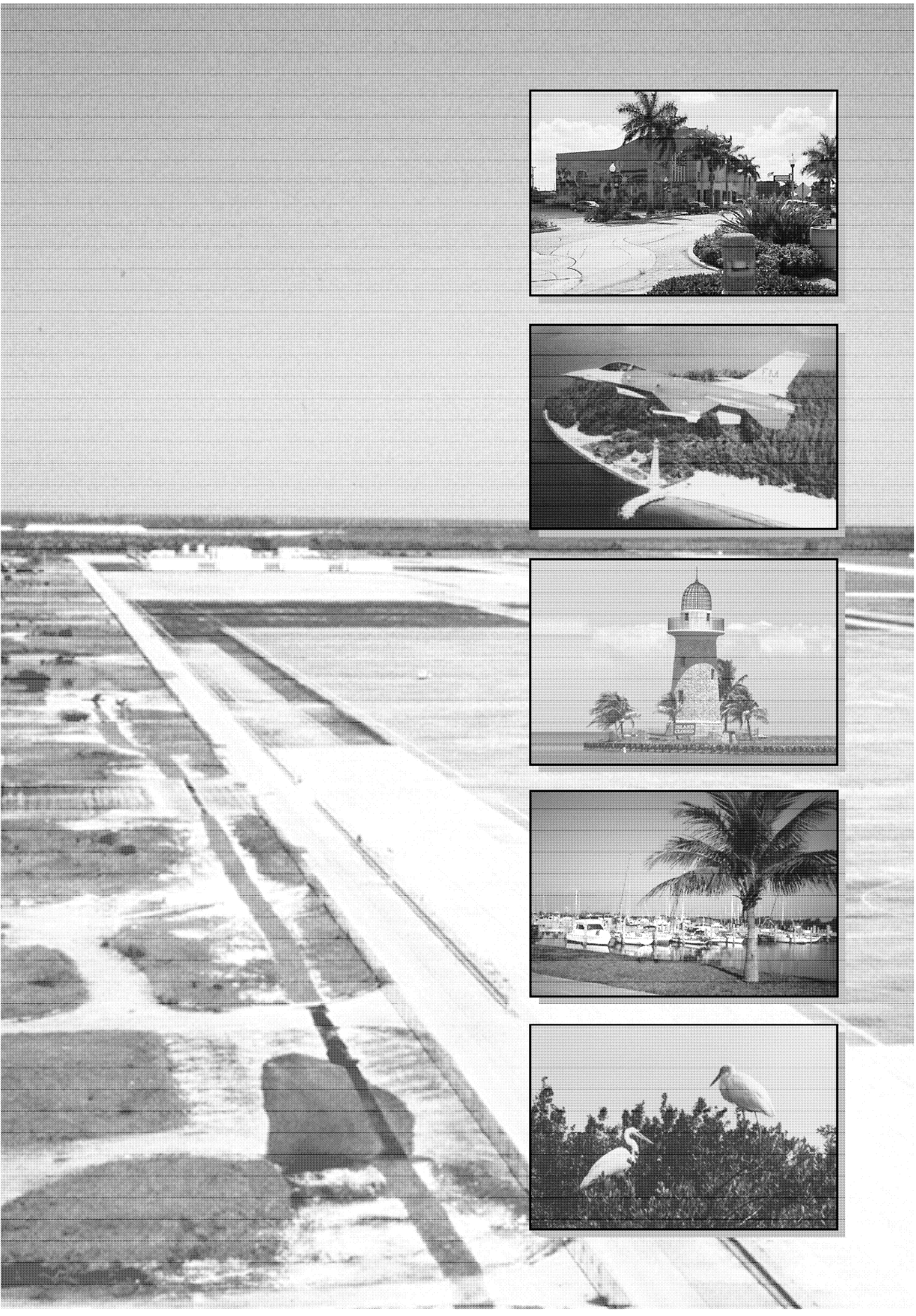
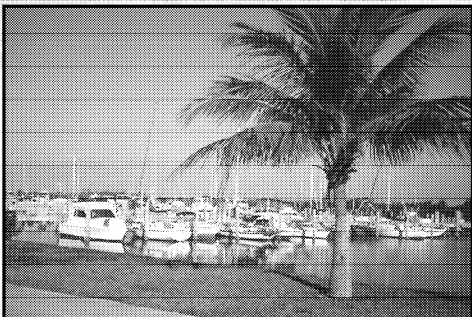


## 4.0 ENVIRONMENTAL CONSEQUENCES



## ***IN THIS CHAPTER***

Chapter 4 describes the environmental impacts identified from the Proposed Action, Commercial Spaceport alternative, Mixed Use alternative, No Action alternative, and Independent Land Use Concepts. The chapter is divided into the same 14 resource topics used in Chapter 3:

- Socioeconomics (**Section 4.1**)
- Transportation (**Section 4.2**)
- Utilities (**Section 4.3**)
- Airspace and Safety (**Section 4.4**)
- Noise (**Section 4.5**)
- Land Use and Aesthetics (**Section 4.6**)
- Hazardous Materials, Hazardous Waste, and Petroleum Products (**Section 4.7**)
- Air Quality (**Section 4.8**)
- Earth Resources (**Section 4.9**)
- Water Resources (**Section 4.10**)
- Biological Resources (**Section 4.11**)
- Cultural Resources (**Section 4.12**)
- Minority and Low-Income Populations (**Section 4.13**)
- Department of Transportation Act Section 4(f) Lands (**Section 4.14**)

The information on each alternative includes:

- ❖ The direct and indirect impacts of the alternative estimated for 2000, 2005, 2015, and full buildout.
- ❖ The potential cumulative impacts of the alternative in combination with other future projects and developments in the region.
- ❖ Mitigation measures that might reduce or eliminate the impacts.

The results of some resource analyses are used in other resources. For example, employment and population estimates in Socioeconomics are used to estimate traffic in Transportation and Utilities consumption. Noise information is used in Land Use and Biological Resources. Findings in Water Resources also affect Biological Resources. Noise and Land Use information feeds into the analysis of impacts on Minority and Low-Income Populations.

Some of the interrelationships among resources are reflected in the summary of impacts by selected topics in **Section 2.9.2 of Chapter 2**.



## **4.0 ENVIRONMENTAL CONSEQUENCES**

This chapter describes the environmental effects that could result from disposal and subsequent reuse of 1,632 acres of surplus property at former Homestead AFB, referred to in the SEIS as the “disposal property.” As described in Section 2.1, this is the remaining surplus property at the former base not already conveyed or proposed for conveyance. Chapter 4 describes analyzed impacts within the same 14 resource topics described in Chapter 3. Each section addresses the following alternatives, which are described in detail in Chapter 2:

- Proposed Action (commercial airport)
- Commercial Spaceport alternative
- Mixed Use alternative
- No Action alternative
- Independent land use concepts

The Draft SEIS examined three possible scenarios for the Mixed Use alternative: Market-Driven development, Collier Resources Company proposal, and Hoover Environmental Group plan. The Final SEIS also includes the joint Collier-Hoover proposal submitted during the comment period on the Draft SEIS. The Collier-Hoover proposal is apparently intended by the proponents to replace both the original Collier proposal and the original Hoover plan, but those two scenarios have been retained in the Final SEIS for comparison. Each section in this chapter addresses the Market-Driven scenario first, followed by the Collier-Hoover proposal, and then the original Collier and Hoover plans.

The impacts described in this chapter represent a best estimation of the consequences of conveying ownership of the disposal property to public or private entities for reuse. The reuse developments analyzed below are not being proposed by the Air Force or FAA and would not be implemented by those agencies. Rather, the Air Force and FAA have largely relied on plans developed by Miami-Dade County, other proposals received for reuse of former base property, and other studies and discussions to devise a reasonable estimation of what could occur subsequent to property conveyance. This is done to provide Air Force and FAA decision makers with an understanding of the reasonably foreseeable environmental consequences of alternative federal decisions.

Because the environmental impacts described in this chapter would stem from the actions of others, and the level of planning that has been accomplished varies among alternatives, the quantitative estimates presented in this SEIS should be considered nominal. The actual reuse details may ultimately differ somewhat as planning progresses. However, given uncertainties about future events, the effects described in this chapter present the most likely range of consequences that might be anticipated from the reuse of the disposal property at former Homestead AFB. Among the factors that could affect the outcome of development plans are the approvals required under Chapter 288 of the Florida Statutes and permits required for surface water management. These requirements are described in Section 2.2.6.

The discussion of each alternative includes direct and indirect impacts, cumulative impacts, and mitigation measures. For the Proposed Action, there is also a discussion of possible future expansion of the commercial airport to include a second runway. Similarly, the analysis of the Commercial Spaceport alternative discusses the possibility of a combined Commercial Spaceport/Airport. Three time frames are presented to reflect the progress of reuse development: 2000, 2005, and 2015. In addition, the analysis examines the potential for full buildout beyond 2015.

## ENVIRONMENTAL CONSEQUENCES

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As the analysis attempts to project potential environmental consequences farther into the future, the ability to accurately predict impacts becomes more difficult. Impacts in 2015 are more difficult to predict than those in 2005, and full buildout could be in the distant future and extremely difficult to predict with a high level of confidence. Among the factors that are difficult to project into the far future are the precise nature and pace of the development of a commercial airport for the Proposed Action, the evolution of commercial space launch technology for the Commercial Spaceport alternative, future technological changes that could affect air pollutant and noise emissions, and other unpredictable events that may change the future baseline or affect the environmental consequences.

The impacts of each alternative are compared against the baseline conditions described in Chapter 3. In some cases, this baseline is represented by current conditions in the region of influence. In other circumstances, the baseline has been projected into the future to reflect changes expected to occur, independent of the reuse of the disposal property at former Homestead AFB. For example, population and development in south Florida will continue to grow whether or not the former base property is developed. As discussed in Section 2.1.3, there are various forecasts of the expected magnitude of that growth. For the purposes of this SEIS, a moderate growth forecast has been used to estimate the baseline population and level of development in 2000, 2005, and 2015. Each reuse alternative is then added to the baseline growth to assess the impacts. In addition, the analysis of cumulative impacts considers the effects of each alternative in combination with a more aggressive, high-growth population forecast for Miami-Dade County. This provides an estimation of the total effect of reuse of former Homestead AFB in combination with other, unrelated growth and development. Baseline conditions could not be projected across all resources for full buildout, because of the uncertainty of its timing and because forecasts are not generally available beyond 20 years into the future.

As another example of how the projected baseline is used, some of the surplus property at former Homestead AFB has already been transferred to other entities for reuse (see Section 2.1), and their reuse plans are in various stages of implementation. The realization of those plans for the previously conveyed property is considered part of the future baseline because it is not affected by the decisions that will emerge from this SEIS.

Although this chapter is organized in 14 resource sections, it is acknowledged that these resources are interrelated to a substantial degree. In recognition of those interrelationships, each resource topic relies upon the findings of relevant other analyses. For example, the population changes projected in the Socioeconomics analysis are reflected in projected traffic changes in the Transportation analysis, which are subsequently reflected in the emissions estimates of the Air Quality analysis. As another example, the same population changes can be expected to generate a need for additional housing, which would affect Land Use and increase Utilities demand, thereby affecting Water Resources, which, in turn, may impact Biological Resources.

## 4.1 SOCIOECONOMICS

### 4.1.1 Introduction

Socioeconomic impacts associated with implementation of the Proposed Action and alternatives are discussed in five major areas: (1) economic activity (employment and earnings), (2) population, (3) housing, (4) public services (government structure, public education, fire protection, police protection, and health services), and (5) public finance.

Most of the impacts identified would be related to either direct or indirect employment associated with reuse of former Homestead AFB property. Direct jobs are defined as on-site reuse-related jobs within the boundaries of the former base. Indirect jobs would be off site but related to or stimulated by reuse activities. These could include, for example, jobs with businesses that provide supplies to on-site developers, or wholesale food distributors who supply on-site restaurants. Another type of indirect job is one created by the personal expenditures of employees working on the former base property. Those employees and their families would spend their earnings on such items as food and clothing and stimulate employment as a result.

The analysis of some socioeconomic impacts is based on population, which can be affected by development if that development stimulates population migration. Migratory-related effects are associated with persons who would move into the area primarily in response to the reuse of former Homestead AFB and resulting job opportunities.

As described in Section 2.1.3, there are a number of potential sources of workers who could fill the jobs (direct and indirect) created by the Proposed Action and alternatives. They include (1) new entrants into the labor force, (2) unemployed persons residing in south Miami-Dade County, (3) workers in-migrating to Miami-Dade County to fill specialized jobs or hoping to find employment at the former base (who would be likely to take up residence in the south part of the county), (4) employed persons residing in south Miami-Dade County who commute to jobs in the north part of the county and who could change their place of work, and (5) persons (employed and unemployed) currently residing and working in north Miami-Dade County who could relocate their place of residence and take jobs in the south part of the county. A small percentage of jobs could also be filled by Broward or Monroe County residents.

Based on a moderate level of baseline growth, the number of employees in south Miami-Dade County, south of Eureka Drive, is estimated to increase by more than 20,000 workers between 2000 and 2015. For the county as a whole, the number is 117,000. This increased labor pool would provide the primary source of workers for reuse-related jobs. It is reasonable to assume that new entrants into the labor force in the south county would prefer (all other things being equal) to take employment close to their place of residence rather than commute long distances.

The estimated number of unemployed workers who could fill reuse-related jobs was based on the 1997 unemployment level. The unemployment rate in Miami-Dade County at that time was 7 percent and had not fallen below 5 percent in well over a decade. It was assumed that the unemployment rate could fall as low as 5 percent if more jobs were available. This led to an estimated 2 percent of the workers in the labor force of south Miami-Dade County available to fill jobs created by reuse of former Homestead AFB. Since 1997, the unemployment rate for the county has declined to 6 percent (**Bureau of Labor Statistics 2000**). For comparison, unemployment rates for the state as a whole and for the nation were both close to 4 percent (**Bureau of Labor Statistics 2000**). Therefore, estimating that 2 percent of the labor force would be available from the unemployed labor pool continues to be a reasonable assumption. In December 1999, there were an estimated 51,651 unemployed persons in Miami-Dade



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County (**Bureau of Labor Statistics 2000**). The SEIS assumes that between 1,095 and 1,550 reuse-related jobs could be filled by unemployed persons.

In-migration of some workers (and their dependents) into the county could occur to fill specific labor skill requirements and also because some workers might be attracted to the area in search of employment.

Some workers who currently commute north from their homes in the south county may take a job closer to home. There are more jobs per housing unit in the north part of Miami-Dade County than in the south (**Miami-Dade County 1998e**). The projected baseline estimates there will be an average of 0.8 jobs per housing unit in the south county by 2015, compared to about 1.4 jobs per housing unit in the north part of the county. The number of persons per housing unit is projected to be 2.82 in the south and 2.56 in the north. This difference between the north and south county areas likely means that the south part of the county is more of a bedroom community, and many residents there commute to work at places in the north part of the county or outside the county. It is anticipated that some of those commuters would take jobs closer to their places of residence if they had the opportunity, in order to reduce transportation time and cost. To estimate the number that might take jobs associated with the reuse of former Homestead AFB, it was assumed that the ratio between employment and housing units in south Miami-Dade County could reasonably increase from 0.80 to 1.0 by 2015. Because those people already reside in the southern part of the county, they would not create any population-related impacts (such as construction of new housing).

Finally, some workers currently living in the northern part of Miami-Dade County may relocate to the south county if employment opportunities are there. This could lead to some redistribution of population within the region. People who migrated south to take reuse-related jobs would stimulate housing construction and increase community service requirements in the south county.

### 4.1.2 Economic Activity

This section estimates employment effects associated with on-site development (direct employment), related off-site jobs (indirect employment), and jobs associated with other projected future development (cumulative employment). **Table 4.1-1** shows projected baseline and total estimated reuse-related employment associated with each alternative in Miami-Dade County as a whole and in the south county, for 2000, 2005, and 2015. Estimated reuse-related employment is also shown for full buildout, but no baseline projections are available for that milestone because of the uncertainty of when that could occur.

The projected baseline employment assumes a moderate growth rate in Miami-Dade County. Under this projection, employment is forecast to increase from 1,125,612 jobs in 1995 to 1,281,878 in 2015, a net increase of 156,266 jobs. Based on projections generated by Miami-Dade County for Transportation Analysis Zones in the county, most of these jobs (83 percent) are expected to be located in the northern part of the county (north of Eureka Drive). Of the 26,781 new jobs projected for the area south of Eureka Drive, over 64 percent are expected to occur in and around the City of Homestead and Florida City.

**Table 4.1-1. Projected Baseline and Reuse-Related Employment in Miami-Dade County and the South County Region**

Alternative	2000	2005	2015	Full Buildout
Miami-Dade County Baseline	1,164,679	1,203,745	1,281,878	NA
Proposed Action	0	4,527	27,546	38,454
Commercial Spaceport	0	4,405	10,065	13,017
Mixed Use	0	3,726–7,023	8,922–14,679	13,948–24,477
No Action	0	0	0	0
South County Baseline	48,378	55,074	68,464	NA
Proposed Action	0	3,637	23,191	32,716
Commercial Spaceport	0	3,532	8,472	10,939
Mixed Use	0	3,320–9,039	7,848–15,843	12,350–23,091
No Action	0	0	0	0

Source: SAIC.

Note: Employment for alternatives is in addition to baseline.

NA Not available

**Table 4.1-2** shows projected baseline earnings for Miami-Dade County as a whole and for the south county under each alternative. Reuse-related earnings from both direct and indirect employment are shown for each alternative. Again, no baseline is available for full buildout.

**Table 4.1-2. Projected Baseline and Reuse-Related Earnings in Miami-Dade County and the South County Region**

Alternative	2000 (million)	2005 (million)	2015 (million)	Full Buildout (million)
Miami-Dade County Baseline	\$33,706	\$34,836	\$37,097	NA
Proposed Action	\$0	\$131	\$799	\$1,116
Commercial Spaceport	\$0	\$129	\$295	\$381
Mixed Use	\$0	\$106–203	\$259–425	\$405–695
No Action	\$0	\$0	\$0	\$0
South County Baseline	\$1,400	\$1,594	\$1,981	NA
Proposed Action	\$0	\$105	\$673	\$950
Commercial Spaceport	\$0	\$103	\$248	\$321
Mixed Use	\$0	\$94–243	\$228–459	\$358–670
No Action	\$0	\$0	\$0	\$0

Source: SAIC.

NA Not available

#### 4.1.2.1 Proposed Action

**Employment.** Under the Proposed Action, the total direct and indirect reuse-related employment in 2015 is estimated at 27,546 jobs. This includes 13,187 direct, on-site jobs and 14,359 indirect jobs located off-site. These numbers do not include employment associated with activities on the retained and previously

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conveyed property, which are included in the projected baseline. The reuse-related employment would represent 2.5 percent of the 1995 employment level for Miami-Dade County.

About 84 percent of the reuse-related jobs are expected to be located in south Miami-Dade County (23,191 of 27,546). This would represent about 56 percent of the south Miami-Dade County baseline employment level of 41,683 in 1995 and 34 percent of the projected baseline in 2015.

Total reuse-related employment of 27,546 jobs would be the equivalent of 3.5 years of employment growth for the entire county over and above that projected for 1995 through 2015 under baseline conditions. The total number of jobs attributable to implementation of the Proposed Action would represent 2 percent of total countywide employment in 2015 and contribute 18 percent over and above the projected growth in jobs during the period 1995 through 2015.

In the case of south Miami-Dade County, reuse-related employment of 23,191 jobs would equate to over 17 years of baseline growth. Employment from the Proposed Action would represent 34 percent of baseline employment in 2015 and contribute 87 percent over and above the projected growth in baseline jobs between 1995 and 2015.

Based on the development potential of the disposal property (considering factors such as zoning, land use, floor area ratio), total employment (direct and indirect) at full buildout could increase to 38,454 jobs, with 32,716 (85 percent) likely to be located in south Miami-Dade County. This would include all the direct jobs and about 73 percent of the indirect jobs.

The direct employment includes on-site operations jobs and construction jobs. On-site operations jobs are estimated to be 2,070 in 2005, rising to 12,777 in 2015 and 17,459 at full buildout. Construction jobs are estimated at 141 in 2005, increasing to 410 by 2015. Construction jobs could not be estimated for full buildout. Indirect jobs associated with on-site development of the Proposed Action and related secondary development are estimated to be 2,316 in 2005, rising to 14,359 by 2015 and 20,995 at full buildout. These estimates include businesses that might relocate from elsewhere in the region to the vicinity of the airport because of changes in accessibility, convenience, and development trends in the region.

No additional employment has been estimated in connection with spending by visitors to the region who enter through the airport. For the purposes of this analysis, it is assumed that passengers coming into the airport would be visiting the area for tourism, business, and other attractions already existing in the region. They would have come to the region anyway but through another airport. Some exceptions might occur if the new airport provided lower priced service or provided service to locations not already served. Without the new airport, most visitors would be expected to select other airports or other means of transportation to travel to the local area. These passenger-related jobs are assumed to be included in the baseline projections as part of the regional growth anticipated for the area.

In 2015, about 1,377 of the reuse-related jobs in the south county are assumed to be filled by persons migrating to the area from outside the county, and about 3,247 are assumed to relocate to south Miami-Dade County from the north. By full buildout, this could increase to 1,923 migrating into the south county and 4,601 workers relocating from the north.

**Earnings.** Under the Proposed Action, earnings associated with total reuse-related employment are estimated to reach \$131 million in 2005, \$799 million in 2015, and \$1,116 million by full buildout. Earnings attributable to on-site jobs would comprise an estimated \$60 million in 2005, \$372 million in 2015, and \$508 million at full buildout. The remainder would be generated by off-site jobs. These earnings do not include employment on the retained and conveyed property.



Baseline earnings in Miami-Dade County were estimated to total \$26,853 million in 1995. The contribution of \$799 million associated with reuse-related jobs in 2015 would represent 2.5 percent of the 1995 earnings for the county. Most (estimated 84 percent) of reuse-related earnings would be associated with workers in south Miami-Dade County. This estimated level of earnings (\$673 million) would represent 56 percent of the baseline earnings of \$1,206 million in the south county area in 1995.

Under moderate employment growth reflected in the projected baseline, earnings in Miami-Dade County in 2015 could reach an estimated \$37,097 million. This would represent an increase of \$4,522 million over the 1995 level of \$32,575 million. The estimated earnings associated with the Proposed Action would represent 2 percent of total countywide earnings in 2015 and contribute 18 percent over and above the projected growth in earnings during the period 1995 through 2015. Earnings in southern Miami-Dade County in 2015 under the projected baseline could reach \$1,981 million, an increase of \$775 million over the 1995 level of \$1,206 million. The estimated earnings attributable to the Proposed Action (\$673 million) would represent 34 percent of baseline earnings in 2015 and contribute 87 percent over and above the projected growth in baseline earnings during the period 1995 through 2015.

Total reuse-related earnings (direct and indirect) at full buildout could reach \$1,116 million. Of this total, \$950 million (85 percent of the total) are estimated to be associated with workers residing in the southern part of the county.

### **Cumulative Impacts**

Other unrelated developments could occur in Miami-Dade County concurrently with the Proposed Action. It is not possible to identify all the specific development projects that are likely to be initiated during this time period, but an indication of the growth that might occur can be inferred from employment projections prepared by the Miami-Dade County Planning Department, which are higher than the projected baseline. The following paragraphs discuss how the higher level of growth forecast by the county could affect employment and earnings by 2015, when the difference from the moderate-growth baseline would be greatest. Estimates could not be generated for full buildout because forecasts are not available that far into the future.

The county's high-growth projections forecast total employment in Miami-Dade County at 1,403,563 jobs in 2015 (**Miami-Dade County 1998e**). This is an increase of 277,951 jobs over the 1,125,612 jobs estimated for 1995. The majority (94 percent) of the jobs are forecast to be located in the northern part of the county (**Miami-Dade County 1998e**). In the south county, employment is projected by the county to increase by 39,393 jobs from 41,683 in 1995 to 81,076 in 2015. This includes 2,839 jobs projected by the county for former Homestead AFB.

The 27,546 jobs currently estimated for the Proposed Action in the SEIS would represent 2 percent of cumulative baseline employment countywide in 2015 and contribute 10 percent of the projected growth in jobs over the period 1995 through 2015. In the south county, the estimated 23,191 reuse-related jobs would represent 29 percent of cumulative employment in 2015 and contribute 59 percent of the projected growth in jobs in south Miami-Dade County over the period 1995 through 2015. If all reuse-related jobs are assumed to be additional to the county's forecast (except the 2,389 on-site jobs already accounted for by the county), cumulative employment in the south county could be 9,938 higher than with a moderate level of growth. Alternatively, some of the reuse-related jobs may be accounted for in growth projected for the northern part of the county but which might actually occur in the south county. That is, it is possible that not all the jobs attributable to the Proposed Action would be additional to those projected in the high-growth forecasts.

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Based on these employment projections, total earnings in Miami-Dade County could reach \$40,619 million in 2015. This would represent an increase of \$8,044 million over the \$26,853 million estimated for 1995. In south Miami-Dade County, earnings could increase by \$1,140 million from \$1,206 million in 1995 to \$2,346 million in 2015.

Under these assumptions, the earnings associated with reuse-related jobs would represent 2 percent of cumulative baseline earnings countywide in 2015 and contribute 10 percent of the projected growth in earnings over the period 1995 through 2015. In the southern portion of Miami-Dade County, the earnings of reuse-related workers (direct and indirect) could reach \$673 million in 2015. This would represent 29 percent of cumulative earnings in 2015 and contribute 59 percent of the projected growth in earnings in south Miami-Dade County over the period 1995 through 2015.

### Mitigation Measures

The estimated increases in employment and earnings from the Proposed Action are considered a beneficial impact, especially in light of the economic distress experienced since 1992, from which the southern part of Miami-Dade County has not fully recovered. The ability of existing south county workers to benefit from the more skilled (and higher paid) employment opportunities may depend on the availability of job training. Miami-Dade County could establish training programs geared toward aviation and other high-skill jobs for workers near former Homestead AFB.

### Possible Future Expansion

Activity levels at the proposed airport could increase substantially with the addition and full utilization of a second runway. It is possible that employment (both direct and indirect) and earnings could double over levels projected for 2015. However, this is not expected to be a prospect until the middle of the century or beyond. A second runway is not within the scope of the property disposal actions addressed in this SEIS.

#### 4.1.2.2 *Commercial Spaceport Alternative*

**Employment.** The Commercial Spaceport alternative is estimated to generate 10,065 direct and indirect jobs by 2015, including 5,128 on-site, direct jobs and 4,937 off-site, indirect jobs. These numbers do not include employment on the retained and conveyed property. Reuse-related employment would represent 1 percent of the 1995 employment level for the county.

Most (estimated 84 percent) of the jobs would be located in south Miami-Dade County, which is projected to receive 8,472 of the 10,065 jobs. This would represent 20 percent of the baseline employment level of 41,683 in the south county in 1995.

The total reuse-related employment would be equivalent to 1.3 years of employment growth for the entire county over and above that projected for 1995 through 2015 under the projected baseline and 6.3 years of baseline growth in the south county area. The total number of jobs estimated for the Commercial Spaceport alternative would represent less than 1 percent of total countywide employment in 2015 and contribute 6 percent over and above the projected growth in jobs during the period 1995 through 2015. An increase of 8,472 jobs in the southern part of the county would represent 12 percent of baseline employment in 2015 and contribute 32 percent over and above the projected growth in baseline jobs during the period 1995 through 2015.

Total employment (direct and indirect) at full buildout could number 13,017 jobs, with about 84 percent located in south Miami-Dade County.

On-site operations jobs are estimated to number 2,094 in 2005, rising to 4,984 in 2015 and 6,600 at full buildout. Construction jobs are estimated at 167 in 2005 and 144 in 2015 (no estimates could be generated for full buildout). Indirect employment is estimated to contribute 2,144 jobs in 2005, rising to 4,937 by 2015 and 6,417 at full buildout. Approximately 68 percent of the indirect jobs are expected to be located in south Miami-Dade County.

It is likely that a portion of the total reuse-related jobs would not be filled by persons currently residing in Miami-Dade County and there would be some in-migration to the county, estimated at 503 workers by 2015 and 651 by full buildout. The estimated number of re-use related jobs is not considered large enough to stimulate appreciable migration from the northern part of the county to the south.

**Earnings.** Under the Commercial Spaceport alternative, earnings associated with total reuse-related employment are estimated to reach \$129 million in 2005, \$295 million in 2015, and \$381 million at full buildout. These earnings do not include those associated with employment on the retained and conveyed property. The reuse-related earnings would represent about 1 percent of the 1995 earnings level for the county and less than 1 percent of countywide earnings in 2015. It would contribute about 6 percent over and above the projected growth in earnings between 1995 and 2015.

An estimated 84 percent of the earnings are assumed to be associated with workers in the south county. Earnings of \$248 million in 2015 would represent 20 percent of the 1995 baseline for the south county and 13 percent of projected baseline earnings in 2015. This would contribute 32 percent over and above the projected growth in baseline earnings during the period 1995 through 2015.

Total reuse-related earnings associated with full buildout could reach \$381 million. Of this total, it is estimated that \$321 million (84 percent) would be associated with workers residing in south Miami-Dade County.

### **Combined Commercial Spaceport/Airport**

If a combined Commercial Spaceport/Airport were developed at former Homestead AFB, total reuse-related employment could number 22,182 jobs in 2015. This would represent 2 percent of the 1995 employment level for the county. Most (estimated 84 percent) of the jobs would likely be located in south Miami-Dade County, where they could represent 44 percent of the baseline employment level in 1995.

The total reuse-related employment of 22,182 jobs would be the equivalent of 2.8 years of employment growth for the entire county over and above the projected baseline. It would represent 2 percent of total countywide employment in 2015 and contribute 14 percent over and above the projected growth in jobs during the period 1995 through 2015.

In southern Miami-Dade County, an estimated 18,522 jobs in 2015 would be the equivalent of 13.8 years of baseline growth and represent 27 percent of baseline employment in 2015. It would contribute 69 percent over and above the projected growth in baseline jobs during the period 1995 through 2015.

Total employment associated with full buildout of the combined Commercial Spaceport/Airport is estimated to number 23,744 jobs, 19,870 (84 percent) of which would likely be located in south Miami-Dade County.



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Reuse-related employment could result in an estimated 1,109 workers migrating to the area by 2015 and 1,187 by full buildout. No relocation of workers from the north county to the south is estimated for the combined Commercial Spaceport/Airport.

It is estimated that earnings associated with this employment could reach \$641 million in 2015, most (84 percent) in south Miami-Dade County. These earnings would represent 2 percent of total countywide earnings in 2015 and contribute 14 percent over and above the projected growth in earnings during the period 1995 through 2015. In the south county, estimated reuse-related earnings would represent 27 percent of baseline earnings in 2015 and contribute 69 percent over and above the projected growth in baseline earnings during the period 1995 through 2015. Total reuse-related earnings associated with full buildout could reach \$686 million, 84 percent of which is assumed to be associated with workers residing in the south county.

### **Cumulative Impacts**

Cumulatively, employment could increase to 1,403,563 jobs countywide and 81,076 in the south county area by 2015, based on Miami-Dade County high-growth forecasts. In the southern portion of Miami-Dade County, a total of 8,472 jobs attributable to the Commercial Spaceport alternative would represent about 11 percent of forecast cumulative employment in 2015 and contribute 22 percent of the projected growth in jobs over the period 1995 through 2015.

Under high growth, cumulative earnings in Miami-Dade County are estimated to reach \$40,619 million in 2015, with an increase in earnings in south Miami-Dade County to \$2,346 million in 2015. The earnings associated with total reuse-related jobs would represent less than 1 percent of cumulative baseline earnings countywide in 2015 and contribute about 4 percent of the projected growth in earnings over the period 1995 through 2015. In the southern portion of the county, the earnings of reuse-related workers could reach \$248 million in 2015. This would represent 11 percent of cumulative earnings in 2015 and contribute 22 percent of the projected growth in earnings in south Miami-Dade County over the period 1995 through 2015.

The development of a combined Commercial Spaceport/Airport could increase employment to 1,425,745 jobs countywide (99,598 in the south county) and \$41,260 million in earnings (\$3,781 million in the south county) in 2015.

### **Mitigation Measures**

The estimated increases in employment attributable to implementation of the Commercial Spaceport alternative are considered to be a beneficial impact. As described for the Proposed Action, the availability of job training offered by either Miami-Dade County or the spaceport developer/operator could increase the ability of local workers to take advantage of reuse-related employment opportunities.

#### **4.1.2.3      *Mixed Use Alternative***

The Mixed Use alternative includes a range of potential developments represented by a Market-Driven scenario, the Collier-Hoover proposal, the original Collier proposal, and the original Hoover plan (**CRC/HEG 2000, Collier Resources Company 1999, Hoover Environmental Group 1999**). Up through 2015, the employment levels estimated for the Collier-Hoover proposal are higher than for the Market-Driven scenario. At full buildout, employment associated with the Market-Driven scenario could be substantially higher, but this would likely only be realized far into the future.

There are a number of potential effects associated with implementation of the Collier-Hoover proposal that would differ from the Market-Driven scenario and original Collier proposal. These differences relate to assumptions made about where visitors to the plan's aquarium would come from. The Hoover Environmental Group has estimated that the aquarium could attract 1.5 million visitors annually. For analysis purposes, it has been assumed that 70 percent of those visitors would not be residents of Miami-Dade County, based on the experience of other aquariums in the country. Of the 30 percent who would be residents of Miami-Dade County, 80 percent are assumed to reside in the northern portion of the county and 20 percent in south Miami-Dade County, based on general population distribution in the county.

It is assumed that the aquarium would comprise a major tourist attraction that could add to the number of tourists currently choosing Miami-Dade County as a destination. It is assumed that 90 percent of the out-of-county visitors to the aquarium would have visited Miami-Dade County whether or not there were an aquarium there and would include a visit to the aquarium as part of their visit. Ten percent of the out-of-county visitors are assumed to be attracted to the county by the new aquarium. Even those who might have come to Miami-Dade County without the aquarium present might not necessarily come to the south part of the county. As a consequence, the development of an aquarium in Homestead could result in a redistribution of tourist-related spending within the county (from north to south) even though tourist spending countywide might not increase substantially.

Employment and earnings for the four scenarios included in this alternative were estimated using the same multipliers and methods used for the Proposed Action and alternatives. The Collier-Hoover proposal, as well as the original Collier proposal, contained employment projections, which were used in the analysis. For the other scenarios, employment was estimated based on the land uses included in each scenario. Earnings were calculated as a function of employment.

### **Employment**

**Market-Driven Development.** Under this scenario, total reuse-related employment in 2015 (direct and indirect) is estimated at 9,287 jobs. The on-site direct jobs would number 4,607, with the remaining 4,680 comprising indirect jobs located off site. (These numbers do not include employment associated with the retained and conveyed property.) This would represent less than 1 percent of the 1995 employment level for the county. Most (estimated 89 percent) would be expected to be located in south Miami-Dade County, which is assumed to receive 8,254 of the total of 9,287 reuse-related jobs. This would represent 20 percent of the baseline employment level in 1995.

A total of 9,287 jobs would be the equivalent of 1.2 years of employment growth for the entire county over and above that for 1995 through 2015 under the projected baseline. It would represent less than 1 percent of total countywide employment in 2015 and contribute 6 percent over and above the projected growth in jobs during the period 1995 through 2015. In the case of south Miami-Dade County, reuse-related employment of 8,254 jobs would equate to 6.2 years of baseline growth. It would represent 12 percent of baseline employment in 2015 and contribute 31 percent over and above the projected growth in baseline jobs during the period 1995 through 2015.

On-site operations jobs are estimated at 1,657 in 2005, rising to 4,411 in 2015 and 12,052 at full buildout. Construction jobs are estimated at 214 in 2005 and 196 in 2015 (no estimates could be generated for full buildout). Indirect employment associated with the Market-Driven scenario is assumed to contribute 1,855 jobs in 2005, rising to 4,680 by 2015 and 12,425 at full buildout. About 78 percent of the indirect jobs in 2015 are assumed to be located in south Miami-Dade County.

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Total employment associated with full buildout could number 24,477 jobs, based on the potential of the property to accommodate development. Of this total, 21,721 jobs (89 percent) could be located in south Miami-Dade County. However, considering market conditions, it is unlikely that full buildout could be achieved until well into middle of the 21<sup>st</sup> century.

**Collier-Hoover Proposal.** Under this proposal, total reuse-related employment in 2015 (direct and indirect) associated with development is estimated at 12,357 jobs countywide. The on-site direct jobs would number 5,486, with the remaining 6,871 comprising indirect jobs located off site. This would represent 1.1 percent of the 1995 employment level for the county. (These numbers do not include the employment associated with the retained and previously transferred property.)

South Miami-Dade County could receive 13,764 jobs by 2015, which would represent 33 percent of the baseline employment level in 1995. The number of reuse-related jobs projected for south Miami-Dade County (13,764) exceeds those projected for the county as a whole (12,357) to reflect an assumed redistribution of tourist and related expenditures from the north to the south part of the county. As more of the tourist spending could be attracted to the south part of the county by the presence of a world-class aquarium at Homestead, some tourism-related jobs currently in the northern part of the county might be lost and replaced with jobs closer to the Homestead area.

A total of 12,357 jobs is the equivalent of 1.6 years of employment growth for the entire county over and above that projected under 1995 through 2015 baseline conditions. In the case of south Miami-Dade County, reuse-related employment of 13,764 jobs equates to 10.3 years of baseline growth. It would represent 1.0 percent of total countywide employment in 2015 and contribute 7.9 percent over and above the projected growth in jobs during the period 1995 through 2015. In the south county, reuse-related employment would represent 20 percent of baseline employment in 2015 and contribute 51 percent over and above the projected growth in baseline jobs during the period 1995 through 2015.

Under the Collier-Hoover proposal, on-site operations jobs are estimated at 2,234 in 2005, rising to 5,381 in 2015 and 10,069 at full buildout. Construction jobs are estimated at 329 in 2005 and 105 in 2015 (no estimates could be generated for full buildout). Indirect employment is estimated to contribute 3,737 jobs in 2005, rising to 6,871 by 2015 and 11,683 at full buildout. This reflects an estimated 2,683 jobs relocated from the north county to the south county due to the attraction of the aquarium. In south Miami-Dade County, 5,850 indirect jobs could be generated by 2005, 8,278 by 2015, and 12,014 at full buildout. Total reuse-related employment in south Miami-Dade County at full buildout could number 22,083.

**Original Collier Proposal.** Total reuse-related employment in 2015 with the original Collier Resources Company proposal (direct and indirect) is estimated at 8,922 jobs. The on-site direct jobs are estimated to number 4,077, with the remaining 4,845 comprising indirect jobs located off site. This would represent less than 1 percent of the 1995 employment level for Miami-Dade County. (These numbers do not include employment associated with the retained and conveyed property.) Most of the reuse-related jobs (88 percent) would be expected to be located in the south county, which is estimated to receive 7,848 of the total of 8,922 reuse-related jobs. This would represent 19 percent of the baseline employment level in 1995.

A total of 8,922 jobs would be the equivalent of 1.1 years of employment growth for the entire county over and above that estimated for 1995 through 2015 under the projected baseline. It would represent less than 1 percent of total countywide employment in 2015 and contribute 6 percent over and above the projected growth in jobs during the period 1995 through 2015. In south Miami-Dade County, reuse-related employment of 7,848 jobs would equate to 5.9 years of baseline growth. It would represent



11 percent of baseline employment in 2015 and contribute 29 percent over and above the projected growth in baseline jobs during the period 1995 through 2015.

On-site operations jobs for the original Collier proposal are estimated at 1,912 in 2005, rising to 4,005 in 2015 and 6,810 at full buildout. Construction jobs are estimated at 199 in 2005 and 72 in 2015 (no estimate could be generated for full buildout). Indirect employment associated with implementation of the Collier Resources proposal is estimated to contribute 1,905 jobs in 2005, rising to 4,845 by 2015 and 7,138 at full buildout. About 78 percent of the indirect jobs are expected to be located in south Miami-Dade County.

Total employment associated with full buildout of the Collier proposal could number 13,948 jobs. Of this total, it is projected that 89 percent could be located in south Miami-Dade County.

***Original Hoover Plan.*** Under the original Hoover Environmental Group plan, total reuse-related employment in 2015 (direct and indirect) is estimated at 14,679 jobs countywide. The on-site direct jobs are estimated to number 6,819, with the remaining 7,860 comprising indirect jobs located off site. This would represent 1.3 percent of the 1995 employment level for the county. (These numbers do not include employment associated with the retained and previously transferred property.)

South Miami-Dade County could receive an estimated 15,843 jobs in 2015, which would represent 38 percent of the baseline employment level in 1995. Like the Collier-Hoover proposal, the number of reuse-related jobs projected for south Miami-Dade County (15,843) exceeds those projected for the county as a whole (14,679) because of the assumed redistribution of tourist and related expenditures from the north to the south part of the county.

A total of 14,679 jobs countywide would be the equivalent of 1.9 years of employment growth for the entire county over and above that estimated for 1995 through 2015 under the projected baseline. It would represent 1.2 percent of total countywide employment in 2015 and contribute 9.4 percent over and above the projected growth in jobs during the period 1995 through 2015. In the case of south Miami-Dade County, reuse-related employment of 15,843 jobs would equate to 11.9 years of baseline growth. It would represent 23 percent of baseline employment in 2015 and contribute 56 percent over and above the projected baseline growth in jobs during the period 1995 through 2015.

