-3. Estimated F-22 Aircraft Emissions in Nellis Range Complex Airspace (Tons/Year)

	Desert MOA	*Reveille MOA*	*R-4806*	*R-4807*	*R-4809*	*R-48081*	*Total NRC*
CO	*0.80*	*0.80*	0.61	2.73	0.22	0.44	5.60
NO_x	167.60	34.60	22.60	60.15	4.71	19.64	309.30
VOC	0.20	0.04	0.21	0.15	0.01	0.02	0.63
SO_x	5.10	1.10	0.68	3.69	0.14	0.60	11.31
PM_{10}	1.70	0.40	0.24	1.27	0.05	0.21	2.17

[1] NTS airspace managed by DoE; used for aircraft transit only.

Table 4.3-4 shows that the F-22 would tend to contribute a higher percentage of NO_x and SO,; these increases are due to engine design. The percentage contribution of the F-22 would decrease as total sortie-operations in the NRC increased towards 300,000. For example, F-22 SO, emissions under the 300,000 sortie-operation scenario would represent a 4.6 percent lower contribution to the total SO, emissions than those under a 200,000 sortie-operation scenario. Total emissions for the NRC, including those by the F-22, would continue to be distributed throughout a volume of air of 13,000 cubic miles resulting in low criteria pollutant concentrations (refer to Table 3.3-6). Air quality effects associated with total NRC aircraft operations would continue to be insignificant.

Table 4.3-4. Estimated F-22 Contribution to Total Nellis Range Complex Emissions

	NRC Total Emissions (Tons/Year) 200,000 Sortie-Operations	*% Contribution F-22*	*NRC Total Emissions (Tons/Year) 300,000 Sortie-Operations*	*% Contribution F-22*
c o	110.5	5.6%	165.6	3.4%
NO_x	2083.1	14.9%	3124.4	**9.9%**
voc	15.0	4.2%	24.3	2.6%
SO_x	81.8	13.8%	122.5	***9.2%***
PM_{10}	35.0	6.2%	52.8	4.1%

Use of the NRC by F-22s would not result in exceedences of NAAQS or PSD increments. No measurable changes to ground-level pollutant concentrations (refer to Table 3.3-6) would be anticipated for two reasons. First, F-22 sortie-operations would fall within the 200,000 to 300,000 total sortie-operations in the NRC. Second, the F-22 would spend 89 percent of its flight time at 10,000 feet AGL or higher and less than 8 percent of its flight time below the mixing height of 5,000 feet AGL.

No impairment of visibility in PSD Class I areas would occur as a result of the F-22 beddown. Criteria to determine significant impacts on visibility within Class I areas usually apply to stationary emission sources; mobile sources are generally exempt from permit review. The negligible potential for F-22s to contribute to already minimal pollutant concentrations indicates that the Proposed Action would not impair visibility. Smokeless engines in the aircraft and the F-22's dominant use of altitudes above 10,000 feet AGL make the possibility of visible atmospheric discoloration extremely remote. The Class I area nearest to the NRC is Zion National Park, approximately 37 miles east of the NRC. Emissions from aircraft would quickly disperse and would not be expected to affect visual range from a reference point 37 miles away. Therefore, impacts on visibility from the alternative within Class I areas close to the NRC would be insignificant.

4.4 SAFETY

This section evaluates the Proposed Action to determine its potential to affect safety risks to military personnel, the public, and property. Fire and ground safety are assessed for the potential to increase risk, as well as for the Air Force's capability to manage that risk by limiting exposure, responding to emergencies, and suppressing fires. Analysis of aircraft flight risks correlates projected Class A mishaps and bird-aircraft strike hazards with current use of the airspace to consider the magnitude of the change in risk associated with the proposal. Projected changes to uses and handling requirements of explosives are compared with current uses **and** practices. If a unique situation is anticipated to develop as a result of the Proposed Action, the capability to manage that situation is assessed. Finally, when the changes in risk arising from the Proposed Action are considered individually and collectively, assessments can be made about the adequacy of disaster response planning and the need for new or modified procedures and requirements that may become necessary.

4.4.1 No-Action Alternative

Under the No-Action Alternative, operations on the base and throughout the NRC would be unchanged from current conditions. Ground, flight, and ordnance safety considerations associated with current operations, as discussed in section 3.4, would remain unchanged.

Current operations and training activities on Nellis AFB and within the NRC do not pose a significant safety risk to the public, military personnel, or property. Since these conditions would not change under the No-Action Alternative, it would not result in significant impacts.

4.4.2 Proposed Action

Under the Proposed Action, the beddown of F-22s for FDE program and WS alters some of the conditions regarding safety both on base and within the NRC. However, none of these changes would significantly degrade safety conditions in either ROI. The beddown and operations of the F-22 would not influence current safety conditions or procedures.

NELLIS AFB

OPERATIONS AND MAINTENANCE: Operations and maintenance activities conducted on Nellis AFB would continue to be performed in accordance with all applicable safety directives. There are no specific aspects of F-22 operations or maintenance that would create any unique or extraordinary safety issues.

As part of the F-22 beddown, some new facilities would be constructed, and other, older facilities would be demolished. New facilities would include buildings on the flightline to support F-22 operations and maintenance, additional munitions support facilities, and a new dormitory. No unique construction practices or materials would be required. During

construction, standard industrial safety standards and best management practices would be followed. No unusual ground safety risks would be expected to arise from these activities.

FIRE AND CRASH RESPONSE: Fire and crash response would continue to be provided by Air Force tire departments. If new response procedures are required for unique materials used in the construction of the F-22, they would be developed after the production mode F-22 is finalized. Under the Proposed Action, fire lighters would be fully trained and appropriately equipped for crash and rescue response.

AIRCRAFT MISHAPS: 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 the proposed F-22 operations at Nellis AFB begin, the initial OT&E phase 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. At Nellis AFB, only highly experienced fighter pilots support the FDE phase and develop tactics at the WS. Their activities will provide additional data about the aircraft's safe operating parameters and further minimize flight risks. As the programs proceed 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 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. The majority of flight operations would be conducted over remote areas, where population densities are very low. In the unlikely event that an aircraft accident occurs, it would not subject people or property on the ground to undue risk.

BIRD-AIRCRAFT STRIKE HAZARDS: A total of 135 bird-aircraft strikes have been documented for Nellis AFB over a 1 O-year period. Implementing the Proposed Action would not alter this low rate. Two factors support this conclusion: (1) the F-22 would operate like all other fighters that have used Nellis AFB and rarely encounter bird-aircraft strikes and (2) no aspect of the Proposed Action would increase concentrations of birds on or near the base.

MUNITIONS USE AND HANDLING: On Nellis AFB, a new munitions maintenance and storage facility would be constructed to support JDAM storage. This facility would be designed and approved for JDAM maintenance and storage. No requirements for safety waivers associated with their use are anticipated. The Proposed Action would not require development of new safety arcs nor would it change arming and dearming locations.

NELLIS RANGE COMPLEX

FIRE RISK AND MANAGEMENT: Within the NRC, current procedures to minimize ground safety risks associated with air-to-air and air-to-ground training would continue. Operations and maintenance activities on NAFR would continue to be conducted according to current processes and procedures. All actions would be accomplished by technically qualified personnel and would be conducted in accordance with applicable Air Force safety requirements, approved technical data, and Air Force Occupational, Safety, and Health standards.

Since the use of NAFR would not appreciably change and the overall levels of ordnance and flare use would remain within average yearly variations, there is no anticipated increase in fire risk. The end of this safety section details fire risks associated with the proposed use of flares by F-22s. Planned disaster response actions and range fire suppression capabilities have proven adequate in the past and would likely be adequate in the future. The land areas surrounding training ranges ensure public protection by restricting presence in the safety areas associated with laser use, emitters, and targets supporting air-to-ground ordnance delivery.

SONIC BOOMS: Although the number of booms would be expected to increase (see section 4.2), resulting overpressures would remain well below levels that would create health risks to people or any other safety risks to structures on the ground.

AIRCRAFT MISHAPS: A range of expected maximum and minimum sortie-operations were considered to assess aircraft mishaps under current operations. The greatest indicated risk is associated with use of MOA airspace (Desert MOA). Throughout the MOA airspace, statistical projections indicate the probability of a Class A mishap once every 2 years. However, when the level of use is considered, this equates to a probability of a mishap of only 0.00003 percent per year. Risks associated with aircraft mishaps for aircraft currently using the airspace are anticipated to remain relatively unchanged. The mishap rate and risk of mishaps for a new aircraft like the F-22 may be higher in its early years, but would be expected to decrease through time to lower levels matching those of other fighter aircraft. As more information about the operating characteristics of the aircraft is gained, the probability and risk of a pilot exceeding its safe operating regime is minimized. Given this historic pattern reflecting decreased risk over time, F-22 operations in the NRC would not pose significant safety risks.

BIRD-AIRCRAFT STRIKE HAZARDS: Since 1985, there have been ten documented strikes in the NRC: one was a Class B mishap, three were Class C mishaps, and the other six strikes caused little or no damage. Risk associated with bird-aircraft strikes is expected to remain low under the Proposed Action. The F-22 would fly above 10,000 feet AGL 89 percent of the time. This is well above the altitude (3,000 feet AGL) where 95 percent of bird-aircraft strikes occur.

ORDNANCE USE AND HANDLING: Use of live and training ordnance would continue on NAFR. Training activities would also continue to employ chaff and flares. The F-22 will also be capable of delivering the JDAM or equivalent. By 2008, the JDAMs or other similar ordnance used with

the F-22 would represent about 3 to 5 percent of the total ordnance used on NAFR. Only trained and qualified personnel would handle ordnance in accordance with all explosive safety standards and detailed published technical data.

The overall type and amount of total ordnance expended would continue at current levels, Added tonnage of ordnance contributed by the F-22 would be less than the normal annual variation on NAFR. Weapons employment procedures are detailed in AFI 13-2 12, Volume 2/NAFB Supplement. Operational constraints pertaining to use of specific delivery tactics, ordnance type, or aircraft headings are developed to mitigate any potentially unsafe condition and ensure that ordnance remains within the applicable safety footprint.

No degradation of public safety is expected from release of ordnance by F-22s since there is no public access near target areas. Weapons safety footprints for ordnance delivery by F-22s are currently under development. These footprints will define safety and operational requirements for F-22 ordnance delivery to ensure all ordnance comes to rest within the approved ranges within NAFR.

CHAFF AND FLARES: Under the Proposed Action, 36,000 bundles of chaff and 8,000 flares would be released annually by F-22s, contributing about 9 percent of the total chaff and about 8 percent of the total flare use for the NRC. Since the total amount or type of flares and chaff in the NRC would not increase under the Proposed Action, no change to baseline conditions would be expected.

As described in section 3.4, Safety, available information and studies (Air Force 1997c) indicate chaff poses no health risk to humans or wildlife, affects soils and vegetation negligibly, and is unlikely to impact aesthetics. Assuming a conservative average of 3 million fibers per chaff bundle and an even distribution throughout the NRC, annual F-22 use of chaff would contribute one fiber per approximately 240 square feet. This density would be greater under NAFR airspace, which the F-22 would use the most, but it would still remain quite low and unnoticeable.

The F-22 would release flares as part of the FDE and WS sortie-operations, but this activity would not affect safety, fire risk, or natural resources. Minimum flare release altitude for the F-22 would be 700 feet AGL over the numbered and electronic combat ranges of NAFR and 5,000 feet AGL in the MOAs. While the actual burn time of the flares expected to be used by the F-22 is classified, the minimum release altitude of 700 feet AGL is designed to allow the flares to burn out completely at least 100 feet above the ground (Air Force 1997c). The release altitude in the MOAs provides an additional buffer against burning material contacting the ground. However, 89 percent of F-22 flight activities and flare releases would occur at 10,000 feet AGL or higher. Since flare releases would commonly be more than 13 times the minimum-release altitude, the potential for burning material contacting the ground would be negligible.

In the unlikely event of an inadvertent release of a flare below the minimum altitude, the risk of a wildfire would remain minimal. As described in section 3.4.2, the probability of a fire starting

from a single ignition source such as a flare is extremely low, even with the right fuel, wind, and vegetation conditions.

Flares and flare residues, as detailed in section 3.4.2, do not pose a health risk to humans or animals because they are not likely to be ingested and the quantities involved are negligible. The extremely small quantities of flare residues also have little potential to affect soil or water.

4.5 HAZARDOUS MATERIALS AND WASTE

The qualitative and quantitative assessment of impacts from hazardous materials and waste focuses on how and to what degree the alternatives affect hazardous materials use and management, hazardous waste generation and management, and waste disposal. A substantial increase in the quantity or toxicity of hazardous substances used or generated is considered a potentially significant impact. Reduced quantities and types of hazardous substances would be considered a beneficial impact. If the quantity of hazardous substances used or generated did not change, then there would be no impact.

A comparative analysis of existing and proposed hazardous materials and waste management practices was performed to evaluate impacts. Hazardous waste generation records were reviewed to determine the magnitude of anticipated increases in hazardous waste generation based on historic levels, existing management practices, and storage capacity.

Since changes associated with the Proposed Action in the NAFR and NRC would not affect hazardous materials and waste (section 2.5), only potential impacts on Nellis AFB are discussed. Fire and medical teams responding to F-22 crashes on the ranges would be fully trained in handling the expected resulting hazardous waste and materials. All hazardous material and waste would be removed from the mishap site by trained teams and properly disposed of according to the techniques established by the F-22 Special Projects Office.

4.5.1 No-Action Alternative

Under the No-Action Alternative, Nellis AFB personnel would continue to use hazardous materials in the same manner and quantity as they currently do. The types and amounts of hazardous waste generated would continue without change under this alternative. Existing procedures for the centralized management, procurement, handling, storage, issuing, and disposal of hazardous materials used on base would remain unchanged. Spill prevention, control, and countermeasures plans would not require updating.

The No-Action Alternative includes no specific plans to alter or demolish asbestos-containing buildings. Normal modifications and repairs to such buildings would likely occur as at present. Any asbestos-containing materials encountered during these efforts would be handled under existing rules to reduce exposure to, and release of, friable asbestos.

4.5.2 Proposed Action

HAZARDOUS MATERIALS AND HAZARDOUS WASTE GENERATION: The hazardous materials and waste associated with the F-22 program would not significantly impact installation management programs. Management protocols for hazardous substances related to the F-22 would follow existing regulations and procedures. If any new waste streams are identified after the production

model of the F-22 is finalized, the appropriate transportation, storage, and disposal procedures would be implemented and Nellis AFB's RCRA Part B permit would be modified as necessary.

The F-22 hazardous materials (HAZMAT) program would consist of the following processes: identification and tracking, materials evaluation and materials decision, reporting and documentation, and information dissemination. The HAZMAT program would minimize the quantity and types of hazardous materials associated with the F-22. Ozone-depleting substances would be eliminated. Fire protection systems associated with the F-22 would use HFC 125 for fire zones. The use of cadmium would be minimized. Other substances such as volatile organic compounds, isocyanates, and chrome would be present in coatings, but sanding and overcoating are expected to occur less frequently than with other aircraft. Efforts would continue to minimize the use of methyl ethyl ketone (a toxic solvent) and methylene dianiline (used in adhesives).

The most commonly used hazardous materials on the F-22 flight line would include jet and motor fuels, other types of petroleum products, paints, thinners, adhesives, cleaners, lead-acid batteries, hydraulic fluids, and non-halogenated solvents.

Maintenance activities associated with the F-22 would include Aircraft Structural Maintenance, which includes structural repair, corrosion control, and composite repair; aircraft avionics, electrical system, radar, wheel and tire repair; jet engine, fueling system, structural and navigational/communication repairs; and aircraft washdown. Materials used during these activities would include primers, topcoats, various coatings, solvents, sealants, epoxies, solder, paint and epoxy strippers, adhesives, refrigerants, coolants, hydraulic fluids, cleaners, lubricants, and degreasers.

Other planned maintenance operations would involve minor maintenance for vehicles and equipment associated with the F-22 program. These operations would not differ from those currently performed for vehicles and equipment associated with other aircraft types at Nellis AFB. Petroleum, oil, and lubricants, as well as other substances required for minor maintenance activities, would be stored temporarily at approved accumulation points within the maintenance facility. Substances used for, or resulting from, minor maintenance activities would be stored in small quantities at each facility. Diesel fuel for support vehicles would be stored in existing aboveground storage tanks, and appropriate spill prevention and containment strategies would continue to be implemented. In addition, a spill prevention, control, and countermeasures plan would be implemented, and appropriate spill response equipment would be located on site.

Since complete and specific data for the F-22 are not yet available, quantitative assessment of the potential increase in hazardous waste generation associated with the F-22 mission requires use of surrogate data for similar aircraft. Estimated increases in hazardous waste generation are based on waste generation data for the F-15C, a comparably sized, twin-engine fighter.