Under the original Hoover plan, on-site operations jobs are estimated at 2,550 in 2005, rising to 6,510 in 2015 and 10,910 at full buildout. Construction jobs are estimated at 497 in 2005 and 309 in 2015 (no estimates could be generated for full buildout). Indirect employment is estimated to contribute 3,976 jobs in 2005, rising to 7,860 by 2015 and 11,982 at full buildout. In south Miami-Dade County, 5,992 indirect jobs could be generated by 2005 and 9,024 in 2015. Total employment in south Miami-Dade County at full buildout could number 23,091.

The estimated range of employment among the four scenarios varies considerably (see Table 4.1-1), with the Market-Driven scenario showing the slowest growth but the most potential at full buildout, and the original Hoover plan, if implemented as envisioned, showing the highest employment in the near term.

## **Earnings**

***Market-Driven Development.*** This scenario could reach almost \$106 million in 2005, \$263 million in 2015, and \$695 million at full buildout. These estimates do not include earnings associated with the retained and conveyed property. Direct on-site employment is estimated to contribute about \$46 million in 2005, \$123 million in 2015, and \$335 million at full buildout. The remainder of the estimated earnings

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would be generated by indirect jobs. This contribution would represent less than 1 percent of the earnings level for the county and contribute 6 percent over and above the projected growth in earnings during the period 1995 through 2015.

Approximately 89 percent of the earnings are assumed to be associated with reuse-related workers located in south Miami-Dade County. This level of earnings (\$234 million in 2015) would represent 20 percent of the baseline earnings of \$1,206 million in the area in 1995. It would represent 12 percent of baseline earnings in 2015 and contribute 31 percent over and above the projected growth in baseline earnings during the period 1995 through 2015.

Total reuse-related earnings associated with full buildout of the Market-Driven scenario could reach \$695 million, \$615 million of which (89 percent) are estimated to be associated with workers residing in south Miami-Dade County.

**Collier-Hoover Proposal.** Total earnings estimated for the Collier-Hoover proposal could reach \$182 million in 2005, \$358 million in 2015, and \$631 million at full buildout. (These estimates do not include earnings associated with employment on the retained and previously transferred property.) Of this, direct on-site employment would contribute about \$65 million in 2005, \$157 million in 2015, and \$293 million at full buildout. The remainder of the estimated earnings would be generated by indirect jobs. The contribution would represent 1.1 percent of the earnings level for the county and contribute 8 percent over and above the projected growth in earnings during the period 1995 through 2015.

In 2015, approximately \$399 million in earnings are projected to be associated with reuse-related workers located in south Miami-Dade County. This is higher than the total countywide earnings because the increase in employment in the south county is projected to be higher as indirect jobs are drawn away from the northern part of the county. This level of earnings would represent 33 percent of the baseline earnings of \$1,206 million in the area in 1995. It would represent 20 percent of baseline earnings in 2015 and contribute 51 percent over and above the projected growth in baseline earnings during the period 1995 through 2015. Total reuse-related earnings associated with workers residing in south Miami-Dade County at full buildout could reach \$641 million.

At an estimated 1.5 million visitors per year, the proposed Collier-Hoover aquarium would have similar visitation as the aquariums in other cities (e.g., National Aquarium in Baltimore, Tennessee Aquarium in Chattanooga, and New England Aquarium). An analysis conducted by International Design for the Environment Associates, Inc. of the economic impact of the National and Tennessee Aquariums in the early 1990s estimated that they generated between \$128 and \$134 million in spending (both for operations and visitor spending) at visitor levels similar to those estimated in the Collier-Hoover proposal (CRC/HEG 2000).

With 1.5 million visitors, the Collier-Hoover proposal could generate estimated annual visitor expenditures of approximately \$197 million. Of that, about \$182 million could represent expenditures that would have otherwise been made in north Miami-Dade County. This includes an estimated \$28 million by north county residents who visit the aquarium and \$154 million by out-of-county visitors who elect to spend at least a portion of their visit at the aquarium.

**Original Collier Proposal.** Earnings estimated for the original Collier Resources Company proposal could reach \$116 million in 2005, \$259 million in 2015, and \$405 million at full buildout. (These estimates do not include earnings associated with the retained and conveyed property.) Of this, direct on-site employment is estimated to contribute about \$56 million in 2005, \$117 million in 2015, and \$198 million at full buildout. The remainder of the earnings are assumed to be generated by indirect jobs.

This contribution would represent less than 1 percent of the earnings for the county and contribute 6 percent over and above the projected growth in earnings during the period 1995 through 2015.

Approximately 88 percent of the earnings are assumed to be associated with reuse-related workers located in south Miami-Dade County. This level of earnings (\$228 million in 2015) would represent 19 percent of the baseline earnings of \$1,206 million in the area in 1995. It would represent 11 percent of baseline earnings in 2015 and contribute 29 percent over and above the projected growth in baseline earnings during the period 1995 through 2015.

Total reuse-related earnings associated with full buildout of the original Collier proposal could reach \$405 million, \$358 million of which (88 percent) would likely be associated with workers residing in south Miami-Dade County.

***Original Hoover Plan.*** Total earnings estimated for the original Hoover Environmental Group plan could reach \$203 million in 2005, \$425 million in 2015, and \$665 million at full buildout. (These estimates do not include earnings associated with employment on the retained and conveyed property.) Of this, direct on-site employment is estimated to contribute about \$74 million in 2005, \$190 million in 2015, and \$318 million at full buildout. The remainder of the estimated earnings would be generated by indirect jobs. The total contribution would represent 1.3 percent of the earnings for the county and contribute 9 percent over and above the projected growth in earnings during the period 1995 through 2015.

In 2015, approximately \$459 million in earnings are assumed to be associated with reuse-related workers located in south Miami-Dade County. This is higher than projected for total earnings because indirect jobs are projected to be drawn from the northern part of the county. This level of earnings would represent 38 percent of the baseline earnings of \$1,206 million in the area in 1995. It would represent 23 percent of baseline earnings in 2015 and contribute 59 percent over and above the projected growth in baseline earnings during the period 1995 through 2015. Total reuse-related earnings associated with workers residing in south Miami-Dade County at full buildout could reach \$670 million.

The Collier-Hoover proposal projects the highest earnings of all the alternatives in 2005, and the Market-Driven scenario projects the lowest. By 2015, the Collier-Hoover proposal is projected to have higher earnings than the Commercial Spaceport alternative but lower than the Proposed Action. At full buildout, the Market-Driven scenario and Collier-Hoover proposal could have similar earnings potential.

### **Cumulative Impacts**

Assuming a high level of population growth, cumulative employment with implementation of the Mixed Use alternative could increase up to 1,403,563 countywide and 81,076 in the south county by 2015. The 8,992 to 14,679 jobs estimated for the Mixed Use alternative in 2015 (12,357 for the Collier-Hoover proposal) would represent about 1 percent of cumulative employment countywide and contribute 3 to 5 percent of the projected growth in jobs over the period 1995 through 2015. In the southern portion of the county, the estimated 7,776 to 15,834 reuse-related jobs (13,764 for the Collier-Hoover proposal) would represent 10 to 20 percent of cumulative employment in 2015 and contribute 20 to 40 percent of the projected growth in jobs in south Miami-Dade County over the period 1995 through 2015. Project-related earnings of \$259–425 million (\$358 million for the Collier-Hoover proposal) in 2015 would represent about 1 percent of countywide cumulative earnings of \$40,619 million in 2015. Earnings of \$228 to 459 million (\$399 million for the Collier-Hoover proposal) associated with the project in the south county would represent 10 to 20 percent of cumulative earnings of \$2,346 million in 2015.

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### **Mitigation Measures**

The estimated increases in employment and earnings under this alternative are considered beneficial. As described for the Proposed Action, job training could be furnished by Miami-Dade County or the developer to enable local workers to take advantage of employment opportunities in the R&D and other office and industrial developments.

#### **4.1.2.4      *No Action Alternative***

Under the No Action alternative, no activity would occur on the disposal property. Activities would continue on the retained and conveyed properties. Employment on the retained property is assumed to remain essentially constant through 2015. Direct employment on the conveyed properties is expected to increase by approximately 350 jobs above the 1995 level of about 100 jobs. Such changes in employment would be minor and would not have a measurable impact on employment or earnings locally or regionally.

#### **4.1.2.5      *Independent Land Use Concepts***

Among the independent land use concepts, it is likely that a number could be incorporated in the reuse alternatives described above. Employment effects associated with these independent land use concepts are considered subsumed under the reuse alternatives addressed above. Agricultural use or a cemetery would likely generate very low levels of employment. Other uses (corrections complex, film/television production studio, theme park, world teleconference center) could generate measurable employment opportunities, but it is unlikely that the employment would exceed the levels projected for the Proposed Action.

### **4.1.3          Population**

Based on a review of historical employment and unemployment data for Miami-Dade County, and the magnitude and types of jobs that could be created by reuse of former Homestead AFB, it is anticipated that most new reuse-related jobs would be filled by persons already residing in the region at the time. These workers would come primarily from the pool of available labor, or might be workers currently living in the southern part of the county but commuting to the north county who would take a job closer to home. A few might commute from residences in other parts of the county or outside the county. A portion of the new jobs created would probably be filled by people who would migrate into Miami-Dade County and who, along with their dependents, would represent “new” population. There also may be some relocation of workers and their dependents from the northern to the southern part of the county. This estimated in-migrating and relocating population is used to identify the additional demand for housing and public services.

Under the moderate population growth forecasts adopted to represent future baseline conditions, the population of Miami-Dade County is projected to increase from 2,056,789 persons in 1995 to 2,530,604 in 2015, a net increase of 473,815 persons. This is an average annual rate of change over the period of 1 percent.

Approximately 16 percent of the increase in population is forecast to be in the southern part of Miami-Dade County (south of Eureka Drive). Of the 76,375 additional population projected for the south county, over 64 percent of the growth is expected to occur in and around the City of Homestead and Florida City. Population for the City of Homestead is projected to rise from 23,190 in 1995 to 63,532 in

2015, while the population of Florida City is forecast to increase from 4,898 to 13,278 over the same time period.

The population effects associated with implementation of the Proposed Action and alternatives would be intimately tied to the creation of jobs and especially the jobs filled by workers (and their accompanying family members) who relocate into the area. In the sections that follow, estimates of total reuse-related population are presented first, followed by a discussion of the in-migrating population. “Reuse-related population” consists of all workers filling either direct or indirect jobs generated by reuse of former Homestead AFB disposal property, plus their household members. “In-migrating and relocating population” refers to those workers and their households who would move to the local area to take a reuse-related job and who would not live in the area otherwise. For analysis purposes, all in-migrating population is assumed to take up residence in south Miami-Dade County, although some people may locate in other areas. In-migration to other areas is anticipated to be negligible.

**Table 4.1-3** shows the estimated baseline and in-migrating population under the Proposed Action and alternatives for 2000, 2005, 2015, and full buildout. Baseline population projections are not available for full buildout because of the uncertainty and variability of the time frame and limitations in available forecasts. Table 4.1-3 presents estimated reuse-related in-migration for Miami-Dade County as a whole and for the south county. Estimates for the south county that exceed those for the county as a whole reflect workers and their families relocating from the north to the south part of the county.

**Table 4.1-3. Projected Baseline Population and Reuse-Related In-Migration in Miami-Dade County and the South County Region**

Alternative	2000	2005	2015	Full Buildout
Miami-Dade County Baseline	2,175,243	2,293,697	2,530,604	NA
Proposed Action	0	518	3,156	4,407
Commercial Spaceport	0	504	1,153	1,492
Mixed Use	0	426–805	1,023–1,682	1,597–2,805
No Action	0	0	0	0
South County Baseline	182,324	201,414	239,592	NA
Proposed Action	0	518	10,597	14,951
Commercial Spaceport	0	504	1,153	1,492
Mixed Use	0	426–805	1,023–1,682	1,597–2,805
No Action	0	0	0	0

Source: SAIC.

NA Not available

#### **4.1.3.1 Proposed Action**

Under the Proposed Action, a total of 10,375 persons are anticipated to be associated with reuse-related employment either as workers or their families in 2005, increasing to 63,126 in 2015 and 88,124 at full buildout. Population associated with activities on the retained and conveyed properties are not included in those numbers. Of the total reuse-related population, 8,335 persons are assumed to reside in south Miami-Dade County in 2005, 53,146 in 2015, and 74,974 at full buildout.

In 2005, the Proposed Action is projected to attract 518 people, including workers and dependents, from outside Miami-Dade County who would migrate into the county, increasing to 3,156 in 2015 and 4,407 at

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full buildout. All are expected to locate in the southern part of the county. In addition, another 7,441 are anticipated to relocate from the northern part to the southern part of the county by 2015, increasing to 10,544 at full buildout. These projections would result in an increase of 10,597 in the population of south Miami-Dade County, south of Eureka Drive, by 2015 and 14,951 by full buildout.

Population in Miami-Dade County was estimated to total 2,056,789 persons in 1995, with 163,235 persons located in the southern portion of the county (**Miami-Dade County 1998e**). A reuse-related increase of 3,156 persons in the year 2015 would represent 0.2 percent of the total 1995 county population, the equivalent of 0.1 year of population growth. It would represent 0.1 percent of total county population in 2015 and contribute 0.7 percent of the projected population growth over the period 1995 through 2015.

For south Miami-Dade County, an increase of 10,597 in population in 2015 would represent 6.5 percent of the 1995 population and equate to 2.8 years of population growth above the projected baseline. The in-migrating and relocating population would represent 4 percent of baseline population in 2015 and contribute 14 percent of the projected population growth over the period 1995 through 2015. This in-migration/relocation is estimated to increase the population of the City of Homestead by 4.2 percent and Florida City by 1.2 percent. These numbers indicate a relatively small effect on overall county population, but a noticeable redistribution in population growth to the southern portion of Miami-Dade County.

### Cumulative Impacts

The Miami-Dade County Planning Department's high-growth projections forecast a population of 3,030,495 in 2015 (**Miami-Dade County 1998e**). This would be an increase of 973,706 over the 2,056,789 persons estimated for 1995. By 2015, the southern part of the county would still only represent about 13 percent of the population in the county. However, 25 percent of the county's population increase over the period 1995 through 2015 would occur in the southern part of the county. The population in southern Miami-Dade County is projected to increase by 243,782, from 163,235 in 1995 to 407,017 in 2015.

Without reuse of former Homestead AFB, the high-growth projections forecast an increasing move toward a bedroom community in south Miami-Dade County, with an increasing percent of the population commuting to employment outside their area of residence. The Proposed Action could have the effect of offsetting some of that imbalance between the location of employment opportunities and residential areas by providing jobs closer to south county residents.

Under the high-growth forecasts, the ratio of jobs to population between 1995 and 2015 is projected to decrease from 0.55 to 0.46 in the county as a whole and from 0.26 to 0.20 in the south county (**Miami-Dade County 1998e**). This implies that there would be sufficient labor available in the southern part of the county to fill reuse-related jobs. If the ratio were to remain constant, for example, there would be a pool of over 22,000 workers living in the south county in 2015 but working elsewhere. Therefore, it would not be expected that workers would relocate from the northern parts of the county to take jobs at former Homestead AFB. A limited number of in-migrants (estimated at 3,156) could still be expected to be attracted to the region to fill specialized jobs or just to respond to the employment opportunities.

This total in-migrating population attributable to the Proposed Action under high-growth conditions would represent 0.1 percent of the cumulative population in Miami-Dade County in 2015 and contribute 0.3 percent of the projected population growth over the period 1995 through 2015. In the southern portion of Miami-Dade County, the additional population would represent 0.8 percent of the cumulative

population in 2015 and contribute 4.4 percent of the projected population growth in south Miami-Dade County over the period 1995 through 2015.

### **Mitigation Measures**

Population increases are not in and of themselves environmental impacts that require mitigation. They can result in impacts on other resources, such as housing and public services, which are addressed in subsequent sections.

The possibility of a buffer zone between former Homestead AFB and Biscayne National Park could reduce the opportunities for residential development, and thereby the potential for population growth, in areas included in the buffer. Population growth would be limited to unprotected areas, which could lead to higher densities within the Urban Development Boundary or development in other locations. However, much of the area being considered for a potential buffer is already publicly owned or otherwise protected from development. Development of privately owned property outside the UDB is currently limited to one residence per 5 acres. A buffer that retained the same permitted level of development would not affect development in the short term but could constrain future expansion of the UDB (e.g., into the Urban Expansion Area). If the buffer prohibited any additional development, a small amount of low-density residential development would no longer be able to occur in the affected area.

### **Possible Future Expansion**

The possibility that an expanded airport could double airport-related employment could result in additional in-migration and relocation of over 10,000 job holders to the south Miami-Dade County area, increasing the population by an estimated 23,000. These are only gross estimates and actual in-migration could differ substantially depending on conditions at the time of the expansion.

#### **4.1.3.2      *Commercial Spaceport Alternative***

Under the Commercial Spaceport alternative, it is estimated that 10,094 people, comprised of workers and their families, could be associated with reuse-related employment by 2005, increasing to 23,066 by 2015 and 29,831 by full buildout. The population associated with the retained and conveyed properties is not included in the above numbers. Of the total reuse-related population, 8,094 persons are assumed to reside in south Miami-Dade County in 2005, increasing to 19,415 by 2015 and 25,069 by full buildout.

An estimated 504 people could migrate into the county by 2005 under this alternative, increasing to 1,153 by 2015 and 1,492 by full buildout. All would be expected to move to the south part of the county. In 2015, this would represent 0.1 percent of the total county population. A total in-migrating population of 1,153 persons would be the equivalent of less than 0.1 year of population growth for the entire county as projected over the period 1995 through 2015. It would represent 0.1 percent of total county population in 2015 and contribute 0.2 percent of the projected population growth over the period 1995 through 2015.

For south Miami-Dade County, in-migration of 1,153 persons in 2015 (no population relocation from the north county to the south is anticipated) would represent 0.7 percent of the 1995 population. It would also equate to 0.3 year of population growth above that projected for baseline growth in the 1995 to 2015 time period. It would represent 0.5 percent of 2015 baseline population in the south county and contribute 1.5 percent of the projected population growth over the period 1995 through 2015. The in-migration is estimated to increase the population of the City of Homestead by 0.4 percent and Florida City 0.1 percent in 2015.

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### **Combined Commercial Spaceport/Airport**

Population associated with a combined Commercial Spaceport/Airport could include 50,834 people by 2015. This does not include the workers and their families associated with retained and conveyed properties.

An estimated 2,541 people could be expected to migrate into Miami-Dade County by 2015. This would represent 0.1 percent of the total county population and be the equivalent of 0.1 year of population growth for the entire county as projected over the period 1995 through 2015. The total in-migrating population attributable to a combined Commercial Spaceport/Airport would represent 0.1 percent of total county population in 2015 and contribute 0.5 percent of the projected population growth over the period 1995 through 2015.

All of the in-migrating population would be expected to locate in the southern part of the county. In 2015, this would represent 1.6 percent of the population in the south county in 1995 and be the equivalent of 0.7 year of population growth. It would represent about 1 percent of baseline population in the south county in 2015 and contribute 3 percent of the projected population growth over the period 1995 through 2015 in that area. The estimated effect on the City of Homestead would be to increase population by 0.8 percent, and in Florida City it could increase the population by 0.2 percent in 2015.

### **Cumulative Impacts**

The Miami-Dade County high-growth projections forecast a population of 3,030,495 persons in 2015 (**Miami-Dade County 1998e**). The estimated in-migrating population attributable to the Commercial Spaceport alternative would be 0.04 percent of the cumulative population in Miami-Dade County in 2015 and contribute 0.1 percent of the projected population growth over the period 1995 through 2015. In the southern portion of the county, this additional population would represent 0.3 percent of the cumulative population in 2015 and contribute 0.5 percent of the projected population growth over the period 1995 through 2015.

With a combined Commercial Spaceport/Airport, the estimated in-migration could be 0.1 percent of the cumulative population in Miami-Dade County in 2015 and contribute 0.3 percent of the projected population growth over the period 1995 through 2015. In the southern portion of the county, this would represent 0.6 percent of cumulative baseline population in 2015 and contribute 1.0 percent of the projected population growth over the period 1995 through 2015.

### **Mitigation Measures**

As with the Proposed Action, population increases attributable to this alternative would not, by themselves, have environmental impacts. Potential impacts on related resources such as housing and public services and are addressed in subsequent sections.

If a buffer area between the Commercial Spaceport and Biscayne NP were established, it could constrain population growth in protected areas, as discussed for the Proposed Action, but the reuse-related population growth is expected to be less under this alternative, and the impact would likely be negligible.

#### **4.1.3.3      *Mixed Use Alternative***

The four scenarios examined for this alternative could differ in their effects on population. Under the Market-Driven scenario, a total of 8,539 persons, including workers and their families, are estimated to



be associated with reuse of former Homestead AFB by 2005, increasing to 21,283 by 2015 and 56,093 by full buildout. These numbers do not include the population associated with retained and conveyed properties. Of the total reuse-related population, 7,604 are assumed to reside in south Miami-Dade County in 2005, 18,916 in 2015, and 49,777 at full buildout. No in-migration would be expected to occur if the reuse of the former Homestead AFB property were to rely on latent demand. With some incentives and outside stimulation, a modest number of in-migrants could be attracted to the area. For analysis purposes, it was assumed in-migration could total up to 426 in 2005, increasing to 1,063 by 2015 and 2,805 by full buildout.

With the Collier-Hoover proposal, a total of 14,438 persons, including workers and their families, are projected to be associated with reuse of former Homestead AFB by 2005, increasing to 28,318 by 2015 and 49,849 by full buildout. An estimated 19,280 persons would be expected to reside in south Miami-Dade County in 2005, 31,542 in 2015, and 50,607 at full buildout. A modest number of in-migrants could be attracted to the south county. For analysis purposes, it was assumed in-migration could total up to 719 in 2005, increasing to 1,418 by 2015 and 2,496 by full buildout.

Based on the employment projections in their proposal, an estimated 9,204 persons, including workers and their families, could be associated with the original Collier Resources Company development by 2005, increasing to 20,446 by 2015 and 27,635 by full buildout. Of this total, 8,246 could be expected to reside in south Miami-Dade County in 2005, 17,985 in 2015, and 25,002 at full buildout. No in-migration would be expected to occur if the development relied on existing labor supply. For analysis purposes, it was assumed that a small number of in-migration could occur, which was estimated at 461 in 2005, increasing to 1,023 by 2015 and 1,597 by full buildout.

Under the original Hoover plan, a total of 16,095 persons, including workers and their families, are estimated to be associated with reuse of former Homestead AFB by 2005, increasing to 33,640 by 2015 and 52,461 by full buildout. An estimated 20,715 persons would be expected to reside in south Miami-Dade County in 2005, 36,307 in 2015, and 52,917 at full buildout. A modest number of in-migrants could be attracted to the area. For analysis purposes, it was assumed in-migration could total up to 805 in 2005, increasing to 1,682 by 2015, and 2,624 by full buildout.

### **Cumulative Impacts**

The total in-migrating population potentially attributable to the Mixed Use alternative would likely be no more than 0.1 percent of the cumulative population in Miami-Dade County high-growth forecast for 2015 and contribute less than 0.2 percent of the projected population growth over the period 1995 through 2015. In the southern portion of the county, this would represent up to 0.4 percent of the cumulative population in 2015 and contribute up to 0.7 percent of the projected population growth over the period 1995 through 2015.

### **Mitigation Measures**

As with the other alternatives, the effects of any population increases attributable to reuse of former Homestead AFB would be reflected in impacts on housing and public services, addressed in subsequent sections. With the small population increases identified for this alternative, the establishment of a buffer would have a negligible effect.

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### 4.1.3.4 No Action Alternative

Under the No Action alternative, population in the ROI would be expected to remain as forecast for the projected baseline. A higher growth level as forecast by the Miami-Dade County Planning Department could increase the population to 3,030,495 in the county as a whole and 407,017 in the south county by 2015 even without reuse of the former base property.

### 4.1.3.5 Independent Land Use Concepts

The independent land use concepts are not anticipated to affect population in the ROI, beyond the impacts projected for the Proposed Action and other reuse alternatives.

### 4.1.4 Housing

With the population growth assumed in the moderate-growth baseline, housing in Miami-Dade County is forecast to increase from 812,767 units in 1995 to 980,172 units in 2015, a net increase of 167,405 housing units. This would be an average annual rate of change over the period of 0.9 percent. Of the countywide baseline increase in housing between 1995 and 2015, 17 percent is expected to be located in the southern part of the county (south of Eureka Drive). Over 67 percent of that increase would likely occur in and around the City of Homestead and Florida City.

The housing effects associated with implementation of the Proposed Action and alternatives would be intimately tied to increases in population. All of the reuse-related population increase is assumed to occur in south Miami-Dade County. **Table 4.1-4** presents baseline and estimated reuse-related housing for the Proposed Action and alternatives in the south county for 2000, 2005, 2015, and full buildout.

**Table 4.1-4. Projected Baseline and Reuse-Related Housing in Miami-Dade County and the South County Region**

Alternative	2000	2005	2015	Full Buildout
South Miami-Dade County Baseline	63,796	70,892	85,083	NA
Proposed Action	0	188	3,854	5,436
Commercial Spaceport	0	183	419	543
Mixed Use	0	155–293	372–612	502–1,020
No Action	0	0	0	0

Source: SAIC.

NA Not available

#### 4.1.4.1 Proposed Action

Under the Proposed Action, new housing would need to be constructed in south Miami-Dade County to accommodate in-migrating persons and persons relocating from the north part of the county. This does not include housing demand associated with the retained and conveyed properties. Housing stock in south Miami-Dade County was estimated to total 56,700 in 1995. Reuse-related demand in south Miami-Dade County could amount to 188 units by 2005, 3,854 units by 2015, and 5,436 by full buildout. The 2015 level would equate to 2.7 years of growth over the period 1995 through 2015. About 1,848 of the new housing units needed by 2015 in the south county would be attributable to direct, on-site jobs. By

full buildout, these jobs could generate a demand for another 620 units. The remaining increase in housing would be attributable to indirect jobs.

It is projected that, under a moderate population growth scenario, southern Miami-Dade County in 2015 would contain 85,083 housing units. This exhibits an increase of 28,383 units over the 1995 level of 56,700 units. The reuse-related housing demand could represent an additional demand of 4.5 percent above the baseline housing in 2015 and contribute an additional 13.6 percent to the projected growth in housing unit demand over the period 1995 through 2015.

An estimated 973 of these new housing units would be expected to be built in the City of Homestead by 2015. This would comprise 3.8 percent of the projected baseline housing of 25,480 units in the corresponding year. In Florida City, 57 reuse-related housing units are estimated to be needed by 2015. This would comprise 1.2 percent of the housing stock of 4,675 in the corresponding year.

### **Cumulative Impacts**

Miami-Dade County high-growth forecasts project housing stock will number 1,145,515 units in 2015 (**Miami-Dade County 1998e**). This would be an increase of 165,343 units over the projected baseline. About 12 percent of the housing stock is forecast to be located in the southern part of the county in 2015. However, 25 percent of the countywide increase in housing is projected to occur in the southern part of the county, from 56,700 units in 1995 to 140,567 units in 2015. An increase of 3,854 housing units by 2015 attributable to the Proposed Action would represent 0.8 percent of the cumulative housing in 2015 and contribute 4.6 percent of the projected cumulative growth in demand for housing in south Miami-Dade County over the period 1995 through 2015.

### **Mitigation Measures**

No mitigation measures are suggested in housing. The establishment of a buffer between HST and Biscayne NP could preclude housing from being developed in the protected area. Currently, low-density residential development is permitted at one unit per 5 acres outside the UDB. It is not known whether a buffer would allow that level of development to continue or prohibit all future development. In any case, housing supply is not expected to be measurably affected.

### **Possible Future Expansion**

It is conceivable that the increase in demand for housing attributable to airport growth could double if HST were to expand to a second runway in the future.

#### **4.1.4.2      *Commercial Spaceport Alternative***

Total housing demand for the Commercial Spaceport alternative to accommodate in-migrating persons is estimated to number 183 units in 2005, increasing to 419 units in 2015, and 543 units by full buildout. A reuse-related demand for 419 housing units in 2015 would represent 0.7 percent of the 1995 stock in south Miami-Dade County. This would be the equivalent of 0.3 years of growth in housing stock in the south county over the period 1995 through 2015. The reuse-related housing demand could represent an additional demand of 0.5 percent over baseline and contribute an additional 1.5 percent to the projected growth in housing unit demand over the period 1995 through 2015. About half of the increased demand would be attributable to direct, on-site jobs and the remainder to indirect jobs.

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The number of housing units in the City of Homestead is estimated to increase by 89 units under this alternative. This would comprise 0.3 percent of the projected baseline housing of 25,480 units in 2015. In Florida City, four additional housing units could be needed by 2015. This would comprise 0.1 percent of the housing stock of 4,675 in the corresponding year.

### **Combined Commercial Spaceport/Airport**

A combined Commercial Spaceport/Airport could generate an increase in demand for 923 housing units by 2015. The reuse-related housing demand (all of which is assumed to occur in the south county) would represent an additional demand of 1.1 percent above baseline housing in 2015 and contribute an additional 3.3 percent to the projected growth in housing unit demand over the period 1995 through 2015. At full buildout, housing demand could increase to 989 units.

Of the 923 additional housing units estimated for 2015, 193 would be expected to be located in the City of Homestead. This would comprise 0.8 percent of the projected baseline housing of 25,480 units in 2015. Nine of the additional units would be expected to be located in Florida City. This would comprise 0.2 percent of the housing stock of 4,675 in 2015.

### **Cumulative Impacts**

The Miami-Dade County high-growth forecast would add another 55,484 units in the southern part of the county over the projected baseline in 2015 (**Miami-Dade County 1998e**). The estimated demand for housing units attributable to implementation of the Commercial Spaceport alternative would represent 0.3 percent of the cumulative housing units projected for the southern part of the county in 2015 and contribute 0.5 percent of the projected cumulative growth in demand for housing over the period 1995 through 2015. The estimated increase in demand for housing units associated with a combined Commercial Spaceport/Airport would represent 0.7 percent of the cumulative housing in 2015 and contribute 1.1 percent of the projected cumulative growth in south Miami-Dade County over the period 1995 through 2015.

### **Mitigation Measures**

No mitigation measures for housing are suggested for this alternative. The effects on housing supply of establishing a buffer between the Commercial Spaceport and Biscayne NP would be negligible.

#### **4.1.4.3      *Mixed Use Alternative***

The Mixed Use alternative could result in a modest level of in-migration that could result in an increase in the demand for housing. For the Market-Driven scenario, this could involve up to 155 units in 2005, 387 units in 2015, and 1,020 units by full buildout, not including demand associated with the retained and conveyed properties. About half would be attributable to direct on-site jobs. This reuse-related housing demand in the southern part of Miami-Dade County could represent an additional demand of 0.5 percent to baseline housing in 2015 and contribute an additional 1.4 percent to the projected growth in housing unit demand over the period 1995 through 2015. An estimated increase of 80 housing units in the City of Homestead would comprise 0.3 percent of the projected baseline housing of 25,480 units in 2015. In Florida City, four additional housing units would comprise 0.1 percent of the housing stock of 4,675 in the corresponding year.

The Collier-Hoover proposal could result in an increase in demand of up to 262 housing units in 2005, 514 units in 2015, and 906 units by full buildout. Almost half would be attributable to direct on-site jobs.

This reuse-related housing demand in the southern part of Miami-Dade County could represent an additional demand of 0.6 percent to baseline housing in 2015 and contribute an additional 1.8 percent to the projected growth in housing unit demand over the period 1995 through 2015. An estimated increase of 92 housing units in the City of Homestead would comprise 0.4 percent of the projected baseline housing of 25,480 units in 2015. In Florida City, four additional housing units would comprise 0.1 percent of the housing stock of 4,675 in the corresponding year.

The original Collier Resources Company proposal could result in an increase in demand of up to 167 housing units in 2005, 372 units in 2015, and 502 units by full buildout. About half would be attributable to direct on-site jobs. This reuse-related housing demand in the southern part of Miami-Dade County could represent an additional demand of 0.4 percent to baseline housing in 2015 and contribute an additional 1.3 percent to the projected growth in housing unit demand over the period 1995 through 2015. An estimated increase of 73 housing units in the City of Homestead would comprise 0.3 percent of the projected baseline housing of 25,480 units in 2015. In Florida City, three additional housing units would comprise 0.1 percent of the housing stock of 4,675 in the corresponding year.

The original Hoover Environmental Group plan could result in an increase in demand of up to 293 housing units in 2005, 612 units in 2015, and 954 units by full buildout. About half would be attributable to direct on-site jobs. This reuse-related housing demand in the southern part of Miami-Dade County could represent an additional demand of 0.7 percent to baseline housing in 2015 and contribute an additional 2.1 percent to the projected growth in housing unit demand over the period 1995 through 2015. An estimated increase of 113 housing units in the City of Homestead would comprise 0.4 percent of the projected baseline housing of 25,480 units in 2015. In Florida City, five additional housing units would comprise 0.1 percent of the housing stock of 4,675 in the corresponding year.

### **Cumulative Impacts**

The Miami-Dade County high-growth forecasts project another 55,484 housing units in the southern part of the county above that estimated for the projected baseline by 2015 (**Miami-Dade County 1998e**). The increase in demand for housing units attributable to the Mixed Use alternative would represent 0.3 to 0.4 percent of the cumulative housing units in 2015 and contribute 0.4 to 0.7 percent of the projected cumulative growth in demand for housing over the period 1995 through 2015.

### **Mitigation Measures**

No mitigation measures for housing are suggested for this alternative. The impacts of a buffer, if one were established, on housing supply would be as described under the Proposed Action.

#### ***4.1.4.4 No Action Alternative***

Housing under the No Action alternative is assumed to remain as projected for baseline conditions. Cumulative growth could add an additional 55,484 housing units to south Miami-Dade County if the county's high-growth forecasts were achieved (**Miami-Dade County 1998e**).

#### ***4.1.4.5 Independent Land Use Concepts***

Any housing demand associated with the independent land use concepts would not exceed demands projected for the Proposed Action and alternatives.

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### 4.1.5 Public Services

The public services analysis addresses local government employment, public education, fire protection, police protection, and health care services. The analysis of impacts to government structure addresses the potential change in the need for government personnel employed by Miami-Dade County, the City of Homestead, and Florida City as a result of reuse-related population changes. Public service factors based on existing ratios of government personnel to total population in these areas were used to project potential future demand. Total baseline and reuse-related government personnel for the Proposed Action and alternatives in Miami-Dade County as a whole and in the south county are presented in **Table 4.1-5**.

**Table 4.1-5. Projected Baseline and Reuse-Related Government Personnel in Miami-Dade County, City of Homestead, and Florida City**

Alternative	2000	2005	2015	Full Buildout
Miami-Dade County Baseline	22,514	23,740	26,192	NA
Proposed Action	0	6	33	46
Commercial Spaceport	0	6	12	16
Mixed Use	0	4–9	11–17	10–37
No Action	0	0	0	0
City of Homestead Baseline	301	360	527	NA
Proposed Action	0	1	18	34
Commercial Spaceport	0	1	3	3
Mixed Use	0	0–1	1–3	2–5
No Action	0	0	0	0
Florida City Baseline	67	82	121	NA
Proposed Action	0	2	15	32
Commercial Spaceport	0	2	6	8
Mixed Use	0	2–4	5–8	8–17
No Action	0	0	0	0

Source: SAIC.

NA Not available

For the public education analysis, changes in enrollments affecting Miami-Dade County Public Schools were derived from reuse-related population effects described in Section 4.1.3 (Population). Enrollments in Miami-Dade County Public Schools in the 1996–97 school year comprised 16.2 percent of the total population of the county. This percentage was used to estimate enrollments based on anticipated population growth. The associated increase in teachers was based on a countywide ratio of 19.6 students per teacher. Reuse-related increases in enrollments in Miami-Dade County Schools represent those persons expected to move into the county from elsewhere due to the project (in-migrants), all of whom are anticipated to live in the southern part of the county. The reuse-related enrollment effects shown for south Miami-Dade County schools reflect both persons moving into the county from elsewhere and persons relocating to south Miami-Dade County from the north county. Enrollment effects due to people relocating could require reassignment of teachers and resources from the north county to the south county. Projected baseline and reuse-related enrollment for the Proposed Action and alternatives in Miami-Dade County as a whole and in the south county is presented in **Table 4.1-6**.

**Table 4.1-6. Projected Baseline and Reuse-Related School Enrollment in Miami-Dade County and the South County Region**

Alternative	2000	2005	2015
Miami-Dade County Baseline	352,607	371,808	410,211
Proposed Action	0	84	511
Commercial Spaceport	0	82	187
Mixed Use	0	69–131	166–273
No Action	0	0	0
South County Baseline	29,555	32,649	38,838
Proposed Action	0	84	1,718
Commercial Spaceport	0	82	187
Mixed Use	0	69–131	166–273
No Action	0	0	0

Source: SAIC.

The Miami-Dade County Fire Rescue Department serves the unincorporated portions of the county, as well as certain incorporated communities, including Homestead and Florida City. The fire protection analysis focuses on potential changes in the number of firefighters that would be needed in south Miami-Dade County. Projected changes in the required number of firefighters employed by the Miami-Dade County Fire Rescue Department were derived from reuse-related population effects described in Section 4.1.3. A factor of 0.7 firefighters per 1,000 persons, reflecting the 1998 ratio for the department's service area, has been used to estimate the increased need for firefighting personnel resulting from the project (**Moore 1998**).

The police protection analysis addresses reuse-related changes in the number of sworn officers needed in Homestead and Florida City and in the unincorporated areas of south Miami-Dade County. The two cities have their own police departments, and the Miami-Dade County Police Department serves the unincorporated portions of the county. A factor of 2.77 sworn officers per 1,000 persons has been used to estimate the increased need for sworn officers in unincorporated south Miami-Dade County, based on the estimated existing ratio for all of unincorporated Miami-Dade County (**Alvarez 1998**). A factor of 2.71 sworn officers per 1,000 persons has been used for the City of Homestead and 4.68 sworn officers per 1,000 persons for Florida City, based on existing ratios in these communities (**Bowe 1998**). The results are summarized in **Table 4.1-7** for the projected baseline and Proposed Action and alternatives.

With regard to health services, population-based service factors were used in calculating additional demand due to reuse-related population growth, based on the existing number of health care professionals in Miami-Dade County (6,031 doctors, 1,351 dentists, 13,526 registered nurses, and 3,842 practical nurses) (**Agency for Health Care Administration 1998**). Factors of 2.9 doctors per 1,000 persons; 0.64 dentists per 1,000 persons; 6.6 registered nurses per 1,000 persons; and 1.8 licensed practical nurses per 1,000 persons were used to calculate total personnel for the projected baseline and the Proposed Action and alternatives, which are summarized in **Table 4.1-8**.

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**Table 4.1-7. Projected Baseline and Reuse-Related Sworn Officers in the City of Homestead, Florida City, and the Balance of Miami-Dade County**

Alternative	2000	2005	2015	Full Buildout
City of Homestead Baseline	88	105	154	NA
Proposed Action	0	0	5	7
Commercial Spaceport	0	0	0	1
Mixed Use	0	0	0	1
No Action	0	0	0	0
Florida City Baseline	32	39	58	NA
Proposed Action	0	0	<1	0
Commercial Spaceport	0	0	0	2
Mixed Use	0	0	0	2
No Action	0	0	0	0
Balance of Miami-Dade County Baseline	384	413	451	NA
Proposed Action	0	2	23	34
Commercial Spaceport	0	2	3	8
Mixed Use	0	2	4	7
No Action	0	0	0	0

Source: SAIC.

NA Not available

<1 Less than 1.

**Table 4.1-8. Projected Baseline and Reuse-Related Increase in Demand for Health Care Professionals in Miami-Dade County and the South County Region**

Alternative	2000	2005	2015	Full Buildout
Miami-Dade County Baseline	25,311	26,689	29,445	NA
Proposed Action	0	6	37	37
Commercial Spaceport	0	6	14	16
Mixed Use	0	4–9	5–19	5–31
No Action	0	0	0	0
South County Baseline	2,121	2,344	2,788	NA
Proposed Action	0	6	123	173
Commercial Spaceport	0	6	14	16
Mixed Use	0	4–9	5–19	5–31
No Action	0	0	0	0

Source: SAIC.

NA Not available

### 4.1.5.1 Proposed Action

**Government Structure.** Combining direct and secondary project effects, the total increased need for government personnel from the Proposed Action (excluding the retained and transferred property) by 2015 is projected to be 33 employees for the government of Miami-Dade County (based on a service



ratio of 10.35 personnel per 1,000 persons), 18 employees for the City of Homestead (based on a service ratio of 8.29 personnel per 1,000 persons), and 15 employees in Florida City. This represents a 0.1 percent increase over the projected baseline requirement in 2015 in Miami-Dade County, 3.4 percent in the City of Homestead, and 12.4 percent in Florida City. Compared to a government employment in 1995, it represents a 0.2 percent increase for Miami-Dade County, 7.5 percent increase for the City of Homestead, and 27.8 percent increase for Florida City. Projected growth would also result in an increased need for facilities and equipment utilized by reuse-related government employees. Full buildout could generate a need for an additional 13 government personnel for Miami-Dade County, 7 personnel for the City of Homestead, and 5 personnel for Florida City.

**Public Education.** Combining direct and secondary project effects, the total increase in students in Miami-Dade County Public Schools from the Proposed Action (excluding the retained and transferred property) is projected to be 511 students associated with in-migrating households by 2015, creating a need for 27 additional teachers. This equates to a 0.1 percent addition to the 2015 baseline.

In south Miami-Dade County schools, there would be a total increase of 1,718 students and related demand for 88 teachers by the year 2015. This enrollment increase represents a 4.4 percent addition to the 2015 baseline. Of the 1,718 student reuse-related effect in the south county, 511 students would be in-migrants requiring new hiring of teachers and 1,207 students would relocate from the north county, which could create the need for reassignment of teachers from north county to south county schools. It is not possible to predict how the enrollment changes would be distributed across the 300 schools in the county.

Countywide, the combined enrollment effect of the Proposed Action through 2015 would be 0.2 percent of 1996–97 enrollments. Under a moderate growth scenario baseline, enrollments in Miami-Dade County Schools in 2015 would number 410,211 students without the project. This represents an increase of 69,307 students over the 1996–97 level of 340,904 pupils. The Proposed Action would equate to an additional 0.1 years of projected baseline growth over the 1997 to 2015 period.

For south Miami-Dade County, the enrollment effect of the Proposed Action through 2015 would be 6.5 percent over and above the 1996–97 enrollments. Under the moderate growth scenario baseline, enrollments in south Miami-Dade County schools in 2015 would number 38,838 students without the project. This represents an increase of 12,377 students over the 1996–97 level of 26,460 pupils. The Proposed Action would equate to an additional 2.5 years of projected baseline growth over the 1997 to 2015 period. Full buildout could create the need for an additional 10 new teachers, as well as the potential for reassignment of 36 teachers from north county to south county schools.

**Fire Protection.** Combining direct and secondary project effects, the total increased need for additional firefighters from the Proposed Action in south Miami-Dade County (excluding the retained and transferred property) is projected to be eight firefighters by 2015. Of this total, one firefighter would be needed in the City of Homestead, less than one in Florida City, and seven in the balance of south Miami-Dade County. This represents a 2.3 percent addition in the City of Homestead and a 3.1 percent addition in the balance of south Miami-Dade County in 2015. The reuse-related need for firefighters in south Miami-Dade County represents demand created by both in-migrating and relocating population. As a result, six of the eight firefighters needed could potentially be reassigned from the north county to the south county based on the number of individuals relocating, whereas two of the needed firefighters would represent potential new hires based upon the number of in-migrants to the county. The reuse-related growth would also result in an increased need for administrative and support personnel, as well as facilities and equipment utilized by the department in the south county.

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The reuse-related effects represent a 4.9 percent increase for the City of Homestead over projected baseline growth of 24 firefighters between 1998 and 2015. The reuse-related effect in the balance of south Miami-Dade County represents a 7.2 percent increase over the 17 firefighters needed to accommodate the baseline growth between 1998 and 2015. Full buildout could result in the need for one additional firefighter in the City of Homestead and two in the balance of south Miami-Dade County.

***Police Protection.*** Combining direct and secondary project effects, the total increased need for sworn officers from the Proposed Action in 2015 (excluding the retained and transferred property) is projected to be five sworn officers in the City of Homestead, less than one sworn officer in Florida City, and 23 sworn officers in unincorporated south Miami-Dade County. This would represent a 7.1 percent increase in the number of sworn officers in the City of Homestead and 6 percent increase in sworn officers in the unincorporated area of the county. Reuse-related growth would also result in an increased need for administrative and support personnel, as well as facilities and equipment. Full buildout could create a need for an additional two sworn officers in the City of Homestead, less than one in Florida City, and 11 in unincorporated south Miami-Dade County.

***Health Care Services.*** Combining direct and secondary project effects, the total increased need for medical professionals countywide from the Proposed Action (excluding the retained and transferred property) is projected to be 9 doctors, 2 dentists, 20 registered nurses, and 6 practical nurses by 2015 due to persons in-migrating into the county. This represents 0.2 percent of the current number of medical professionals in the county and represents a 0.1 percent addition to the 2015 baseline need. This projected growth would also result in increased needs for administrative and support personnel, hospital, office, and clinic facilities, and equipment and supplies. Reuse-related persons relocating from the north to the south parts of the county could result in a redistribution of medical professionals within the county involving approximately 21 doctors, 5 dentists, 47 registered nurses, and 13 licensed practical nurses.

The reuse-related demand in Miami-Dade County would be over and above the baseline growth of 1,144 doctors, 256 dentists, 2,566 registered nurses, and 729 practical nurses forecast for 1998 to 2015. The reuse-related demand in south Miami-Dade County would be over and above the 184 doctors, 41 dentists, 415 registered nurses, and 118 licensed practical nurses needed between 1998 and 2015.

Full buildout could create the need for an additional 12 doctors, 2 dentists, 28 registered nurses, and 8 licensed practical nurses in south Miami-Dade County.

Many medical services are provided by private practitioners and (private) for-profit and not-for-profit hospitals and clinics. Some of these providers could be expected to expand their services or locate new facilities in the county in response to increased economic activity and related population growth.

### **Cumulative Impacts**

The Miami-Dade County high-growth forecasts would increase the need for public services above 1998 baseline levels. The cumulative effect is estimated to result in an additional 9,591 government personnel, 7,670 teachers, and 10,512 health care professionals by 2015 in the county and 163 firefighters and 540 sworn officers in the balance of the county. The demands generated by the Proposed Action would represent less than 1 percent of this cumulative growth.

### **Mitigation Measures**

No mitigation measures are suggested to reduce impacts from the Proposed Action on public services.

**Possible Future Expansion**

Expansion of HST and associated population effects could double the increased demand for government workers, teachers, firefighters, sworn officers, and health care professionals over that generated by the Proposed Action.

**4.1.5.2 Commercial Spaceport Alternative**

**Government Structure.** Combining direct and secondary project effects, the total increased need for government personnel from the Commercial Spaceport alternative (excluding the retained and transferred property) by 2015 is projected to be 12 employees for the government of Miami-Dade County, 3 employees for the City of Homestead, and 6 employees in Florida City. This represents less than 0.1 percent of the projected baseline requirement in 2015 in Miami-Dade County, 0.6 percent in the City of Homestead, and 5.0 percent in Florida City. It represents less than 0.1 percent of 1998 local government personnel levels for Miami-Dade County, 1.3 percent for the City of Homestead, and 11.1 percent for Florida City. Reuse-related growth would also result in an increased need for facilities and equipment utilized by reuse-related government employees. Full buildout could create the need for an additional four government personnel in Miami-Dade County, less than one employee in the City of Homestead, and two personnel in Florida City.

**Public Education.** Combining direct and secondary project effects, the total increase in students in Miami-Dade County Public Schools from the Commercial Spaceport alternative (excluding the retained and transferred property) is projected to be 187 students associated with in-migrating households by 2015, which would require an additional 10 teachers. All of these students would be expected to attend south county schools. Countywide, these students represent less than 0.1 percent in addition to the 2015 baseline number, whereas they represent 0.5 percent in addition to the south county 2015 baseline need.

Countywide, the combined enrollment effect of the Commercial Spaceport alternative through 2015 would be less than 0.1 percent of 1996–97 enrollments and equate to less than 0.1 additional years of projected baseline growth over the 1997–2015 period. For south Miami-Dade County, the enrollment effect of the Commercial Spaceport alternative through 2015 would be 0.7 percent above the 1996–97 enrollments. This would equate to an additional 0.3 years of projected baseline growth over the 1997–2015 period. Full buildout could result in an additional 55 students and an associated need for 2 teachers in south Miami-Dade County schools.

**Fire Protection.** Combining direct and secondary project effects, the total increased need for additional firefighters from the Commercial Spaceport alternative in south Miami-Dade County (excluding the retained and transferred property) is projected to be less than one firefighter by 2015. Full buildout could result in another two firefighters in south Miami-Dade County.

**Police Protection.** Combining direct and secondary project effects, the total increased need for sworn officers from the Commercial Spaceport alternative in 2015 (excluding the retained and transferred property) is projected to be less than one sworn officer in the City of Homestead, less than one sworn officer in Florida City, and three sworn officers in unincorporated south Miami-Dade County. Full buildout could increase the need for one additional sworn officer in the City of Homestead, 2 in Florida City, and 5 sworn officers in unincorporated south Miami-Dade County.

**Health Care Services.** Combining direct and secondary project effects, the total increased need for medical professionals countywide from the Commercial Spaceport alternative (excluding the retained and transferred property) is projected to be four doctors, less than one dentist, eight registered nurses,

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and two practical nurses by 2015. Full buildout could increase the need two additional registered nurses. The reuse-related growth could also result in an increased need for administrative and support personnel, medical facilities, equipment and supplies.

Private practitioners, private for-profit and private not-for-profit medical facilities could also be expected to expand their services or locate new facilities in the county in response to increased economic activity and related population growth.

### **Combined Commercial Spaceport/Airport**

A combined Commercial Spaceport/Airport could result in a need for 26 additional employees for the government of Miami-Dade County, 4 additional employees for the City of Homestead, and 13 additional employees for Florida City in 2015. This represents an increase of 0.1 percent over 1998 local government personnel working for Miami-Dade County, 1.7 percent increase for the City of Homestead, and 24.1 percent increase for Florida City. Full buildout could create the need for an additional two government personnel for Miami-Dade County, one government personnel for the City of Homestead, and one personnel for Florida City.

**Public Education.** A combined Commercial Spaceport/Airport is projected to increase school enrollment by 412 students, which would require an additional 21 teachers. All of these students would be expected to attend south county schools. Countywide, these students would represent 0.1 percent in addition to the 2015 baseline and represent 1 percent of the south county baseline. At full buildout, this could increase by an additional 29 students, requiring one additional teacher.

**Fire Protection.** A combined Commercial Spaceport/Airport is projected to require an additional two firefighters by 2015 in south Miami-Dade County. This represents less than a 2 percent addition to baseline levels in south Miami-Dade County in 2015. The additional growth at full buildout would increase the need by less than one firefighter.

**Police Protection.** A combined Commercial Spaceport/Airport is projected to generate a requirement for one sworn officer in the City of Homestead, less than one sworn officer in Florida City, and 6 sworn officers in unincorporated south Miami-Dade County. Full buildout could increase the need by less than one sworn officer in the City of Homestead and Florida City and one sworn officer in unincorporated south Miami-Dade County.

**Health Care Services.** A combined Commercial Spaceport/Airport is projected to generate a need for 8 doctors, 2 dentists, 16 registered nurses, and 4 practical nurses by 2015. This represents 0.1 percent of the current level in the county and a 0.1 percent increase to the 2015 baseline. Full buildout could increase the need by one additional registered nurse.

### **Cumulative Impacts**

The Miami-Dade County high-growth forecasts would increase the need for public services above the 1998 baseline levels, involving 9,591 additional government personnel, 7,670 additional teachers, and 10,512 additional health professionals by 2015 in the county and 163 additional firefighters and 540 additional sworn officers in the balance of the county. The demands generated by the Commercial Spaceport alternative, with or without a joint-use airport, would represent less than 1 percent of the cumulative growth.

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## Mitigation Measures

No mitigation measures are suggested to reduce impacts from the Commercial Spaceport alternative on public services.

### 4.1.5.3 *Mixed Use Alternative*

**Government Structure.** Combining direct and secondary project effects, the total increased need for government personnel from the Mixed Use alternative (excluding the retained and transferred property) by 2015 is projected to range from 11 to 17 employees for the government of Miami-Dade County, 1 to 3 employees for the City of Homestead, and 5 to 8 employees for Florida City. This represents less than 0.1 percent of the projected baseline requirement in 2015 in Miami-Dade County, 0.2 to 0.6 percent in the City of Homestead, and 4 to 7 percent in Florida City. It also represents less than 0.1 percent of 1998 local government personnel levels for Miami-Dade County, 0.4 to 1.3 percent for Homestead, and 9 to 15 percent for Florida City. Reuse-related growth would also result in an increased need for facilities and equipment utilized by reuse-related government employees. Full buildout could generate a need for an additional 5 to 18 government personnel by Miami-Dade County, 1 to 2 personnel by the City of Homestead, and 3 to 9 personnel by Florida City.

**Public Education.** Combining direct and secondary project effects, the total increase in students in Miami-Dade County Public Schools from the Mixed Use alternative (excluding the retained and transferred property) is projected to range from 166 to 273 students, which would require an additional 8 to 13 teachers. All of these students would be expected to attend south county schools. Countywide, these students would represent less than 0.1 percent increase to the 2015 baseline and 0.4 to 0.7 percent increase to the south county baseline in 2015.

For south Miami-Dade County, the enrollment effect of the Mixed Use alternative through 2015 could range from 0.6 to 1.0 percent over 1996–97 enrollments. The project would equate to an additional 0.2 to 0.4 years of projected baseline growth over 1997 to 2015. Full buildout could add another 94 to 282 students and require an additional 4 to 15 teachers.

**Fire Protection.** Combining direct and secondary project effects, the total increased need for additional firefighters from the Mixed Use alternative in south Miami-Dade County (excluding the retained and transferred property) is projected to be one firefighter by 2015. Full buildout could add a requirement for an additional two firefighters in south Miami-Dade County.

**Police Protection.** Combining direct and secondary project effects, the total increased need for sworn officers from the Mixed Use alternative in 2015 (excluding the retained and transferred property) is projected to be less than one sworn officer in the City of Homestead and Florida City and up to three sworn officers in unincorporated south Miami-Dade County. Reuse-related growth would also result in an increased need for administrative and support personnel, as well as facilities and equipment utilized by the department's personnel. Full buildout could increase the need for one additional sworn officer by the City of Homestead, two in Florida City, and up to seven sworn officers in unincorporated south Miami-Dade County.

**Health Care Services.** Combining direct and secondary project effects, the total increased need for medical professionals countywide from the Mixed Use alternative (excluding the retained and transferred property) is projected to be 1 to 5 doctors, less than one dentist, 3 to 11 registered nurses, and 1 to 3 practical nurses by 2015. For each of the four categories of medical professionals, the need created by the Mixed Use alternative through 2015 would be less than 0.1 percent of the current level in the county and

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represents less than a 0.1 percent addition to the 2015 baseline. The reuse-related growth could also result in an increased need for administrative and support personnel, medical facilities, equipment and supplies. Full buildout could increase the need by up to 5 doctors, 2 dentists, 12 registered nurses, and 3 licensed practical nurses. Private practitioners, private for-profit and private not-for-profit medical facilities could also be expected to expand their services or locate new facilities in the county in response to increased economic activity and related population growth.

### **Cumulative Impacts**

The Miami-Dade County high-growth forecasts could increase the need for public services above the 1998 baseline levels by 9,591 government personnel, 7,670 teachers, and 10,512 health care professionals by 2015 in the county and 163 firefighters and 540 sworn officers in the balance of the county. The added demands generated by the Mixed Use alternative would represent substantially less than 1 percent of the cumulative growth.

### **Mitigation Measures**

No mitigation measures have been identified for public service impacts of the Mixed Use alternative.

#### **4.1.5.4      *No Action Alternative***

Under the No Action alternative, public services are assumed to remain as projected for baseline conditions but could increase due to cumulative growth.

#### **4.1.5.5      *Independent Land Use Concepts***

Public service impacts of the independent land use concepts would not exceed the effects reported for the Proposed Action and alternatives.

### **4.1.6          Public Finance**

This section addresses local government public finances for Miami-Dade County, the City of Homestead, and Florida City. Public revenues and expenditures of local governments within Miami-Dade County, and especially within south Miami-Dade County in and around the City of Homestead and Florida City, could potentially be affected by reuse-related changes in economic activity. In the recent past, revenues in Miami-Dade County exceeded expenditures by 11.5 percent in FY96, with total revenues of \$2.137 billion and total expenditures of \$1.916 billion (see Table 3.1-9) (**Metro-Dade County 1997b**). In the City of Homestead, revenues in FY96 approximated expenditures (see Table 3.1-10), with revenues of \$28.671 million and expenditures of \$29.02 million, creating a 1.2 percent shortfall (**City of Homestead 1997**). In Florida City, revenues and expenditures were also about equal in FY96 (see Table 3.1-11) (**City of Florida City 1997**).

#### **4.1.6.1      *Proposed Action***

County and municipal revenue sources would potentially increase as a result of the Proposed Action. For example, property taxes attributable to taxable new development, service charges and fees paid by new businesses, and sales taxes paid by the increased numbers of job-holders. Potentially offsetting these gains would be payment of the local share of public expenditures required to build and operate a commercial airport, and public expenditures that would be needed to provide public services for off-site land development and serve the additional population that may come in to the county as a result of the

Proposed Action. Capital and operating expenditures for public infrastructure such as roads, water and wastewater systems, parks, and schools, and expenditures for general government services, fire and police protection, health care, and social services may increase.

The Proposed Action would likely improve the jobs/housing balance in south Miami-Dade County and could create the type of development in and around the airport area (e.g., commercial and industrial uses) that is often sought by local governments because of its ability to improve both the local economy and the tax base. Because of the potential magnitude of new jobs and increases in public revenues, it is highly probable that the project would generate long-term benefits for public finance. However, local public expenditures would be required to build and operate the commercial airport and to provide infrastructure improvements and services to new businesses and residents, offsetting at least a portion of the potential revenues.

### **Cumulative Impacts**

Changes in local government revenues and expenditures would be expected to result from cumulative population and job growth and related land development, business and household activities, and expenditures. Under the Miami-Dade County high-growth forecasts, the rate of population growth in south Miami-Dade County could continue to substantially outpace the growth in jobs, and the difference is projected to grow even larger over the next 20 years. If this disparity between employment and population were to occur, increased planning would need to be done by local governments to ensure that public resources were available to provide needed infrastructure and services to new development and increased population. Increases in annual public expenditures would need to be budgeted so that they were matched by similar increases in public revenues. The Proposed Action could improve the employment-population balance in south Miami-Dade County and increase public revenues.

### **Mitigation Measures**

The impacts of the Proposed Action on public finance are anticipated to be beneficial, and no mitigation measures are suggested. The establishment of a buffer between HST and Biscayne NP could reduce potential future increases in revenues from property taxes, assuming that future residential and other types of development would not take place within the buffer.

### **Possible Future Expansion**

It is possible that future expansion could double the level of employment and population increase estimated for full buildout of the Proposed Action. It is expected that changes in revenues and expenditures would increase proportionately.

#### **4.1.6.2      *Commercial Spaceport Alternative***

County and municipal revenue sources would potentially increase under the Commercial Spaceport alternative. For example, property taxes attributable to taxable new development, service charges and fees paid by new businesses, and sales taxes paid by the increased numbers of job-holders would be expected to increase. The magnitude of the local public investment related specifically to on-site development of this alternative is not known. Potentially offsetting the gains would be payment of public expenditures that would be needed to provide public services for off-site land development and serve additional population that may come into the county. Capital and operating expenditures for public infrastructure such as roads, water and wastewater systems, parks, and schools, and expenditures for general government services, fire and police protection, health care, and social services may increase.

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The Commercial Spaceport alternative would likely improve the jobs/housing balance in south Miami-Dade County through the addition of jobs-producing land uses that are generally sought by local governments because of their ability to improve both the local economy and the tax base. Because of the potential magnitude of new jobs and increases in public revenues, it is highly probable that this alternative would generate long-term benefits for public finance. However, local public expenditures would be needed to provide infrastructure improvements and services to new businesses and residents, offsetting at least a portion of the potential revenues.

### **Combined Commercial Spaceport/Airport**

A combined Commercial Spaceport/Airport would further increase revenues. However, the amount of public investment would also likely be higher due to the requirement to develop commercial airport facilities.

### **Cumulative Impacts**

Cumulative impacts of this alternative would be substantially the same as reported for the Proposed Action.

### **Mitigation Measures**

The impacts of the Commercial Spaceport alternative on public finance are anticipated to be beneficial, and no mitigation measures are suggested. The potential effects of a buffer on property tax revenues would be as described under the Proposed Action.

#### **4.1.6.3      *Mixed Use Alternative***

County and municipal revenue sources would potentially increase as a result of the Mixed Use alternative. For example, property taxes attributable to taxable new development, service charges and fees paid by new businesses, and sales taxes paid by the increased numbers of job-holders would be expected to increase. Potentially offsetting these gains would be public expenditures that would be needed to provide public services for off-site land development and serve any additional population that may come to south Miami-Dade County as a result of the Mixed Use alternative. Capital and operating expenditures for public infrastructure such as roads, water and wastewater systems, parks, and schools, and expenditures for general government services, fire and police protection, health care, and social services may increase. This alternative would create fewer jobs than the Proposed Action but may also require fewer local public expenditures for its development.

### **Cumulative Impacts**

Under the high level of growth forecast by Miami-Dade County, population in the south county would be expected to substantially outpace the growth in jobs. Depending on which scenario was developed, the Mixed Use alternative could include fewer jobs and provide more housing than the Proposed Action or Commercial Spaceport alternative. In that event, its offsetting effect on the imbalance between employment and population would be less. Increased planning would be needed by local governments to ensure that public resources are available to provide needed infrastructure and services to new development and new population. In addition, any increases in annual public expenditures would need to be budgeted so that they were matched by similar increases in public revenues.



**Mitigation Measures**

The impacts of the Mixed Use alternative on public finance are anticipated to be beneficial, and no mitigation measures are suggested. The potential effects of a buffer on property tax revenues would be as described under the Proposed Action.

**4.1.6.4      *No Action Alternative***

Under the No Action alternative, potential public revenues and expenditures associated with reuse of the disposal property at former Homestead AFB would not take place. Baseline growth in south Miami-Dade County would create taxable new development, service charges and fees paid by new businesses, and sales taxes paid by the increased numbers of job-holders. Potentially offsetting these gains would be public expenditures that would be needed to provide public services to the additional population that may come to south Miami-Dade County under baseline conditions. Capital and operating expenditures may increase for public infrastructure such as roads, water and wastewater systems, parks, and schools, and expenditures for general government services, fire and police protection, health care, and social services. These conditions would be further aggravated if the county's high-growth forecasts were achieved. In the south county, potential improvements in the jobs/housing balance that could be realized under the reuse alternatives, and the associated fiscal benefits, would not occur.

**4.1.6.5      *Independent Land Use Concepts***

Without specific information on the individual independent land uses, it is not possible to predict their impacts on public finance. However, they are not likely to differ substantially from the Proposed Action and other reuse alternatives.

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## 4.2 TRANSPORTATION

### 4.2.1 Introduction

Reuse-related effects on roadway traffic were assessed by estimating the number of trips generated by each land use, considering the expected number of employees, visitors, residents, and service vehicles associated with construction and other on-site activities for the Proposed Action and each alternative. The principal trip-generating land uses included airport, industrial, commercial, educational, recreational, residential, and military uses.

The analysis is based on estimated reuse-related peak-hour trips, distributed on the local road network; existing data on roadway capacities and traffic volumes; and standards established by state and local transportation agencies. Standard analysis techniques of trip generation, trip distribution, and traffic assignment were used. Trip generation was based on applying the trip rates from the Institute of Transportation Engineers *Trip Generation Manual*, 5<sup>th</sup> Edition to the proposed land uses to forecast peak-hour trips. Level of service standards were based upon the *Florida Level of Service Standards and Guidelines Manual for Planning* (FDOT 1995) prepared by Florida Department of Transportation. Roadway improvements necessary to mitigate the impacts of reuse-related traffic would be in conformance with the local comprehensive plan, unless otherwise noted.

For each alternative, primary access to former Homestead AFB is assumed to be by three existing roadways: SW 288<sup>th</sup> Street (also called Bougainville Boulevard), Coral Sea Boulevard, and Florida Avenue. In addition, the Proposed Action includes one proposed roadway, Homestead Parkway. The Homestead Parkway would be a proposed extension of Bougainville Boulevard to the northeast corner of the base and off base to intersect SW 112<sup>th</sup> Avenue (see Figure 2.2-1).

A summary of the estimated total daily trips generated by activities at former Homestead AFB under the Proposed Action and alternatives is shown in Table 4.2-1.

**Table 4.2-1. Summary of Total Daily Trips Generated at Former Homestead AFB**

Reuse Alternative	2000	2005	2015	Full Buildout
Proposed Action	5,412	12,454	52,118	76,101
Commercial Spaceport Alternative	5,362	13,055	24,490	31,574
Mixed Use Alternative				
Market-Driven Development	5,362	12,203	26,339	62,034
Collier-Hoover Proposal	5,362	27,509	47,123	66,644
Original Collier Proposal	5,362	23,532	39,154	46,496
Original Hoover Plan	5,362	34,741	56,448	75,842
Projected Baseline/No Action Alternative	5,362	5,952	7,517	9,094

Source: SAIC.

Note: Includes trips for retained and previously conveyed areas.

The analysis of impacts on emergency evacuation during a hurricane evacuation considered several factors in the determination of roadway capacity and total travel time. The major roadways leading out of the area to the north are U.S. Highway 1 and Florida's Turnpike. U.S. Highway 1 is a four-lane divided highway, and Florida's Turnpike is a four-lane expressway. Assuming these two roadways are the major links for travel in the northern direction, the four northbound lanes will be heavily used during an evacuation.

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It is assumed that the four northbound lanes have a capacity of 2,000 passenger cars per hour per lane. Two lanes (one each direction) are planned to be added to Florida's Turnpike by 2005, so the evacuation capacity will be increased by 2,000 vehicles per hour. The analysis in the SEIS is based on the projected population of the area and the assumption that there will be an average of three persons per vehicle during an evacuation.

In the event of a nuclear accident at the Turkey Point Nuclear Power Plant, all persons within at least a 10 mile radius would need to be evacuated. The main roadways leading out of this area are U.S. Highway 1, Krome Avenue, Florida's Turnpike, SW 107<sup>th</sup> Avenue north of SW 328<sup>th</sup> Street, SW 137<sup>th</sup> Avenue north of SW 328<sup>th</sup> Street, SW 328<sup>th</sup> Street east of SW 137<sup>th</sup> Avenue, and SW 344<sup>th</sup> Street east of U.S. Highway 1.

The evacuation travel time was estimated using the same assumptions used to estimate hurricane evacuation time. The population within 10 miles of Turkey Point is estimated to have been 133,644 in 1995. For the future baseline projections, this population was assumed to grow at the same rate as the total south Miami-Dade County population. It was also assumed that there will be ten main lanes available for evacuation in 2000, with eleven lanes available in 2005 and 2015, due to the widening of Florida's Turnpike.

### 4.2.2 Proposed Action

#### Roadways

The peak-hour traffic generation of the Proposed Action in combination with the projected baseline on the former base is estimated to be 773 trips in 2000, 1,577 trips in 2005, 6,103 trips in 2015, and 9,246 at full buildout. **Table 4.2-2** shows the estimated traffic conditions on key roadways in the area in 2000, 2005, and 2015, due to the traffic generated by the Proposed Action. Full buildout could not be analyzed because projected baseline trip estimates are not available to add to the Proposed Action trips. Without a total traffic volume, including baseline and proposed trips, level of service cannot be determined. Trips associated with reuse-related secondary development were also estimated, based on an estimated increase in employment in south Miami-Dade County of 3 percent in 2005 and 15 percent in 2015.

Considering direct trips from on-site areas, traffic associated with secondary development, and the projected increase in baseline traffic, LOS was calculated for roads in the ROI. Several roads are projected to have volumes in excess of the acceptable service capacity by 2015 (see Section 3.2 for description of minimal acceptable LOS in the ROI). These are shown on **Figure 4.2-1**. SW 137<sup>th</sup> Avenue from SW 268<sup>th</sup> Street to SW 288<sup>th</sup> Street is anticipated to experience an unacceptable LOS by 2005 under the projected baseline, but this problem would be corrected by a scheduled road improvement before 2015. The LOS for 2015 in Table 4.2-2 reflects that expected upgrade. Sections of U.S. Highway 1, Krome Avenue, SW 127<sup>th</sup> Avenue, SW 268<sup>th</sup> Street, and SW 288<sup>th</sup> Street are projected to experience unacceptable LOS by 2015, also under the projected baseline.

As discussed in Section 3.2 and shown in Table 4.2-2, portions of U.S. Highway 1 will be operating above capacity, although they will not exceed minimum acceptable LOS, under the projected baseline. The Proposed Action is estimated to have the most effect on the portion of this highway between SW 112<sup>th</sup> Avenue and SW 308<sup>th</sup> Street. In portions of this area, trips associated with the Proposed Action could increase peak-hour traffic by 25 percent. In some segments, this could cause LOS to degrade to unacceptable levels, while in others, an existing unacceptable situation would be further aggravated.

**Table 4.2-2. Estimated Increase in Peak-Hour Traffic Volumes and LOS on Key Roads—Proposed Action**

Roadway	Link	2000			2005			2015		
		Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Proposed Action <sup>1</sup>	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Proposed Action	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Proposed Action
FL Turnpike Ext.	from Old Cutler Road to SW 112th Ave	0	B	B	215	A	B	1682	B	C
FL Turnpike Ext.	from SW 112th Ave to SW 137th Ave	0	B	B	109	A	A	721	B	B
FL Turnpike Ext.	from SW 137th Ave to SW 288th St	0	B	B	63	A	A	563	B	B
FL Turnpike Ext.	from SW 288th St to SW 308th St	0	B	B	188	B	B	1177	B	C
FL Turnpike Ext.	from SW 308th St to SW 172nd Ave	0	A	A	146	A	A	894	A	B
FL Turnpike Ext.	from SW 172nd Ave to U.S. Highway 1	0	A	A	113	A	A	718	B	B
U.S. Highway 1	from SW 112th Ave to SW 137th Ave	0	D	D	124	F	F	876	F	F
U.S. Highway 1	from SW 137th Ave to SW 147th Ave	0	C	C	109	C	C	704	F	F
U.S. Highway 1	from SW 147th Ave to SW 157th Ave	0	D	D	157	E	E	889	F	F
U.S. Highway 1	from SW 157th Ave to SW 308th St	0	D	D	161	E	E	908	F	F
U.S. Highway 1	from SW 308th St to SW 328th St	0	B	B	113	B	B	641	B	C
U.S. Highway 1	from SW 328th St to SW 336th St	0	B	B	115	B	B	709	B	B
U.S. Highway 1	from SW 336th St to SW 352nd St	0	B	B	88	B	B	520	B	B
Krome Avenue	from SW 248th St to SW 272nd St	0	B	B	33	B	C	212	C	E
Krome Avenue	from SW 272nd St to Homestead City Limits	0	B	B	32	B	B	200	B	C
Krome Avenue	from Homestead City Limits to SW 328th St	0	C	C	14	C	C	80	C	C
Krome Avenue	from SW 328th St to SW 352nd St	0	B	B	43	B	B	264	C	D
SW 107th Avenue	from SW 268th St to SW 328th St	0	A	A	21	A	A	179	A	A
SW 112th Avenue	from U.S. Highway 1 to Old Cutler Road	0	D	D	97	D	D	781	D	D
SW 112th Avenue	from Old Cutler Rd to FL Turnpike	0	B	B	130	B	B	1178	B	C
SW 112th Avenue	from FL Turnpike to SW 268th St	0	B	B	205	B	B	2086	B	B
SW 127th Avenue	from SW 268th St to Homestead AFB	0	A	A	393	A	C	1854	B	E
SW 137th Avenue	from U.S. Highway 1 to SW 268th	0	B	B	65	B	B	400	B	B
SW 137th Avenue	from SW 268th St to SW 288th St	0	C	C	187	D	F	1122	B	C
SW 137th Avenue	from SW 288th St to SW 328th St	0	B	B	40	B	B	237	B	B

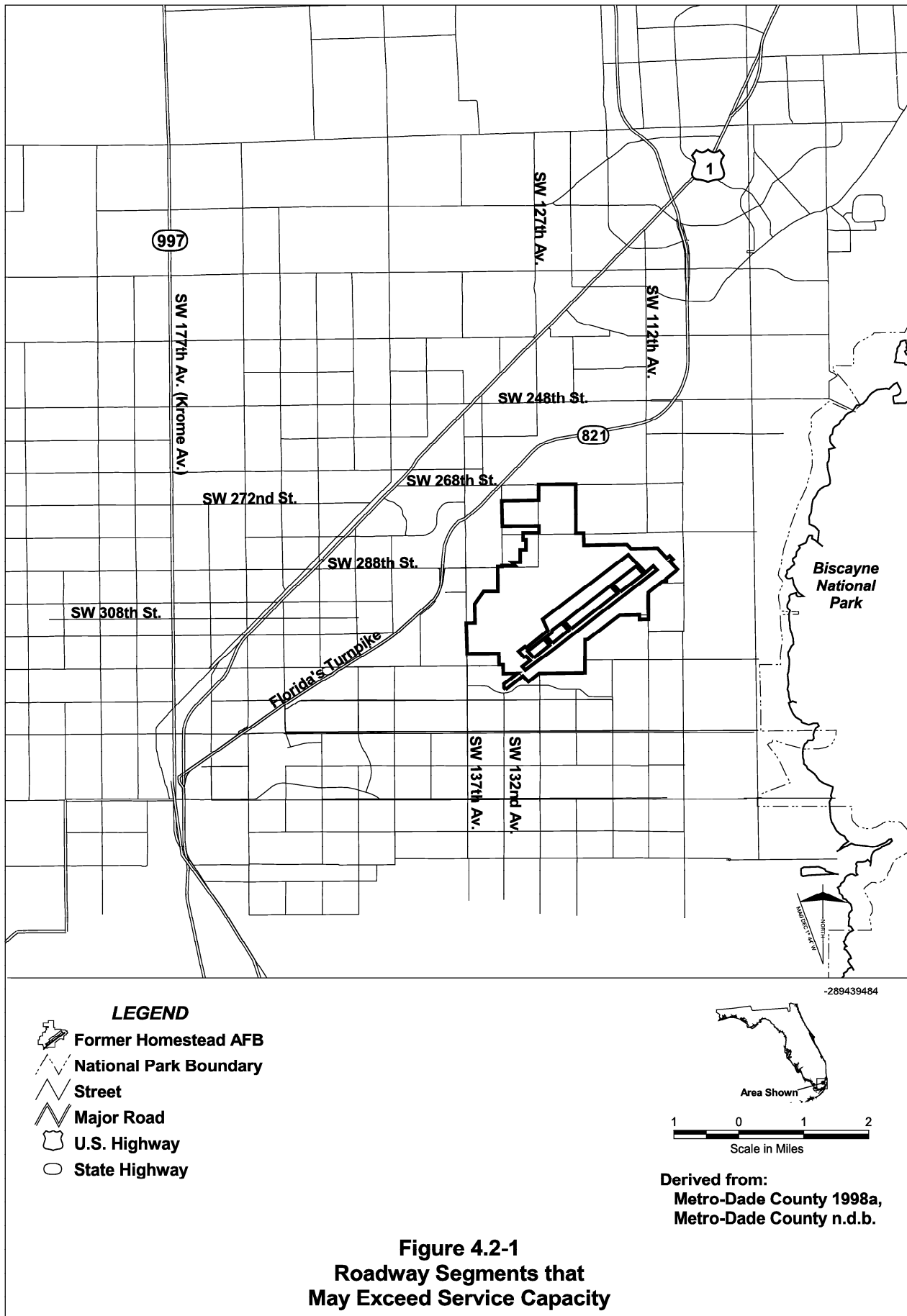
Roadway	Link	2000			2005			2015		
		Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Proposed Action <sup>1</sup>	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Proposed Action	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Proposed Action
SW 268th Street	from SW 112th Ave to SW 127th Ave	0	B	B	227	B	B	1506	B	C
SW 268th Street	from SW 127th Ave to SW 137th Ave	0	B	B	223	B	B	1473	B	C
SW 268th Street	from SW 137th Ave to U.S. Highway 1	0	C	C	109	C	C	633	C	D
SW 288th Street	from SW 132nd Ave to SW 137th Ave	0	B	B	349	B	B	1832	B	F
SW 288th Street	from SW 137th Ave to FL Turnpike	0	D	D	310	D	D	1680	D	F
SW 288th Street	from FL Turnpike to U.S. Highway 1	0	C	C	185	C	C	1015	C	D
SW 312th Street	from SW 137th Ave to 3-Mile Road	0	B	B	8	B	B	46	B	B
SW 312th Street	from 3-Mile Rd to FL Turnpike	0	B	B	8	B	B	55	B	B
SW 312th Street	from FL Turnpike to U.S. Highway 1	0	C	C	63	D	D	390	D	D
SW 328th Street	from SW 142nd Ave to Homestead City Limits	0	A	A	8	A	A	46	A	A
SW 328th Street	from SW 112th St to SW 142nd Ave	0	A	A	8	A	A	46	A	A
SW 344th Street	from SW 112th Ave to SW 132nd Ave	0	A	A	3	A	A	18	A	A
SW 344th Street	from SW 132nd Ave to SW 147th Ave	0	A	A	8	A	A	48	A	A

Source: SAIC; **FDOT 1995.**

Note: <sup>1</sup> Does not include an estimated 50 daily trips associated with the Proposed Action because associated peak hour volumes could not be estimated.

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The segment of Krome Avenue between SW 248<sup>th</sup> Street and SW 272<sup>nd</sup> Street is projected to decline from LOS C to an unacceptable level E by 2015, due to the Proposed Action. A segment of SW 127<sup>th</sup> Avenue from the site to SW 268<sup>th</sup> Street is anticipated to be the most affected, declining from LOS B to LOS E in 2015. SW 288<sup>th</sup> Street between SW 132<sup>nd</sup> Avenue and Florida's Turnpike could also be substantially affected, declining from LOS B (in one segment) and D to LOS F with the increased traffic estimated for the Proposed Action.

### Emergency Evacuation

The total travel time during a hurricane evacuation was estimated based on the assumed roadway capacity and vehicle occupancy. Travel time does not include mobilization time or queuing delay time. The Florida Division of Emergency Management has determined that Miami-Dade County has a clearance time of 10 to 15 hours, depending on the category of the approaching hurricane (**Department of Community Affairs 1999**). The estimated total travel time is shown in **Table 4.2-3**. The estimates are somewhat less than the total clearance time and are reasonable based on the fact that they do not include mobilization and queuing time.

**Table 4.2-3. Estimated Hurricane Evacuation Travel Time by Reuse Alternative**

Alternative	Total Travel Time (hours)		
	2000	2005	2015
Projected Baseline/No Action	7.6	6.7	8.0
Proposed Action	7.6	6.7	8.3
Commercial Spaceport	7.6	6.7	8.0
Mixed Use	7.6	6.7	8.0

An estimate of "evacuation capacity" can be determined based on the assumption that there will be four main lanes available for evacuation in 2000 and five lanes available in 2005. In 2000 and 2005/2015, the evacuation capacity of the roadway system is estimated to be 8,000 vehicles per hour and 10,000 vehicles per hour, respectively.

Only a slight variation in the total travel time needed for evacuation was found among the three alternatives. Most of the change in evacuation time is reflected in the projected baseline (the decline in 2005 reflects planned road improvements). The Proposed Action is estimated to have virtually no effect on evacuation time in 2000 and 2005. By 2015, it could increase total evacuation travel time by about 20 minutes.

**Table 4.2-4** presents estimated travel time to evacuate the 10 mile area around Turkey Point in the event of an accident at the nuclear power plant.

The main variation in travel time shown in Table 4.2-4 is attributable to the projected baseline population growth. It is assumed that the four- and six-lane highways have a capacity of 1,800 passenger cars per hour per lane. The two lanes planned to be added to Florida's Turnpike by 2005 will increase the evacuation capacity by 1,800 vehicles per hour.

These calculations do not include the time involved with reporting the incident, ordering the evacuation, or lost time as vehicles enter the system. The analysis reports on how long it would take all evacuating vehicles to proceed through the roadway system.



**Table 4.2-4. Estimated Evacuation Travel Time in Event of an Accident at Turkey Point Nuclear Power Plant**

Alternative	Total Travel Time (hours)		
	2000	2005	2015
Projected Baseline/No Action	3.6	3.6	4.2
Proposed Action	3.6	3.6	4.4
Commercial Spaceport	3.6	3.6	4.2
Mixed Use	3.6	3.6	4.2–4.3

### Cumulative Impacts

If the high population growth projected by Miami-Dade County for the south county area were to occur (at a 4.6 percent growth rate), the volume of traffic in the ROI could more than double between 1995 and 2015. As LOS declined on some roadways, travelers would tend to find alternate routes. Overall reductions in LOS could be expected, but it is difficult to predict how traffic would redistribute itself and the effects on LOS of specific roads. Regional roadways would be the most likely to be adversely affected, since people tend to use these roadways preferentially until traffic flow is seriously impeded. For example, segments of U.S. Highway 1 that are projected to decline from LOS D and E in 2000 to F in 2015 with the Proposed Action would be further degraded with accelerated growth. Some roadways currently operating at LOS A and B, particularly arterials, could decline to LOS E and F much sooner than 2015.