Estimates show that about 70 percent of the hazardous waste generated by the F-22 would be derived from six processes: Aircraft Structural Maintenance, aerospace ground equipment

maintenance, in-squadron maintenance, munitions maintenance, propulsion and test cell, and supply fuels management. Less notable contributions to overall waste generation would come from additional maintenance activities, such as avionics, tire and wheel shops, and the structural sheet metal shop.

Estimated waste generation by specific activity is summarized in Table 4.5- 1. After full implementation of the Proposed Action in 2008, F-22 maintenance would generate about 4,000 pounds of RCRA hazardous waste per year (856 pounds per year x 17 aircraft). This total would represent less than a 3 percent increase in total hazardous waste relative to current conditions. No new types of waste streams are anticipated, and this increase would not effect current hazardous waste management protocols or generator status. Nevertheless, if any new waste streams are identified for either classified or non-classified hazardous wastes and materials after the production model of the F-22 is finalized, the appropriate transportation, storage, and disposal procedures would be developed, and Nellis AFB's RCRA Part B permit would be modified as necessary. Through recycling and pollution prevention, hazardous waste at Nellis AFB has declined and will continue to decline. These procedures would be applied to waste streams from the F-22.

Table 4.5-l. Estimated Hazardous Waste Generation (pounds/year/aircraft)

Maintenance Activity	*Pounds*
Aircraft Structural Maintenance	111
Aerospace Ground Equipment	200
In-Squadron Maintenance	368
Munitions Maintenance	40
Propulsion and Test Cell	80
Supply Fuels Management	57
TOTAL	856

Construction and maintenance activities associated with the Proposed Action would require the use of hazardous substances such as petroleum, oil, and lubricants. During construction, use of these substances for fueling and equipment maintenance would have the potential for minor spills and releases. Use of best construction practices would reduce this potential to an insignificant level.

Specialized training for handling and disposal of wastes would be available for any personnel associated with the Proposed Action that may come in contact with these materials. In addition, a ***Storm Water Pollution Prevention Plan*** (Air Force 1998) prepared by Nellis AFB personnel

provides methods for the reduction or elimination of pollution in local groundwater sources, if any hazardous materials are inadvertently released.

Adherence to all requirements for hazardous materials storage and use, as well as temporary storage of hazardous wastes, would be monitored under the Air Force's Environmental Compliance Assessment Management Program.

ASBESTOS: Asbestos may be encountered as structures are remodeled or demolished to accommodate new F-22 support facilities. The Air Force currently practices to remove exposed friable asbestos and manages other asbestos-containing materials in place, depending on the potential threat to human health. Friable asbestos, if encountered, would be removed and disposed of in a local asbestos-permitted landfill.

Analysis of the potential impacts to earth resources employs the following steps: identifying locations where the actions may directly or indirectly affect earth resources; defining the nature of the affected earth resource; and evaluating the degree to which the characteristics, abundance, or value of the resource would be altered, depleted, or degraded.

In terms of water resources, no aspect of current operations at Nellis APB affects either hydrologic setting or water sources; this would not change under the Proposed Action. Therefore, this analysis focuses on potential effects on water use, availability, and quality.

Since changes associated with the Proposed Action in the NRC, including NAFR, would not affect any undisturbed earth or water resources (refer to section 2.5), this section discusses only potential impacts on Nellis APB.

4.6.1 No-Action Alternative

Implementation of the No-Action alternative would result in no change in activities at Nellis AFB. As a result, no change in topography or soil erosion would occur. Furthermore, no change in water uses, availability, or quality would be expected. Therefore, no impact to surface water or groundwater would occur if the No-Action Alternative were implemented.

4.6.2 Proposed Action at Nellis AFB

EARTH RESOURCES: The potential for impacts from the Proposed Action on Nellis APB would be associated with construction of new facilities and, to a lesser degree, alteration of existing facilities. Soil loss and erosion could potentially take place, but, as described below, the impact caused by soil loss and erosion would be negligible.

Site grading associated with construction of the flightline, munitions, and dormitory facilities would be the primary activity with the potential to affect earth resources. Grading for new facilities would cause loss of some disturbed groundcover, which would increase the potential for soil erosion. However, several factors indicate that erosion and soil loss would be negligible. First, the area affected would be only 4.0 acres within the developed portion of Nellis AFB. Roughly 39 percent of the proposed construction would replace existing buildings. Second, construction activities would take place over 7 years and range from about 4,200 to 91,030 square feet in any single year, limiting the total area exposed to erosion at any one time. Third, low precipitation (8 inches per year) and low runoff (0.2-2.1 inches per year), combined with the flat topography of the base, would substantially reduce the potential for erosion. Lastly, Air Force requirements to employ standard construction practices (e.g., soil stockpiling and watering) would further limit both wind and water erosion. Based on these factors, construction grading would not measurably degrade soil resources through erosion or loss. Similarly, fugitive dust would be limited (see section 4.3, Air Quality).

WATER AVAILABILITY, USE, AND QUALITY;' Under the Proposed Action, construction activities and personnel increases are not expected to appreciably affect the surface waters at Nellis AFB or in the surrounding areas. Surface water for Nellis AFB is transported via pipelines from Lake Mead. Sources of groundwater are available from the principal alluvial-fill aquifer underlying the Las Vegas Valley. Although proposed changes in operations and personnel would increase the use of water, the increase in personnel would be only about 4 percent, and on-base construction would be temporary and use little water. Use of water for F-22 program activities, including personnel, is likewise expected to be limited, and its affect on the availability of groundwater at Nellis AFB or in the surrounding areas would be minimal.

Use of water for the proposed F-22 programs would not significantly affect availability of surface water or groundwater at Nellis AFB or elsewhere in the area. Full implementation of the F-22 programs in 2008 would result in use of approximately 400 to 500 AFY, which is well within Nellis AFBs water allocation and will not require Nellis AFB to seek additional water rights.

Projected on-base construction would disturb existing groundcover, but the potential for soil loss, erosion, and sedimentation would be temporary and limited in scope. Required use of best management practices would further reduce this impact. Because no perennial or ephemeral streams, natural lakes, or other open bodies of water are present at Nellis AFB, no sediments would be introduced into surface waters.

The Proposed Action includes paving and construction of buildings with impermeable surfacing. During construction at Nellis AFB, soils would temporarily be compacted, which would impede drainage and reduce water infiltration. In other areas, such activities could increase runoff volumes and could alter current hydrological processes. However, the base lacks significant open water bodies and the area altered would be 4.0 acres. Since no surface water resources of consequence are located on base and the newly impenetrable surfaces would be less than 0.04 percent of the total base, implementation of the Proposed Action would not significantly impact surface water. Existing spill prevention, control, and countermeasure plans would protect surface water sources during construction and use of facilities, so the potential for on- or off-base surface water quality to be affected would be negligible.

Construction and paving associated with the Proposed Action would result in slightly fewer acres available to facilitate groundwater recharge, but the impact would be negligible given the low average annual precipitation and the lack of year-round surface water on base. Infiltration historically has been a minimal source of recharge.

No floodplains have been identified on base. Since the existing potential for flooding on Nellis AFB is minimal, the Proposed Action would not increase flood hazards on the base.

4.7 BIOLOGICAL RESOURCES

Determination of the significance of potential impacts to biological resources is based on (1) the importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource, (2) the proportion of the resource that would be affected relative to its occurrence in the region, (3) the sensitivity of the resource to proposed activities, and (4) the duration of ecological ramifications. Impacts to biological resources are significant if species or habitats of high concern are adversely affected over relatively large areas or disturbances reduce population size or distribution of a species of high concern. No significant impacts to biological resources would result by implementing the Proposed Action.

This section analyzes the potential for direct or indirect impacts to biological resources from implementation of the Proposed Action. Direct impacts would be associated with the proposed construction and operations of facilities at Nellis AFB, and direct and indirect impacts could result from the proposed operation of the F-22 over the NRC.

4.7.1 No-Action Alternative

Under the No-Action Alternative, there would be no change to current baseline conditions. No new construction or testing and training operations would occur; therefore, there would be no impact to biological resources.

4.7.2 Proposed Action

NELLIS AFB

VEGETATION: The Proposed Action, requiring the construction of new facilities and the demolition of older facilities, would be restricted to six previously disturbed areas on Nellis AFB. Since construction activities, structural modifications, and demolition associated with the Proposed Action would occur in previously disturbed areas that currently support no sensitive plant species or wetlands, there would be no significant impacts on vegetation at Nellis AFB.

WETLANDS: No designated wetlands or areas exhibiting wetland characteristics exist on or near the proposed areas of construction; therefore, implementation of the Proposed Action would have no impact on wetlands.

WILDLIFE: Since the proposed facilities construction and modifications would occur on previously developed areas that are predominantly graded or paved, proposed construction activities would not have significant impacts on terrestrial wildlife.