Estimated traffic increases from reuse-induced population growth in south Miami-Dade County could contribute an additional 1 to 2 percent over projected high-growth traffic volumes. While this would be a small increase, the effect on a seriously strained roadway network would be adverse.

### Mitigation Measures

LOS could be improved on road segments estimated to be adversely affected by the Proposed Action by widening the roads (adding lanes) and thereby increasing capacity. The following improvements would achieve acceptable service levels on the affected road segments:

- Widen U.S. Highway 1 between SW 112<sup>th</sup> Avenue and SW 308<sup>th</sup> Street from four to six lanes. This will likely be needed whether or not the Proposed Action is implemented, to accommodate baseline growth.
- Widen Krome Avenue between SW 248<sup>th</sup> Street and SW 272<sup>nd</sup> Street from two to four lanes.
- Widen SW 127<sup>th</sup> Avenue between SW 268<sup>th</sup> Street and the former base from two to four lanes.
- Widen SW 288<sup>th</sup> Street between SW 132<sup>nd</sup> Avenue and Florida's Turnpike from four to six lanes.

Improvement of mass transit service to the Homestead area could reduce traffic congestion and degradation of level of service. This could be considered in certain key areas, such as along U.S. Highway 1, in response to baseline growth, even without reuse of former Homestead AFB. By itself, the proposed commercial airport would not be likely to reach levels of traffic sufficient for mass transit mitigations for 10 to 15 years.

A higher level of population growth in the region, as considered in the cumulative impact analysis, could exert sufficient pressure on local roadways to warrant earlier mitigation through mass transit options,

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perhaps as early as the 2005 time frame. This need would be largely generated by overall population growth rather than the proposed airport.

### Possible Future Expansion

Possible expansion of HST could result in more than double the amount of direct traffic to and from the airport, based on the estimated additional employment and passenger levels. However, it is not possible to estimate the effect of this expansion on LOS of roadways in the ROI for several reasons. The timing of the possible expansion is not known; therefore, the future baseline population and related traffic volumes on local roadways cannot be estimated. If an expansion occurred, it would not be expected to occur within the planning horizon of current long-range transportation plans. Therefore, future roadway improvements that might be made in response to regional growth are not known. New mass transit systems (indicated schematically in the ALP) and other changes could radically alter commuting patterns in the future. These uncertainties prevent a meaningful analysis at this time. Further environmental impact analysis would have to address these transportation issues at the time construction of a second runway was actually proposed.

### 4.2.3 Commercial Spaceport Alternative

#### Roadways

The peak-hour traffic generation of the Commercial Spaceport alternative in combination with projected baseline traffic is estimated to be 773 trips in 2000, 1,628 trips in 2005, 3,115 trips in 2015, and 4,060 trips at full buildout. Trips associated with spaceport-related secondary development were also estimated, based on a potential increase in employment in south Miami-Dade County of 2 percent in 2005 and 5 percent in 2015. **Table 4.2-5** shows estimated traffic conditions on specific roadways in the ROI in 2000, 2005, and 2015.

Several roads are projected to have volumes in excess of the acceptable service capacity by 2015. Sections of SW 137<sup>th</sup> Avenue could experience an unacceptable LOS by 2005, but this problem is expected to be corrected by a scheduled road improvement before 2015. Sections of U.S. Highway 1 are projected to reach unacceptable LOS by 2005 (between SW 112<sup>th</sup> Avenue and SW 137<sup>th</sup> Avenue) or 2015 (SW 147<sup>th</sup> Avenue to SW 157<sup>th</sup> Avenue), but this is expected to occur under the projected baseline as well. SW 288<sup>th</sup> Street between SW 137<sup>th</sup> Avenue and Florida's Turnpike is projected to decline to LOS E with the additional traffic generated by this alternative.

#### Emergency Evacuation

As shown in Table 4.2-3, the Commercial Spaceport alternative is estimated to increase total evacuation travel time in the event of a hurricane by only a few minutes. Table 4.2-4 shows that evacuation time for the Turkey Point Nuclear Power Plant would not be affected.

#### Combined Commercial Spaceport/Airport

The peak-hour traffic generation of a combined Commercial Spaceport/Airport in combination with the projected baseline is estimated to be 773 trips in 2000, 2,860 trips in 2005, and 5,544 trips in 2015. With inclusion of secondary traffic, the same roadway segments would be expected to experience unacceptable LOS as described above, but earlier. Specifically, sections of SW 137<sup>th</sup> Avenue would experience unacceptable LOS by 2005, but this would be corrected by 2015 with the improvements already planned.

**Table 4.2-5. Estimated Increase in Peak-Hour Traffic Volumes and LOS on Key Roads—Commercial Spaceport Alternative**

Roadway	Link	2000			2005			2015		
		Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alternative	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alternative	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alternative
FL Turnpike Ext.	from Old Cutler Road to SW 112th Ave	0	B	B	220	A	B	669	B	B
FL Turnpike Ext.	from SW 112th Ave to SW 137th Ave	0	B	B	105	A	A	260	B	B
FL Turnpike Ext.	from SW 137th Ave to SW 288th St	0	B	B	56	A	A	215	B	B
FL Turnpike Ext.	from SW 288th St to SW 308th St	0	B	B	192	B	B	433	B	C
FL Turnpike Ext.	from SW 308th St to SW 172nd Ave	0	A	A	151	A	B	332	A	B
FL Turnpike Ext.	from SW 172nd Ave to U.S. Highway 1	0	A	A	116	A	A	268	B	A
U.S. Highway 1	from SW 112th Ave to SW 137th Ave	0	D	D	116	F	F	317	F	F
U.S. Highway 1	from SW 137th Ave to SW 147th Ave	0	C	C	103	C	C	246	F	F
U.S. Highway 1	from SW 147th Ave to SW 157th Ave	0	D	D	155	E	E	304	F	F
U.S. Highway 1	from SW 157th Ave to SW 308th St	0	D	D	160	E	E	312	F	F
U.S. Highway 1	from SW 308th St to SW 328th St	0	B	B	113	B	B	220	B	B
U.S. Highway 1	from SW 328th St to SW 336th St	0	B	B	116	B	B	258	B	B
U.S. Highway 1	from SW 336th St to SW 352nd St	0	B	B	87	B	B	182	B	B
Krome Avenue	from SW 248th St to SW 272nd St	0	B	B	30	B	C	71	C	C
Krome Avenue	from SW 272nd St to Homestead City Limits	0	B	B	29	B	B	68	B	C
Krome Avenue	from Homestead City Limits to SW 328th St	0	C	C	14	C	C	28	C	C
Krome Avenue	from SW 328th St to SW 352nd St	0	B	B	41	B	B	90	C	C
SW 107th Avenue	from SW 268th St to SW 328th St	0	A	A	22	A	A	74	A	A
SW 112th Avenue	from U.S. Highway 1 to Old Cutler Road	0	D	D	95	D	D	304	D	D
SW 112th Avenue	from Old Cutler Rd to FL Turnpike	0	B	B	129	B	B	480	B	C
SW 112th Avenue	from FL Turnpike to SW 268th St	0	B	B	215	B	B	895	B	B
SW 127th Avenue	from SW 268th St to Homestead AFB	0	A	A	421	A	B	638	B	C
SW 137th Avenue	from U.S. Highway 1 to SW 268th	0	B	B	68	B	B	151	B	B
SW 137th Avenue	from SW 268th St to SW 288th St	0	C	C	195	D	F	415	B	B
SW 137th Avenue	from SW 288th St to SW 328th St	0	B	B	42	B	B	88	B	B

Roadway	Link	2000			2005			2015		
		Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive
SW 268th Street	from SW 112th Ave to SW 127th Ave	0	B	B	239	B	B	582	B	B
SW 268th Street	from SW 127th Ave to SW 137th Ave	0	B	B	235	B	B	568	B	B
SW 268th Street	from SW 137th Ave to U.S. Highway 1	0	C	C	112	C	C	229	C	C
SW 288th Street	from SW 132nd Ave to SW 137th Ave	0	B	B	368	B	B	652	B	B
SW 288th Street	from SW 137th Ave to FL Turnpike	0	D	D	326	D	D	605	D	E
SW 288th Street	from FL Turnpike to U.S. Highway 1	0	C	C	194	C	C	366	C	C
SW 312th Street	from SW 137th Ave to 3-Mile Road	0	B	B	8	B	B	16	B	B
SW 312th Street	from 3-Mile Rd to FL Turnpike	0	B	B	10	B	B	19	B	B
SW 312th Street	from FL Turnpike to U.S. Highway 1	0	C	C	59	D	D	132	D	D
SW 328th Street	from SW 142nd Ave to Homestead City Limits	0	A	A	7	A	A	16	A	A
SW 328th Street	from SW 112th St to SW 142nd Ave	0	A	A	7	A	A	16	A	A
SW 344th Street	from SW 112th Ave to SW 132nd Ave	0	A	A	4	A	A	7	A	A
SW 344th Street	from SW 132nd Ave to SW 147th Ave	0	A	A	8	A	A	16	A	A

Source: SAIC; **FDOT 1995.**

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### Cumulative Impacts

Cumulative impacts with the Commercial Spaceport alternative would be similar to the Proposed Action, with reuse-related traffic making a slightly smaller contribution (about 1 percent) to total traffic volumes with a high level of population growth. This would be a minor effect, considering several roadways could experience marginal or unacceptable LOS by 2015 if high growth occurred.

### Mitigation Measures

Increasing the capacity on affected roadway segments could reduce adverse impacts resulting from reuse-related traffic under the Commercial Spaceport alternative. The following improvements would achieve acceptable service levels:

- Widen U.S. Highway 1 between SW 112<sup>th</sup> Avenue and SW 127<sup>th</sup> Street from four to six lanes. This will likely be needed to accommodate baseline growth, with or without the Commercial Spaceport traffic.
- Widen U.S. Highway 1 between SW 147<sup>th</sup> Avenue and SW 308<sup>th</sup> Street from four to six lanes. Again, this would be required by baseline growth, at least to 157<sup>th</sup> Street.
- Widen SW 288<sup>th</sup> Street between SW 137<sup>th</sup> Avenue and Florida's Turnpike from four to six lanes.

Mass transit could be considered to mitigate roadway congestion, as described for the Proposed Action. This would be largely in response to baseline population growth rather than the development of the Commercial Spaceport alternative.

#### 4.2.4 Mixed Use Alternative

##### Roadways

The impacts of this alternative would vary depending on whether it involved Market-Driven development or the plans developed by Collier Resources Company and/or the Hoover Environmental Group.

**Market-Driven Development.** The peak-hour traffic generation under the Market-Driven scenario in combination with the projected baseline was estimated to be 773 trips in 2000, 1,590 trips in 2005, 3,267 trips in 2015, and 7,570 by full buildout. Trips associated with reuse-related secondary development were estimated to increase 3 percent in 2005 and 5 percent in 2015. **Table 4.2-6** presents the estimated traffic conditions on key roads in the ROI in 2000, 2005, and 2015. Full buildout could not be modeled for reasons discussed under the Proposed Action.

Sections of SW 137<sup>th</sup> Avenue would experience an unacceptable LOS by 2005, but this problem is expected to be corrected by a scheduled road improvement before 2015. The same sections of U.S. Highway 1 projected to experience unacceptable LOS under the Proposed Action and Commercial Spaceport alternative would do so under this alternative, as well as under the projected baseline. The same segment of SW 288<sup>th</sup> Street would be adversely affected as under the other alternatives.

**Table 4.2-6. Estimated Increase in Peak-Hour Traffic Volumes and LOS on Key Roads—Market-Driven Development**

Roadway	Link	2000			2005			2015		
		Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive
FL Turnpike Ext.	from Old Cutler Road to SW 112th Ave	0	B	B	219	A	B	612	B	B
FL Turnpike Ext.	from SW 112th Ave to SW 137th Ave	0	B	B	110	A	A	290	B	B
FL Turnpike Ext.	from SW 137th Ave to SW 288th St	0	B	B	64	A	A	150	B	B
FL Turnpike Ext.	from SW 288th St to SW 308th St	0	B	B	192	B	B	535	B	C
FL Turnpike Ext.	from SW 308th St to SW 172nd Ave	0	A	A	148	A	A	425	A	B
FL Turnpike Ext.	from SW 172nd Ave to U.S. Highway 1	0	A	A	115	A	A	323	B	A
U.S. Highway 1	from SW 112th Ave to SW 137th Ave	0	D	D	126	F	F	319	F	F
U.S. Highway 1	from SW 137th Ave to SW 147th Ave	0	C	C	111	C	C	284	F	F
U.S. Highway 1	from SW 147th Ave to SW 157th Ave	0	D	D	159	E	E	430	F	F
U.S. Highway 1	from SW 157th Ave to SW 308th St	0	D	D	164	E	E	445	F	F
U.S. Highway 1	from SW 308th St to SW 328th St	0	B	B	115	B	B	314	B	C
U.S. Highway 1	from SW 328th St to SW 336th St	0	B	B	117	B	B	324	B	B
U.S. Highway 1	from SW 336th St to SW 352nd St	0	B	B	90	B	B	242	B	B
Krome Avenue	from SW 248th St to SW 272nd St	0	B	B	34	B	C	81	C	D
Krome Avenue	from SW 272nd St to Homestead City Limits	0	B	B	32	B	B	81	B	C
Krome Avenue	from Homestead City Limits to SW 328th St	0	C	C	14	C	C	40	C	C
Krome Avenue	from SW 328th St to SW 352nd St	0	B	B	44	B	B	115	C	C
SW 107th Avenue	from SW 268th St to SW 328th St	0	A	A	22	A	A	63	A	A
SW 112th Avenue	from U.S. Highway 1 to Old Cutler Road	0	D	D	99	D	D	264	D	D
SW 112th Avenue	from Old Cutler Rd to FL Turnpike	0	B	B	132	B	B	359	B	B
SW 112 <sup>th</sup> Avenue	from FL Turnpike to SW 268th St	0	B	B	208	B	B	604	B	B
SW 127th Avenue	from SW 268th St to Homestead AFB	0	A	A	400	A	B	1190	B	D
SW 137th Avenue	from U.S. Highway 1 to SW 268th	0	B	B	66	B	B	192	B	B
SW 137th Avenue	from SW 268th St to SW 288th St	0	C	C	190	D	F	548	B	B
SW 137th Avenue	from SW 288th St to SW 328th St	0	B	B	41	B	B	120	B	B

Roadway	Link	2000			2005			2015		
		Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive
SW 268th Street	from SW 112th Ave to SW 127th Ave	0	B	B	231	B	B	672	B	B
SW 268th Street	from SW 127th Ave to SW 137th Ave	0	B	B	227	B	B	660	B	B
SW 268th Street	from SW 137th Ave to U.S. Highway 1	0	C	C	111	C	C	312	C	C
SW 288th Street	from SW 132nd Ave to SW 137th Ave	0	B	B	355	B	B	1037	B	C
SW 288th Street	from SW 137th Ave to FL Turnpike	0	D	D	315	D	D	920	D	E
SW 288th Street	from FL Turnpike to U.S. Highway 1	0	C	C	188	C	C	545	C	D
SW 312th Street	from SW 137th Ave to 3-Mile Road	0	B	B	8	B	B	24	B	B
SW 312th Street	from 3-Mile Rd to FL Turnpike	0	B	B	10	B	B	27	B	B
SW 312th Street	from FL Turnpike to U.S. Highway 1	0	C	C	64	D	D	161	D	D
SW 328th Street	from SW 142nd Ave to Homestead City Limits	0	A	A	8	A	A	20	A	A
SW 328th Street	from SW 112th St to SW 142nd Ave	0	A	A	8	A	A	20	A	A
SW 344th Street	from SW 112th Ave to SW 132nd Ave	0	A	A	3	A	A	10	A	A
SW 344th Street	from SW 132nd Ave to SW 147th Ave	0	A	A	8	A	A	21	A	A

Source: SAIC; **FDOT 1995.**

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**Collier-Hoover Proposal.** The peak hour traffic generation under the Collier-Hoover proposal in combination with the projected baseline was estimated to be 773 trips in 2000, 2,382 trips in 2005, 4,531 trips in 2015, and 7,737 by full buildout. **Table 4.2-7** describes the estimated traffic conditions on key roads in the ROI in 2000, 2005, and 2015. Full buildout could not be modeled.

A section of SW 137<sup>th</sup> Avenue would experience an unacceptable LOS by 2005, but this problem is expected to be corrected by a scheduled road improvement before 2015. Sections of U.S. Highway 1, Krome Avenue, SW 127<sup>th</sup> Avenue, and SW 288<sup>th</sup> Street are expected to experience unacceptable LOS by 2015. The degradation in LOS on U.S. Highway 1 would also occur under the projected baseline. The decline in the other road segments would be attributable to the Collier-Hoover development.

**Original Collier Proposal.** The peak-hour traffic generation of the original Collier proposal, in combination with projected baseline, was estimated to be 773 trips in 2000, 1,374 trips in 2005, 2,087 trips in 2015, and 2,794 by full buildout. Trips associated with reuse-related secondary development were estimated to be 3 percent in 2005 and 6 percent in 2015. **Table 4.2-8** presents the estimated traffic conditions on key roads in the ROI in 2000, 2005, and 2015. Full buildout could not be modeled.

The impact of the original Collier proposal would likely be similar to the Market-Driven scenario. Sections of SW 137<sup>th</sup> Avenue would experience an unacceptable LOS by 2005, but this problem is expected to be corrected by a scheduled road improvement before 2015. The same sections of U.S. Highway 1 would experience unacceptable LOS by 2015, because of anticipated deterioration under the projected baseline.

**Original Hoover Plan.** The peak-hour traffic generation of the original Hoover plan, in combination with projected baseline, was estimated to be 773 trips in 2000, 3,050 trips in 2005, 5,508 trips in 2015, and 7,986 by full buildout. Trips associated with reuse-related secondary development were estimated to increase 11 percent in 2005 and 15 percent in 2015. **Table 4.2-9** presents the estimated traffic conditions on key roads in the ROI in 2000, 2005, and 2015. Full buildout could not be modeled.

Four roads are projected to have volumes in excess of the acceptable service capacity by 2015. Sections of SW 137<sup>th</sup> Avenue would experience an unacceptable LOS by 2005, but this problem is expected to be corrected by a scheduled road improvement before 2015. Sections of U.S. Highway 1, Krome Avenue, SW 127<sup>th</sup> Avenue, SW 268<sup>th</sup> Street, and SW 288<sup>th</sup> Street would be expected to decline to LOS E by 2015. In the case of U.S. Highway 1, these problems would occur with the projected baseline growth. The other reductions in service would be attributable to reuse of former Homestead AFB.

### Emergency Evacuation

As shown in Table 4.2-3, the Mixed Use alternative is estimated to increase total evacuation travel time in the event of a hurricane by only a few minutes. Table 4.2-4 shows that evacuation time for the Turkey Point Nuclear Power Plant could increase slightly under the Collier-Hoover or original Hoover plan but would not be affected by the other two scenarios.

### Cumulative Impacts

The cumulative impacts of the Mixed Use alternative in combination with a high growth rate in Miami-Dade County could range from similar to the Commercial Spaceport alternative, with Market-Driven development or the original Collier proposal, to similar to the Proposed Action if the original Hoover plan were implemented and received the level of visitation envisioned.



**Table 4.2-7. Peak-Hour Traffic Volumes and LOS on Key Roads—Collier-Hoover Proposal**

Roadway	Link	2000			2005			2015		
		Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive
FL Turnpike Ext.	from Old Cutler Road to SW 112th Ave	0	B	B	405	A	B	837	B	B
FL Turnpike Ext.	from SW 112th Ave to SW 137th Ave	0	B	B	109	A	B	271	B	B
FL Turnpike Ext.	from SW 137th Ave to SW 288th St	0	B	B	0	A	A	0	B	B
FL Turnpike Ext.	from SW 288th St to SW 308th St	0	B	B	277	B	B	667	B	C
FL Turnpike Ext.	from SW 308th St to SW 172nd Ave	0	A	A	228	A	A	554	A	B
FL Turnpike Ext.	from SW 172nd Ave to U.S. Highway 1	0	A	A	185	A	A	441	B	A
U.S. Highway 1	from SW 112th Ave to SW 137th Ave	0	D	D	75	F	F	171	F	F
U.S. Highway 1	from SW 137th Ave to SW 147th Ave	0	C	C	75	C	D	171	F	F
U.S. Highway 1	from SW 147th Ave to SW 157th Ave	0	D	D	155	E	F	372	F	F
U.S. Highway 1	from SW 157th Ave to SW 308th St	0	D	D	175	E	F	431	F	F
U.S. Highway 1	from SW 308th St to SW 328th St	0	B	B	115	B	B	292	B	C
U.S. Highway 1	from SW 328th St to SW 336th St	0	B	B	151	B	B	378	B	B
U.S. Highway 1	from SW 336th St to SW 352nd St	0	B	B	97	B	B	243	B	B
Krome Avenue	from SW 248th St to SW 272nd St	0	B	B	7	B	C	18	C	D
Krome Avenue	from SW 272nd St to Homestead City Limits	0	B	B	14	B	B	36	B	C
Krome Avenue	from Homestead City Limits to SW 328th St	0	C	C	22	C	C	54	C	C
Krome Avenue	from SW 328th St to SW 352nd St	0	B	B	36	B	C	91	C	D
SW 107th Avenue	from SW 268th St to SW 328th St	0	A	A	39	A	A	80	A	A
SW 112th Avenue	from U.S. Highway 1 to Old Cutler Road	0	D	D	100	D	D	214	D	D
SW 112th Avenue	from Old Cutler Rd to FL Turnpike	0	B	B	186	B	B	389	B	B
SW 112th Avenue	from FL Turnpike to SW 268th St	0	B	B	417	B	B	837	B	B
SW 127th Avenue	from SW 268th St to Homestead AFB	0	A	A	783	A	C	1602	B	E
SW 137th Avenue	from U.S. Highway 1 to SW 268th	0	B	B	122	B	B	269	B	B
SW 137th Avenue	from SW 268th St to SW 288th St	0	C	C	306	D	F	714	B	B
SW 137th Avenue	from SW 288th St to SW 328th St	0	B	B	75	B	B	171	B	B

Roadway	Link	2000			2005			2015		
		Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive
SW 268th Street	from SW 112th Ave to SW 127th Ave	0	B	B	463	B	B	935	B	B
SW 268th Street	from SW 127th Ave to SW 137th Ave	0	B	B	341	B	B	720	B	B
SW 268th Street	from SW 137th Ave to U.S. Highway 1	0	C	C	139	C	C	298	C	C
SW 288th Street	from SW 132nd Ave to SW 137th Ave	0	B	B	727	B	B	1805	B	F
SW 288th Street	from SW 137th Ave to FL Turnpike	0	D	D	594	D	D	1445	D	F
SW 288th Street	from FL Turnpike to U.S. Highway 1	0	C	C	354	C	C	869	C	D
SW 312th Street	from SW 137th Ave to 3-Mile Road	0	B	B	14	B	B	36	B	B
SW 312th Street	from 3-Mile Rd to FL Turnpike	0	B	B	14	B	B	36	B	B
SW 312th Street	from FL Turnpike to U.S. Highway 1	0	C	C	36	D	D	91	D	D
SW 328th Street	from SW 142nd Ave to Homestead City Limits	0	A	A	7	A	A	18	A	A
SW 328th Street	from SW 112th St to SW 142nd Ave	0	A	A	7	A	A	18	A	A
SW 344th Street	from SW 112th Ave to SW 132nd Ave	0	A	A	7	A	A	18	A	A
SW 344th Street	from SW 132nd Ave to SW 147th Ave	0	A	A	7	A	A	18	A	A

Source: SAIC; **FDOT 1995.**

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**Table 4.2-8. Estimated Increase in Peak-Hour Traffic Volumes and LOS on Key Roads—Original Collier Proposal**

Roadway	Link	2000			2005			2015		
		Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive
FL Turnpike Ext.	from Old Cutler Road to SW 112th Ave	0	B	B	217	A	B	405	B	B
FL Turnpike Ext.	from SW 112th Ave to SW 137th Ave	0	B	B	102	A	B	234	B	B
FL Turnpike Ext.	from SW 137th Ave to SW 288th St	0	B	B	65	A	A	155	B	B
FL Turnpike Ext.	from SW 288th St to SW 308th St	0	B	B	148	B	B	329	B	C
FL Turnpike Ext.	from SW 308th St to SW 172nd Ave	0	A	A	101	A	A	228	A	A
FL Turnpike Ext.	from SW 172nd Ave to U.S. Highway 1	0	A	A	94	A	A	205	B	A
U.S. Highway 1	from SW 112th Ave to SW 137th Ave	0	D	D	117	F	F	267	F	F
U.S. Highway 1	from SW 137th Ave to SW 147th Ave	0	C	C	102	C	C	231	F	F
U.S. Highway 1	from SW 147th Ave to SW 157th Ave	0	D	D	120	E	E	278	F	F
U.S. Highway 1	from SW 157th Ave to SW 308th St	0	D	D	124	E	D	288	F	F
U.S. Highway 1	from SW 308th St to SW 328th St	0	B	B	83	B	B	198	B	B
U.S. Highway 1	from SW 328th St to SW 336th St	0	B	B	85	B	B	199	B	B
U.S. Highway 1	from SW 336th St to SW 352nd St	0	B	B	72	B	B	169	B	B
Krome Avenue	from SW 248th St to SW 272nd St	0	B	B	34	B	C	79	C	D
Krome Avenue	from SW 272nd St to Homestead City Limits	0	B	B	32	B	B	74	B	C
Krome Avenue	from Homestead City Limits to SW 328th St	0	C	C	12	C	C	29	C	C
Krome Avenue	from SW 328th St to SW 352nd St	0	B	B	41	B	B	97	C	C
SW 107th Avenue	from SW 268th St to SW 328th St	0	A	A	14	A	A	25	A	A
SW 112th Avenue	from U.S. Highway 1 to Old Cutler Road	0	D	D	83	D	D	178	D	D
SW 112th Avenue	from Old Cutler Rd to FL Turnpike	0	B	B	124	B	B	247	B	B
SW 112th Avenue	from FL Turnpike to SW 268th St	0	B	B	175	B	B	298	B	B
SW 127th Avenue	from SW 268th St to Homestead AFB	0	A	A	254	A	B	416	B	B
SW 137th Avenue	from U.S. Highway 1 to SW 268th	0	B	B	47	B	B	90	B	B
SW 137th Avenue	from SW 268th St to SW 288th St	0	C	C	128	D	E	274	B	B
SW 137th Avenue	from SW 288th St to SW 328th St	0	B	B	30	B	B	61	B	B

Roadway	Link	2000			2005			2015		
		Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive
SW 268th Street	from SW 112th Ave to SW 127th Ave	0	B	B	190	B	B	323	B	B
SW 268th Street	from SW 127th Ave to SW 137th Ave	0	B	B	122	B	B	227	B	B
SW 268th Street	from SW 137th Ave to U.S. Highway 1	0	C	C	65	C	C	131	C	C
SW 288th Street	from SW 132nd Ave to SW 137th Ave	0	B	B	286	B	B	634	B	B
SW 288th Street	from SW 137th Ave to FL Turnpike	0	D	D	229	D	D	502	D	D
SW 288th Street	from FL Turnpike to U.S. Highway 1	0	C	C	144	C	C	318	C	C
SW 312th Street	from SW 137th Ave to 3-Mile Road	0	B	B	7	B	B	16	B	B
SW 312th Street	from 3-Mile Rd to FL Turnpike	0	B	B	8	B	B	20	B	B
SW 312th Street	from FL Turnpike to U.S. Highway 1	0	C	C	61	D	D	144	D	D
SW 328th Street	from SW 142nd Ave to Homestead City Limits	0	A	A	7	A	A	17	A	A
SW 328th Street	from SW 112th St to SW 142nd Ave	0	A	A	7	A	A	17	A	A
SW 344th Street	from SW 112th Ave to SW 132nd Ave	0	A	A	3	A	A	6	A	A
SW 344th Street	from SW 132nd Ave to SW 147th Ave	0	A	A	7	A	A	17	A	A

Source: SAIC; **FDOT 1995.**

LOS Level of Service

**Table 4.2-9. Estimated Increase in Peak-Hour Traffic Volumes and LOS on Key Roads—Original Hoover Plan**

Roadway	Link	2000			2005			2015		
		Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive
FL Turnpike Ext.	from Old Cutler Road to SW 112th Ave	0	B	B	1196	A	B	2182	B	C
FL Turnpike Ext.	from SW 112th Ave to SW 137th Ave	0	B	B	271	A	A	409	B	B
FL Turnpike Ext.	from SW 137th Ave to SW 288th St	0	B	B	263	A	B	370	B	C
FL Turnpike Ext.	from SW 288th St to SW 308th St	0	B	B	408	B	B	713	B	C
FL Turnpike Ext.	from SW 308th St to SW 172nd Ave	0	A	A	255	A	A	472	A	B
FL Turnpike Ext.	from SW 172nd Ave to U.S. Highway 1	0	A	A	248	A	A	442	B	B
U.S. Highway 1	from SW 112th Ave to SW 137th Ave	0	D	D	481	F	F	743	F	F
U.S. Highway 1	from SW 137th Ave to SW 147th Ave	0	C	C	420	C	E	657	F	F
U.S. Highway 1	from SW 147th Ave to SW 157th Ave	0	D	D	425	E	F	693	F	F
U.S. Highway 1	from SW 157th Ave to SW 308th St	0	D	D	372	E	E	604	F	F
U.S. Highway 1	from SW 308th St to SW 328th St	0	B	B	220	B	B	348	B	C
U.S. Highway 1	from SW 328th St to SW 336th St	0	B	B	178	B	B	295	B	B
U.S. Highway 1	from SW 336th St to SW 352nd St	0	B	B	181	B	B	283	B	B
Krome Avenue	from SW 248th St to SW 272nd St	0	B	B	127	B	C	180	C	D
Krome Avenue	from SW 272nd St to Homestead City Limits	0	B	B	109	B	B	158	B	C
Krome Avenue	from Homestead City Limits to SW 328th St	0	C	C	22	C	C	38	C	C
Krome Avenue	from SW 328th St to SW 352nd St	0	B	B	121	B	C	181	C	D
SW 107th Avenue	from SW 268th St to SW 328th St	0	A	A	112	A	A	214	A	A
SW 112th Avenue	from U.S. Highway 1 to Old Cutler Road	0	D	D	417	D	D	705	D	E
SW 112th Avenue	from Old Cutler Rd to FL Turnpike	0	B	B	645	B	C	1134	B	B
SW 112th Avenue	from FL Turnpike to SW 268th St	0	B	B	1251	B	B	2364	B	B
SW 127th Avenue	from SW 268th St to Homestead AFB	0	A	B	2103	A	E	4092	B	F
SW 137th Avenue	from U.S. Highway 1 to SW 268th	0	B	B	242	B	B	465	B	B
SW 137th Avenue	from SW 268th St to SW 288th St	0	C	C	473	D	F	892	B	B
SW 137th Avenue	from SW 288th St to SW 328th St	0	B	B	130	B	B	250	B	B

Roadway	Link	2000			2005			2015		
		Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive	Increase in Traffic Volume	Projected Baseline/ No Action LOS	LOS With Reuse Alterna- tive
SW 268th Street	from SW 112th Ave to SW 127th Ave	0	B	B	1356	B	C	2570	B	F
SW 268th Street	from SW 127th Ave to SW 137th Ave	0	B	B	951	B	B	1813	B	D
SW 268th Street	from SW 137th Ave to U.S. Highway 1	0	C	C	428	C	C	784	C	D
SW 288th Street	from SW 132nd Ave to SW 137th Ave	0	B	B	225	B	B	502	B	C
SW 288th Street	from SW 137th Ave to FL Turnpike	0	D	D	407	D	D	826	D	E
SW 288th Street	from FL Turnpike to U.S. Highway 1	0	C	C	203	C	C	406	C	C
SW 312th Street	from SW 137th Ave to 3-Mile Road	0	B	B	10	B	B	18	B	B
SW 312th Street	from 3-Mile Rd to FL Turnpike	0	B	B	16	B	B	26	B	B
SW 312th Street	from FL Turnpike to U.S. Highway 1	0	C	C	202	D	D	294	D	D
SW 328th Street	from SW 142nd Ave to Homestead City Limits	0	A	A	20	A	A	30	A	A
SW 328th Street	from SW 112th St to SW 142nd Ave	0	A	A	20	A	A	30	A	A
SW 344th Street	from SW 112th Ave to SW 132nd Ave	0	A	A	2	A	A	5	A	A
SW 344th Street	from SW 132nd Ave to SW 147th Ave	0	A	A	21	A	A	32	A	A

Source: SAIC; **FDOT 1995.**

LOS Level of Service

**Mitigation Measures**

The mitigation measures identified for the Commercial Spaceport alternative would also be appropriate for the Market-Driven development and original Collier proposal. To reduce the potential impacts from the Collier-Hoover proposal and bring affected roadways to acceptable service levels, the following additional measures are suggested.

- Widen U.S. Highway 1 between SW 112<sup>th</sup> Avenue and SW 308<sup>th</sup> Street from four to six lanes. This will likely be needed to accommodate baseline growth.
- Widen Krome Avenue between SW 248<sup>th</sup> Street and SW 272<sup>nd</sup> Street and between SW 328<sup>th</sup> Street and SW 352<sup>nd</sup> Street from two to four lanes.
- Widen SW 127<sup>th</sup> Avenue from SW 268<sup>th</sup> Street to the former base from two to six lanes.
- Widen 268<sup>th</sup> Street from SW 112<sup>th</sup> Avenue to SW 137<sup>th</sup> Avenue from four to six lanes.
- Widen SW 288<sup>th</sup> Street from SW 132<sup>nd</sup> Avenue to Florida's Turnpike from four to six lanes.

Similar improvements would be needed with the original Hoover plan. Mass transit could be considered to reduce roadway congestion, as described for the Proposed Action.

**4.2.5 No Action Alternative**

Under the No Action alternative, peak-hour traffic on roadways in the ROI would be the same as under the projected baseline, as shown in each foregoing table. By 2015, U.S. Highway 1 could decline from LOS C and D in 2000 to LOS F. Krome Avenue between SW 248<sup>th</sup> Street and SW 272<sup>nd</sup> Street may continue to operate at LOS B in some areas and decline slightly to LOS C in others. SW 312<sup>th</sup> Street between Florida's Turnpike and U.S. Highway 1 may decline from LOS C to D by 2005. Only U.S. Highway 1 between 112<sup>th</sup> Avenue and SW 137<sup>th</sup> Avenue is projected to exceed its maximum service volume by 2015.

**4.2.6 Independent Land Use Concepts**

Traffic generated by most of the independent land use concepts would be subsumed within the estimates generated for the Proposed Action and other reuse alternatives.

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## 4.3 UTILITIES

This section addresses projected water consumption, wastewater generation, solid waste disposal, electrical consumption, and natural gas consumption in the ROI for the Proposed Action and alternatives.

### 4.3.1 Introduction

The analysis of impacts on utilities considers direct on-site demand generated by employment and land development located on former Homestead AFB and indirect demand generated by estimated changes in population. On-site demand projections derived from usage factors for the type of anticipated development and intensity of use. Projected utility demands for former Homestead AFB include the combined total use of retained areas, conveyed areas, and the disposal property.

Projected baseline average daily utility demands in the ROI for 2000, 2005, and 2015 are presented in Section 3.3. Those utility demands were calculated based on projected baseline population levels. The utility impact analysis in this section is based on the population impacts presented in Section 4.1, which shows population increases estimated to result from implementation of the Proposed Action and alternatives. The percent increases in population for the utility service areas (generally south Miami-Dade County, City of Homestead, and Florida City) were used as factors to calculate future utility demands that would result from population growth caused by implementation of the Proposed Action and alternatives on top of the projected baseline growth.

Population was used as the determining factor for utility demand rather than employment because persons already resident in the county are expected to fill most of the jobs generated by reuse of the former base (see Section 4.1). These persons are part of the baseline population projections and, thus, already have been factored into the projected baseline utility demand, as presented in Section 3.3. Therefore, only population increases attributable to reuse-related in-migration and relocation were used to factor future increases in utility demands resulting from implementation of the Proposed Action and alternatives. The following sections provide total estimated utilities consumption in 2000, 2005, 2015. Demands for full buildout could not be estimated because baseline population levels are not available for that phase of development.

### 4.3.2 Potable Water

#### 4.3.2.1 *Proposed Action*

The estimated total average daily water demand in the ROI in 2000, 2005, and 2015 under the Proposed Action is presented in **Table 4.3-1**. Projected water demand is shown for each of the water treatment plant service areas in the ROI, including WASD's Alexander Orr and Rex System plants (which serve most of the unincorporated area of south Miami-Dade County), the City of Homestead, Florida City, and former Homestead AFB.

The total water demand in the ROI with the Proposed Action is estimated to be approximately 290 mgd in 2015. This would be about 10 mgd (less than 4 percent) greater than the projected baseline demand in 2015. About 7 percent of the increase would be attributed to direct, on-site demand, and the remainder to off-site effects.

## UTILITIES

**Table 4.3-1. Total Water Demand in the ROI—Proposed Action**

<b>Water Treatment Plant Service Area</b>	<b>2000 (mgd)</b>	<b>2005 (mgd)</b>	<b>2015 (mgd)</b>	<b>Permitted Capacity (mgd)</b>
Alexander Orr (WASD)	187.0	206.6	250.3	196.0 <sup>1</sup>
Rex System (WASD)	6.6	7.4	11.8	12.6
City of Homestead	11.4	13.6	20.6	17.0
Florida City	3.2	3.9	5.8	4.1
Former Homestead AFB	0.3	0.4	1.0	3.0
<b>Total</b>	<b>208.5</b>	<b>231.9</b>	<b>289.5</b>	<b>232.7</b>
Projected Baseline/No Action	208.5	231.0	279.3	232.7

Source: SAIC.

Note: <sup>1</sup> Planned for expansion to 220 mgd.

mgd = million gallons per day

The projected service area water demands would be within the existing permitted capacities (or currently planned expansions) of their water treatment plants (as shown in Table 3.3-1), except at Alexander Orr, City of Homestead, and Florida City in 2015. As shown in Table 4.3-1, the capacities of these facilities are already expected to be exceeded by the projected baseline demand. Therefore, additional treatment capacity will be needed before 2015 with or without the Proposed Action. In each case, the amount of additional capacity required to accommodate the Proposed Action is small compared to the additional capacity required to accommodate the projected baseline. At the Alexander Orr plant, the Proposed Action is estimated to add 5.3 mgd (2 percent) over the projected baseline demand of 245 mgd in 2015. At the City of Homestead plant, the Proposed Action increase would be less than 1 mgd (3.5 percent) and at Florida City, the Proposed Action would not increase the projected baseline demand.

### **Cumulative Impacts**

If the Miami-Dade County high-growth forecasts were to occur, population in the southern portion of the county could be approximately 70 percent higher than under the projected baseline with moderate growth. Water demand could be expected to exceed current permitted capacities of water treatment plants in the ROI before 2005. About 5 percent of this increase would be contributed by the Proposed Action.

### **Mitigation Measures**

If the additional water treatment capacity necessary to treat projected baseline water demand is developed on a timely basis with an adequate margin of additional capacity, it could accommodate the demand attributable to the Proposed Action.

### **Possible Future Expansion**

Activity levels at HST could increase substantially with the addition and full utilization of a second runway. It is conceivable that the resulting increase in water demand could be double that of the Proposed Action.

#### 4.3.2.2 Commercial Spaceport Alternative

The estimated total average daily water demand in the ROI in 2000, 2005, and 2015 under the Commercial Spaceport alternative is presented in **Table 4.3-2**. Projected water demand is shown for each of the water treatment plant service areas in the ROI.

**Table 4.3-2. Total Water Demand in the ROI—Commercial Spaceport Alternative**

Water Treatment Plant Service Area	2000 (mgd)	2005 (mgd)	2015 (mgd)	Permitted Capacity (mgd)
Alexander Orr (WASD)	187.0	206.2	245.5	196.0 <sup>1</sup>
Rex System (WASD)	6.6	7.4	8.7	12.6
City of Homestead	11.4	13.6	20.0	17.0
Florida City	3.2	3.9	5.8	4.1
Former Homestead AFB	0.3	0.4	0.6	3.0
<b>Total</b>	<b>208.5</b>	<b>231.5</b>	<b>280.6</b>	<b>232.7</b>
Projected Baseline/No Action	208.5	231.0	279.3	232.7

Source: SAIC.

Note: <sup>1</sup> Planned for expansion to 220 mgd.  
mgd million gallons per day

The total water demand in the ROI with the Commercial Spaceport alternative is estimated to be approximately 281 mgd in 2015. This would be about 1 mgd (less than 1 percent) greater than the projected baseline demand in 2015. Direct, on-site demands would generate about 17 percent of this demand, with the remainder attributable to off-site demand.

The projected service area water demands would be within the existing permitted capacities (or currently planned expansions) of their water treatment plants, except at Alexander Orr, City of Homestead, and Florida City in 2015, which are expected to exceed their capacities under the projected baseline. Therefore, additional treatment capacity will be needed before 2015 with or without the Commercial Spaceport alternative. In each case, the amount of additional capacity required to accommodate the Commercial Spaceport alternative is very small compared to the additional capacity required to accommodate the projected baseline. At the Alexander Orr plant, reuse-generated increase in demand would be 0.5 mgd (0.2 percent), at the City of Homestead it would be 0.1 mgd (0.5 percent), and at Florida City there would be no change over the projected baseline in 2015.