Projected noise levels with the addition of the F-22 at Nellis AFB are similar to current baseline noise levels (see section 4.2, Noise and Land Use). Wildlife would not be adversely affected.

Bird-aircraft strikes have not historically presented an operational constraint to Nellis AFB. In the course of over 700,000 airfield operations between January 1985 and October 1996, there

have been a total of 135 bird-aircraft strikes (none of these Class A or B mishaps) involving Nellis AFB aircraft within the immediate vicinity of the base (see section 3.4, Safety). Since the Proposed Action would only increase base operations by 13 percent and Nellis AFB has a successful and aggressive Bird Airstrike Hazard program, a significant increase in bird-aircraft strikes around Nellis AFB is unlikely.

THREATENED, ENDANGERED, AND SENSITIVE SPECIES: Only the federally listed deserttortoise, listed as threatened by both the USFWS and NDOW, exists on Nellis AFB. Surveys conducted in 1992 found a small population in the northeastern portion of Area II. Current plans are to locate the munitions facilities in previously disturbed sites within the fenced munitions storage area, near similar facilities. A previous USFWS opinion (USFWS 1992a) regarding the potential current or future impacts to the desert tortoise population states the level of impact was ". . .not likely to appreciably reduce the likelihood of survival and recovery of the Mojave population of the desert tortoise in the wild.. . " The USFWS issued reasonable and prudent measures, including implementing terms and conditions designed to minimize incidental take in Areas I, II, and III. According to 50 CFR Section 402.16, any new Air Force action that may affect the desert tortoise in Area II, not considered in previous biological opinions, would require reinitiation of consultation with the USFWS. Nellis AFB would avoid impacts to the tortoise due to construction activities. Since projected noise levels (see section 4.2, Noise and Land Use) would diverge little from current levels, the desert tortoise would not be adversely affected by noise associated with the Proposed Action.

The California bearpoppy, currently listed as a species of concern, is located in Areas II and III on Nellis APB. Construction activities would be restricted to previously disturbed areas and would not impact this species. Other federal species of concern, chuckwalla, banded gila monster, 11 species of bats, and 4 species of birds, would not be affected by the Proposed Action.

NELLIS RANGE COMPLEX

VEGETATION: Potential impacts to vegetation resources were evaluated for both direct and indirect effects as a result of fire; ordnance delivery, recovery, and removal; and maintenance of targets.

The use of flares and ordnance delivery may occasionally result in accidental fires that adversely affect vegetation and wildlife habitat by removing plant cover (short-term effect) or altering the plant community (long-term effect). Removal of vegetation can also lead to increased erosion and sedimentation that can cause long-term environmental change. The level and extent of effects on biological resources are site specific and depend on factors such as type of plant community (i.e., adaptation to fire), season, and frequency of fires.

Range areas occasionally have fires, either caused by munitions spotting charges or, in rare cases, flares. Techniques used to keep fires from spreading include placing fire breaks around targets, on-site fire spotting, and fire suppression crews (Air Force 1997d). An MOU exists between Nellis AFB and BLM, which establishes basic procedures and responsibilities for fire prevention, reporting, and fire suppression and management (Nellis AFB and BLM 1987).

Existing operational restrictions (altitude restrictions, fire rating restrictions, flare types permitted) are greater in training areas (i.e., MOAs) over non-DoD land. Restrictions at NRC set a 5,000-feet AGL minimum-release altitude in MOAs overlying public land (Air Force 1997e). With the current restrictions and guidelines for flare use over MOAs, the chance of fires is extremely rare; therefore, impacts to areas underlying MOA airspace due to flare use would not be significant.

The most prevalent procedures currently used to reduce fire risk from flares are suspension of flare use during periods of high fire risk and restricting the release altitude of flares. Suspension of the use of flares during high-risk periods is an effective procedure to reduce fires (Air Force 1997c). Although four to five fires occur on NAFR every year caused by ordnance, flares, or other sources, they tend to be small and contained within the target areas, which are generally devoid of vegetation or have fire breaks around them. Therefore, impacts to vegetation on the ranges and under the MOAs would be short term and minimal.

Under the Proposed Action, F-22s would use existing target areas on NAFR for ordnance delivery and training; no new roads, targets, or facilities will be built. Since flight activities do not result in any ground disturbance, habitat underlying the Desert and Reveille MOAs would not be impacted.

WETLANDS: Wetlands in the North and South ranges are composed of springs and seeps, and the pools, small streams, and saturated soils they support; there is only one intermittent creek found on either range. Due to the dispersed nature of these resources and the lack of any ground-disturbing activities (e.g., ordnance use) at or near any wetland area, impacts to wetlands would not be significant. Since the lands underlying the Desert and Reveille MOAs would not be subjected to any ground-disturbing activities, wetlands found there would not be affected by the Proposed Action.

WILDLIFE: Potential impacts to wildlife were evaluated for both direct and indirect effects as a result of fire, ordinance delivery, recovery and removal; maintenance of targets; fires; and noise. For a discussion of bird-aircraft strike hazards, see sections 3.4 and 4.4.

There is a possibility that flare use and ordnance delivery may start accidental fires. Impacts to wildlife due to fire would be due to habitat disturbance, similar to those described for vegetation; these impacts would be short term and not significant. Fires would be less likely to occur in MOAs because ordnance delivery, the predominant cause of military-related tires, would not occur.

Under the Proposed Action, F-22s would use existing target areas on NAFR for ordnance delivery and training; no new roads, targets, or facilities would be built. Lands underlying the Desert and Reveille MOAs would not be subject to any ground-disturbing activities. Because there would be no new ground-disturbing activities from implementation of the Proposed Action, impacts to wildlife habitat would not occur.

The greatest impact to wildlife from aircraft overflights is from the visual effect of the approaching aircraft and the concomitant subsonic noise. Most reactions by wildlife to visual

stimuli occur in response to overflights below 1,000 AGL (Lamp 1989; Bowles 1995). No major visual impact is expected from F-22 overflights since 94 percent of the operations would take place at altitudes above 1,000 feet AGL and 90 percent would occur above 10,000 feet. Those operations that would take place at altitudes below 1,000 feet AGL would be restricted to target areas on both ranges.

Studies on the effects of noise on wildlife have been predominantly conducted on mammals and birds. Studies on subsonic aircraft disturbances of ungulates (e.g., pronghorn, bighorn sheep, elk, and mule deer), in both laboratory and field conditions, have shown that effects are transient and of short duration and suggest that the animals habituate to the sounds (Workman et *al.* 1992; Krausman *et* al. 1993, 1998; Weisenberger *et* al. 1996). Similarly, the impacts to raptors and other birds (e.g., waterfowl, grebes) from aircraft low-level flights were found to be brief and insignificant and not detrimental to reproductive success (Smith ***et al.*** 1988; Lamp 1989; Ellis et ***al.*** 1991; Grubb and Bowerman 1997). Consequently, changes to the number and types of overflights are not expected to significantly impact wildlife or wildlife populations.

Subsonic noise levels and overflights associated with the Proposed Action over the entire NRC are similar to those for baseline conditions (see sections 3.2 and 4.2, Noise and Land Use) and are within normally acceptable criteria. Since there is essentially no change, the Proposed Action would not result in significant impacts to wildlife from subsonic noise.

Supersonic operations would take place within currently authorized areas of the NRC. Only in Elgin, Coyote, and R-74 airspace units did projected noise levels for supersonic flight operations exceed 45 CDNL. In these three areas, the number of sonic booms expected to reach the ground would increase a maximum of six per month, for a total of between 10 and 35 per month.

Studies of the effects of supersonic noise on birds and mammals have suggested that animals tend to habituate to sonic booms and that long term effects are not adverse. Captive and free-ranging ungulates exhibited a startle response and increased heart rates upon initial exposure to a sonic boom and decreased response with succeeding exposures (Workman *et al.* 1992). In raptors, Ellis *et al.* (199 1) found that peregrine and prairie falcons' responses to simulated sonic booms were often minimal and never associated with reproductive failure. Typically, birds quickly resumed normal activities within a few seconds following a sonic boom. While the falcons were noticeably alarmed by the sonic booms, the negative responses were brief and not detrimental to reproductive success during the course of the study. Sonic boom levels and frequency of occurrence are slightly higher than baseline levels (see section 4.2, Noise and Land Use); therefore, potential impacts to wildlife from sonic booms would not be significant.

THREATENED, ENDANGERED, AND SENSITIVE SPECIES: No federally listedplantspecies are known to occur on the ranges. Some populations of sensitive plant species are found on the ranges, but not within existing target areas. Other listed plant species, such as Beatley milkvetch, half-ring pod milkvetch, Ute ladies'-tresses, and sunnyside elkweed are known or suspected to occur on the NRC, but are not found on the NAFR. Existing threats to populations of sensitive plant species on the ranges include ordnance delivery and the use of flares (see section 4.7.2). Threats to these plant populations are minimal, since ordnance delivery activities are restricted to existing target areas; therefore, impacts to sensitive plant species found on the ranges would not be significant.

According to the USFWS Biological Opinion that reviewed the potential impacts to desert tortoise populations on Ranges 62, 63, and 64, ". . . current weapons testing and training is not likely to jeopardize the continued existence of the desert tortoise, and is not likely to destroy or adversely modify designated critical habitat." The USFWS issued a number of reasonable and prudent measures, with their implementing terms and conditions, which are designed to minimize incidental take that might otherwise result from current weapons testing and training (USFWS 1997a).

Impacts due to fire on threatened and endangered species and sensitive wildlife species, both on NAFR and NRC, would be minimal, since the chance of fires caused by flares or munitions is extremely low.

The only federally listed species occurring on the ranges that may be affected by noise is the desert tortoise. Studies on the effects of subsonic noise on desert tortoises have found impacts to be insignificant (Bowles *et al.* 1996). Subsonic noise levels associated with the Proposed Action are similar to those under baseline conditions (see sections 3.2 and 4.2, Noise and Land Use). Since there is essentially no change, the Proposed Action would not result in significant impacts to special status species from subsonic noise. Supersonic flight would not occur in airspace over desert tortoise populations.

As with other wildlife found under MOAs, the greatest effect of military overflights on special status species is from the visual effect of the aircraft and its associated noise. Visual impacts are not expected to be significant because most MOA operations would take place at altitudes above 1,000 feet AGL, which is higher than the level at which wildlife react to visual stimuli (Lamp 1989; Bowles 1995).

The impacts of noise from aircraft overflights on special status species are expected to be the same as those discussed for wildlife. Winter populations of bald eagles are found on Pahranagat NWR under the Desert MOA. Pahranagat NWR and other noise-sensitive habitats underlying MOA airspace, including Desert NWR and Key Pittman Wildlife Management Area, have overflights restricted to 2,000 feet AGL and supersonic overflights restricted to 5,000 feet AGL. Pahranagat NWR is further avoided by 1 NM (Air Force, Navy, and DOI 198 1). Transient, migrating peregrine falcons may be present in low numbers within the NRC, but the impacts to these individuals from noise are not expected to be significant.

Overall, there would be no significant effect on special status species because aircraft operations and noise levels would not substantially increase over existing levels. Most of the additional operations would occur at high altitudes, therefore, these operations would not take place in areas with concentrations of noise-sensitive endangered species.

4.8 CULTURAL RESOURCES

The methodology for identifying, evaluating, and mitigating impacts to cultural resources has been established through federal laws and regulations including the National Historic Preservation Act, the Archaeological Resource Protection Act, the Native American Graves Protection and Repatriation Act, and the American Indian Religious Freedom Act. This process requires identifying significant cultural resources potentially affected by an action, determining the effect of that action, and implementing measures to avoid, reduce, or otherwise mitigate those effects.

A project affects a significant resource when it alters the property's characteristics, including relevant features of its environment or use, that qualify it as significant according to the National Register of Historic Places (NRHP) criteria. Effects may include the following:

- Physical destruction, damage, or alteration of all or part of the resources;
- Alteration of the character of the surrounding environment that contributes to the resource's qualifications for the NRHP;
- Introduction of visual, audible, or atmospheric elements that are out of character with the resource or alter its setting; and
- Neglect of the resource resulting in its deterioration or destruction.

Potential impacts are assessed by (1) identifying project activities that could directly or indirectly affect significant resources; (2) identifying the known or expected significant resources in areas of potential effect; and (3) determining whether a project activity would have no effect, no adverse effect, or an adverse effect on significant resources (36 CFR 800.9).

General sources of impacts to archaeological, architectural, and traditional resources from the Proposed Action may include the following:

- Ground disturbance from construction or modification to facilities.
- Noise, vibrations, and visual impacts from construction and air and ground operations.

Impacts to traditional cultural resources can be determined only through consultation with the affected American Indian groups. However, physical disturbance to prehistoric archaeological sites (especially rock art sites), disturbance to traditionally used plant and animal resources, and increased noise over sacred or traditional use areas have often been cited by American Indians as significant impacts. Consultation with American Indian groups was conducted through the Native American Interaction Program (NAIP) by Nellis AFB in accordance with the *Presidential Memorandum on Government-to-Government Relations with Native American Tribal Governments;* Executive Order *13084, Consultation and Coordination with Indian Tribal*

Governments; DoD Policy on American Indian and Native Alaskan Consultation (1998); and Executive Order *13007, Sacred Indian Sites.*

4.8.1 No-Action Alternative

Under this alternative, no new construction, building modifications, additional target use, or increased noise or sonic booms would occur. The effect on the environment would be unchanged relative to baseline. Therefore, this alternative would have no impacts to archaeological, architectural, or traditional resources.

4.8.2 Proposed Action

NELLIS AFB

ARCHAEOLOGICAL RESOURCES. Building construction activities could affect cultural resources; however, new construction is proposed within already disturbed sections of Areas I and II, and effects to archaeological resources due to construction is unlikely. All of Area I and 66 percent of Area IT have been surveyed for archaeological resources. A total of 66 archaeological sites have been recorded and 22 of these, including six prehistoric and two historic districts all within Area II, are considered eligible to the NRHP. If the new construction is placed in areas that are developed or previously disturbed or within areas previously surveyed that do not contain archaeological sites, then no impact to archaeological resources is expected. Under the Proposed Action, new construction is proposed for disturbed areas within the Munitions Area in Area II. The Munitions Area has never been surveyed for cultural resources. When new construction is placed in unsurveyed areas or areas known to contain archaeological resources, then Section 106 consultation and survey to identify archaeological remains would be conducted. Nellis AFB would avoid disturbing significant cultural resources of possible.

In addition to construction and demolition on base, the addition of 17 F-22 aircraft would expand the areas adjacent to Nellis AFB subject to noise equal to or above 65 dB. The effects of noise on archaeological resources may be related to setting. Noise that affects setting may be caused by construction and maintenance of facilities and by machinery or vehicles. Aircraft noise and overflights can also affect setting. To be adversely affected, the setting of a resource must be an integral part of the characteristics that qualify the resource for listing on, or eligibility for, the NRHP. Because of modern development, this characteristic is often not the case for significant cultural resources, especially in urban or semi-urban environments. Even in rural areas, noise intrusions from vehicles, farm machinery, and off-road machines may create a noise environment that is probably inconsistent with the original setting of the property.

If the audible and visible aspects of the setting are fundamental to the resource's significance, then the nature and magnitude of potential impact from audible or visual intrusions on that setting can be evaluated. Intrusions sufficient to alter the setting can adversely affect the resource. The nature and magnitude of the impacts depend upon the characteristics of the affected cultural resource, the amount by which the sound level exceeds baseline noise levels, the other types of

noise sources in the vicinity of the cultural resource, and the frequency with which people visit the resource.

The area adjacent to Nellis AFB is currently used for grazing or development, and it contains two major highways. There are over 20 prehistoric sites and portions of several historic transportation sites known to occur here, including the Arrowhead Trail. Fourteen of these resources are potentially significant. Additional noise is unlikely to adversely affect archaeological resources in this area or the existing setting.

ARCHITECTURAL RESOURCES. None of the buildings subject to demolition or modification are considered significant cultural resources. Therefore, construction activities would not have an adverse effect on architectural resources on Nellis AFB. Since no historic structures are located near construction areas, and they are unlikely to be affected by vibrations and noise. Historic structures are also unlikely to be affected by noise and vibrations by overflights. Noise levels (SEL) for the F-22 would not exceed 110 dB.

Studies have established that damage to structures from subsonic noise-related vibration, even historic buildings, requires high decibel levels generated at close proximity to the structure and in a low frequency range (Battis 1983, 1988; USFS 1992). Aircraft must generate at least 120 dB at a distance of no more than 150 feet to potentially damage structures (Battis 1988).

A study by Wyle Laboratories (Sutherland 1990) indicated that a large, high-speed aircraft flying directly over a building had less than a 0.3 percent chance of damaging fragile structures such as wooden buildings. The probability of an aircraft operating at 200 feet AGL at 540 knots true airspeed directly over such a structure is extremely unlikely to cause damage. Operations at higher elevations would have a lower potential for causing damage since on-the-ground noise levels decrease as the aircraft rises. Structures offset from the flight track have an even lower probability of being affected by low-flying aircraft. Since 90 percent of the F-22 sortie-operations would be conducted over 10,000 feet AGL, damage to structures from either noise or vibrations is unlikely.