#### Combined Commercial Spaceport/Airport

The estimated average daily water demand in the ROI with a combined Commercial Spaceport/ Airport is presented in **Table 4.3-3**. The total water demand in the ROI is estimated to be about 282 mgd in 2015, just slightly more than the Commercial Spaceport alternative without a commercial airport. This would be about 3 mgd (1 percent) greater than the projected baseline demand in 2015.

## UTILITIES

**Table 4.3-3. Total Water Demand in the ROI—Combined Commercial Spaceport/Airport**

<b>Water Treatment Plant Service Area</b>	<b>2000 (mgd)</b>	<b>2005 (mgd)</b>	<b>2015 (mgd)</b>	<b>Permitted Capacity (mgd)</b>
Alexander Orr (WASD)	187.0	206.7	246.3	196.0 <sup>1</sup>
Rex System (WASD)	6.6	7.6	9.1	12.6
City of Homestead	11.4	13.7	20.1	17.0
Florida City	3.2	3.9	5.8	4.1
Former Homestead AFB	0.3	0.6	0.9	3.0
<b>Total</b>	<b>208.5</b>	<b>232.5</b>	<b>282.2</b>	<b>232.7</b>
Projected Baseline/No Action	208.5	231.0	279.3	232.7

Source: SAIC.

Note: <sup>1</sup> Planned for expansion to 220 mgd.

mgd million gallons per day

### Cumulative Impacts

If the high-growth forecasts for south Miami-Dade County were to occur, the population could be approximately 70 percent higher than under baseline conditions, and water demand could significantly exceed current permitted capacities of water treatment plants in the ROI before 2005. The proportion of this exceedance that would be contributed by the Commercial Spaceport alternative would be very small (much less than 1 percent).

### Mitigation Measures

If the additional water treatment capacity necessary to treat projected baseline water demand is developed on a timely basis with any margin of additional capacity, it would accommodate the estimated demand of the Commercial Spaceport alternative.

#### 4.3.2.3 Mixed Use Alternative

The impact of the Mixed Use alternative on water demand and supply would depend on how the alternative was implemented. Four potential plans were analyzed: a Market-Driven development scenario, a joint proposal submitted by Collier Resources Company and the Hoover Environmental Group, the original Collier proposal, and the original Hoover plan. The estimated range of total average daily water demand in the ROI in 2000, 2005, and 2015 encompassing the four scenarios is presented in **Table 4.3-4**.

With Market-Driven development, total water demand in the ROI is estimated to be approximately 281 mgd in 2015. This would be slightly more than 1 mgd (less than 1 percent) greater than the projected baseline. Estimates for the original Collier proposal are about the same. Under the Collier-Hoover proposal, total water demand is estimated to be approximately 233 mgd in 2005 and 282 mgd in 2015 (about 1 percent of the projected baseline). Total water demand for the original Hoover plan is estimated to be about the same as the Collier-Hoover proposal.

Projected baseline demand would exceed the capacities of the Alexander Orr, City of Homestead, and Florida City facilities by 2015, and additional treatment capacity will be needed before 2015 with or without the Mixed Use alternative. The amount of additional capacity required to accommodate the Mixed Use alternative would be similar to the Commercial Spaceport alternative and very small (less than 1 percent) compared to the additional capacity required to accommodate the projected baseline.

**Table 4.3-4. Total Water Demand in the ROI—Mixed Use Alternative**

<b>Water Treatment Plant Service Area</b>	<b>2000 (mgd)</b>	<b>2005 (mgd)</b>	<b>2015 (mgd)</b>	<b>Permitted Capacity (mgd)</b>
Alexander Orr (WASD)	187.0	206.2–206.5	245.5–246.0	196.0 <sup>1</sup>
Rex System (WASD)	6.6	7.4–7.7	8.7–9.1	12.6
City of Homestead	11.4	13.6	20.0	17.0
Florida City	3.2	3.9–4.0	5.8	4.1
Former Homestead AFB <sup>2</sup>	0.3	0.4–0.7	0.7–1.4	3.0
<b>Total</b>	<b>208.5</b>	<b>231.5–232.5</b>	<b>280.7–282.3</b>	<b>232.7</b>
Projected Baseline/No Action	208.5	231.0	279.3	232.7

Source: SAIC.

Note: <sup>1</sup> Planned for expansion to 220 mgd.<sup>2</sup> Does not include water for irrigation.

mgd million gallons per day

### Cumulative Impacts

If the high-growth forecasts for south Miami-Dade County were to occur, population could be approximately 70 percent higher than under baseline conditions, and water demand could significantly exceed current permitted capacities of water treatment plants in the ROI before 2005. The proportion of this exceedance that would be contributed by the Mixed Use alternative would be very small (less than 1 percent).

### Mitigation Measures

If the additional water treatment capacity necessary to treat baseline water demand is developed on a timely basis with any margin of additional capacity, it would accommodate the demand of the Mixed Use alternative.

#### 4.3.2.4 *No Action Alternative*

Under the No Action alternative, no activity would occur on the disposal property, except continued use of the airfield for military and other government operations, which is included in the projected baseline. There would be no impacts due to reuse of former Homestead AFB. The projected baseline growth would still result in exceedances of the capacities of the Alexander Orr, City of Homestead, and Florida City facilities. This would likely require these purveyors to modify their existing water use permits.

#### 4.3.2.5 *Independent Land Use Concepts*

It is possible that some of the independent land use concepts could be incorporated in the Proposed Action or the industrial and commercial uses of the Commercial Spaceport and Mixed Use alternatives. The water demands of these independent land use concepts are considered subsumed under the development scenarios addressed above.

Two independent land use concepts could generate higher than average water demand: agriculture and a cemetery. In each case, the water demand could be highly variable depending on factors such as farming practices, type of crop, amount of irrigation-dependent landscaping, and weather patterns.

## UTILITIES

### 4.3.3 Wastewater

#### 4.3.3.1 Proposed Action

The estimated total average daily wastewater generation in 2000, 2005, and 2015 under the Proposed Action is presented in **Table 4.3-5**. Projected wastewater generation is shown for each of the wastewater treatment plant service areas in the ROI. The service areas included in the table are WASD's South District plant (which serves most of the unincorporated area of south Miami-Dade County) and the City of Homestead. Florida City and former Homestead AFB wastewater is treated at the South District plant.

**Table 4.3-5. Total Wastewater Generation in the ROI—Proposed Action**

Wastewater Treatment Plant Service Area	2000 (mgd)	2005 (mgd)	2015 (mgd)	Planned Average Flow (mgd)
South District (WASD)	84.5	93.7	115.6	112.5
City of Homestead	3.3	4.0	6.0	6.0
<b>Total</b>	<b>87.8</b>	<b>97.7</b>	<b>121.6</b>	<b>118.5</b>
Projected Baseline/No Action	87.8	97.4	116.9	118.5

Source: SAIC.

mgd million gallons per day

The total wastewater generation in the ROI with the Proposed Action is estimated to be approximately 122 mgd in 2015. This would be 5 mgd (about 4 percent) greater than the projected baseline of 116.9 mgd in 2015 (shown in Table 4.3-5). About 15 percent of this increase is attributable to direct, on-site development, with the rest from off-site demand. The projected wastewater generation rates would be within the capacities of the planned average flows of currently planned expansions of the treatment plants (as shown in Table 3.3-3), except at the South District plant in 2015. The estimated treatment demand at South District in 2015 would be 115.6 mgd, with a planned average flow of 112.5 mgd, about 2 percent less than the estimated demand with the Proposed Action.

Miami-Dade WASD operates three regional wastewater treatment plants in the north, central, and south districts. The system is interconnected and the service districts have flexible boundaries. Flows from one district can be diverted to other plants in the system. The north and central plants are considerably larger than the south plant, as shown in Table 3.3-3. A 2 percent exceedance at the South District plant would not be a significant impact on the overall system. The Proposed Action wastewater treatment demand (1.4 mgd) would be small (about 1 percent) of the projected baseline in 2015.

#### Cumulative Impacts

If the high-growth forecasts for south Miami-Dade County were to occur, the population could be approximately 70 percent higher than under baseline conditions and wastewater treatment demand could significantly exceed planned capacities of treatment plants in the ROI before 2005. The proportion of this exceedance that would be contributed by the Proposed Action would be small (about 2 percent).

#### Mitigation Measures

No mitigation measures are suggested.

## Possible Future Expansion

Activity levels at HST could increase substantially with the addition and full utilization of a second runway. It is conceivable that the resulting increase in wastewater generation could be double that of the Proposed Action.

### 4.3.3.2 Commercial Spaceport Alternative

The estimated total average daily wastewater generation in the ROI in 2000, 2005, and 2015 for the Commercial Spaceport alternative is presented in **Table 4.3-6**. Total wastewater generation in the ROI with the Commercial Spaceport alternative is estimated to be approximately 117.5 mgd in 2015. This would be 0.6 mgd (less than 1 percent) above the projected baseline of 116.9 in 2015. Direct, on-site development would account for about 75 percent of the increase, with the rest attributable to off-site demand. All of the projected wastewater generation rates would be within the capacities of the planned average flows of currently planned expansions of the treatment plants.

**Table 4.3-6. Total Wastewater Generation in the ROI—Commercial Spaceport Alternative**

Wastewater Treatment Plant Service Area	2000 (mgd)	2005 (mgd)	2015 (mgd)	Planned Average Flow (mgd)
South District (WASD)	84.5	93.7	111.7	112.5
City of Homestead	3.3	4.0	5.8	6.0
<b>Total</b>	<b>87.8</b>	<b>97.7</b>	<b>117.5</b>	<b>118.5</b>
Projected Baseline/No Action	87.8	97.4	116.9	118.5

Source: SAIC.  
mgd million gallons per day

## Combined Commercial Spaceport/Airport

The total estimated average daily wastewater generation in the ROI in 2000, 2005, and 2015 for a combined Commercial Spaceport/Airport is presented in **Table 4.3-7**. Total wastewater generation in the ROI is estimated to be approximately 118.3 mgd in 2015, just slightly more than the Commercial Spaceport alternative without a commercial airport. This would be approximately 1.4 mgd (less than 1 percent) greater than the projected baseline demand in 2015. All of the projected wastewater generation rates would be within the capacities of the planned average flows of currently planned expansions of the treatment plants.

## Cumulative Impacts

If the high-growth forecasts for south Miami-Dade County were to occur, the population could be approximately 70 percent higher than under baseline conditions and wastewater treatment demand could significantly exceed planned capacities of treatment plants in the ROI before 2015. The proportion of this exceedance that would be contributed by the Commercial Spaceport alternative or the combined Commercial Spaceport/Airport would be very small (much less than 1 percent).

## Mitigation Measures

No mitigation measures are needed or suggested.

## UTILITIES

**Table 4.3-7. Total Wastewater Generation in the ROI—Combined Commercial Spaceport/Airport**

<b>Wastewater Treatment Plant Service Area</b>	<b>2000 (mgd)</b>	<b>2005 (mgd)</b>	<b>2015 (mgd)</b>	<b>Planned Average Flow (mgd)</b>
South District (WASD)	84.5	94.1	112.5	112.5
City of Homestead	3.3	4.0	5.8	6.0
<b>Total</b>	<b>87.8</b>	<b>98.1</b>	<b>118.3</b>	<b>118.5</b>
Projected Baseline/No Action	87.8	97.4	116.9	118.5

Source: SAIC.

mgd million gallons per day

### **4.3.3.3 Mixed Use Alternative**

The estimated range of total average daily wastewater generation in the ROI in 2000, 2005, and 2015 under the Mixed Use alternative is presented in **Table 4.3-8**. Total wastewater generation in the ROI is estimated to range from approximately 117.9 to 118.5 mgd in 2015. The Market-Driven development would be at the lower end of the range. Total wastewater generation under the Collier-Hoover proposal is estimated to be about 98 mgd in 2005 and 118 mgd in 2015. This would be between 1 and 2 mgd (less than 1 percent) above the projected baseline demand in 2015. The projected wastewater generation rates would be within the capacities of the planned average flows of currently planned expansions of the treatment plants.

**Table 4.3-8. Total Wastewater Generation in the ROI—Mixed Use Alternative**

<b>Wastewater Treatment Plant Service Area</b>	<b>2000 (mgd)</b>	<b>2005 (mgd)</b>	<b>2015 (mgd)</b>	<b>Planned Average Flow (mgd)</b>
South District (WASD)	84.5	93.8–94.1	112.1–112.7	112.5
City of Homestead	3.3	4.0	5.8	6.0
<b>Total</b>	<b>87.8</b>	<b>97.8–98.1</b>	<b>117.9–118.5</b>	<b>118.5</b>
Projected Baseline/No Action	87.8	97.4	116.9	118.5

Source: SAIC.

mgd million gallons per day

## **Cumulative Impacts**

If the high-growth forecasts for south Miami-Dade County were to occur, the population could be approximately 70 percent higher than under baseline conditions, and wastewater generation could significantly exceed planned capacities of treatment plants in the ROI before 2015. The proportion of this exceedance that would be contributed by the Mixed Use alternative would be very small (less than 1 percent).

## **Mitigation Measures**

No mitigation measures are needed or suggested.



#### 4.3.3.4 No Action Alternative

Under the No Action alternative, no activity would occur on the disposal property, except continued use of the airfield for military and other government operations, which is included in the projected baseline. The No Action alternative would have no impact on wastewater treatment demand or capacity.

#### 4.3.3.5 Independent Land Use Concepts

Some of the independent land use concepts could be incorporated in the Proposed Action or the industrial and commercial uses of the Commercial Spaceport and Mixed Use alternatives. No effects specific to these independent land use concepts are expected to exceed those associated with the Proposed Action and other alternatives.

### 4.3.4 Solid Waste

#### 4.3.4.1 Proposed Action

The estimated total average daily solid waste disposal in the ROI in 2000, 2005, and 2015 under the Proposed Action is presented in **Table 4.3-9**. Projected solid waste disposal is shown for each of the solid waste generation areas in the ROI, including the unincorporated area of Miami-Dade County, the City of Homestead, Florida City, and former Homestead AFB.

**Table 4.3-9. Total Solid Waste Generation in the ROI—Proposed Action**

Solid Waste Generation Area	2000 (tpd)	2005 (tpd)	2015 (tpd)
Unincorporated Area	638	706	868
City of Homestead	127	152	230
Florida City	12	15	22
Former Homestead AFB	5	12	44
<b>Total</b>	<b>782</b>	<b>885</b>	<b>1,164</b>
Projected Baseline/No Action	782	877	1,088

Source: SAIC.

tpd      tons per day

Total solid waste disposal in the ROI with the Proposed Action is estimated to be approximately 1,164 tpd in 2015. This would be 76 tpd (about 7 percent) greater than the projected baseline in 2015 (shown in Table 4.3-9). Direct, on-site development would account for about 52 percent of the increase, with the rest attributable to off-site demand. The projected solid waste disposal rates would be within the capacities of the existing waste disposal facilities.

### Cumulative Impacts

If the high-growth forecasts for south Miami-Dade County were to occur, the population could be approximately 70 percent higher than under baseline conditions and solid waste disposal requirements could significantly impact the available capacities at solid waste disposal facilities. The proportion of this impact that would be contributed by the Proposed Action would be about 5 percent.

## UTILITIES

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### Mitigation Measures

No mitigation measures are needed or suggested.

### Possible Future Expansion

Activity levels at the proposed airport could increase substantially with the addition and full utilization of a second runway. It is conceivable that the resulting increase in solid waste generation could be double that of the Proposed Action.

#### 4.3.4.2 Commercial Spaceport Alternative

The estimated total average daily solid waste disposal in the ROI in 2000, 2005, and 2015 under the Commercial Spaceport alternative is presented in **Table 4.3-10**. Total solid waste disposal in the ROI under the Commercial Spaceport alternative is estimated to be approximately 1,109 tpd in 2015. This would be 21 tpd (about 2 percent) greater than the projected baseline in 2015. About 81 percent of this increase would be attributable to direct, on-site development, with the rest due to off-site demand. The projected solid waste disposal rates would be within the capacities of the existing waste disposal facilities.

**Table 4.3-10. Total Solid Waste Generation in the ROI—Commercial Spaceport Alternative**

Solid Waste Generation Area	2000 (tpd)	2005 (tpd)	2015 (tpd)
Unincorporated Area	638	706	842
City of Homestead	127	152	223
Florida City	12	15	22
Former Homestead AFB	5	12	22
<b>Total</b>	<b>782</b>	<b>885</b>	<b>1,109</b>
Projected Baseline/No Action	782	877	1,088

Source: SAIC.

tpd        tons per day

### Combined Commercial Spaceport/Airport

Total projected average daily solid waste disposal in the ROI in 2000, 2005, and 2015 for a combined Commercial Spaceport/Airport is presented in **Table 4.3-11**. Total solid waste disposal in the ROI is estimated to be 1,125 tpd in 2015. This would be 37 tpd (about 3 percent) greater than the projected baseline demand in 2015. All of the projected solid waste disposal rates would be within the capacities of the existing waste disposal facilities.

### Cumulative Impacts

If the high-growth forecasts for south Miami-Dade County were to occur, the population could be approximately 70 percent higher than under baseline conditions and solid waste disposal requirements could significantly impact the available capacities at solid waste disposal facilities. The proportion of this impact that would be contributed by the Commercial Spaceport alternative would be about 2 percent.

**Table 4.3-11. Total Solid Waste Generation in the ROI—Combined Commercial Spaceport/Airport**

<b>Solid Waste Generation Area</b>	<b>2000 (tpd)</b>	<b>2005 (tpd)</b>	<b>2015 (tpd)</b>
Unincorporated Area	638	709	846
City of Homestead	127	153	224
Florida City	12	15	22
Former Homestead AFB	5	17	33
<b>Total</b>	<b>782</b>	<b>894</b>	<b>1,125</b>
Projected Baseline/No Action	782	877	1,088

Source: SAIC.

tpd      tons per day

### Mitigation Measures

No mitigation measures are needed or suggested.

#### 4.3.4.3 Mixed Use Alternative

The estimated range of total average daily solid waste disposal rates in the ROI in 2000, 2005, and 2015 under the Mixed Use alternative are presented in **Table 4.3-12**. Total solid waste disposal in the ROI is estimated to be between 1,107 and 1,129 tpd in 2015. This would be 19–41 tpd (about 2–4 percent) greater than the projected baseline demand in 2015. The Market-Driven scenario would be at the lower end of the range. Total solid waste generation under the Collier-Hoover proposal is estimated to be 891 tpd in 2005 and 1,122 tpd in 2015. The projected solid waste disposal rates would be within the capacities of the existing waste disposal facilities.

**Table 4.3-12. Total Solid Waste Generation in the ROI—Mixed Use Alternative**

<b>Solid Waste Generation Area</b>	<b>2000 (tpd)</b>	<b>2005 (tpd)</b>	<b>2015 (tpd)</b>
Unincorporated Area	638	706–707	842–845
City of Homestead	127	152	223
Florida City	12	15	22
Former Homestead AFB	5	10–18	20–39
<b>Total</b>	<b>782</b>	<b>883–892</b>	<b>1,107–1,129</b>
Projected Baseline/No Action	782	877	1,088

Source: SAIC.

tpd      tons per day

### Cumulative Impacts

If the high-growth forecasts for south Miami-Dade County were to occur, the population could be approximately 70 percent higher than under baseline conditions, and solid waste disposal requirements could significantly impact the available capacities at solid waste disposal facilities. The proportion of this exceedance that would be contributed by the Mixed Use alternative would be 1–2 percent.

## UTILITIES

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### Mitigation Measures

No mitigation measures are needed or suggested.

#### 4.3.4.4 *No Action Alternative*

Under the No Action alternative, no activity would occur on the disposal property, except continued use of the airfield for military and other government operations, which is included in the projected baseline. The No Action alternative would have no impact on solid waste.

#### 4.3.4.5 *Independent Land Use Concepts*

Some of the independent land use concepts could be incorporated in the Proposed Action or the industrial and commercial uses of the Commercial Spaceport and Mixed Use alternatives. No solid waste disposal impacts specific to these independent land use concepts are expected to exceed those associated with the Proposed Action and other alternatives.

### 4.3.5 Electricity

#### 4.3.5.1 *Proposed Action*

The estimated total average daily electrical demand in the ROI in 2000, 2005, and 2015 under the Proposed Action is presented in **Table 4.3-13**. Projected electrical demand is shown for each of the electrical service areas in the ROI. The service areas include south Miami-Dade County and former Homestead AFB, both served by Florida Power and Light Company, plus the additional electrical power generated by the City of Homestead.

**Table 4.3-13. Total Electrical Demand in the ROI—Proposed Action**

Electrical Demand Area	2000 (MWh/d)	2005 (MWh/d)	2015 (MWh/d)
South Miami-Dade County	28,629	31,693	38,926
City of Homestead	184	220	333
Former Homestead AFB	56	93	280
<b>Total</b>	<b>28,869</b>	<b>32,006</b>	<b>39,539</b>
Projected Baseline/No Action	28,869	31,902	38,010

Source: SAIC.

MWh/d megawatt hours per day

The total electrical demand in the ROI with the Proposed Action is estimated to be approximately 39,539 MWh/day in 2015. This would be 1,529 MWh/day (about 4 percent) greater than the projected baseline demand in 2015 (shown in Table 4.3-13). Direct, on-site development would account for about 14 percent of the increase, with the rest due to off-site demand. All of the projected service area electrical demands would be within the existing capacities of the electrical utilities.

### Cumulative Impacts

If the high-growth forecasts for south Miami-Dade County were to occur, the population could be approximately 70 percent higher than under projected baseline conditions and electrical demand could

increase considerably. This increase would be within the capability of the FPL power distribution system, which currently has a statewide system capacity that is 40 percent in excess of demand.

### Mitigation Measures

No mitigation measures are needed or suggested.

### Possible Future Expansion

Activity levels at the proposed airport could increase substantially with the addition and full utilization of a second runway. It is conceivable that resulting increase in electrical demand could be double that of the Proposed Action.

#### 4.3.5.2 Commercial Spaceport Alternative

The estimated total average daily electrical demand in the ROI in 2000, 2005, and 2015 under the Commercial Spaceport alternative is presented in **Table 4.3-14**. The total electrical demand in the ROI with the Commercial Spaceport alternative is estimated to be approximately 38,280 MWh/day in 2015. This would be 270 MWh/day (less than 1 percent) greater than the projected baseline demand in 2015. Direct, on-site development would account for about 47 percent of the increase, with the rest due to off-site demand. All of the projected service area electrical demands would be within the existing capacities of the electrical utilities.

**Table 4.3-14. Total Electrical Demand in the ROI—Commercial Spaceport Alternative**

Electrical Demand Area	2000 (MWh/d)	2005 (MWh/d)	2015 (MWh/d)
South Miami-Dade County	28,629	31,690	37,762
City of Homestead	184	220	323
Former Homestead AFB	56	113	195
<b>Total</b>	<b>28,869</b>	<b>32,023</b>	<b>38,280</b>
Projected Baseline/No Action	28,869	31,902	38,010

Source: SAIC.

MWh/d megawatt hours per day

### Combined Commercial Spaceport/Airport

Total projected average daily electrical demand in the ROI for a combined Commercial Spaceport/Airport in 2000, 2005, and 2015 is presented in **Table 4.3-15**. The total electrical demand in the ROI is estimated to be approximately 38,513 MWh/day in 2015, just slightly more than the Commercial Spaceport alternative without a commercial airport. This would be 503 MWh/day (about 1 percent) greater than the projected baseline demand in 2015. All of the projected electrical demands would be within the existing capacities of the electrical treatment plants.

### Cumulative Impacts

The cumulative increase in electrical demand generated by a high level of population growth would be within the capacity of the FPL power distribution system.

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**Table 4.3-15. Total Electrical Demand in the ROI—Combined Commercial Spaceport/Airport**

Electrical Demand Area	2000 (MWh/d)	2005 (MWh/d)	2015 (MWh/d)
South Miami-Dade County	28,629	31,788	37,932
City of Homestead	184	221	325
Former Homestead AFB	56	143	256
<b>Total</b>	<b>28,869</b>	<b>32,152</b>	<b>38,513</b>
Projected Baseline/No Action	28,869	31,902	38,010

Source: SAIC.

MWh/d megawatt hours per day

### Mitigation Measures

No mitigation measures are needed or suggested.

#### 4.3.5.3 Mixed Use Alternative

The estimated range of total average daily electrical demand in the ROI in 2000, 2005, and 2015 under the Mixed Use alternative is presented in **Table 4.3-16**. The total electrical demand could range from 38,254 to 38,437 MWh/day in 2015. This would be between 244 and 427 MWh/day (up to about 1 percent) greater than the projected baseline demand. The Market-Driven scenario would be at the low end of the range. Total electrical demand under the Collier-Hoover proposal is estimated to be 32,071 MWh/day in 2005 and 38,363 MWh/day in 2015. All of the projected service area electrical demands would be within the capacities of the electrical utilities.

**Table 4.3-16. Total Electrical Demand in the ROI—Mixed Use Alternative**

Electrical Demand Area	2000 (MWh/d)	2005 (MWh/d)	2015 (MWh/d)
South Miami-Dade County	28,629	31,681–31,752	37,782–37,886
City of Homestead	184	220	323
Former Homestead AFB	56	91–117	149–228
<b>Total</b>	<b>28,869</b>	<b>31,992–32,089</b>	<b>38,254–38,437</b>
Projected Baseline/No Action	28,869	31,902	38,010

Source: SAIC.

MWh/d megawatt hours per day

### Cumulative Impacts

The cumulative increase in electrical demand generated by a high level of population growth would be within the capacity of the FPL power distribution system.

### Mitigation Measures

No mitigation measures are needed or suggested.

#### 4.3.5.4 No Action Alternative

Under the No Action alternative, no activity would occur on the disposal property, except continued use of the airfield for military and other government operations, which is reflected in the projected baseline (see Table 3.3-7). The No Action alternative would have no effect on electrical demand or supply.

#### 4.3.5.5 Independent Land Use Concepts

Some of the independent land use concepts could be incorporated in the Proposed Action or the industrial and commercial uses of the Commercial Spaceport and Mixed Use alternatives. No effects specific to these independent land use concepts are expected to exceed those associated with the Proposed Action and other alternatives.

### 4.3.6 Natural Gas

#### 4.3.6.1 Proposed Action

The City Gas service area includes the northern portion of south Miami-Dade County. The City of Homestead, Florida City, and former Homestead AFB do not currently have natural gas service. The estimated total average daily natural gas demand in the ROI in 2000, 2005, and 2015 under the Proposed Action is presented in **Table 4.3-17**. The total natural gas demand in the ROI with the Proposed Action is estimated to be 150,317 therms per day in 2015. This would be 5,039 therms per day (about 3 percent) greater than the projected baseline demand in 2015; all of the increase would be from off-site demand. The projected natural gas demands would be within the existing capacities of the natural gas utility.

**Table 4.3-17. Total Natural Gas Demand in the ROI**

Baseline and Alternatives	2000 (therms/day)	2005 (therms/day)	2015 (therms/day)
Projected Baseline/No Action Alternative	110,553	122,553	145,278
Proposed Action	110,553	122,812	150,317
Commercial Spaceport Alternative	110,553	122,803	145,821
Combined Commercial Spaceport/Airport	110,553	123,180	146,480
Mixed Use Alternative	110,553	122,767–123,044	145,783–146,298

Source: SAIC.

### Cumulative Impacts

If the high-growth forecasts for south Miami-Dade County were to occur, the population could be approximately 70 percent higher than under baseline conditions and natural gas demand could increase considerably. This increase would still be well within the capacity of the City Gas distribution system within its service area.

### Mitigation Measures

No mitigation measures are needed or suggested.

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### **Possible Future Expansion**

The possible expansion of HST with a second runway could conceivably double the increase in demand for natural gas reported for the Proposed Action.

#### **4.3.6.2      *Commercial Spaceport Alternative***

The estimated total average daily natural gas demand in the ROI in 2000, 2005, and 2015 under the Commercial Spaceport alternative is presented in Table 4.3-17. The total natural gas demand is estimated to be 145,821 therms per day in 2015. This would be 543 therms per day (less than 1 percent) greater than the projected baseline demand in 2015. The projected natural gas demands would be well within the existing capacities of the natural gas utility.

### **Combined Commercial Spaceport/Airport**

Projected average daily natural gas demand in the ROI in 2000, 2005, and 2015 with a Combined Commercial Spaceport/Airport is estimated to be 146,480 therms per day in 2015 (see Table 4.3-17). This would be 1,202 therms per day (about 1 percent) greater than the projected baseline demand in 2015. The projected natural gas demands would be well within the existing capacities of the natural gas utility.

### **Cumulative Impacts**

The cumulative increase in natural gas demand generated by a high level of population growth would be well within the capacity of the City Gas distribution system within its service area.

### **Mitigation Measures**

No mitigation measures are needed or suggested.

#### **4.3.6.3      *Mixed Use Alternative***

The estimated range of total average daily natural gas demand in the ROI in 2000, 2005, and 2015 under the Mixed Use alternative is presented in Table 4.3-17. The total natural gas demand is estimated to range from 145,783 to 146,298 therms per day in 2015. This would be between 505 and 1,020 therms per day (less than 1 percent) greater than the projected baseline demand in 2015. The projected natural gas demands would be within the existing capacities of the natural gas utility.

### **Cumulative Impacts**

The cumulative increase in natural gas demand generated by a high level of population growth would be well within the capacity of the City Gas distribution system within its service area.

### **Mitigation Measures**

No mitigation measures are needed or suggested.

#### **4.3.6.4      *No Action Alternative***

Under the No Action alternative, no activity would occur on the disposal property, except continued use of the airfield for military and other government operations, which is included in the projected baseline (see Table 4.3-17). There would be no impact on the natural gas utility.



**4.3.6.5      *Independent Land Use Concepts***

The independent land use concepts would not affect natural gas use. There is no natural gas service to former Homestead AFB. Any increase in off-site natural gas use associated with the independent land use concepts would not exceed estimates presented for the Proposed Action and other alternatives.

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## **4.4 AIRSPACE AND SAFETY**

This section addresses the potential effects of the Proposed Action and alternatives on airspace use in the Miami Approach Control Area, flight safety, and ground safety.

### **4.4.1 Introduction**

The airspace analysis compares current and projected future use of airspace in the Miami Approach Control Area by aircraft operations at both Homestead ARS and other airports in the ROI under TRACON control, to determine the potential for impacts on the airspace environment. The analysis considers whether the Proposed Action and alternatives could (1) require modifications to the airspace structure or ATC systems and/or facilities; (2) restrict, limit, or otherwise delay other air traffic in the region; or (3) encroach on other airspace areas or uses. The conclusions are based on information and aviation system planning documents provided by the FAA, FDOT, and other related sources.

The FAA has overall responsibility for airspace management and is required to evaluate any proposed changes or impacts to the airspace structure that may be triggered by changes in airport roles and service levels. This evaluation includes review of the airport proponent's ALP, an airspace analysis, a flight safety review, and assessment of the potential effect of the proposal on air traffic control and air navigational facilities. The FAA then determines the actual requirements for any airspace actions, instrument flight procedures, or new facilities to accommodate the proposed airport improvements or role changes. Consultation with FAA's Miami TRACON was used to identify the flight tracks presented for the Proposed Action. Therefore, the Proposed Action is assumed to conform to FAA, ATC, and safety requirements (see Appendix A).

The safety analysis discusses potential flight and ground safety issues that may arise as a result of implementing the Proposed Action or one of the reuse alternatives. For each alternative, the elements of the reuse plan that have a potential to affect safety were evaluated relative to the degree to which the action could increase or decrease safety risks to ground-support personnel, aircrews, the public, and property.

For the analysis of flight safety risks for civil aircraft FAA, data on mishaps were used to identify the potential for a mishap occurring that could have significant consequences. The potential impacts of a crash, should one occur, on the environment are addressed primarily in the Biological Resources analysis in Section 4.11.

For commercial aviation, significant accidents are categorized as "major" and "serious" and can be compared with total flight hours to calculate a rate of occurrence per 100,000 flying hours. Major and serious accidents are defined as follows (**FAA 1998a**):

- A major accident is one in which any of three conditions is met:
  - An aircraft was destroyed;
  - There were multiple fatalities; or
  - There was one fatality and an aircraft was substantially damaged.
- A serious accident is one in which at least one of two conditions is met:
  - There was one fatality without substantial damage to an aircraft; or
  - There was at least one serious injury and an aircraft was substantially damaged.

## **AIRSPACE AND SAFETY**

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Not all events used to calculate the statistics associated with these accident categories necessarily involved an actual aircraft crash. For example, in 1997, the statistics included a ground crew member crushed by a nose wheel and a passenger who fell through an open catering door during the boarding process (FAA 1998a). Nevertheless, the statistical data provide a reasonable basis for analysis.

No statistical data are available to calculate incidence rates for specific aircraft types (e.g., Boeing 737, Lockheed L-1011). Flight hours used to establish occurrence rates per 100,000 flying hours reflect the aviation industry as a whole. The statistics maintained on general aviation are only categorized by total frequency of accidents and frequency of fatalities. For this analysis, statistics on fatal accidents were used to calculate an incidence rate per 100,000 flying hours.

The risk associated with bird-aircraft strike hazards is also evaluated as a flight safety concern. In the absence of specific data for civil aircraft, the bird-aircraft strike data for F-16 military aircraft at Homestead ARS was used to generate rough estimates of potential risks under the Proposed Action and alternatives.

In considering ground safety, potential reuse-related activities were reviewed to determine if they might pose an additional or unique risk. For some alternatives, the ground safety analysis also considered explosive safety issues, which were evaluated in terms of increased risk. The airport safety analysis considered the appropriateness of land uses in the areas potentially exposed to safety risks from the former Homestead AFB airfield.

The analysis of ground safety issues associated with the Turkey Point Nuclear Power Plant is dependent on the safety analysis report required by NRC (see Section 3.4.4).

### **4.4.2      Airspace**

#### **4.4.2.1      *Proposed Action***

The Proposed Action would introduce increasing numbers of civil aircraft operations at HST into the airspace in successive future years. Considering the higher levels of military aircraft operations that occurred in the past, airspace and ATC system capabilities to accommodate the proposed operations, and FAA review processes required for implementation of the Proposed Action, no significant impacts on airspace use are anticipated. The Proposed Action would not likely require any major airspace reclassifications or modifications for the Miami Approach Control area, individual airports and traffic patterns, Alert Area A-291D, or IR-053 as a direct result of this action.

General aviation operational levels are currently much lower than they were in the late 1970s. Many general aviation operations are either local training flights conducting multiple touch-and-go landings in closed airport traffic patterns or transients operating under VFR conditions which do not normally require ATC clearances and radar services. Commercial, air transport, and military operations are conducted on arrival and departure routes that provide separation between the different airports in the region. Considering these factors, the regional airspace structure and routes, procedures, and radar/navigational aids comprising the ATC system have been able to accommodate current air traffic operations and the higher levels experienced in the past without any significant constraints.

Increased operations estimated for HST and those forecast for the other airports in the region may eventually present some potential constraints that could be resolved within the context of the regional airspace system and FAA review. Any route changes/additions that may be needed to accommodate future activities would be developed in consultation with the Miami FAA TRACON to make the most

efficient use of the airspace while avoiding any potential conflicts between the different airports, and would require public coordination and compliance with NEPA.

Two considerations are important in resolving any potential conflicts: the flight tracks and the flight profiles flown by the aircraft involved. A *flight track* describes the path of an aircraft over the surface of the earth and is defined by the track's length and width. A *flight profile* adds altitude, the height of the aircraft above the ground as it flies along the flight track.

To support the analyses in this SEIS, a series of flight tracks were developed to represent the expected patterns of operation as HST expands to include large components of commercial and private civilian air traffic. For planning purposes, consultations were held with Miami TRACON and the Miami ARTCC, as well as with the FAA's Airspace and Air Traffic officials at the national level. As a result of this coordination, and considering existing operations in the region, a series of "backbone" flight tracks was developed between HST and each arrival and departure navigational fix serving the area. The expected dispersion on either side of these backbones was developed from an analysis of radar data from airports currently operating in the region. The resulting dispersed flight tracks are illustrated in Appendix B.

The airspace in the southern Florida region is complex. Several airports use the same navigational fixes for arrivals and departures, and flight tracks to and from different airports cross and overlap. When introduced into HST, civil aircraft operations would have to be integrated into the existing airspace structure and would be constrained by other operations at airports in the ROI, especially Miami International. The vertical flight profiles for civil aircraft operating from HST were developed with these constraints in mind. Instead of a constant and steady rate of climb (for departures) or descent (for arrivals), these flight profiles more closely resemble stair steps. Aircraft would proceed to established altitudes and then fly level until they passed beyond navigational fixes, thereby flying above or below potentially conflicting traffic. Thus, aircraft using the same fixes would be safely separated by altitude from other aircraft intersecting their flight tracks. In this way, the aircraft proposed to operate from HST would be smoothly integrated into the overall regional air traffic flow, while still being safely separated from other air traffic, and not constraining any other airport's operations.

### **Cumulative Impacts**

None of the other activities considered in the cumulative impact analysis involve aviation activities. Therefore, no additional cumulative impacts on airspace use or management are anticipated. Future increases in regional air traffic are reflected in the projected baseline. The potential effects from the addition of a fourth runway at MIA were taken into consideration in identifying flight paths for the Proposed Action and included in the analysis of its effects.

### **Mitigation Measures**

No mitigation measures involving airspace management are suggested. All airspace safety considerations have been incorporated in the identification of flight paths for the Proposed Action.

### **Possible Future Expansion**

Possible future airport expansion at HST could include a second runway. With a second runway, HST could potentially accommodate a maximum of 370,000 aircraft operations annually. The time frame of initial operation is likely to be no earlier than 2038, with maximum use beyond the middle of the century. This action, coupled with other airport growth in the region for that time period, would require additional review by airport planners and the FAA to ensure that airspace requirements, airport arrival/departure routing, and other ATC system considerations could support aircraft operational levels for the region.

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Anticipated changes based on the introduction of new technology will affect future airspace configuration and procedures.

### **4.4.2.2      *Commercial Spaceport Alternative***

The potential for space vehicle launch and recovery operations to affect airspace use would depend on their specific operational attributes and requirements. An area of airspace may have to be cleared of all nonparticipating aircraft for a short period during the launch/recovery window for a space vehicle operation. Similar restrictions are imposed on air traffic for space shuttle launches/recoveries, aerial demonstrations, and other special ground or flight activities that may interfere with routine airspace use and flight safety. Air traffic operating at MIA and along the eastern coastal region would have the potential to be affected by space vehicle launch/recovery operations at former Homestead AFB. Each launch/recovery operation would be carefully planned and coordinated with the FAA and other interests well in advance of the scheduled periods so that appropriate actions could be taken and advisories issued to safely accommodate the spaceport activities.

The real potential for any airspace impacts cannot be assessed until the flight parameters for the space vehicle(s) are developed and tested, and the FAA's Associate Administrator for Commercial Space Transportation permitting and licensing safety reviews provide a more detailed definition of flight tracks, associated airspace requirements, and operational procedures. However, to the extent that space launch and recovery operations could preclude other operations within a given airspace for some period of time, there could be impacts on military and government activities at Homestead ARS, as well as on civil aircraft at other airports in the region. These could include delays and rerouting requirements.

### **Combined Commercial Spaceport/Airport**

With a combined Commercial Spaceport/Airport, the potential effects on airspace use during scheduled space vehicle launch/recovery operations would be the same as discussed above. During commercial airport operations, the effects would be as described for the Proposed Action.

### **Cumulative Impacts**

No other identified activities considered in the cumulative impacts analysis have the potential to interact with regional airspace use and management. Potential effects from the addition of a fourth runway at MIA have been taken into account in the analysis. No additional cumulative airspace impacts are anticipated.

### **Mitigation Measures**

Any airspace conflicts would be resolved through established ATC scheduling and coordination processes as described above, and no specific mitigation measures are suggested.

### **4.4.2.3      *Mixed Use Alternative***

Under this alternative, Homestead ARS would continue to be used for military and government operations and future aircraft operations would be the same as described in Section 2.1.1.2 and shown in Table 2.1-4. This alternative would have no impact on airspace use in the region.

### **4.4.2.4      *No Action Alternative***

Under the No Action alternative, airspace use would remain as described for the projected baseline in Section 3.4.2.

#### 4.4.2.5 *Independent Land Use Concepts*

The airport-related independent land use concepts (e.g., aircraft maintenance) were incorporated in the analysis of the Proposed Action and Commercial Spaceport alternative. Their impacts on airspace would not be different from those described above. The other independent land use concepts would not affect airspace.

#### 4.4.3 **Flight Safety**

##### 4.4.3.1 *Proposed Action*

**Aircraft Mishaps.** Under the Proposed Action, military and government flight operations are projected to remain at current levels, while commercial and general aviation operations at HST would increase. Considering all operations, and using the military's Class A mishap rate for F-16s and the statistical accident rates for civil operations, **Table 4.4-1** reflects the relative risk of an accident at 2000, 2005, and 2015, assuming current statistical accident rates remain unchanged. Flying hours were calculated assuming that each operation would spend five minutes in the immediate airport environs. No estimates were developed for maximum use of the one runway at HST because it is too far in the future for meaningful prediction.