TRADITIONAL CULTURAL RESOURCES. Noise could potentially affect traditional cultural resources in a variety of ways (AIWS 1997). For example, traditional ceremonies and rituals by members of tribes included in the Consolidated Group of Tribes and Organizations (CGTO) often depend on isolation, solitude, and silence. An aircraft flying overhead, even at very high altitudes, may be deemed an intrusion by members of the CGTO. Overflights and vehicle traffic can be disruptive for American Indians engaged in ceremonial activities, sometimes preventing these activities from being conducted in certain locations.

Traditional resources are not known to exist in this area, but if they do exist, it is unlikely that adverse effects due to the noise increases would result, given the previously developed nature of the area. During discussions with American Indian groups on the effect of noise increases around Nellis AFB due to the Proposed Action, no concerns were expressed.

NELLIS RANGE COMPLEX

***ARCHAEOLOGICAL** RESOURCES.* Ordnance delivery would take place on existing target complexes on the NAFR under the Proposed Action. Similar ordnance is being used at these target areas, and delivery of additional ordnance by F-22 aircraft would not increase disturbed areas near targets. F-22 use of ordnance on existing targets would be unlikely to adversely affect significant cultural resources.

ARCHITECTURAL RESOURCES AND TRADITIONAL CULTURAL RESOURCES. Subsonicnoisewould not increase within the NRC as a result of the Proposed Action. Therefore, no effect to cultural resources is expected from increased subsonic noise associated with the beddown of F-22 aircraft at Nellis AFB.

It is possible for sonic booms to adversely affect some cultural resources. Individual sonic booms vary considerably. The average boom pressure on the ground is 1 pound per square foot (psf). Overpressures on the order of 2 psf would break approximately 75 panes per million. Maximum overpressures of even 6 psf have an extremely low potential to damage structures or displace rocks (Battis 1983). Therefore, while there is some potential for sonic booms to break windows in historic buildings, there is very low potential for structural damage to architectural resources or for displacement and breakage of the components of most archaeological resources.

Supersonic noise levels would increase by 1 to 3 dB (CDNL) under the Proposed Action in R-74, Elgin, and Coyote airspace. Frequency of sonic booms expected with the F-22 would also increase 4 to 6 per month in NRC airspace approved for supersonic flight. Supersonic flight is restricted over Pahute Mesa, Caliente, R4808, and Highway 168 in the southeastern section of the Desert MOA (see Figure 2.2-7) and this restriction will remain unchanged for the Proposed Action. Potential effects from sonic booms include audible intrusions to traditional resources and vibration effects to historic structures and rock art sites. There is very low potential for structural damage to architectural resources due to sonic booms. Therefore, no adverse effects to architectural resources are expected due to an increase in supersonic noise levels or frequency of sonic booms. An increase in sonic boom frequency could adversely affect traditional use or sacred areas by creating an audible intrusion to the setting; however, previous consultations have not elicited concerns. Continuing consultation with American Indian groups would continue through the NAIP to identify areas of concern and to determine the extent of effects to these resources.

Potential effects to cultural resources from chaff are primarily related to visual impacts to resources where setting is the primary significance criteria. These resources may include rural historic landscapes or traditional or sacred areas. The effects to cultural resources from the use of flares is usually associated with the secondary effects of fire. The probability of flares causing fires is usually related to the chances of unexpended flares reaching the ground, the chances of flames igniting vegetation, and the chances of the fire spreading (Air Force 1997c). Chaff and flares would continued to be used as described in section 4.4. This continued use would have a negligible, if any, effect on cultural resources.

4.9 TRANSPORTATION

Since transportation resources should be affected only by on-base construction and increased personnel, the transportation analysis focuses on Nellis APB road network, including those roads which access the base.

4.9.1 No-Action Alternative

Under the No-Action Alternative, transportation activity would continue at the current levels, and jurisdiction of roads would remain unchanged. Implementation of the No-Action Alternative would create no specific impacts to transportation.

4.9.2 Proposed Action

The Proposed Action could affect transportation due to an increase in personnel and planned on-base construction activities. Construction activities, planned for three locations on Nellis APB, are scheduled to occur during three phases over an eight-year period. These activities may result in temporary delays and creation of alternative traffic patterns. Due to the temporary nature of the construction, the staggered completion schedule, and the relative dispersal of the locations, no significant impacts are anticipated.

Off-base transportation and traffic in the vicinity of Nellis APB could be affected by the Proposed Action. In fiscal year 2002, 172 additional personnel are anticipated. Each person would live off base; therefore, average daily traffic would increase on access roads into the base. During the first quarter of fiscal year 2007,195 new personnel are anticipated; 84 of these individuals would be housed on base in the new dormitory facility. Of the remaining 111 individuals who would reside off base, a limited number may participate in car pooling and ride-sharing, and people would be accessing the base at different times because their work schedules would vary. The resulting minimal increased traffic caused by additional personnel would represent a negligible effect on the volume-to-capacity (V/C) ratio.

One intersection within the Nellis APB transportation network, Tyndall Avenue gate and Nellis Boulevard, is rated below the minimum desirable design standard. Increased vehicular activity associated with the proposed addition in personnel could further degrade this condition. Long-range base plans indicate that the Tyndall Avenue gate will be widened. Completion of this plan would help to alleviate the congestion.

4.10 RECREATION AND VISUAL RESOURCES

Potential issues and concerns regarding recreation and visual resources arising from the Proposed Action include an increase in noise, overcrowding of recreation facilities on base, and degradation of the visual environment.

The methodology for determining impacts on recreation resources focuses on (1) determining existing users, (2) determining the noise and visual impacts on recreational use due to a change in sortie-operations on the NRC and airfield operations at Nellis AFB, and (3) determining the effects to recreation of increased personnel on base.

The methodology for determining impacts to visual resources involves review of the visual resources management (VRM) guidelines used by the BLM. Where VRM is not used, scenic or specifically designated areas are identified and the effects of the Proposed Action on the visual quality are assessed.

4.10.1 No-Action Alternative

Under the No-Action Alternative, no increase in base personnel would occur. Access to and availability of recreational resources would remain unchanged. Military aircraft would continue to use the NRC, noise would not increase, and visual resources would remain unchanged. Therefore, under this alternative, no impacts to recreation are expected.

4.10.2 Proposed Action

NELLIS AFB

RECREATION As a result of the Proposed Action, use of on-base facilities by personnel could increase. Recreational activities and sports leagues are evaluated annually. Influxes of personnel are common on the base due to the large number of temporarily assigned personnel. Therefore, an increase in base personnel as a result of the Proposed Action would not adversely affect recreation activities on base.

Recreation is not expected to be affected by noise resulting from the proposed aircraft operations. Noise levels on base range upwards from 65 DNL (see section 4.2, Noise and Land Use), These noise levels are consistent with the existing base noise environment.

One local park lies within the 70 dB noise contour (see Figure 4.2-4). This noise level is considered an acceptable level in accordance with current Clark County regulations. Projected noise increases associated with the F-22 would place this park within the 75 dB contour. However, the location of the park near current 75 dB levels indicates a change of less than 2 dB, which is not considered significant. Three other parks would fall within the 65 dB contour, which is within acceptable levels. Twelve schools and four churches also fall within areas with

noise levels up to 75 DNL. Changes in noise levels for these facilities do not exceed 2 dB and are not significant.

NELLIS RANGE COMPLEX

RECREATION: Public access to NAFR is restricted: few recreational activities occur there. Hunting is the only recreational activity allowed on NAFR. Only under permit conditions and existing MOUs are recreational visits allowed. Because the Proposed Action does not require a change in access for hunting nor does it change the amount of land available, this activity is not expected to change. Hunting on the range would continue to be coordinated with the NDOW and USFWS. Because access would not be restricted on the outlying areas of NAFR, no impact is expected to these areas. The legislative EIS for the NAPR Withdrawal Renewal proposes to allow public use of small portions at the boundary of the NAFR. F-22 operational would not affect the use of these areas.

Noise levels vary from 45 L_{dnmr} to 61 L_{dnmr} over NAFR (refer to Table 4.2-7). Much of the airspace associated with NAFR is located over DoD or DoE controlled land with restricted recreational use. Underneath the NRC, an impact to recreational use is not expected since subsonic noise levels would not perceptibly change.