**Table 4.4-1. Estimated Aircraft Mishap Risk—Proposed Action**

Year	Type	Mishap Rate	Flying Hours	Years Between Mishaps
Current	Military	4.43	1,000	23
	Commercial	0.03	0	NA
	General Aviation	1.63	0	NA
2000	Military	4.43	1,000	23
	Commercial	0.03	0	NA
	General Aviation	1.63	3,403	18
2005	Military	4.43	1,000	23
	Commercial	0.03	812	3,519
	General Aviation	1.63	3,761	16
2015 <sup>1</sup>	Military	4.43	1,000	23
	Commercial	0.03	74,140	462
	General Aviation	1.63	4,731	13

Source: **USAF 1998b, FAA 1998a.**

Note: <sup>1</sup> Based on current statistical accident rates. Future rates are expected to be reduced with improved technological and human factors research.

NA Not applicable

For the military aircraft, the estimated risk is based on the Class A mishap rate for the single-engine F-16, which is the predominant aircraft that will operate from HST, conducting an estimated 12,000 operations per year. Due to the frequency of operations, this aircraft would continue to carry the highest potential risk of mishap. Since all other military and government aircraft that operate from former Homestead AFB will conduct significantly fewer operations, risks associated with their operations would be substantially less. This represents no change from baseline conditions.

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To assess the potential operational flying safety risks associated with commercial and general aviation aircraft at HST, FAA statistical safety data for the last five years were considered. In the case of commercial aviation, a combined total of 24 major and serious accidents occurred. Based on the estimated 68,593,000 flight hours in that same time frame, these data indicate an accident rate of 0.035 per 100,000 flying hours. In the case of general aviation for the same five-year period, 1,923 fatal accidents occurred during an estimated total of 117,770,000 flight hours. This reflects a rate of 1.63 per 100,000 flying hours.

Based on the numbers of operations projected for HST in each year analyzed, the probability of a mishap occurring is estimated as follows:

- For military aircraft—0.000004 ( $4 \times 10^{-6}$ ) or one chance in 276,000.
- For commercial aircraft—0.000000029 ( $2.9 \times 10^{-8}$ ) or one chance in 34,275,060.
- For general aviation aircraft—0.00000136 ( $1.36 \times 10^{-6}$ ) or one chance in more than 735,000.

The Florida Fish and Wildlife Conservation Commission conducts controlled burning on SFWMD lands in the Model Lands Basin and Southern Glades south and southeast of Homestead (see Section 3.6.4.1) to reduce risks of wildfire and enhance and maintain wildlife habitat. These fires and associated smoke could have the potential to interfere with aviation operations. No regulations prohibit these activities when they are an integral part of land management. Coordination between the responsible natural resource management agency, airport managers, and air traffic controllers would minimize potential risks to aviation. If burns are conducted on days when prevailing meteorological conditions are expected to carry the smoke away from the runway and in directions that do not interfere with air traffic routing, there should be little or no impact. Should the runway or critical flight paths become unexpectedly obscured by smoke, air traffic controllers would react just as if meteorological conditions (e.g., fog, severe thunder storms) created a situation in which visibility fell below minimum safe operating levels. The response could range from keeping aircraft in a holding pattern, to temporarily closing the runway, to closing the airport and diverting traffic to an alternate airport.

***Bird-Aircraft Strike Hazard.*** The habitat around former Homestead AFB is conducive to supporting bird populations. Bird dispersal techniques have been developed and are currently required on a regular basis (AFRC 1996b). Vegetation control in aquatic habitats is also practiced (AFRC 1998b). While bird and wildlife control and management are ongoing, some bird-aircraft strikes do occur. Military and other governmental aircraft currently operating from Homestead ARS experience, on average, about six bird strikes per year (Dunaway 1998).

Currently, a bird strike occurs on average once for every 3,300 F-16 operations, resulting in a strike rate of approximately 0.3 per 1,000 operations. Bird strikes involving F-16s are the only data available for Homestead ARS adequate to allow some level of statistical analysis. Therefore, they have been used to provide a rough estimate of bird strike risks for aircraft in general operating from the Homestead airfield. **Table 4.4-2** applies the rate derived from the F-16 data to the total projected number of aircraft operations for the Proposed Action in each of the analysis years and at maximum use of one runway. This provides a rough estimate of the number of strikes that might be expected to occur under the Proposed Action.

Data maintained by the Air Force reflect that Class A mishaps result from 0.06 percent of all reported strikes (USAF 1998a). This means that a Class A mishap occurs only once every 1,667 strikes. If these statistics are applied to the Proposed Action, it would take about 76 years at the level of operations projected for 2005, 37 years at the level of operations projected for 2015, and 24 years at the level of operations projected for maximum use to experience 1,667 strikes. This translates to a probability of catastrophic accident resulting from a bird strike during any given operation of 0.0000002 ( $2 \times 10^{-7}$ ), or less than one chance in 5 million.



**Table 4.4-2. Estimated Annual Bird-Aircraft Strikes—Proposed Action**

Year	Operations	Projected Strikes
2000	60,658	18
2005	74,697	22
2015	150,735	45
Maximum Use	231,274	69

Source: SAIC, derived from **Dunaway 1998**.

While these levels of risk are low, they are based on operations under current conditions. They rely on rough analogies that may underestimate the exposure of commercial aircraft that are larger than fighter aircraft. On the other hand, commercial aircraft also have lower mishap rates. Many other factors including aircraft speed and flight profiles could also affect the level of risk.

There are several aspects of the Proposed Action that have the potential to create situations that would attract wildlife, thus exacerbating the risk of bird-aircraft strikes. FAA has issued Advisory Circular 150/5200-33 on “Hazardous Wildlife Attractants On Or Near Airports.” This Advisory Circular provides recommendations and guidance for locating certain land uses on or in the vicinity of public-use airports. The guidance is intended to minimize land uses that have the potential to attract and sustain wildlife that are hazardous to aircraft operations around airports. Such land uses should be sited no closer than 10,000 feet from the airport itself and 5 statute miles from any airspace supporting approach and departure flight tracks (**FAA 1997**). Land uses identified include human-made or natural areas—such as poorly drained areas, retention ponds, roosting habitats on buildings, landscaping, putrescible-waste disposal operations, wastewater treatment plants, agricultural activities, surface mining, or wetlands—that may be used by wildlife for escape, feeding, loafing, or reproduction. Airport operators, land developers, and land owners are requested to notify the FAA in writing of known or reasonably foreseeable land use practices on or near airports that either attract or may attract hazardous wildlife.

USEPA requires any operator proposing a new or expanded waste disposal operation within 5 statute miles of the end of a runway to notify FAA and airport operators of the proposal. USEPA also requires owners or operators of new municipal solid waste landfill units or lateral expansions of existing units located within 10,000 feet of the end of any runway used by turbojet aircraft to demonstrate successfully that they are not hazardous to aircraft. Although no similar requirements exist for other land use modifications that could create attractants for hazardous wildlife, the FAA requests that proponents of such projects provide notification as early in the development process as possible. Airport operators who become aware of such projects in the airport vicinity should also notify the FAA (**FAA 1997**).

When circumstances indicate that there is a potential for hazardous wildlife to create safety concerns, the holder of the certificate authorizing airport operations is required to comply with the provisions of 14 CFR 139.337, *Wildlife Hazard Management*. Management actions include the following:

- The certificate holder must conduct an ecological study that defines the safety concerns, identifies the wildlife of concern, and describes the attractants contributing to the concern.
- Based on the findings of the study, FAA will determine the need for a Wildlife Hazard Management Plan.
- The Wildlife Hazard Management Plan, if required, will be developed by the certificate holder and will detail measures required to alleviate or eliminate wildlife hazards to air carrier operations. The plan will assign responsibilities, address required habitat modification and land use changes identified

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in the ecological study, identify resources required for implementation, and establish procedures to be followed during air carrier operations to minimize safety risks.

- The plan must be reviewed periodically for effectiveness and currency.

Some current and proposed land uses constitute wildlife attractants as described above and are in close enough proximity to the airfield to create potential safety concerns. Of particular concern is the existing Miami-Dade County landfill.

On the airport site itself, the element of the Proposed Action with the most potential for creating bird-airstrike concerns is the Surface Water Management Master Plan. It includes various mechanisms to manage, direct, and control stormwater runoff, including construction of French drains and retention and detention ponds. The FAA supports the use of French drains and detention ponds but recommends against the use of retention ponds because they provide a more reliable water source that may attract birds (FAA 1997). Similarly, proposals included in the Wildlife/Habitat Management and Mitigation Plan of the Proposed Action could also create wildlife attractants which are discouraged by the FAA when they are in close proximity to airports (FAA 1997).

Outside the former base boundary, the surrounding environment contains numerous wetlands and water bodies that attract waterfowl, including Biscayne Bay, which is within 5 miles of approach and departure flight tracks for the runway. These conditions are part of the existing and past environment and are reflected in historic bird-airstrike statistics for the former base.

Increased development and population expansion in the ROI have the potential to increase the generation of solid waste. Disposal of this waste may exacerbate safety concerns involving the county landfill (“Mount Trashmore”) since both the FAA and USEPA have major concerns with developing or expanding landfills located near aviation facilities (FAA 1997). This landfill currently attracts numerous birds, especially gulls, and dispersal efforts have been generally ineffective.

### **Cumulative Impacts**

None of the future activities identified in the ROI have the potential to directly affect the risk of aircraft accidents, but some could increase risk of bird-aircraft strikes. The L-31E Flowway Redistribution project and the county’s proposed stormwater treatment and distribution area would result in an expansion of wetlands east of the former base. These wetlands could begin approximately 1 mile east of the runway and would be expected to create habitat highly conducive to attracting waterfowl and wading birds.

Miami-Dade County has evaluated its proposed STDA in consideration of FAA Advisory Circular 150/5200-33 and concluded that the STDA is not expected to pose additional risk to present or future operations at the former base (Miami-Dade County 2000a). The reasons stated indicate the area involved in the STDA is already wetland, and no additional wetlands would be created. Although some additional volume of water may be introduced periodically into the area, this would only occur when some water is already present. The project’s design is to manage the additional water volume as detention ponding rather than retention ponding, thereby minimizing the attractiveness of the habitat, as is recommended by FAA.

### **Mitigation Measures**

The analyses of the potential for aircraft accidents do not suggest a significant risk. No specific mitigation measures are recommended. However, coordination between airport developers, land developers, and natural resource management agencies, as well as consideration of the guidance contained in FAA Advisory Circular 150/5200-33, could reduce the possibility of increased risk of bird-aircraft strikes.

Compliance with the provisions of 14 CFR 139.337, *Wildlife Hazard Management*, as outlined above, would mitigate the potential risks to some degree. The ecology of the region reflects conditions that would support wildlife of a size or in numbers that could result in multiple bird strikes and ingestion of birds into a turbojet engine, and could be capable of causing a damaging collision [14 CFR 139.337 (a)(1), (2), and (3)]. Therefore, the Miami-Dade County Aviation Department would be required to conduct an ecological study for HST. This requirement has been acknowledged in the county's Wildlife/Habitat Management Plan. Based on the findings of the study, and in coordination with the FAA, a Wildlife Hazard Management Plan, if required, would develop and detail processes and procedures necessary to alleviate or eliminate wildlife hazards to air carrier operations.

### **Possible Future Expansion**

The construction of a second runway would provide the capability for HST to support additional aviation operations. Increasing the number of operations could reduce the duration between potential mishaps. It is not possible to statistically predict what the risk might be, since any potential airport expansion is not anticipated to occur for 30 years or more. Current mishap rates are unlikely to be applicable so far into the future.

#### **4.4.3.2 Commercial Spaceport Alternative**

**Aircraft Mishaps.** The concept of a horizontal space launch facility is in an early developmental stage, and no historic data are available to assess the potential for mishaps associated with space launch activities. Based on historical experience with vertically launched spacecraft, any launch accident typically results in the loss of both the launch vehicle and the payload.

The FAA's Associate Administrator for Commercial Space Transportation is responsible for licensing space launch activities as directed by 14 CFR Chapter III §401.3, and for ensuring, through its licensing process, that proposed launch activities are not hazardous to public health and safety or the safety of property. At present, no specific standards or requirements exist for commercial launch activities like these that could occur at Homestead under this alternative. However, as part of the licensing requirements, an applicant must provide a Safety Analysis that satisfies requirements in 14 CFR §§411.3, 411.5, and 415.11 through 415.17. The Safety Analysis must identify and evaluate all hazards to public health and safety or to off-site property that may occur during prelaunch or launch. It must also include procedures to be employed to control the hazards identified; qualifications of range safety personnel and other critical personnel responsible for assuring hazard controls; and design characteristics of range safety systems (flight and ground) and their effectiveness in assuring a safe launch operation.

Because the space launch proposals being considered under this alternative are based on evolving technologies that do not as yet have a Safety Analysis, no specific flight safety assessment could be performed for the SEIS. However, the FAA's licensing requirements would ensure that there would be no significant hazards posed by spaceport operations at Homestead.

Mishap risks associated with conventional military and government aircraft operations would be the same under this alternative as under baseline conditions.

**Bird-Aircraft Strike Hazard.** Bird-aircraft strike hazard under the Commercial Spaceport alternative would not be appreciably different from baseline conditions. It is not known whether bird-aircraft strike hazards would be a concern for space launch vehicles.

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### Combined Commercial Spaceport/Airport

A combined Commercial Spaceport/Airport could include some commercial and general aviation operations in addition to the military, other government, and space launch operations. As shown in **Table 4.4.3**, the risk of aircraft mishaps involving these operations would be lower than under the Proposed Action because of a lower number of civil aircraft operations.

**Table 4.4-3. Estimated Aircraft Mishap Risk—Combined Commercial Spaceport/Airport**

Year	Type	Mishap Rate	Flying Hours	Years Between Mishaps
Current	Military	4.43	1,000	23
	Commercial	0.03	0	NA
	General Aviation	1.63	0	NA
2000	Military	4.43	1,000	23
	Commercial	0.03	0	NA
	General Aviation	1.63	0	NA
2005	Military	4.43	1,000	23
	Commercial	0.03	812	3,519
	General Aviation	1.63	834	74
2015 <sup>1</sup>	Military	4.43	1,000	23
	Commercial	0.03	1,353	2,112
	General Aviation	1.63	834	74

Sources: **USAF 1998b, FAA 1998a.**

Notes: <sup>1</sup> Based on current statistical accident rates. Future rates are expected to be reduced with improved technological and human factors research.

NA Not Applicable

The estimated number of bird-aircraft strikes is presented in **Table 4.4-4**. Statistical data from F-16 operations suggest that a serious accident occurs once every 1,667 strikes. At the projected levels of conventional aircraft flight operations at a combined Commercial Spaceport/Airport at full buildout, it would take 119 years of operations to reach that level.

**Table 4.4-4. Estimated Annual Bird-Aircraft Strikes—  
Combined Commercial Spaceport/Airport**

Year	Operations	Projected Strikes
2000	29,824	9
2005	39,724	12
2015	46,534	14
Full Buildout	46,534	14

Source: SAIC, derived from **Dunaway 1998**.

Although the projected number of bird-aircraft strikes would be low under this alternative, the same safety issues and concerns discussed for the Proposed Action would apply to a combined Commercial Spaceport/Airport.

## **Cumulative Impacts**

The potential for cumulative impacts under this alternative would be similar to the Proposed Action.

## **Mitigation Measures**

It is assumed FAA Safety Analysis procedures and licensing requirements would preclude significant safety risks from spaceport and/or space vehicle operations. The potential mitigation measures discussed for the Proposed Action would apply to a combined Commercial Spaceport/Airport.

### **4.4.3.3      *Mixed Use Alternative***

Under this alternative, military and government aviation activities would continue at the airfield, but no civil aviation capability would be developed. The Collier-Hoover proposal, like the original Hoover plan, includes development of extensive on-site wetlands that could increase the bird-airstrike hazard for those activities. Vegetation control and other measures would need to be used to control attraction of birds near the airfield. The proposal discusses possible measures for reducing wildlife attractants in critical areas, especially in close proximity to the runways (**CRC/HEG 2000**). Proposals to manage wastewater treatment and sewage are also designed to reduce the attraction these items have for wildlife.

There could be a potential for the L-31E Flowway Redistribution Project and for the STDA proposed by Miami-Dade County to increase bird-airstrike hazards for continuing military and government operations at Homestead ARS.

### **4.4.3.4      *No Action Alternative***

Under the No Action alternative, military and government aviation activities would continue at the airfield but no other aviation activity would occur. Risks associated with aircraft mishaps and bird-aircraft strikes would remain as described for baseline conditions.

There could be a potential for the L-31E Flowway Redistribution Project and for the STDA proposed by Miami-Dade County to increase bird-airstrike hazards for continuing military and government operations at Homestead ARS.

### **4.4.3.5      *Independent Land Use Concepts***

With one exception, the independent land use concepts would have little or no effect on operational flight safety. The exception could be any agricultural or recreational use near the runway that could attract birds and create a hazard to aircraft operations.

## **4.4.4          Ground Safety**

### **4.4.4.1      *Proposed Action***

**Airport Safety.** The Proposed Action would involve constructing and operating passenger and freight facilities, other aviation support facilities, and infrastructure improvements necessary to support the airport. During construction, standard industrial best-management practices and occupational safety and health requirements would be expected to be followed. Safety risks associated with this development would be no greater than with any similar type of commercial or industrial development. Operations at air passenger and air freight facilities would be similar to operations conducted at other civil airports. No unique ground safety risk is expected to be associated with civil operations at HST.

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The Air Force's AICUZ program provides recommendations for compatible land uses in the immediate vicinity of the runway and other direct aviation support at Air Force bases. Under the Proposed Action, the AICUZ program would no longer be applicable, but land use safety would continue to be addressed by civil aviation standards. The FAA provides land use and airport design standards that include establishing and maintaining clear and safety areas around runways, object-free zones, and obstacle-free zones. The size of and surface areas involved in these zones varies depending on the type of aviation activities, but they provide public and property protection much like the AICUZ program (FAA 1989).

***Turkey Point Nuclear Power Plant.*** FPL operates a power plant with two nuclear reactor units at Turkey Point (Turkey Point Units 3 and 4), located approximately 5 miles from former Homestead AFB. Safety issues associated with the operation of nuclear power plants are addressed in 10 CFR §100.10. NRC staff interpretation of this regulation is described in NUREG-0800, "U.S. NRC Standard Review Plan (SRP) 2.2.3." NRC guidance provides that the frequency of an aircraft accident resulting in radiological consequences greater than 10 CFR Part 100 exposure guidelines be less than about  $1 \times 10^{-7}$  per year. If the risk is greater, it must be shown that the plant can withstand design basis aircraft impacts and associated fires without loss of safe shutdown capability, and without causing a release of radioactivity which would exceed 10 CFR Part 100 dose guidelines.

In 1998, the NRC requested additional aircraft-accident safety analyses of plant operation at Turkey Point, based on the proposal to create a commercial airport at former Homestead AFB. Specifically, the NRC requested that FPL "assess the impact of the projected changes and update the Turkey Point Units 3 and 4 Final Safety Analysis Report and other related documents if such projections significantly exceed that described in the present study to reflect the potential impact of this external hazard" (Jabbour 1998). Based on the number of projected aircraft operations for HST, FPL did not perceive a substantial safety issue. Flight tracks for HST were not available at that time.

Subsequently, information on estimated flight operations and flight tracks developed in connection with this SEIS has been provided to FPL and NRC. Based on these data, FPL has updated the safety risk assessment for Turkey Point Units 3 and 4. The risk assessment completed by FPL using these new data concluded that the probability of an aircraft accident involving Units 3 and 4 that could either prevent a safe shut-down of the units or result in radiological consequences in excess of dosages specified in 10 CFR Part 100 was approximately  $3.63 \times 10^{-7}$  per year. This estimate is conservative because analysts assumed that every crash would result in an unacceptable release of radiation. No reduction in risk was assumed for plant design, site layout, or topographical features.

In consideration of public concerns about risks associated with the incidence of bird-aircraft strikes and the foreign carriers anticipated to use HST under the Proposed Action, additional conservatism was then factored into the risk assessment. Based on national averages, FPL analysts originally calculated the bird-aircraft strike contribution to the risk of serious aircraft accidents to be 4.1 percent for military aircraft and 0.175 percent for civil aircraft. To allow for the bird population densities in southern Florida, these estimates were increased by a factor of five. This raised the estimates to 20.5 percent for military aircraft and 0.875 percent for civil aircraft. These rates are higher than has historically been experienced in the region, making the assessment highly conservative (i.e., tending to overestimate the risk).

The analysts also considered data indicating that mishap rates for aircraft operating in Latin America are 5.7 per 1 million departures, as compared to 0.5 per 1 million departures for the United States. Based on the forecast composition of the civil aircraft fleet that would operate through HST, when these data were considered, the overall probability of an aircraft crash was increased by approximately 5 percent. This also was a conservative assumption, since foreign aircraft operating in the U.S. are required to adhere to U.S. safety standards.

As a result of these two added considerations, the overall risk was increased from  $3.63 \times 10^{-7}$  per year to  $4.43 \times 10^{-7}$  per year. Based on these assessments, FPL concluded that this risk was acceptable, meeting the acceptance criterion of SRP 3.5.1.6 of about  $1 \times 10^{-7}$  per year. FPL's analyses were reviewed and approved by NRC. In approving FPL's assessment, NRC stated, "[FPL's assessment]...meets the SRP 3.5.1.6 acceptance criterion of about  $10^{-7}$  per year. In addition, FPL's estimate is within the guidelines of SRP 2.2.3, wherein the acceptance criterion of  $10^{-6}$  per year is applicable if reasonable qualitative arguments can be made to show that the realistic probability estimate is lower... FPL has qualitatively identified some conservatism inherent in its analysis which indicates that the actual risk from on-site aircraft crashes is lower than the estimate of  $3.63 \times 10^{-7}$  per year." The NRC correspondence is included in **Appendix I**.

While approving FPL's assessment, NRC did highlight the fact that the margin between the estimated crash frequency (using the conservative assumptions described above) and the acceptance guidelines of SRP 3.5.1.6 is relatively small. Therefore, NRC advised FPL to closely monitor the development of aviation activity at Homestead to ensure that the types and levels of operations remain within the envelope of those used for the assessment.

### **Cumulative Impacts**

No other future activities considered in the cumulative impact analysis would have a direct interaction with ground safety considerations addressed for the Proposed Action. While each development and construction project must consider ground safety issues, they are localized and site and project specific. Therefore, there are no identifiable cumulative ground safety impacts.

### **Mitigation Measures**

No specific ground safety mitigations have been identified. Compliance with federal Occupational Safety and Health Administration regulations for specific tasks, standard industrial safety practices, and best-management practices would keep ground safety risks at minimal levels.

### **Possible Future Expansion**

Possible future expansion of HST could include the construction of a second runway and other facilities. Standard industrial safety practices would control ground safety risks during construction. The design and development of the second runway would be expected to follow FAA standards and guidance for airport design, to ensure land uses in the vicinity of the runway would be compatible with that guidance. Additional environmental and safety analyses would be required at the time of a specific proposal to more precisely identify any safety issues, including additional risks involving the Turkey Point plant.

#### **4.4.4.2      *Commercial Spaceport Alternative***

***Spaceport Safety.*** The technologies associated with space launch operations are evolving, and before any space launch operations could be conducted from former Homestead AFB, both the spaceport operator and the space vehicle operators would be required to prepare a detailed Safety Analysis as part of their licensing requirements. Therefore, a detailed ground safety assessment of the potential impacts associated with this alternative is not available for this SEIS. The following assessment is based on preliminary available data.

The spaceport proposals advanced for former Homestead AFB would involve reusable space vehicles that might use hypergolic and/or cryogenic fuels and oxidizers for their propulsion. Hypergolic fuels and oxidizers ignite spontaneously when they are mixed. Cryogenic fuels and oxidizers are liquefied gases

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that are hazardous due to their composition and extremely cold temperatures. The operations proposed at former Homestead AFB would require storage of large quantities of these fuels on site and involve substantial quantity of fuels onboard the vehicle when the system was prepared for launch. It is assumed the quantities of hypergolic fuels would be less than cryogenic fuels.

Because commercial space launch operations are in an early stage of planning, the majority of the safety data pertaining to the storage, use, and handling of these substances has been developed by DOD. Discussions with space vehicle developers indicate that, pending future direction, safety standards described in DOD explosive safety guidelines (**DOD 1997**) would most likely be followed in their operations.

Overall, safety requirements associated with the hypergolic and cryogenic fuels and oxidizers are the most stringent. It is possible that between 500,000 and 1,000,000 pounds of liquid oxygen and liquid hydrogen could be stored at a spaceport on former Homestead AFB. Based on those quantities and their associated hazards, the storage area would most likely have to be located at least 1,800 feet from inhabited buildings (**DOD 1997**).

Existing safety standards for space vehicles have been developed for vertically launched systems (rockets), but not horizontally launched systems like those proposed under the Commercial Spaceport alternative. Based on available data about the proposed systems, the only element that would separate the fuel from the oxidizer on a fully fueled launch vehicle would be the vehicle's integral tankage. Therefore, it is reasonable to assume that a vehicle sitting at the end of a runway prior to launch would be analogous to a "Range Launch Pad" (**Olson 1998**), and explosive equivalents would apply (**DOD 1997**). This indicates a safety zone with a radius of 1,200 feet from parked aircraft and 1,800 feet from inhabited buildings would be required around the space vehicle when fully fueled and stationary.

Other systems could involve launch vehicles fueled with RP-1, a rocket propellant similar to kerosene, with liquid oxygen as an oxidizer. Elements of those operations would also require safety and clear zones, which would be expected to be only slightly less restrictive than those described above.

Preliminary data indicate that the space launch operations would not preclude other uses of the airfield and surrounding area. However, a number of safety issues remain unresolved, and will remain so until the technologies are better defined. Some of these include such considerations as clear zones around the space vehicle while being fueled and serviced, as well as around the vehicle while taxiing from the fueling area to the end of the runway in preparation for launch. Other safety or clear zones along the vehicle's flight track may also be required. All of these issues would have to be resolved in the Safety Analysis required for licensing space launch activities.

If a commercial launch facility were established with no conventional civil aviation operations, it is assumed the Air Force's AICUZ program described in Section 3.4 would continue to apply. Since the space launch aspect of this alternative is still in a technological development phase, it is uncertain at this time if additional restrictions may be associated with those operations. It is reasonable to assume that some additional requirements may result from the Safety Analysis that must be conducted as part of the space operations licensing process.

***Turkey Point Nuclear Power Plant.*** Assessing possible risks to the Turkey Point facility associated with this alternative is not possible at this time. An additional risk assessment would be required once adequate information became available about the space launch vehicles and their hazards, to ensure there would be no significant risk of an accident, or if an accident occurred, radiological release would not exceed NRC dose guidelines in 10 CFR Part 100.



### **Combined Commercial Spaceport/Airport**

Ground safety considerations for a combined Commercial Spaceport/Airport facility would include the requirements described for the Proposed Action, in addition to the spaceport safety issues described above. Locating both the spaceport facilities, with their safety requirements/restrictions, and civil airport facilities within the available land area would increase the complexity of compatible siting. In particular, the compatibility of public facilities, such as passenger terminals, located along the flightline with pre-launch space vehicle preparations would have to be addressed in the design of the facility and in the spaceport and launch operator licensing processes.

### **Cumulative Impacts**

No other future activities considered in the cumulative impact analysis would be expected to have a direct interaction with ground safety considerations at the spaceport, so no cumulative impacts have been identified.

### **Mitigation Measures**

With the implementation of safety analyses required to license a commercial launch facility at former Homestead AFB, no additional mitigation measures would be needed.

#### ***4.4.4.3 Mixed Use Alternative***

Under the Mixed Use alternative, no additional aviation development would occur. Standard construction and industrial and commercial safety requirements would apply. No specific or unique ground safety concerns have been identified with this alternative. Existing AICUZ recommendations would continue to apply. Aviation flight risks to the Turkey Point Nuclear Power Plant would be the same as they are currently.

#### ***4.4.4.4 No Action Alternative***

Under the No Action alternative, no additional aviation, industrial, or commercial development would occur on the disposal property. Existing military and governmental operations would continue. Recommendations in the Air Force's AICUZ program would continue to apply, and aviation flight risks to the Turkey Point Nuclear Power Plant would be the same as they are currently.

#### ***4.4.4.5 Independent Land Use Concepts***

None of the independent land use concepts are anticipated to pose ground safety risks beyond those described for the Proposed Action and alternatives.

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## 4.5 NOISE

### 4.5.1 Introduction

This section presents the findings of the analysis of noise from aircraft operations at former Homestead AFB, in combination with other aircraft operations in the ROI, under each of the reuse alternatives. Aircraft operations would change under the Proposed Action and Commercial Spaceport alternative. In the analysis of the Mixed Use alternative, as well as the No Action alternative, aircraft operations from the former base do not differ from the projected baseline presented in Section 3.5 and are limited to military and other government missions.

The noise analysis is based on modeling performed with an enhanced version of the FAA's Integrated Noise Model. The INM is described in detail in Section 3.5 and the Noise Appendix. Projected aircraft operations and flight paths were entered into the model for each alternative in 2000, 2005, 2015, and maximum use of a one-runway airport. Noise abatement flight paths are also evaluated for the Proposed Action. For each modeled scenario, noise data are presented in several metrics, including Day-Night Average Sound Level, Peak-Hour Equivalent Sound Level, Maximum Sound Level, Sound Exposure Level, and Time Above ambient.

The full results of the noise analyses are contained in a *Technical Memorandum on Aircraft Noise Considerations in the Transfer of Ownership of Homestead Air Reserve Base, Homestead, Florida, from the United States Air Force to Dade County, Florida* (Landrum & Brown 1999b). The main components of this Technical Memorandum are reproduced in Appendix E. The Technical Memorandum takes into account field measurements of ambient sound levels in the national parks and refuges. The field measurements were conducted in August 1998 by the John A. Volpe National Transportation Systems Center under contract to FAA and in September/October 1997 and November 1998 by Sanchez Industrial Design, Inc. under contract to the National Park Service. The results of the field measurements are in the Volpe Center's *Ambient Sound Levels at Four Department of Interior Conservation Units* (Fleming et al. 1999) and in SID's *Acoustic Data from Biscayne National Park and Everglades National Park* (1997) and 1998 supplemental acoustic data. In addition, Appendix H contains a draft report prepared by Wyle Laboratories to assist NPS in resolving methodological issues associated with defining the natural soundscape in the national parks, that interprets measured and monitored data involving natural ambient levels.

This section summarizes the results of an extensive noise analysis conducted for the SEIS. It primarily focuses on the maximum potential noise levels that might occur if the existing runway were used to its full capacity (maximum use). This is not anticipated to be achieved until sometime in the 2030s, but it provides a sense of the maximum potential impact from reuse of former Homestead AFB. Information for 2000, 2005, and 2015 is provided in Appendix E.

For the Proposed Action, the estimated noise levels from maximum use of a one-runway airport at HST incorporate future changes in aircraft models that are known, but it is not possible to predict other technologies that might evolve by the time maximum use is achieved. The analysis therefore assumes that aircraft at that time will be no quieter than they are expected to be in 2015. As such, it likely overestimates the probable noise levels. It is also assumed that HST would be very successful in achieving an unusually high rate of growth, both to achieve the level of operations forecast for 2015 and to reach its maximum capacity.

## NOISE

Impacts from aircraft noise are also addressed in Sections 4.6 Land Use and Aesthetics, 4.11 Biological Resources, 4.13 Minority and Low-Income Populations, and 4.14 Department of Transportation Act Section 4(f).

### 4.5.2 Proposed Action

**Table 4.5-1** presents forecast average daily operations at HST under the Proposed Action for the major aircraft types in each period of analysis.

**Table 4.5-1. Summary of Forecast Average Daily Operations at HST**

Aircraft Type	Current	2000	2005	2015	Maximum Use
Military and Government	54.31	54.31	54.31	54.31	54.31
Commercial Passenger	0	0	20.85	140.33	345.87
General Aviation	0	111.87	123.65	155.54	155.54
Aircraft Maintenance	0	0	1.56	4.03	4.03
Cargo	0	0	4.27	58.77	73.88
<b>Total Daily Operations</b>	<b>54.31</b>	<b>166.18</b>	<b>204.64</b>	<b>412.98</b>	<b>633.63</b>
<b>Total Annual Operations</b>	<b>19,824</b>	<b>60,658</b>	<b>74,697</b>	<b>150,735</b>	<b>231,274</b>

Source: Derived from **Landrum & Brown 1999b**.

The noise levels produced by these operations would be determined by the type of aircraft flying into and out of HST, the flight tracks used (determined by origin and destination), and distance from the airfield. Each takeoff and each landing counts as an operation, so the number of civil aircraft landing and taking off from HST would be half the number of operations depicted in Table 4.5-1. Generally, any specific location on the ground could only be exposed to either the landing or the takeoff of a given aircraft, not both, because the arrival and departure paths would be on opposite sides of the airport. As aircraft flew farther away from the airport, they would disperse along different flight paths, so not every aircraft would fly over the same point, except very close to the runway. As shown in Table 2.2-5, a wide variety of aircraft types are forecast to fly at HST. Commercial passenger, cargo, and high-performance general aviation jets are projected to comprise 50–55 percent of the operations. All these factors would affect the noise level at different locations.

Flight paths for civil aircraft operating into and out of HST have been identified for the Proposed Action in consultation with FAA. These differ from flight tracks currently used and projected to continue to be used for military and government operations. However, in the immediate vicinity of the airfield and out for the first few miles, the departure and arrival routes overlap substantially, diverging thereafter depending on type of aircraft and origin or destination. At greater distances from the airport, the civil aviation traffic are assumed to operate on a more unique set of flight paths. Therefore, noise effects attributable to the Proposed Action would vary depending on whether affected locations are presently exposed to overflight from military and government aircraft operating from Homestead ARS.

Noise effects are presented in the following sections in two main forms: as noise contours and as point noise data. Community noise impacts are described primarily in DNL, L<sub>A</sub>max, Leq(h), and TAamb data are primarily used to describe noise effects in the national parks and refuges.

#### 4.5.2.1 Community Noise

Noise modeling of the Proposed Action using the enhanced version of INM involved applying the total projected annual aircraft operations, by aircraft type, for each year of analysis to derive average daily operations and assigning each operation to a departure or arrival flight path. Nighttime (10:00 p.m. to 7:00 a.m.) operations were separated from daytime operations for the DNL computations in order to apply the 10 dB weighting that is used to reflect the higher level of annoyance associated with nighttime noise events.

**DNL Contours.** Figures 4.5-1 through 4.5-4 depict the estimated DNL 60, 65, 70, and 75 dB noise contours for the Proposed Action for 2000, 2005, 2015, and at maximum use of a one-runway airport at HST, respectively. Table 4.5-2 indicates the land area that would be encompassed within each contour for the maximum use, compared to the existing condition presented in Section 3.5. The total land area affected by DNL 60 dB or higher is projected to increase by 1,568 acres, or 24 percent, at maximum use. The areas within the DNL 65, 70, and 75 dB contours are projected to increase by 22, 15, and 8 percent, respectively. Table 4.5-3 estimates the change in dwelling units and residential population that would be exposed to noise levels exceeding DNL 60 dB. The table shows both existing residents who would be within each contour and the potential growth in population (through 2015) within each contour, assuming no land use compatibility controls are implemented. This estimated growth was based on the moderate growth forecasts described in Section 2.1.3. Because of the uncertainty of the timing and the lack of population forecasts beyond 2020, population growth was not projected for maximum use.

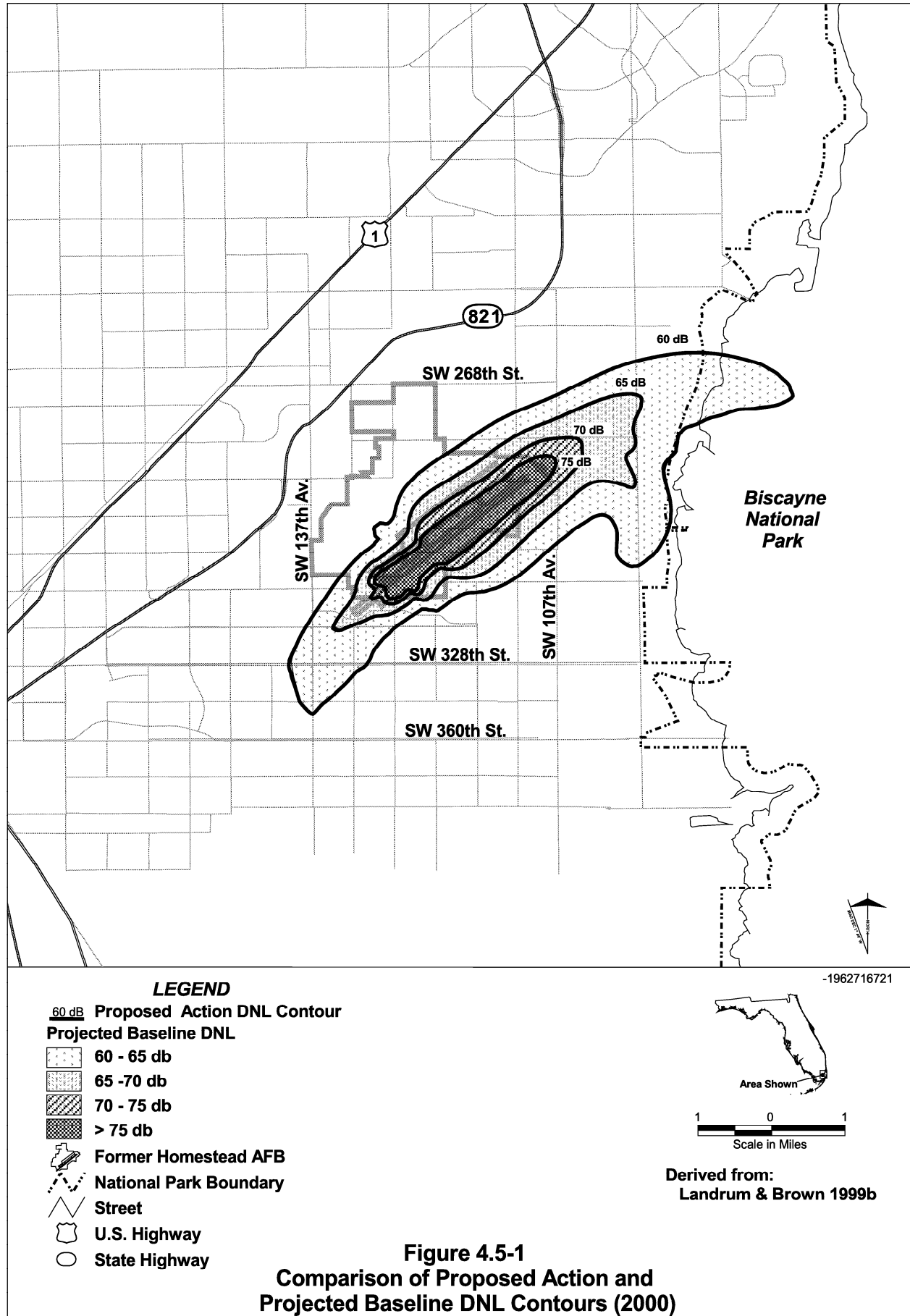
**Table 4.5-2. Land Area Within DNL Contours—Proposed Action at Maximum Use**

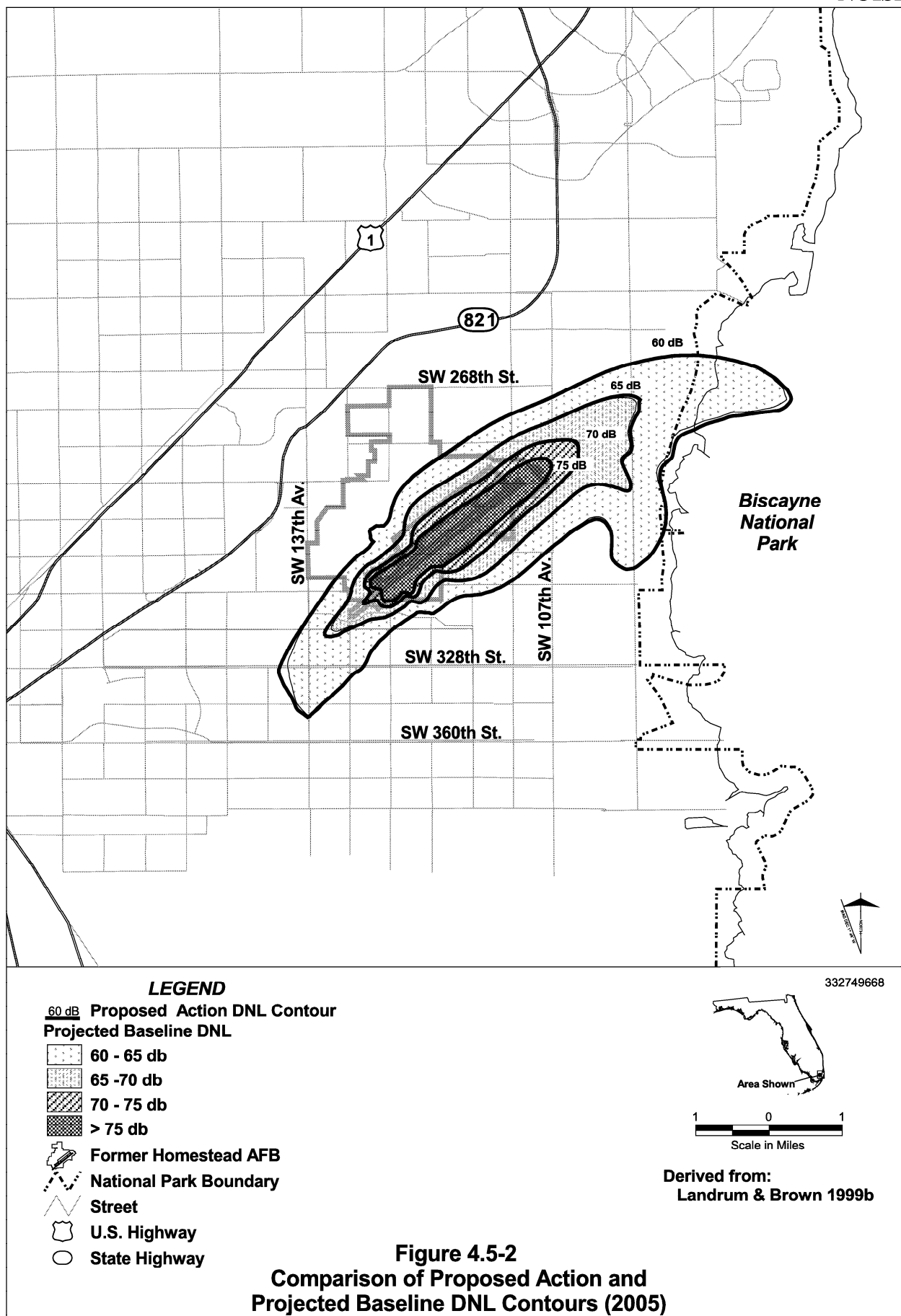
DNL Contour	Within Airport Boundary (acres)		Outside Airport Boundary (acres)		Total Area (acres)	
	Current	Proposed Action	Current	Proposed Action	Current	Proposed Action
60–65 dB	390	404	3,322	4,275	3,712	4,679
65–70 dB	372	384	1,062	1,459	1,434	1,843
70–75 dB	301	326	301	410	602	736
Above 75 dB	666	704	45	64	710	768
Total Above 60 dB	1,729	1,818	4,730	6,208	6,458	8,026

Source: Landrum & Brown 1999b.