Average supersonic exposures would probably increase as a result of the Proposed Action. Under the Elgin airspace, the average number of sonic booms would increase by about 20 percent from 20 to 24 booms per month. Under the Coyote airspace, the average number of sonic booms would increase from 4 to 10 booms per month (see Table 4.2-8). There are a number of recreation areas under these MOAs (see Figure 3.1 0-2), including Key Pittman Wilderness Management Area, White River Petroglyphs site, Beaver Dam State Park, and Ella Mountain. These sonic booms could be perceived as annoying to visitors in a wilderness setting. Due to the subjective nature of annoyance from noise disturbance and because the area is currently subject to sonic booms, some visitors would not be annoyed by the increase. Recreation visitors in developed areas would probably not be affected, because these areas tend to have higher ambient noise levels. In all other MOAs and restricted airspace except for R-74, the frequency of sonic booms is expected to remain the same as under current conditions. Since no recreation is permitted in this area, no impact to recreation is expected.

VISUAL: Impacts from aircraft overflights on the visual environment are difficult to quantify. This difficulty stems from the inability to separate visual impacts from the noise of the overflight. Aircraft overflights are usually noticed because of accompanying noise. Aircraft emissions would not be expected to impair visual quality (section 3.3).

Military aircraft overflights are transitory. The nature of the impact depends on the sensitivity of the resource, the distance from which the aircraft is viewed, and the length of time it is visible. Altitude relative to the viewer also plays a key role in determining impacts. Eyes are typically drawn to the horizon than to the area overhead; people are, less likely to notice aircraft at higher altitudes. Within highly vegetated mountainous areas, views would tend to be screened or

extremely brief. In such areas, the lower the altitude the aircraft flies, the more likely that views of passing aircraft are screened.

The most visually sensitive areas in the NRC include state parks and wildlife refuges (VRM Class II areas). Where the terrain is hilly or undulating, views of aircraft are brief. In areas of flat terrain, the views can be expansive, and military aircraft can be detected. On the open desert, where vegetation is low and visibility unimpaired, the visual effects of low-flying aircraft may also affect the sense of solitude and naturalness for individuals seeking a primitive recreational experience. Since total flight activity in the NRC would not change (see section 2.3), F-22 use would not add to potential visual effects from aircraft flight. F-22 activities would likely be less noticeable because of the higher operational altitudes.

4.11 SOCIOECONOMICS

Analyses of potential impacts to socioeconomic resources performed for this EIS considered both economic and social characteristics of the affected region. These characteristics include the size and demographic composition of the population; employment, income, and other general economic indicators; and population-related resources such as housing and public schools.

Assessment began with a determination of the economic impact of current operations at Nellis AFB presented in section 3.11. Data used to summarize current conditions were obtained primarily from an Economic Resource Impact Statement (ERIS), which included a detailed, categorical breakdown of personnel levels at the base, including payroll disbursements and expenditures in the region (e.g., for contracted service providers, etc.). Assessment of the base's current socioeconomic impact on the ROI enables the most accurate projections possible of impacts to affected indicators that could be realized upon implementation of the Proposed Action.

Two resources originally thought to have the potential to be adversely impacted were housing and public services. Analysis of the housing sector involved examination of the proposed personnel increase as it would impact regional housing supply (e.g., determining whether sufficient-and suitable-vacancies occur on base and in regional housing markets to accommodate increased personnel levels and associated dependents). Assessment of impacts to public services (e.g., availability of sufficient quantity and quality of utilities, fire and police protection, and educational facilities) involved correspondence with purveyors of such services.

4.11.1 No-Action Alternative

Under the No-Action Alternatives, there would be no beddown of F-22 aircraft at Nellis AFB. Implementation, of this alternative would not affect the socioeconomic resources and opportunities associated with Nellis AFB or Clark County.

4.11.2 Proposed Action

EMPLOYMENT: Employment growth in Clark County has outpaced most statistical areas in the U.S. (refer to Table 3.1 1- 1). In Clark County between 1980 and 1995, total non-farm employment increased by 129 percent. By comparison, nationwide non-farm employment increased by 32 percent over the same period (U.S. Department of Commerce 1997).

In Fiscal Year 1996, approximately 9,000 employees comprised the workforce at Nellis AFB. As one of the largest government employers in the ROI, Nellis AFB and its continuing operations represent a significant source of regional economic activity. While not significant in the context of regional economic activity, the addition of 367 jobs to employment at Nellis AFB, combined with indirect employment opportunities created by increased demand for goods and services, would beneficially impact employment in the ROI.

EARNINGS: Nellis AFB is a primary employer in the region, with total annual payroll expenditures of more than $555 million; military employees in Clark County receive average

annual earnings of about $25,000. Based on this average, the 367 new employees at Nellis AFB associated with the Proposed Action would generate a total of approximately $9.1 million in payroll disbursements in the ROI, beneficially impacting regional economic characteristics.

POPULATION: On average, each projected staff member is anticipated to have two dependents. The proposed increase of 367 personnel would yield approximately 1,100 new residents within the ROI (Table 4.1 1- 1). This number would represent a 4.1 percent increase in the total population directly associated with the base and a 0.09 percent increase in Clark County's total population. Such an increase would not have a significant impact on local or regional population or place noticeably significant additional demands on affected community services, utilities, or housing.

Table 4.11-1. Comparison of Existing and Projected Staff and Dependents at Nellis AFB

	Staff	*Dependents*	*Total*
Existing	9,024	18,228	27,252
Projected	9,391	18,970	28,361
Difference	+367	+742	+1,109

HOUSING: Construction has been one of the fastest growing employment sectors in the ROI over the past 15 years. Much of this growth is attributable to rapid population growth and corresponding increased demand for affordable, quality housing in the region. This growth in the regional housing supply is projected to continue; therefore, sufficient and suitable (e.g., new) off-base housing would be available to personnel associated with the Proposed Action.

Currently, housing on base is available in military family housing units, dormitories, and billeting facilities. A total of 1,212 units are available to Nellis AFB personnel and their families. An additional 1,136 beds are available in dormitories, and billeting facilities at the base currently total 482 units. Currently funded projects are scheduled to increase quarters for visiting airmen and officers by another 286 units. The on-base housing supply combined with the expanding off-base supply and proposed dormitory construction on base would be sufficient (and inherently suitable) to accommodate personnel changes associated with the Proposed Action.

PUBLIC SCHOOLS: As of 1996, a total of about 166,700 students were enrolled in Clark County schools. The Air Force estimates that approximately 350 additional children would attend public schools in Clark County under the Proposed Action. These schools would continue to receive federal impact aid in lieu of taxes for each child attending school off base. These students would be phased in over several years, and the increase would be negligible compared to the rapid growth of Clark County. Current facilities in operation in the county and on base can accommodate new students added to the ROI's population upon implementation of the Proposed Action.

PUBLIC **FINANCE:** Because the Proposed Action would have a negligible effect on affected counties' operating budgets and general funds, no significant impact with regard to their ability to provide adequate services would be expected to result from its implementation.

4.12 ENVIRONMENTAL JUSTICE

As directed by Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, this analysis addresses potential disproportionately high and adverse human health or environmental effects on these populations.

The existence of disproportionately high and adverse impacts depends on impacts identified for each of the individual resources (e.g., noise, air quality, water resources, and hazardous materials and wastes). If implementation of the Proposed Action were to have potentially significant effects on people for any other particular resource, then it would be necessary to examine those impacts in terms of their potential to adversely and disproportionately affect minority or low-income communities. Section 3.12 determined that noise was the only resource with such potential.

4.12.1 No-Action Alternative

Because there would be no change from existing conditions under the No-Action Alternative, there would be no environmental justice issues.

4.12.2 Proposed Action

NELLIS AFB

Low-income and minority populations in the residential areas associated with Sunrise Manor and other unincorporated communities near Nellis AFB would bear a disproportionately greater share of noise impacts than the population as a whole in the surrounding community. Portions of Sunrise Manor west and south of Nellis AFB (see Figure 3.2-5) would be subject to increased noise of 2 dB or less above levels currently experienced, but this would occur in areas zoned for noise above 65 DNL. The beddown of the F-22 aircraft would not result in a shift in location or change in shape of affected clear zones or APZs. No significant impact with regard to safety would result from the Proposed Action.

Currently, noise levels affect 26 percent of minority populations (Figure 4.12-1). This would increase by 1 percent to 27 percent under the Proposed Action. The minority population in the community is 25 percent, so this means minority populations already receive a disproportionately greater effect from noise under current operations. Most affected minority members live in areas with noise between 65 and 70 DNL, although the Proposed Action would increase the percentage affected by noise greater than 70 DNL to 26 percent (Table 4.12-1). Minority members potentially annoyed could increase from about 844 to 1,646 (Table 4.12-2). Noise increases would also affect low-income populations. Eleven percent of the people currently affected by noise greater than 65 DNL are considered to belong to low-income groups. This level increases to 19 percent for the Proposed Action. Under the Proposed Action, the number of low-income people affected by noise greater than 65 DNL would increase by 4,641 people (Table 4.12-3). This is 8 percent higher than the 11 percent of the community's population that is considered low-income, and, therefore, represents a disproportionately higher effect on that population.