The Federal Interagency Committee on Urban Noise defined noise impact zones and established guidelines for land use compatibility. Their guidelines have been adopted by FAA and incorporated in Federal Aviation Regulations Part 150. The land use compatibility guidelines are shown in Table 4.5-4. These guidelines identified residential uses, unless treated with adequate noise insulation, as incompatible with noise exposure levels of DNL 65 dB and higher. The FAA encourages communities to reduce or prevent residential land uses within the DNL 65 dB contour to the extent possible.

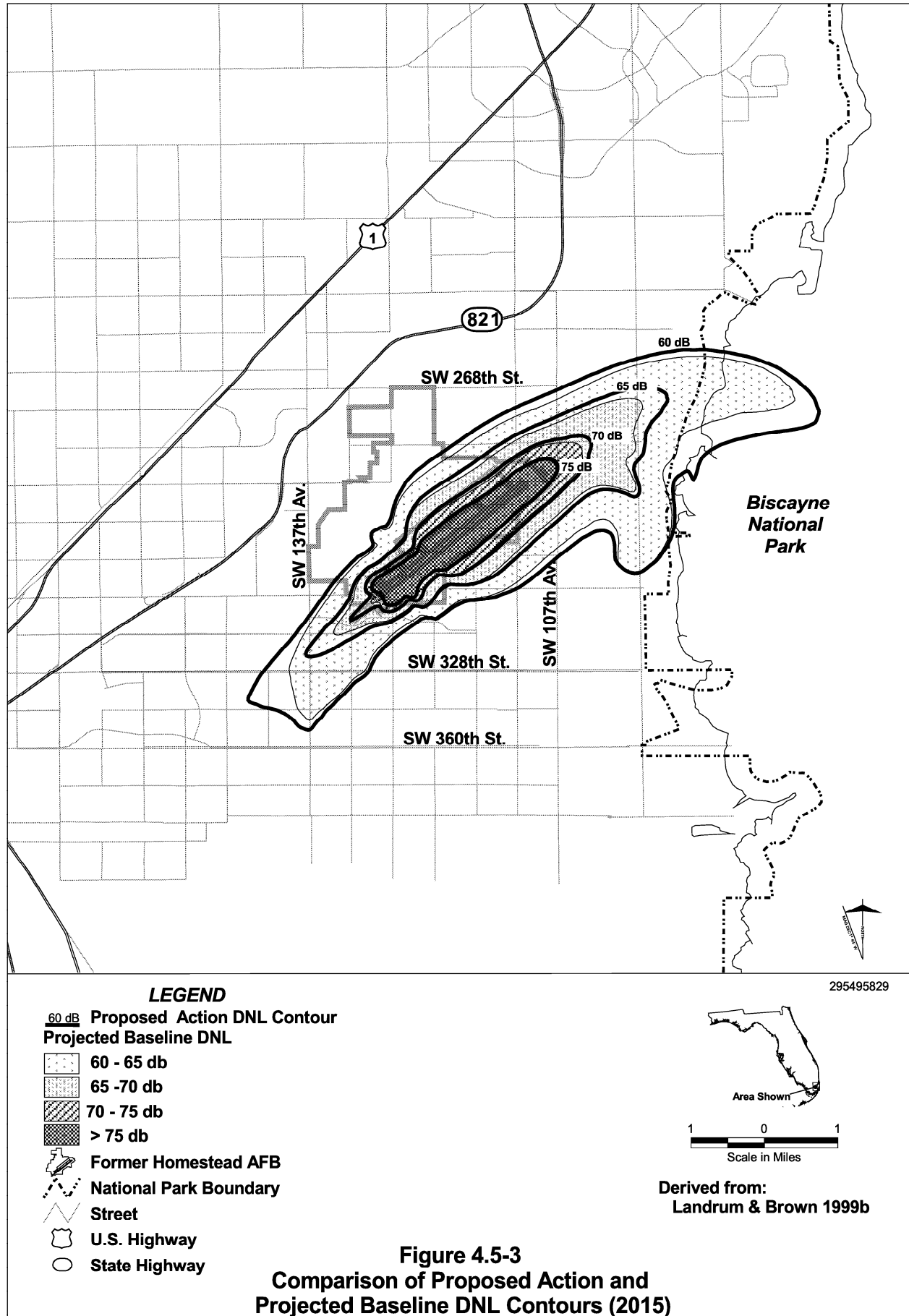
# NOISE



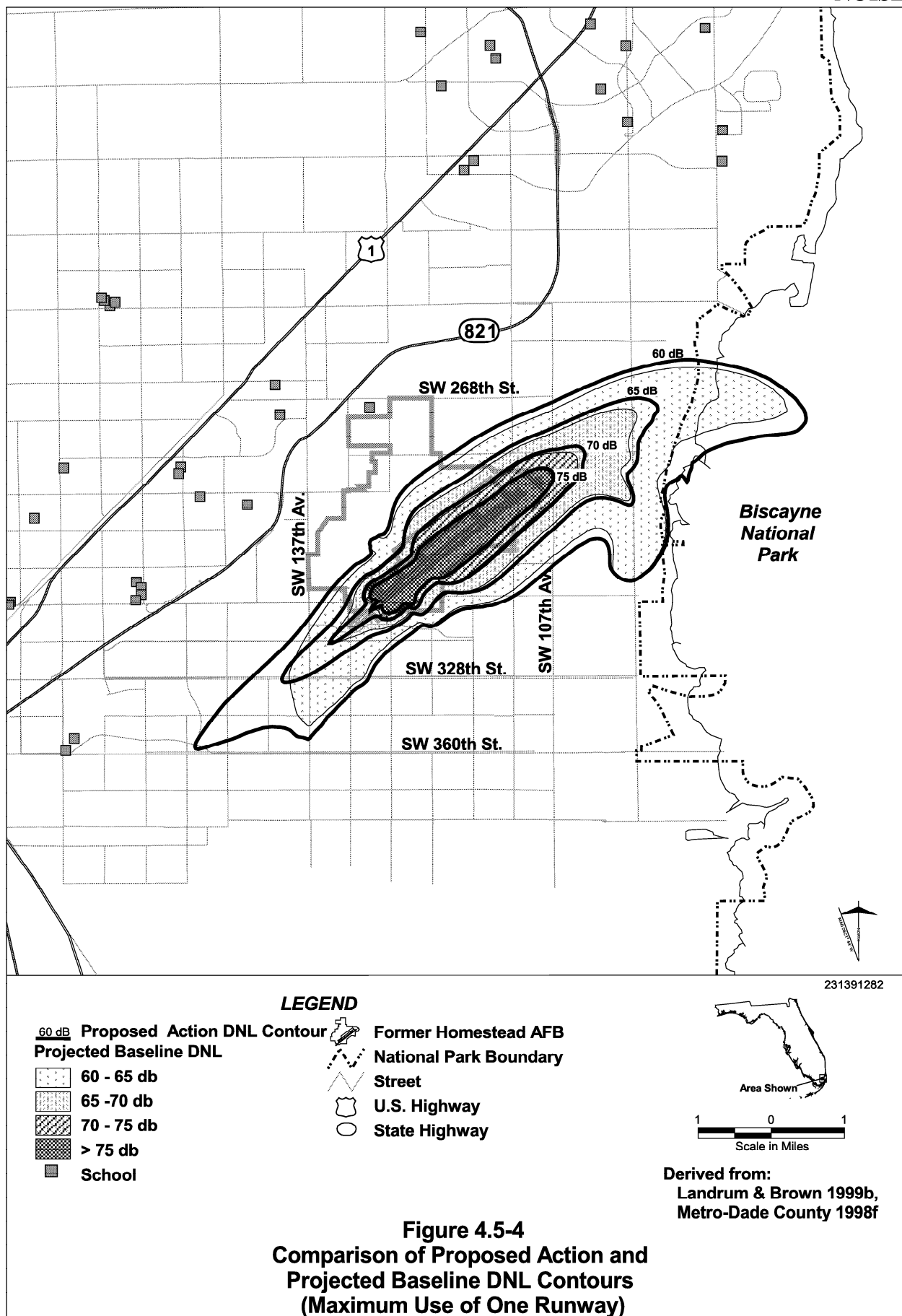


**Figure 4.5-2**  
**Comparison of Proposed Action and**  
**Projected Baseline DNL Contours (2005)**

# NOISE







**Table 4.5-3. Dwelling Units and Population Within DNL Contours—Proposed Action**

DNL Contour	Current Operations		Proposed Action							
			2000		2005		2015		Maximum Use	
	Units	Pop	Units	Pop	Units	Pop	Units	Pop	Units	Pop
<b>Existing Residents</b>										
60–65 dB	202	1,148	212	1,188	228	1,284	273	1,429	262	1,396
65–70 dB	95	656	98	680	99	680	97	642	124	652
70–75 dB	0	0	0	0	3	24	23	166	53	398
Above 75 dB	0	0	0	0	0	0	0	0	1	3
Total Above 60 dB	297	1,804	310	1,868	330	1,988	393	2,237	440	2,449
<b>Projected Growth<sup>1</sup></b>										
60–65 dB	NA	NA	234	1,243	283	1,382	432	1,812	NA	NA
65–70 dB	NA	NA	101	689	109	707	130	737	NA	NA
70–75 dB	NA	NA	0	0	3	24	25	171	NA	NA
Above 75 dB	NA	NA	0	0	0	0	0	0	NA	NA
Total Above 60 dB	NA	NA	335	1,932	395	2,113	587	2,720	NA	NA

Source: **Landrum & Brown 1999b.**Note: <sup>1</sup> Assumes growth in vicinity of HST is not controlled.

NA Not available

Schools are not expected to be adversely affected by the Proposed Action. According to the land use compatibility guidelines, schools are compatible with aircraft noise levels below DNL 65 dB. As shown in Figure 4.5-4, there are no schools within or even close to the DNL 60 dB contour at maximum use of one runway.

By 2015, the potential growth of the airport to include over 51,000 commercial passenger operations and more than 21,000 cargo operations, as well as estimated activity in the maintenance, general aviation, and government operations, would result in an increase in the noise contours. Sometime beyond the year 2015, the airport could reach its one-runway capacity. The forecasts for that condition project that the dominant component of the fleet mix would be passenger aircraft, with passenger jets providing the principal service. In addition, the fleet mix is forecast to include turboprop passenger flights, general aviation activity, continued government operations, and increased levels of cargo activity by jet aircraft. The FAA's expectation is that the future fleet will be comprised of aircraft that are quieter than aircraft currently in service, resulting in reduced individual aircraft source noise, which would counterbalance increases in numbers of aircraft. The extent of potential counterbalance cannot currently be quantified because the noise characteristics of future aircraft types are not known.

The projected increase in noise levels to the southwest of the airport is largely attributable to aircraft landings. Since the airport operates in east flow the majority of time, most landings would occur from the southwest. In those areas where landings would be the dominant operation, the noise exposure would be concentrated because the rate of descent for civil aircraft is relatively constant and the course would generally be straight. In contrast, noise from departures, although individually louder than landings, would be dispersed over a broader area by variable climb rates and turning flight tracks.

Table 4.5-4. Land Use Compatibility Guidelines—FAR Part 150

Land Use	DNL in dB					
	Below 65	65-70	70-75	75-80	80-85	Over 85
<b>Residential</b>						
Residential, other than mobile homes and transient lodgings	Y	N <sup>1</sup>	N <sup>1</sup>	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N <sup>1</sup>	N <sup>1</sup>	N <sup>1</sup>	N	N
<b>Public Use</b>						
Schools, hospitals, nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Governmental services	Y	Y	25	30	N	N
Transportation	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N <sup>4</sup>
Parking	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
<b>Commercial Use</b>						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail—building materials, hardware, and farm equipment	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
Retail trade, general	Y	Y	25	30	N	N
Utilities	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
Communication	Y	Y	25	30	N	N
<b>Manufacturing and Production</b>						
Manufacturing, general	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y <sup>6</sup>	Y <sup>7</sup>	Y <sup>8</sup>	Y <sup>8</sup>	Y <sup>8</sup>
Livestock farming and breeding	Y	Y <sup>6</sup>	Y <sup>7</sup>	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
<b>Recreational</b>						
Outdoor sports arenas and spectator sports	Y	Y	Y <sup>5</sup>	N <sup>5</sup>	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

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

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

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

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

<sup>5</sup> Land use compatible provided special sound reinforcement systems are installed.

<sup>6</sup> Residential buildings require a NLR of 25 dB.

<sup>7</sup> Residential buildings require a NLR of 30 dB.

<sup>8</sup> Residential buildings not permitted.

Y (Yes) Land use and related structures compatible without restrictions.

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

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

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

## NOISE

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Nevertheless, the current condition, projected baseline, and Proposed Action DNL contours are similar. This is because military aircraft contribute so much noise energy to the exposure in the airport environs that they would dominate the Proposed Action conditions, despite the fact that the number of operations is forecast to increase over tenfold by maximum use.

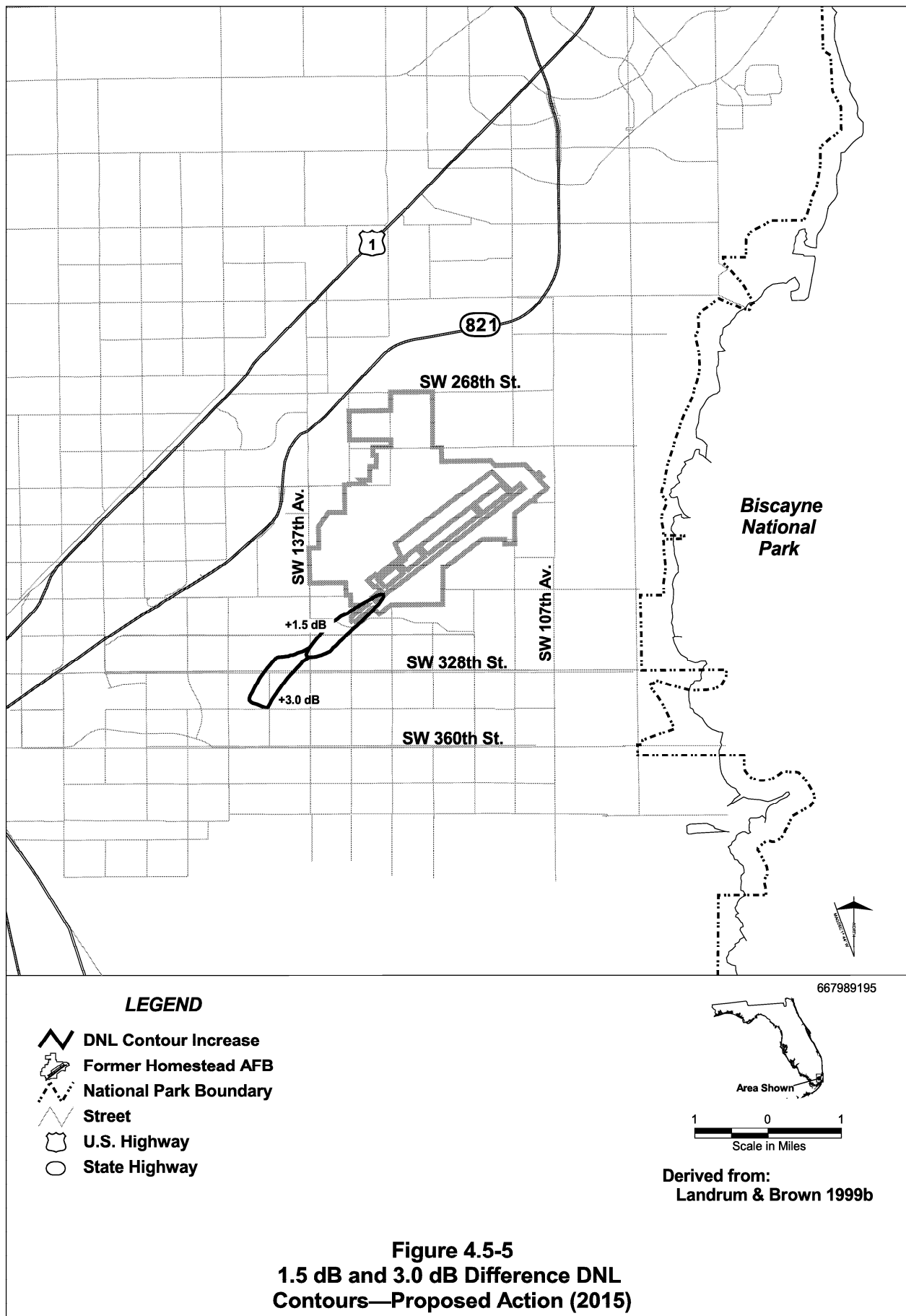
FAA Order 5050.4A defines a significant noise increase as an increase of DNL 1.5 dB or more over noise sensitive land uses within the DNL 65 dB and higher contours. In addition, a Federal Interagency Committee on Noise has recommended that airport noise analyses performed under the National Environmental Policy Act also include increases of DNL 3 dB or more over noise sensitive land uses located in moderate levels of noise exposure between DNL 60 and 65 dB.

To identify areas meeting those criteria, the contours modeled for the Proposed Action for each analysis year were compared to the projected baseline contours. Areas where DNL differences of 1.5 dB and higher were found within the DNL 65 dB contour and where differences of DNL 3.0 dB and higher were identified between DNL 60 and 65 dB contour were mapped and overlain on maps of estimated population density and dwelling units. **Figure 4.5-5** presents a forecast of those areas in 2015 under the Proposed Action. The projected areas of increase are located to the southwest of the airport, along the approach to Runway 5. In 2015, 68 existing dwelling units housing an estimated 513 persons are projected to be located within the area experiencing 1.5 dB increase within the 65 dB contour, while the area experiencing 3.0 dB increase is estimated to have 127 persons in 43 dwellings. **Figure 4.5-6** shows the DNL difference contours for maximum use of a one-runway airport. An estimated 219 existing dwellings and 967 residents are projected to be within the area of 1.5 dB increase, and 74 dwellings with 219 residents are projected to be in the area of 3.0 dB increase. If residential development is not controlled in the high-noise areas, the number of people and dwelling units could increase under maximum use.

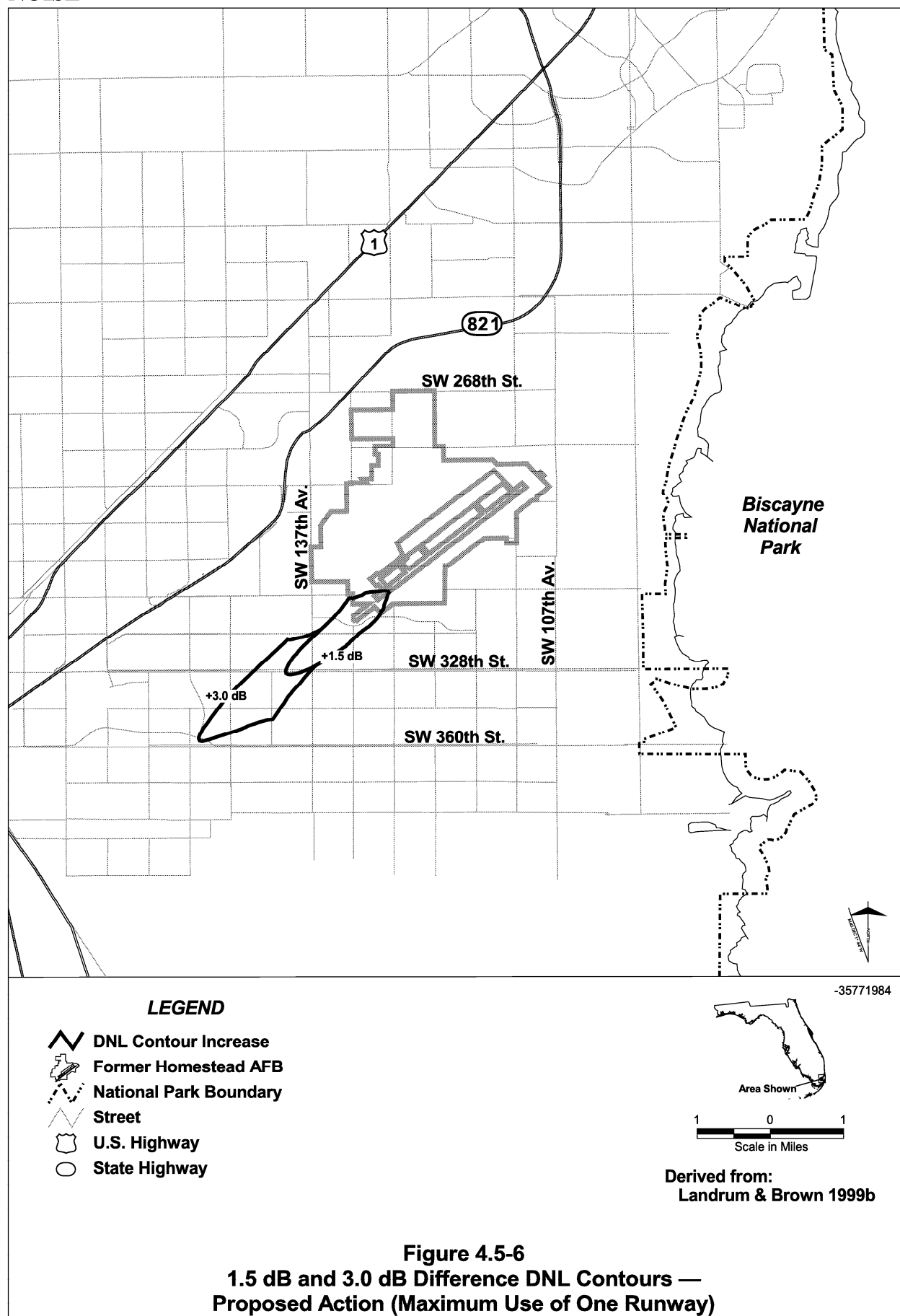
**SEL Contours.** SEL patterns were developed for a combined single departure and single arrival by one military and five civil aircraft along the flight track forecast to be most commonly used by those aircraft to and from HST. SEL patterns for the F-16 military aircraft are shown in Figure 3.5-6. **Figures 4.5-7 through 4.5-11** display SEL patterns of 85 dB and above for the Boeing 727-200 with retrofit engines, Boeing 737-500, Boeing 757-200, McDonnell Douglas MD-82, and Canadair Challenger 601. In each case, the contours widen on takeoff as the aircraft lifts off and begins to climb. These aircraft are the principal user groups expected to contribute to the noise levels at HST if it is used as a civilian airport.

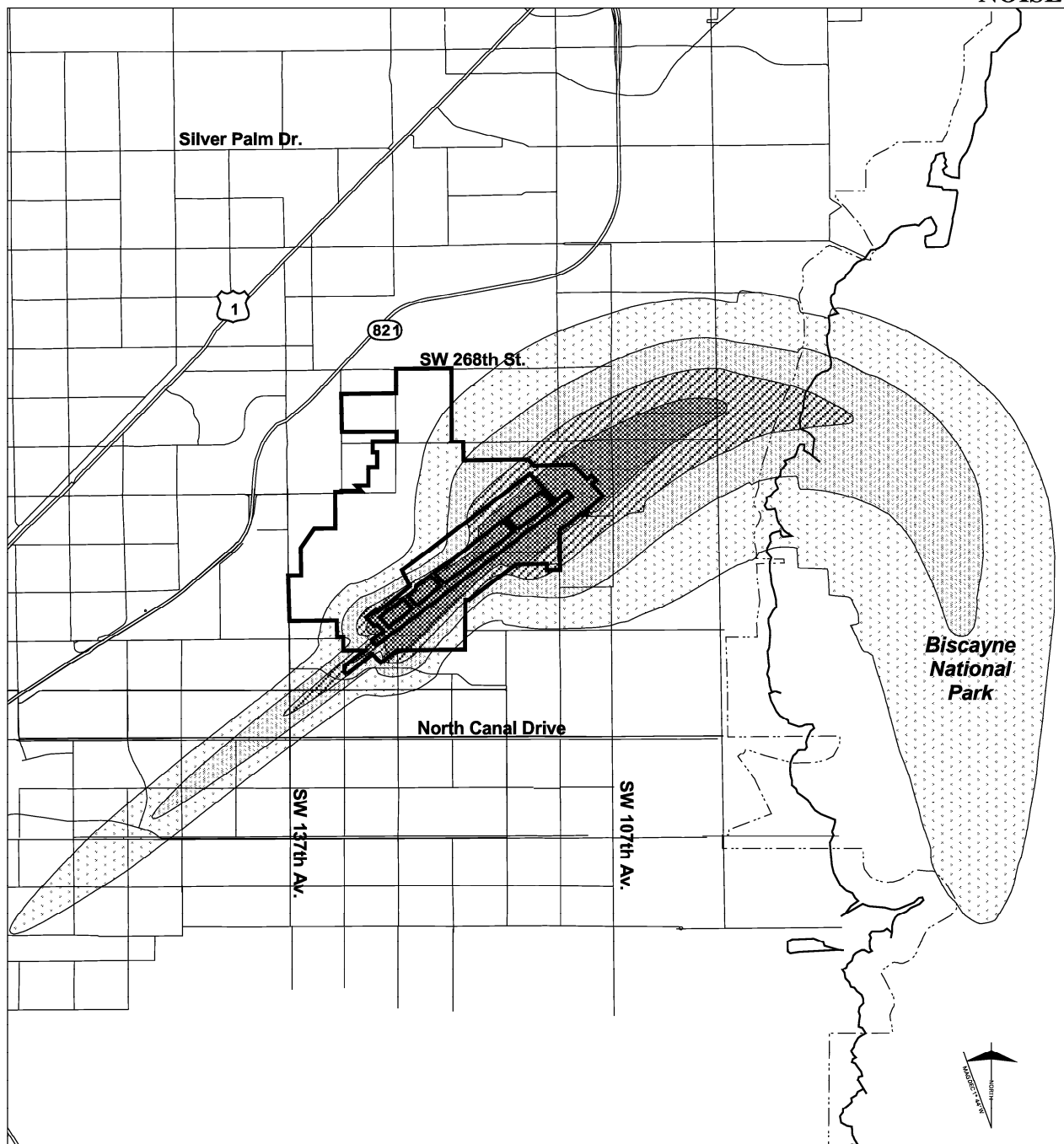
Each SEL footprint represents a specific aircraft operation. The SEL footprints look different because of different aircraft noise characteristics. SEL footprints also look different from DNL contours. The DNL evaluates the total noise energy associated with every operation by every type of aircraft using an airport over the period of a year and then averages it to a single day. DNL contours will usually be smaller than the SEL footprints of louder aircraft and larger than the SEL footprints of the quieter aircraft using an airport.

Figure 4.5-7 shows the SEL footprint for a Boeing 727 aircraft equipped with an engine hush kit to meet Federal Aviation Regulations Part 36 Stage 3 noise standards. The forecasts indicate that this aircraft is not expected to remain in the fleet mix in 2015. The shape of this contour turns right to follow the proposed southward departure climb out, the path anticipated to have the most operations by this aircraft type. To the southwest, the 727 footprint extends about 4 miles from the airport, with the higher level contours appearing as the aircraft descends and slows to its landing.



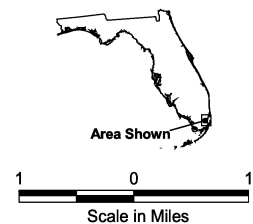
# NOISE





**LEGEND**

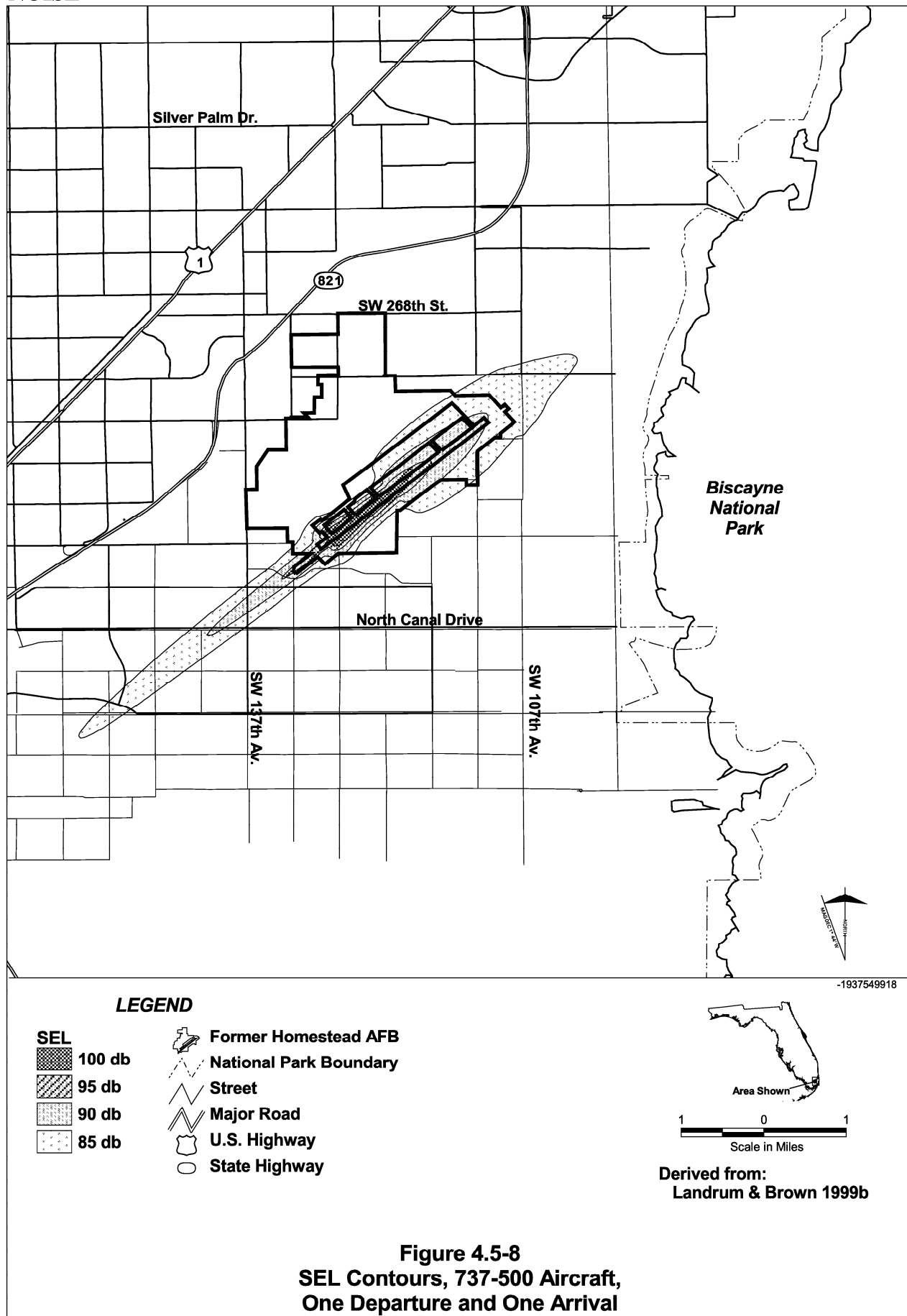
<b>SEL</b>	Former Homestead AFB
100 db	National Park Boundary
95 db	Street
90 db	Major Road
85 db	U.S. Highway
	State Highway



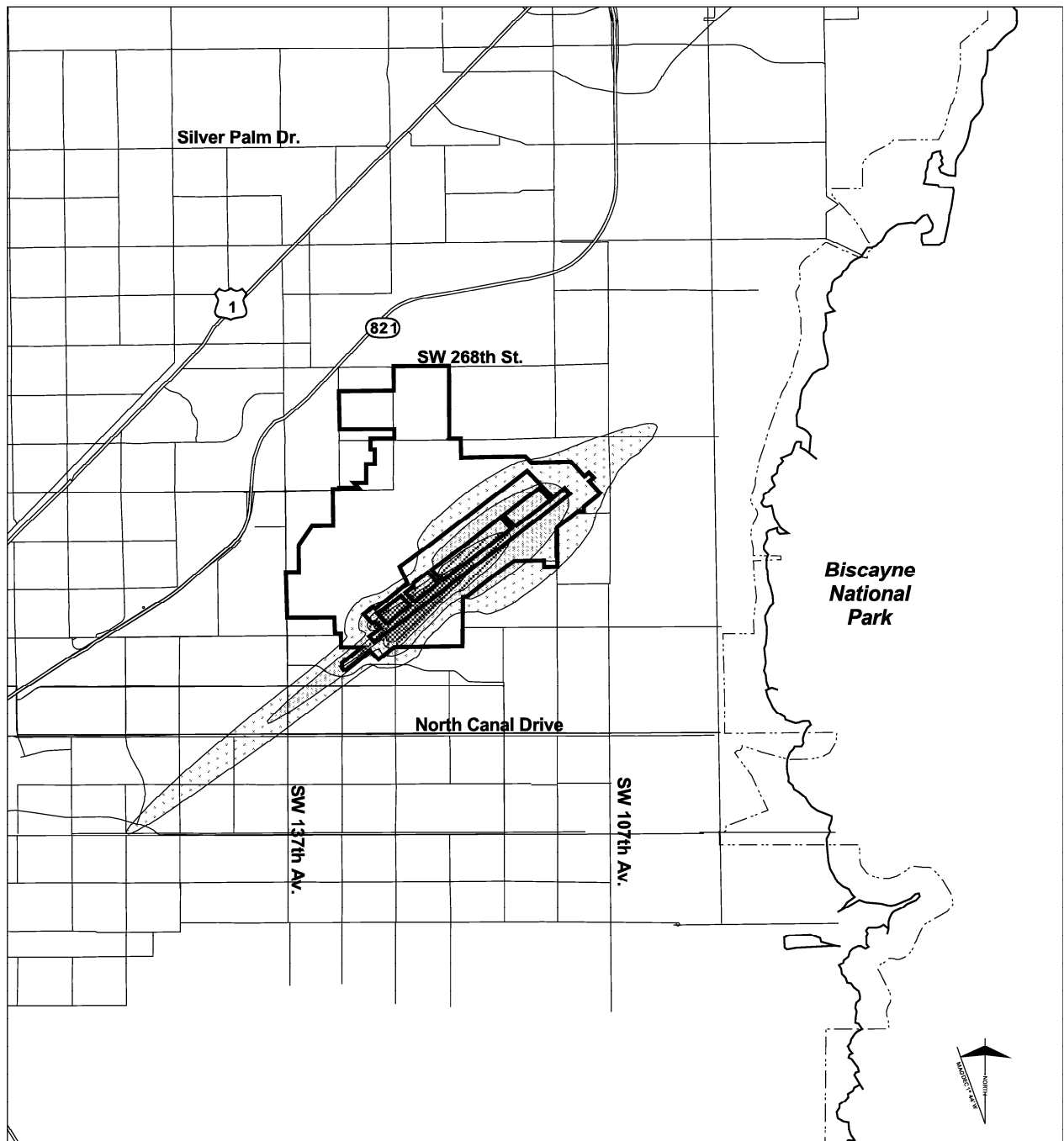
Derived from:  
Landrum & Brown 1999b

**Figure 4.5-7**  
**SEL Contours, 727-200 Hush**  
**Kit Aircraft (727EM2),**  
**One Departure and One Arrival**

# NOISE



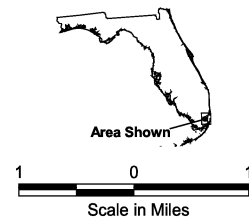




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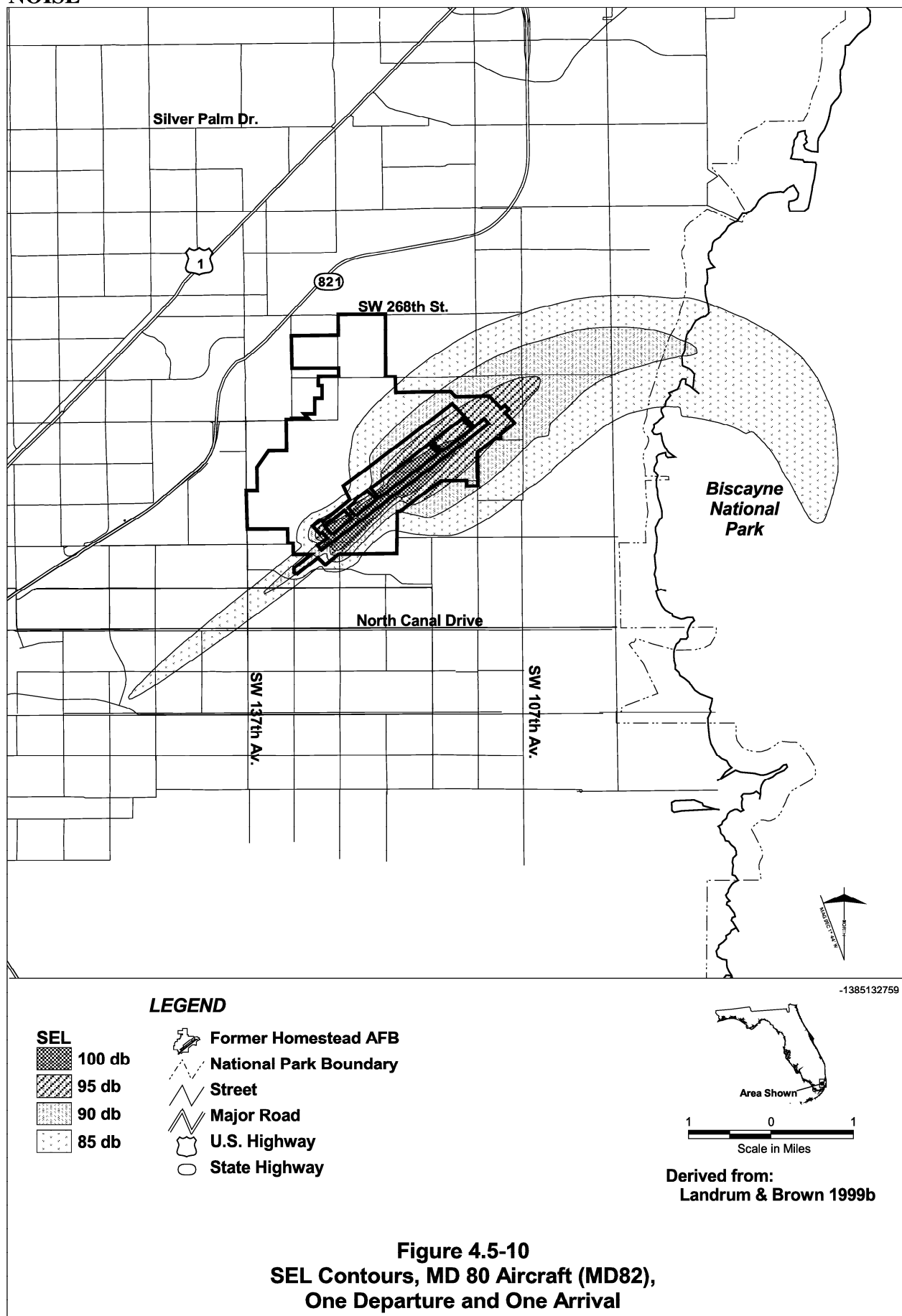
- |            |                        |
|------------|------------------------|
| <b>SEL</b> | Former Homestead AFB   |
| 100 db     | National Park Boundary |
| 95 db      | Street                 |
| 90 db      | Major Road             |
| 85 db      | U.S. Highway           |
|            | State Highway          |

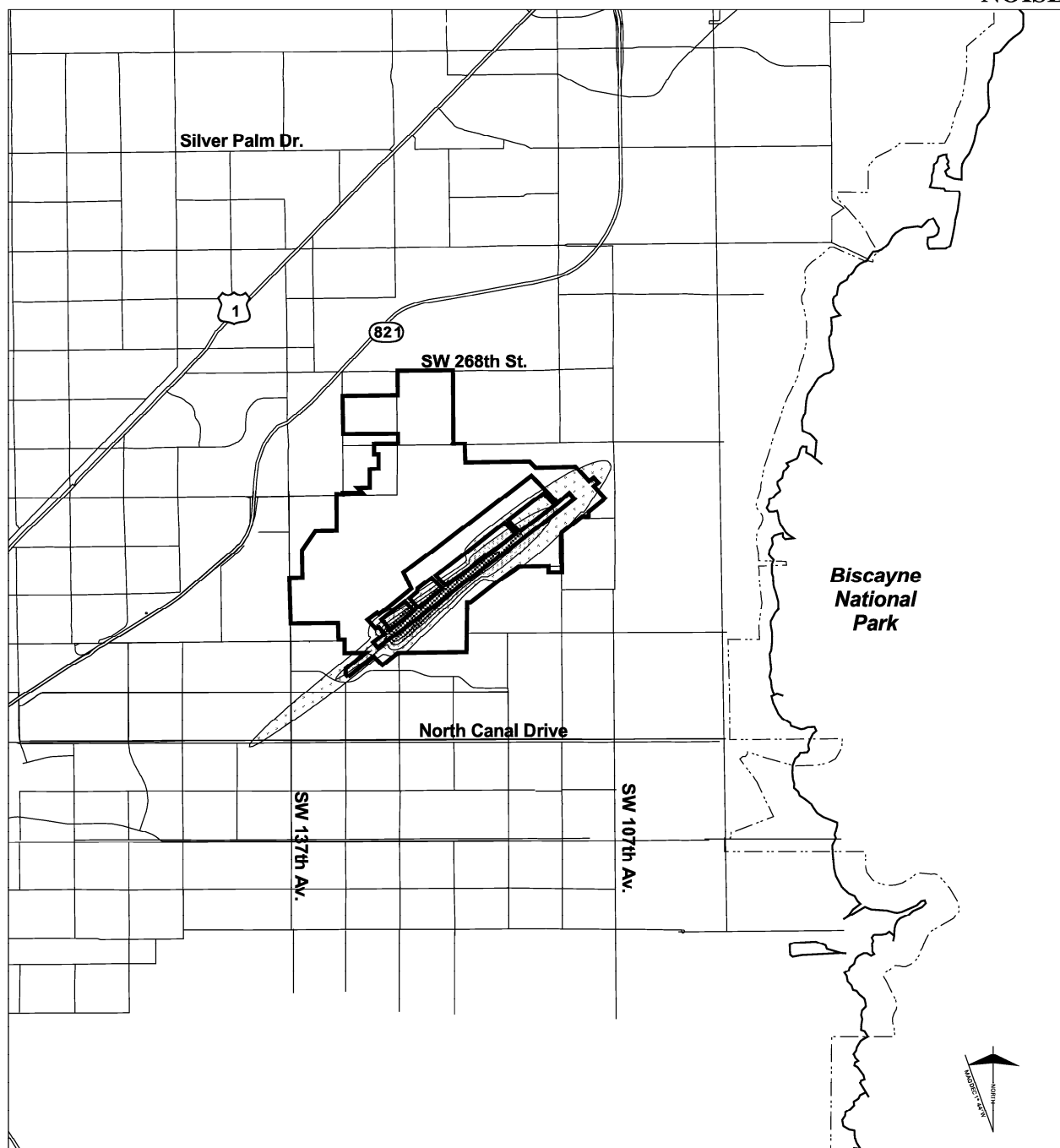


Derived from:  
Landrum & Brown 1999b

**Figure 4.5-9**  
**SEL Contours, 757-200 Aircraft (757RR),**  
**One Departure and One Arrival**

# NOISE

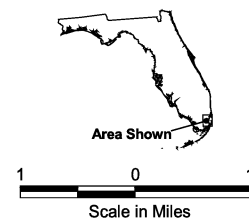




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**LEGEND**

- |            |                        |
|------------|------------------------|
| <b>SEL</b> | Former Homestead AFB   |
| 100 db     | National Park Boundary |
| 95 db      | Street                 |
| 90 db      | Major Road             |
| 85 db      | U.S. Highway           |
|            | State Highway          |



Derived from:  
Landrum & Brown 1999b

**Figure 4.5-11**  
**SEL Contours, CL601 Aircraft,**  
**One Departure and One Arrival**

## NOISE

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Figure 4.5-8 shows the footprint associated with an operational cycle of the Boeing 737-500 commercial jet. This aircraft is expected to be representative of the typical large jet passenger aircraft of future years. The noise footprint indicates that the departure pattern to the northeast quickly fades to levels below SEL 85 dB shortly after passing beyond the airport boundary. Noise at the higher levels would not extend beyond the airport boundaries on takeoff. During the approach from the southwest, the 85 dB contour extends about 3.5 miles from the airport along the extended centerline; noise at the highest level (100 dB) would not extend outside the airport. This aircraft is forecast to be in use at HST by 2005.