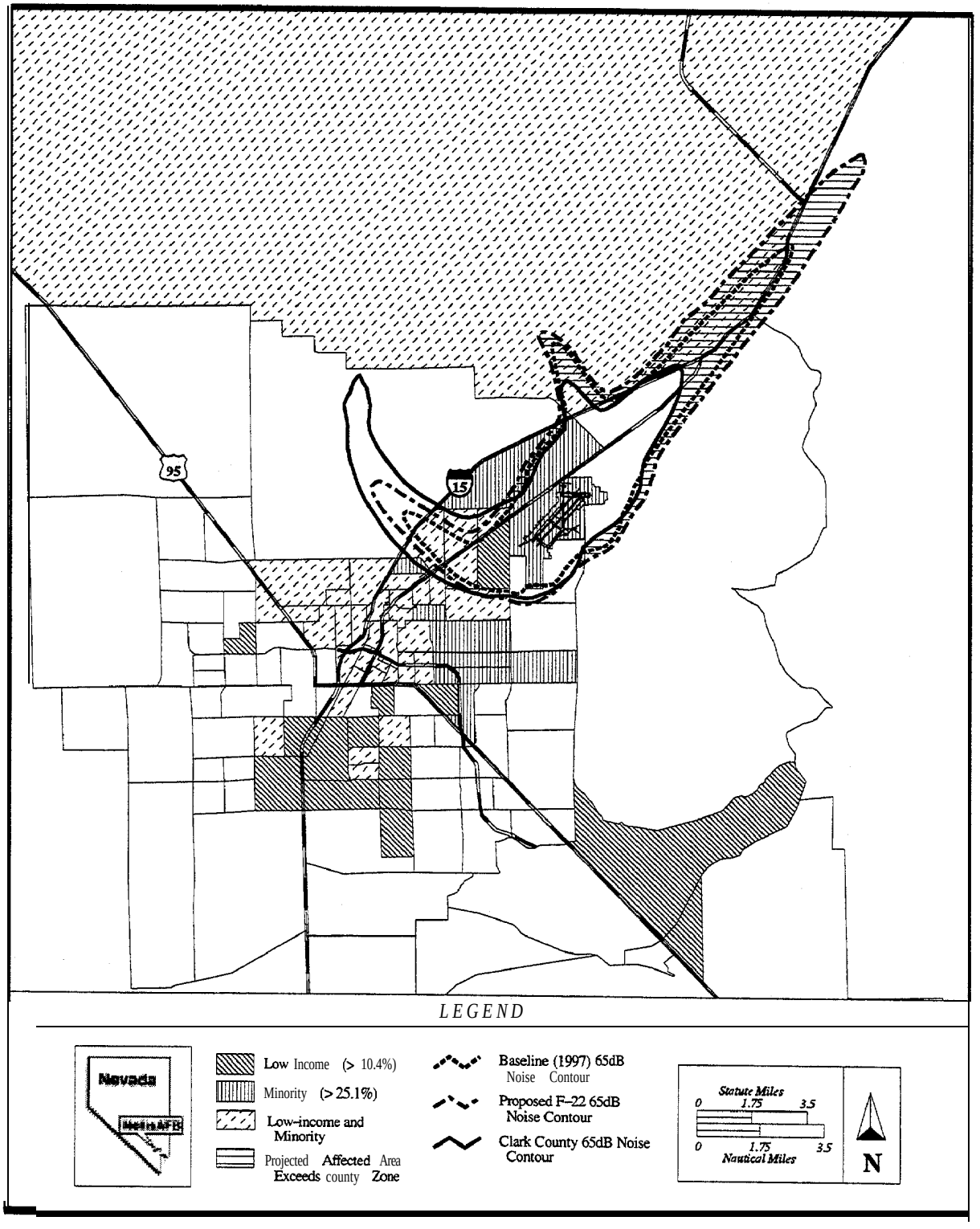

Figure 4.12-l. Proposed Noise Contours and Low-Income and Minority Census Tracts

/net/pulau/oahu/f22/plots/figures/noiseligs9.aml

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Table 4.12-1. Minority Populations Affected by Noise Levels Greater than or Equal to 65 DNL

	Minority	*%*	*Non-Minority*	*%*	*Total County Population*
Clark County Total Population[1]	281,120	*25*	838,88	*75*	1,120,000
	Minority	*%*	*Non-Minority*	*%*	*Total Affected*
Clark County Zoning 165 DNL	13,886	31	30,722	69	44,608
Baseline Noise Levels 165 DNL	5,913	26	16,888	74	22,801
Projected Noise Levels 265 DNL	10,050	27	27,700	73	37,750
Difference Projected - Baseline	+4,137	+1	+10,812	-1	+14,949
Difference Projected – Zoned	-3,836	-4	-3,022	+4	-6,858

1. Total population based on 1996 estimate from Clark County Department of Comprehensive Planning.

Table 4.12-2. Annoyance and Minority Populations in Areas with Noise Greater than 65 DNL

DNL	*Clark County Zoning Population*	*%*	*Baseline Population*	*%*	*% HA'*	*Population Potential HA*	*Projected Population*	*%*	*% HA'*	*Population HA*
65-70	8,812	63	5,783	98	14	810	7,432	74	14	1,041
70-75	3,201	24	100	2	23	23	2,605	26	23	599
75-80	1,580	11	30	0	37	11	3	0	37	1
80-85	293	2	0	0	53	0	9	0	53	5
>85	0	0	0	0	69	0	0	0	69	0
TOTAL	13,886	100	5,913	100		844	10,050	100		1,646

[1] Percent Highly Annoyed (HA) based on Schulz curve

Table 4.123. Effects of Noise Levels around Nellis AFB on Low-Income Populations

	Low-Income	*%*	*Non Low-Income*	*%*	*Total County Population*
Clark County Total Population[1]	123,200	11	996,800	89	1,120,000
	Low-Income	*%*	*Non Low-Income*	*%*	*Total Affected*
Clark County Zoning 165 DNL	5,231	12	39,377	88	44,608
Baseline Noise Levels 265 DNL	2,404	11	20,397	89	22,801
Projected Noise Levels 165 DNL	7,045	19	30,705	81	37,750
Difference Projected - Baseline	4,641	+8	10,308	-8	14,949
Difference Projected - Zoned	+1,814	+7	-8,672	-7	-6,858

1. Total population based on 1996 estimate from Clark County Department of Comprehensive Planning.

The Proposed Action would extend into areas with higher than average minority and low-income populations because a higher percentage of minorities and people with low-incomes live adjacent to Nellis AFB. The noise levels associated with the Proposed Action are within areas already zoned for noise levels above 65 DNL and are in predominantly minority or low-income areas. The 203 acres of projected noise outside the zoned region, south of Nellis AFB and the areas to the north and east are not in areas with a disproportionate number of minority or low-income groups.

ONGOING MEASURES TO REDUCE EFFECTS. Zoning regulations currently require all residential construction within areas affected by noise levels of 65 DNL or greater to include noise attenuation features. Noise attenuation from current standard construction practices can reduce indoor noise by 20 dB or more. The Air Force will continue to work with Clark County and other local officials to support enforcement of existing zoning ordinances and to assess the adequacy of noise abatement measures. If changes are found to be needed to address noise conditions, the Air Force will assist local officials who seek to establish or modify noise attenuation measures. The Air Force will also continue to employ noise abatement procedures around the base including expedited climb-outs for all aircraft and restrictions on the time and the direction of flight activities.

NELLIS RANGE COMPLEX

The Proposed Action's only effect that could have an adverse impact on minority and low-income populations is noise above 65 DNL. No change would occur to subsonic noise levels under the Proposed Action. A 1 to 3 CDNL increase would occur due to supersonic operations in the Elgin and Coyote airspace areas, but the combined subsonic and supersonic noise level would still be less than 65 DNL (see Table 4.2-9). Although Elgin has been identified as a low-income area, Coyote overlies neither low-income nor minority tracts. No disproportionate increase in noise over low-income or minority tracts would occur under the Proposed Action.

AMERICAN INDIAN RESERVATIONS

No American Indian reservations directly underlie airspace affected by the Proposed Action. There would be no disproportionate impacts to American Indian populations.