Figure 4.5-9 presents the footprint for a landing and takeoff by a Boeing 757 commercial jet. The footprint is very similar to that of the B-737-500, although the aircraft is considerably heavier than the 737. The departure portion of the footprint extends beyond the airport boundary at the 85 dB level, but higher noise levels would remain on airport property. Under the approach from the southwest, the tail of 85 dB extends approximately 3 miles from the airport. Use of this aircraft is forecast for after 2005.

Figure 4.5-10 shows the noise footprint for an arrival and takeoff by a McDonnell Douglas MD-82 passenger or cargo jet. The size of the pattern falls between that of the B-727 and the B-737-500, with the lowest indicated noise level terminating over Biscayne Bay. The SEL 90 dB contour is projected to end at the shoreline, while the 95 dB contour is projected to extend beyond the airport boundary to the northeast. This aircraft also has an arrival tail extending to the southwest along the centerline of the approach to a point about 3 miles from landing. The aircraft is projected to enter service at the airport after 2000 and be removed from the passenger fleet by 2015 and from the entire fleet by full buildout.

Figure 4.5-11 shows the footprint of a typical 50 passenger regional jet, represented by the Challenger 601 aircraft. This aircraft is projected to enter local service after 2005 and remain there through full buildout. The 85 dB footprint of the CL-601 barely extends beyond the airport to the northeast and reaches about 1 mile from the airport under the approach from the southwest.

**Community Grid Point Analysis.** DNL contours are based on joining points of equal noise exposure and constitute the primary analysis near airports for community noise impacts. In addition, a number of locations in the vicinity of HST were analyzed for a range of noise metrics as representative examples of noise exposure levels in the community. **Table 4.5-5** lists modeled DNL, LAmax, and Time Above at 12 sample community locations under the Proposed Action at maximum use of a one-runway airport, compared to future baseline/No Action levels. These locations are shown on Figure 3.5-8. A discussion of the noise effects at each community location as measured by the different metrics is provided in Chapter IV of Appendix E.

### Cumulative Impacts

The cumulative impact analysis considered the growth in airport activity in the ROI at airports other than HST. For the noise levels that are included in the community noise analysis, aircraft arrivals and departures at HST dominate the noise. No additional cumulative noise effects are attributable to growth in regional aviation activity serving other airports.

Accelerated population growth in the area surrounding HST could result in more future residents being exposed to noise levels over DNL 60 dB, if land use controls are not imposed by Miami-Dade County to prevent encroachment of incompatible land uses near the airport. Based on the county's high growth forecasts, an additional 64 residents could be affected by 2005 and 492 by 2015.

**Table 4.5-5. Sample Community Noise Levels—Proposed Action at Maximum Use of a One-Runway Airport**

Location	Map Designation <sup>1</sup>	DNL (dB)		LAmax (dB)		Time Above <sup>2</sup> (minutes)	
		Proposed Action	Projected Baseline/No Action	Proposed Action	Projected Baseline/No Action	Proposed Action	Projected Baseline/No Action
Miami-Dade County Community College—Homestead Campus	HCC	42	39	71	71	1	1
Keys Gate Community	KGX	51	43	97	97	5	2
South Dade Center	MH1	71	69	107	107	217	186
Naranja	NJA	48	45	81	78	6	5
Homeless Trust Center	HTA	56	54	83	83	19	16
Homestead High School	HSB	48	43	80	80	2	2
Nursing Home	NHA	48	44	83	83	3	2
Florida City City Hall	FCH	43	39	72	72	1	1
Redland	RFP	40	37	74	74	<1	<1
Ocean Reef Community	ORX	39	35	77	77	<1	<1
Angler's Club	ACX	40	35	77	77	<1	<1
Key Largo	CKL	31	23	69	69	0	0

Source: Landrum & Brown 1999b.

Notes: <sup>1</sup> See Figure 3.5-8.

<sup>2</sup> Time above DNL 65 dB.

<1 Less than 1

### Mitigation Measures

The community location that would be affected by significant and moderate increases in noise as commercial aircraft operations grew at HST would be the South Dade Center located at the southwest end of the runway. Two mitigation options may be considered for this residential area, assuming that future forecast levels of operations are achieved and result in projected noise increases. The two options are (1) acquisition of the residential area and relocation of the residents, or (2) sound attenuation to reduce interior noise levels. In addition, to preclude future land use development from creating additional noncompatible land uses within the noise contours, Miami-Dade County should adopt land use controls prohibiting new residential development in areas projected to be exposed to DNL levels of 65 dB and higher.

Noise contours were computed for each noise abatement flight path described in Section 2.11.2 (see Figures 2.11-1, 2.11-2, and 2.11-3). In each case, the resulting noise contours are virtually identical to the unmitigated Proposed Action contours for the same forecast year. The potential modifications to the flight paths would take place well beyond the area affected by DNL 60 dB and above. There are very minor differences in the area within the DNL 65 dB contour in 2015 and at maximum use which could result in small differences in the population affected. An additional three to nine dwelling units could be within the DNL 65 dB contour with some of the noise abatement flight paths. No differences were

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indicated in areas exposed to DNL increases of 1.5 dB within the 65 dB contour or 3 dB within the 60 dB contour.

None of the community sites selected for grid point analysis are projected to experience any change in Time Above (DNL 65 dB) or LA<sub>max</sub> levels with any of the flight track alternatives, compared to the proposed flight tracks. Several community locations that are outside the DNL 60 dB contour are projected to increase by DNL 1 dB if flight track alternatives are implemented. In each of those instances, the DNL levels for the Proposed Action and flight track alternatives would be less than 65 dB.

Thrust management during aircraft departures and approaches has been used at some airports in the United States as a means of reducing noise exposure of nearby communities. Part 91-53A of the Federal Aviation Regulations sets forth suggested noise abatement departure procedures that may be adopted by various air carriers for the reduction of takeoff noise levels in the close proximity of airports. The takeoff procedures are designated as “close-in” or “distant” noise abatement departure procedures (NADP) based on implementation distance from the runway.

The typical close-in NADP would benefit areas about 3–5 miles from the runway, while a typical distant NADP would benefit areas about 5–9 miles from the runway. At Homestead, the close-in NADP might reduce noise levels over areas northeast of the airport to about the western boundary of Biscayne National Park. To the southwest, single event departure noise levels might be reduced by several decibels over the residential housing immediately southwest of the airport boundary. The distant NADP might result in slightly reduced single event noise levels (normally by less than 3 dBA) over the western portion of Biscayne National Park. To the southwest, the procedure might result in reduced single event noise levels over residential property in Florida City, west of 147<sup>th</sup> Avenue and south of 320<sup>th</sup> Street.

The benefits of any NADP is specifically related to particular aircraft as operated by specific air carriers and cannot be quantified with more clarity than the above estimates at this time. It should be noted that the aircraft that would produce the greatest benefit by using NADPs are projected to be removed from the fleet by 2015, when the number of operations by large civil jet aircraft is forecast to reach substantial levels. Moreover, the F-16 aircraft so dominate the DNL noise contours that little resultant reduction in DNL would be anticipated in any timeframe from the use of NADPs.

In addition to departure procedures, noise levels on approach may be reduced in several ways: through reduction of level segments in the approach profile, by remaining higher longer, and by limiting the amount of reverse thrust used in landing.

More thrust is required to maintain level flight in a step-down profile than is used during a constant descent approach. Emerging technologies such as global positioning satellite navigation, on-board flight management systems (FMS), and Vertical Navigational Performance (VNP) procedures will enable constant descent rate from one flight coordinate to another. Another possibility for reducing arrival noise involves keeping aircraft higher longer, resulting in somewhat steeper descent downstream. For new arrival profiles, however, it is unlikely that new HST procedures could be threaded through the approach and departure corridors over south Florida without affecting the procedures leading to and from the other airports. Consequently, any change in the altitudes and routes associated with the HST traffic would require systemwide consideration of possible effects on operations in the region.

The application of reverse thrust during landing is a measure often cited as a potential noise reduction tool by those unfamiliar with the operating requirements of large aircraft. The use of reverse thrust results in a considerably safer operation and is generally required by the rules set forth by the using carriers. At HST, the only area that would receive any substantive benefit from the limitation of reverse

thrust is the residential area located immediately southwest of the runway. The area would not experience a reduction in DNL, but would receive a reduction of single event levels by several decibels (as much as 10 dBA) during the landing roll.

Advanced navigational procedures using new technology, such as GPS, FMS, and area navigation systems (RNAV), are expected to provide additional opportunities for avoiding or minimizing noise impacts over sensitive areas. Such procedures will allow tighter and less dispersed departure streams, narrower flight corridors, and greater precision on flight paths and on approach into the airport. In 1999, approximately 60 percent of the commercial fleet was equipped with the appropriate technology to allow precision flight within one-half mile of a prescribed course defined by advanced navigation systems. It is projected that this percentage will increase with time until beyond 2005, when virtually all large commercial aircraft will be capable of following such approach and departure courses.

The ability to prescribe specific FMS or GPS courses at Homestead is dependent upon the interrelationships between all approach and departure procedures in an airports environs. In south Florida, the timing for the development of complex FMS, GPS, or RNAV procedures will likely be guided by their utility at MIA or FLL. By the time such measures are useful for substantive noise abatement at HST (beyond 2005), they are likely to have been developed and introduced at other facilities. At the time any such measures are developed elsewhere, it is appropriate to evaluate their usefulness for noise abatement at HST.

As with all developing technology, unforeseen improvements in the handling of air traffic, or the invention of new communication, navigation and surveillance techniques may lead to future improvements in noise mitigation by placing aircraft in areas of lesser sensitivity. The FAA would consider the implementation of such measures as they are developed and proved useful.

The imposition of restrictions on air carrier aircraft operations has additionally been suggested as a possible means of mitigating noise at Homestead. A federal government imposed limitation on the number of air carrier operations to a forecast or artificial level at a public use airport is not authorized by federal law because such a limitation would have the direct or indirect effect of regulating the rates, routes or services of air carriers, contrary to the Airline Deregulation Act of 1978. The U.S. Congress deregulated the airline industry in the Airline Deregulation Act—terminating federal authority to regulate an air carrier's rates, routes, and services. Other than statutory provisions on very limited regulations related to slots and essential air service, there is no statutory provision for federally imposed aeronautical use restrictions at a civilian airport.

A local government in its role as airport proprietor, such as Dade County, has the authority to adopt reasonable, nondiscriminatory restrictions on aircraft operations that do not impose an undue burden on interstate commerce. Any such restrictions proposed by an airport proprietor must comply with the Airport Noise and Capacity Act of 1990 (ANCA). ANCA provides that a restriction on the operation of Stage 3 aircraft (which would be the air carrier and cargo aircraft in operation at Homestead) may become effective only if agreed to by the airport proprietor and all aircraft operators, or if not subject to such an agreement, if submitted to and approved by the FAA under specific statutory criteria. The statutory criteria require a detailed analysis to confirm that the restriction is reasonable, nonarbitrary, and nondiscriminatory; the restriction does not create an undue burden on interstate or foreign commerce; the restriction does not adversely affect airspace, safety, or efficiency; and there has been adequate opportunity for public comment.

It is a relatively common practice for airport proprietors to engage in noise evaluation as airports develop and create higher levels of noise. Most noise evaluations done by airport proprietors include consultation

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with other federal, state, and local agencies having land use jurisdiction in the area. In the case of Homestead, this would certainly include the National Park Service. The SEIS could include a commitment for Dade County, in consultation with the FAA, NPS, and other appropriate parties, to periodically review the noise impact of Homestead and to develop, maintain, and implement a noise mitigation program to minimize noise to the extent possible for the community and the national parks and refuges. Periodic reviews at reasonably-spaced timeframes can review the extent of growth in aircraft operations and noise, advances in aircraft noise reduction, advantageous technological advances in aircraft and air traffic operation, and changes in community development patterns and in national park and refuge plans and operation that are relevant to noise from Homestead. Such reviews can also provide the basis for determining whether airport noise restrictions are needed to reasonably abate noise. Technological advances that are beneficial to noise, including aircraft source noise reduction, are expected by the FAA to advance at a more rapid pace than HST would grow as a commercial airport. The prospects are excellent for technological advances to reduce aircraft noise to a greater extent than can currently be analyzed.

### **Possible Future Expansion**

If a commercial service airport at HST successfully captured air transportation markets and achieved forecast levels of operations, at some point the airport could reach the operating capacity of the single runway, which approximates 231,000 annual operations. If and when growth approached that level, Miami-Dade County could propose to build a second runway to better accommodate the traffic demand and more efficiently handle operations. In fact, the Airport Layout Plan for HST developed by Miami-Dade County includes, for future facility planning purposes, a second runway 9,000 feet long and parallel to and 3,500 feet southeast of the present runway.

Given the capacity of the existing single runway at HST, there is no foreseeable need for a second runway for capacity reasons well beyond 2015. A new federal EIS would be required, in addition to environmental and development impact analyses required by the State of Florida. If the construction of a second runway were approved and operations began near the time the existing runway is forecast to reach 100 percent capacity, the time frame for second runway initial operation could be around 2038. Assuming the addition of a second runway, the time frame in which a two-runway system at HST might reach capacity is estimated to be 2057 or later.

The ability to analyze a runway so far into the future beyond a reasonably foreseeable time frame is highly speculative, particularly in an area of high technology like the aviation industry. Aircraft types, and the technological advancements that are certain to occur in the operation and control of aircraft, as well as in the airspace, are not currently defined for conditions so far into the future. A quantitative noise analysis using detailed noise modeling would be so highly speculative as to be unreliable. The following information provides a current best qualitative discussion of possible noise implications of a future second runway.

If a second runway were constructed, it would probably be initially used principally to reduce congestion on the existing runway. Airports are usually operated so that aircraft departures occur on the inboard runway closest to the terminal and aircraft arrivals occur on the outboard runway. With the terminal complex north of the existing runway at HST, this operational scheme would be expected, applying today's general operating mode. Military aircraft conducting overhead approaches and general aviation touch-and-go training would more likely be conducted on the new parallel runway to avoid aircraft using the existing runway, because the patterns associated with these activities would be south of the airport. Approach paths for itinerant operations on a new runway would likely extend straight in from positions at least 3 miles from touchdown.



If the airport and its level of operations continued to grow and if a new terminal area were developed between the runways, it is likely that the operational use pattern of the airport would shift. Airports with mid-field terminal complexes between runways typically operate with mixed operations on both runways. This means that both arrivals and departures by passenger aircraft would likely occur on each runway, with the runway selected being related to the side of the terminal on which the user has its gates. Activity by general aviation, maintenance, military and cargo operators (except local military and general aviation operations) would likely continue to use the existing runway since those ground-related facilities would be on the north side of the airfield. It may logically be assumed that if half of the passenger aircraft operators used gates on the south side of the mid-field terminal, they would use the south (new) runway. All other aircraft operators could be expected to use the existing runway for itinerant operations, but all local operations (touch-and-go training and overhead approaches) would probably be conducted on the south (new) runway to avoid conflicts with operations on the north runway.

Flight paths for approaches to the new runway would likely remain along the runway centerline for itinerant traffic, but a divergent departure course occasionally would be required when simultaneous takeoffs were conducted from both runways. It is likely that the divergent departure course would be along a heading or electronic course 15 degrees to the south of the extended centerline of the new runway. This divergence meets current FAA standards for traffic separation. It is required only when departures are made at the same time from both runways.

Given the speculative nature of the fleet mix, airport geometry and operations, and future airspace parameters, the noise effects associated with the potential future development of a second parallel runway at HST can only be qualitatively estimated in general terms. In the early years of a second runway, the primary assumptions are that the aircraft fleet mix and total numbers of aircraft would be about the same as for the maximum one-runway condition, and the existing runway would be predominantly used for aircraft departures (primarily in an east flow) while the second southerly runway would be predominantly used for aircraft arrivals (also primarily in an east flow).

Since departures toward the northeast would be expected to remain predominantly on the existing runway, the noise contours northeast of the airport that are governed by aircraft departures would be about the same as with the one-runway configuration for that time frame, as shown in Figure 4.5-4. Southwest of the airport, with few arrivals expected on the existing runway, the contours would more closely resemble the projected baseline on the southwest end of the existing runway. Long, thin arrival spikes in the noise contours associated with approaches on the second runway would be expected to extend to the southwest from that runway. The width of the noise contours near the airport would be slightly wider with a second runway than with one runway.

If the airport continued to grow, departures and arrivals were distributed relatively evenly on two runways, and a mid-field terminal were developed, the noise contours could be expected to widen along their full length by approximately 3,500 feet (the separation distance between the runways) along the southeastern edge of the airport parallel to the new runway. The length of the contours to the northeast might increase beyond the maximum use one-runway contours, owing to a higher service level, although this could be offset by anticipated reductions in noise of future aircraft types. Under the approaches to both runways, parallel spikes of arrival noise would likely be present to the southwest of the airport. Each arrival spike would be expected to be shorter, but broader than a single arrival spike because of the more equal distribution of arrival traffic on both runways.

The maximum operation of a two-runway system at its capacity could produce noise contours that would roughly duplicate over two runways the contours shown in Figure 4.5-4, although the level of operations for a two-runway configuration at its capacity is less than double the maximum use of one runway, so

duplicating the one-runway noise contour would be an overestimation. A higher proportion of commercial passenger and cargo aircraft and a lower number of smaller general aviation aircraft in the mix would serve to increase contour size and extend it outward northeast and southwest of the airport off the ends of both runways. However, reductions in aircraft source noise in the far future years could counterbalance increased numbers of aircraft by an unknown amount.

### **4.5.2.2      *National Parks and Refuges***

A total of over 35,000 noise values were calculated for a set of 539 individual points covering a 4,000 square mile area of south Florida coinciding with Biscayne and Everglades NPs, Crocodile Lake NWR, and Big Cypress National Preserve. The points are centered in grids that were developed to geographically cover the national parks and refuges. These grids are designated A, B, C, D, and E (see Figures 3.5-9, 3.5-10, 3.5-11, 3.5-12, and 3.5-7).

This section summarizes the projected noise effects in the national parks and refuges that may occur if the single runway at HST were intensively used to its full capacity for a commercial airport (i.e., maximum use) and if technology does not produce quieter aircraft than the current quietest models by that time. This is a conservative approach that projects the maximum potential aircraft noise effects that could occur. Projected noise effects for 2000, 2005, and 2015 are included in Appendix E.

Five noise metrics were used in the grid point analysis. Three of those metrics have been graphed to show noise comparisons using a single-event metric (LA<sub>max</sub>), a cumulative metric (Leq(h)), and a Time Above ambient metric (TA<sub>amb</sub>). Data from all five metrics are included in detailed tabular form in the Technical Memorandum (**Landrum & Brown 1999b**). As Figures 4.5-1 through 4.5-4 show, a portion of Biscayne NP along the shoreline and into the bay is currently within the DNL 60 dB contour. That contour would increase in size, beginning with a slight increase in 2005 and growing by a small amount in subsequent years. The change from baseline DNL levels would be less than 3 dB. None of the other parks or refuges would be affected by these levels. Figures 4.5-7, 4.5-10, and 4.5-11, as well as 3.5-6, show that some areas of Biscayne NP would be exposed to SEL levels above 85 dB, as they are currently. The SEL figures only show east flow operations and do not account for west flow operations that are estimated to occur about 6 percent of the time. When departures are to the west, the F-16 SEL 85 dB footprint extends into the eastern edge of Everglades NP under both current and future conditions. The civil aircraft SEL 85 dB footprints are not expected to extend into Everglades NP.

**LA<sub>max</sub>.** The LA<sub>max</sub> metric has been selected to provide an indication of the loudest instantaneous noise levels that are likely to be associated with the Proposed Action. LA<sub>max</sub> is not a cumulative metric and does not reflect the duration of a noise event or the number of events that occur over time. In fact, the majority of the highest LA<sub>max</sub> levels reported in this document are for aircraft events that occur less than once per day and, in some cases, less than once per week. This is because, from a fixed reference point on the ground, a maximum LA<sub>max</sub> value may occur only when a particular type of acoustically dominant aircraft happens to fly relatively close to the point.

LA<sub>max</sub> levels can be compared with ambient noise levels, but caution must be exercised because ambient levels are averages over a sampling period (usually 3 hours in this SEIS) and are actually Leq values combining sound events that are both quieter and louder than the resulting ambient level. Imbedded within the ambient levels, therefore, are values that are substantially higher than the estimated ambient value. The difference between the reported LA<sub>max</sub> value at a given point and its ambient value for that point will therefore be larger than if the LA<sub>max</sub> were compared to the highest value embedded in the ambient data.

**Figure 4.5-12** graphically depicts the changes in LA<sub>max</sub> at the grid point locations due to the Proposed Action at maximum use of one runway. The changes shown in the figure are concentrated beneath the proposed flight paths for HST. The largest effects of 10 dB or more are confined to points that are at considerable distance from the airport. This is due to the dominance of military aircraft in the areas closest to the airfield. Areas north and west of HST are dominated by aircraft noise from other airports in the ROI. **Figure 4.5-13** shows the resulting LA<sub>max</sub> levels and can be compared to current LA<sub>max</sub> levels in Figure 3.5-14.

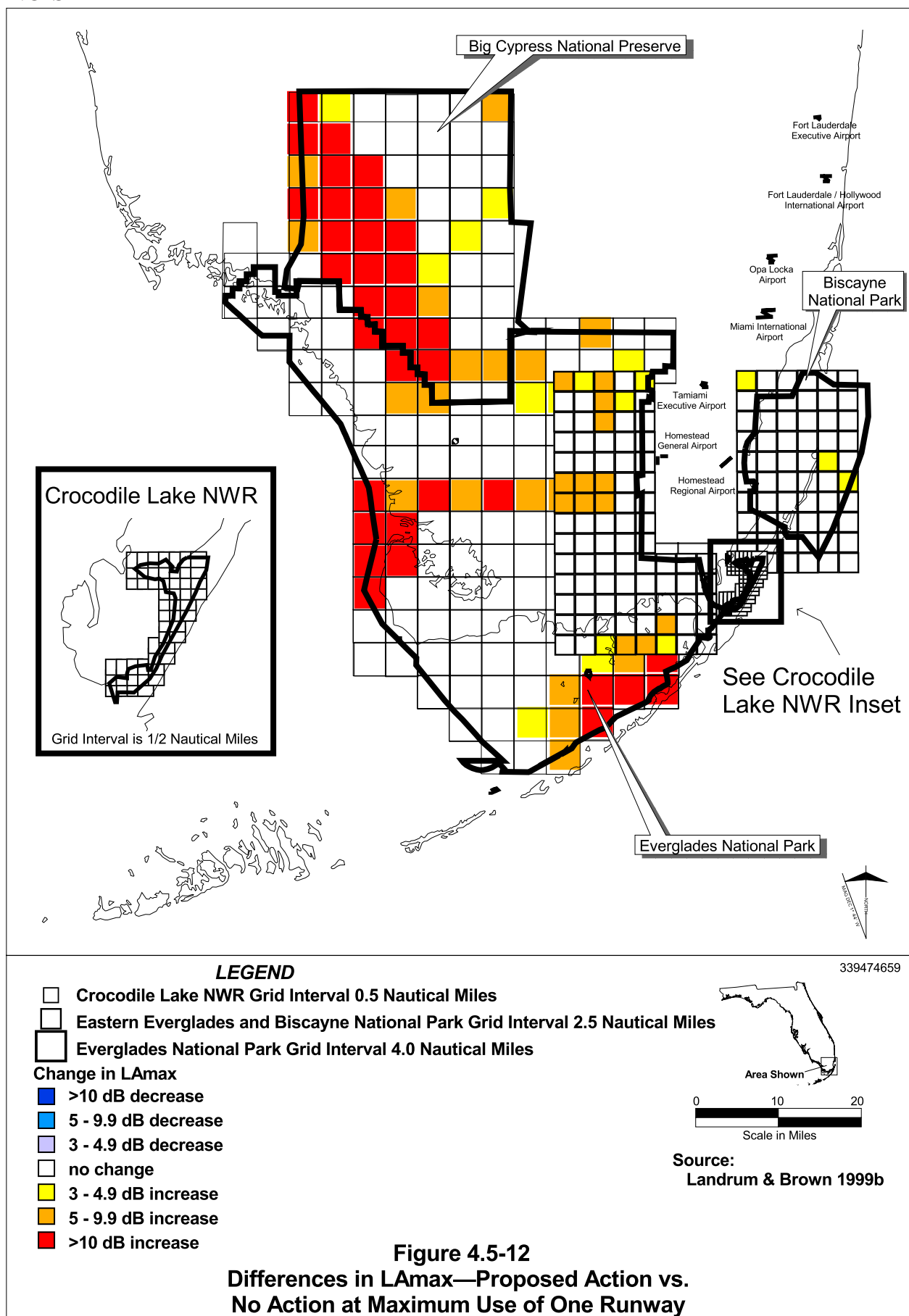
The Proposed Action at maximum use of the single runway would result in little difference in the maximum sound level (LA<sub>max</sub>) in the areas closest to HST that receive the loudest single-event noise. The LA<sub>max</sub> in Biscayne NP and Crocodile Lake NWR would continue to be dominated by military aircraft that are louder than civil aircraft. In areas that are more remote from HST, such as in western and southern Everglades NP and in Big Cypress National Preserve, the Proposed Action would result in LA<sub>max</sub> increases exceeding 10 dB in some areas. The LA<sub>max</sub> increases, on the whole, would occur in areas farther from the airport where civilian and military flight tracks would diverge—in Everglades NP under the FAMIN approach from the southwest and under the MNATE departures in the southeast, and in Big Cypress under the WORPP approach from the northwest (see Section 2.2 for a description of the air traffic fixes).

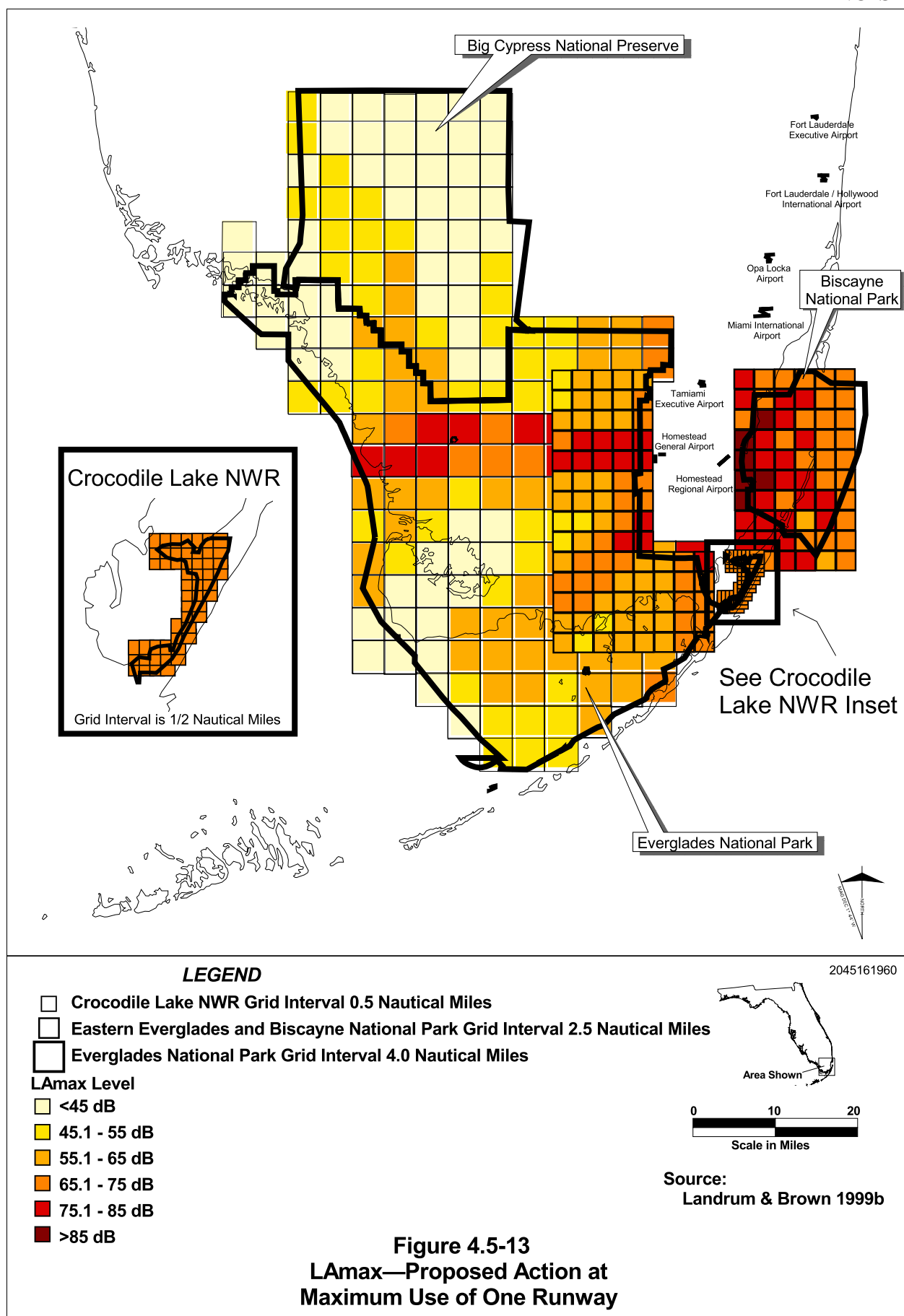
In the areas that would be expected to receive the most increase in LA<sub>max</sub>, the absolute LA<sub>max</sub> values would remain lower than in areas closer to the airport. The effects on the resulting LA<sub>max</sub> absolute values in the national parks and refuges can be generally understood by comparing the color-coded graphically mapped LA<sub>max</sub> absolute value ranges of the Proposed Action at maximum use (Figure 4.5-13) to the existing condition at Homestead ARS (Figure 3.5-14).

To provide a broad sample of the comparison between the Proposed Action and other alternatives (Commercial Spaceport and Mixed Use/No Action, which is the same as the projected baseline), **Table 4.5-6** lists the LA<sub>max</sub> values for the 37 points at which ambient noise levels were measured (see Section 3.5.2.1).

**Leq(h).** The Leq(h) metric represents the average noise level over the one hour period having the most aircraft operations in any 24 hour period. It incorporates the noise level of each event, the duration of each event, and the number of events that occur over the specified one hour time period. Leq metrics in general are sometimes criticized because they appear to mask individual loud events in the averaging process. However, individual loud events are actually accentuated in the calculation. The Leq(h) metric provides an indication of the cumulative effects of multiple noise events with different amplitudes, which LA<sub>max</sub> and TA<sub>amb</sub> do not address. LA<sub>max</sub> addresses amplitude but not the duration or number of events, and TA<sub>amb</sub> indicates the duration of events above a specified threshold.

**Figure 4.5-14** illustrates the changes in Leq(h) under the Proposed Action at maximum use of one runway, and **Figure 4.5-15** shows the resulting Leq(h) levels. Figure 4.5-15 can be compared to current conditions in Figure 3.5-13. At a number of points, both the projected baseline Leq(h) and the Proposed Action Leq(h), as modeled with the INM, were below average traditional ambient levels. Very few areas in the national parks and refuges would experience as much as a 5 dB increase in peak Leq(h) above the traditional ambient level as a result of the Proposed Action at maximum use of the single runway. Leq(h) changes of less than 5 dB are *de minimus* and are mapped as no change because so few people noticeably react to such small changes in cumulative noise at low levels of aircraft noise exposure. Areas showing an increase of between 5 and 9.9 dB would be in eastern Everglades NP, as graphically depicted on Figure 4.5-14. The resulting absolute peak Leq(h) values in the areas of Leq(h) increase at maximum one-runway use, ranging from 35.1 to 45.0 dB, are considered to be low Leq values.





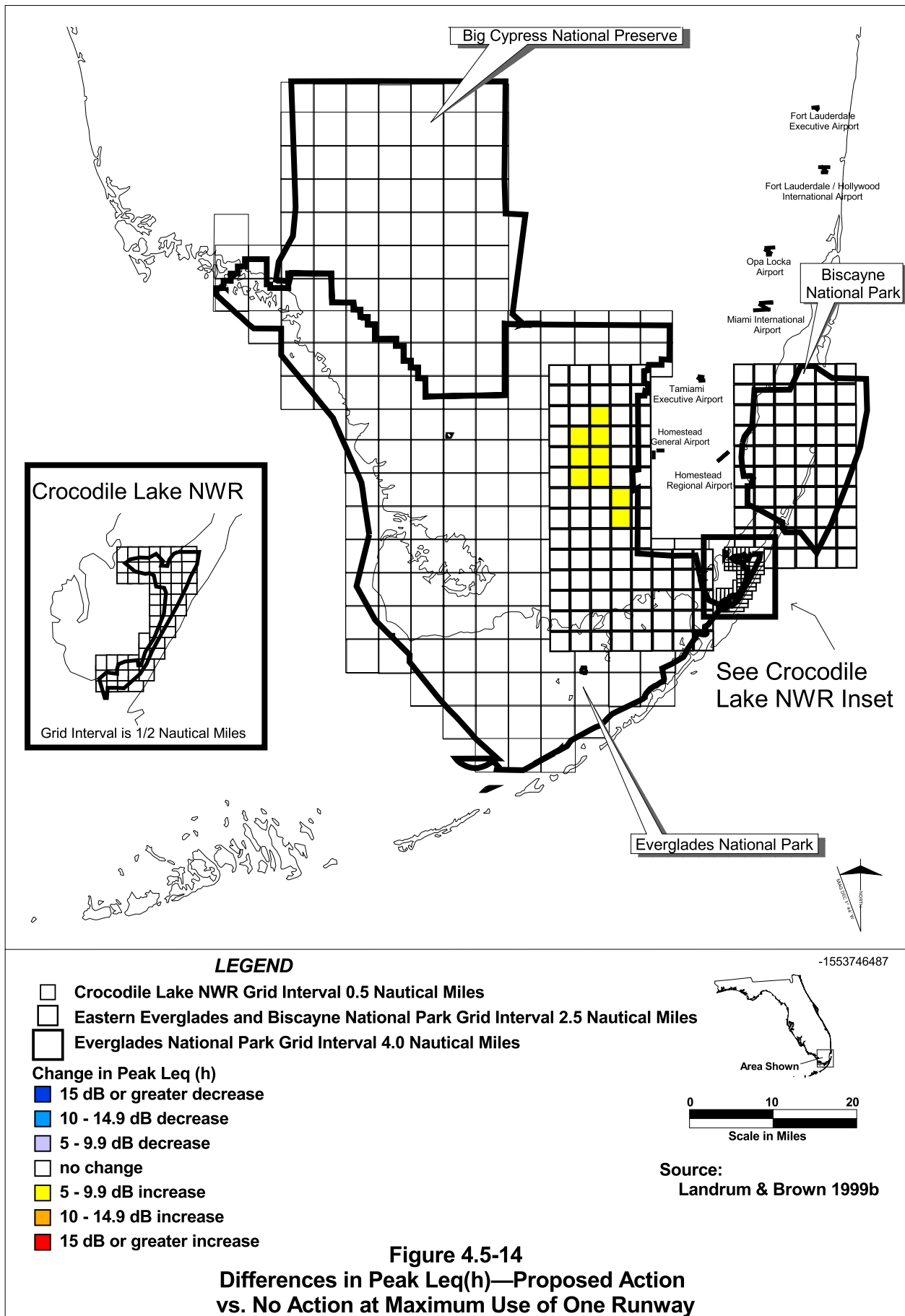
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**Table 4.5-6. Modeled L<sub>A</sub>max Levels (in dB) at Measurement Points**

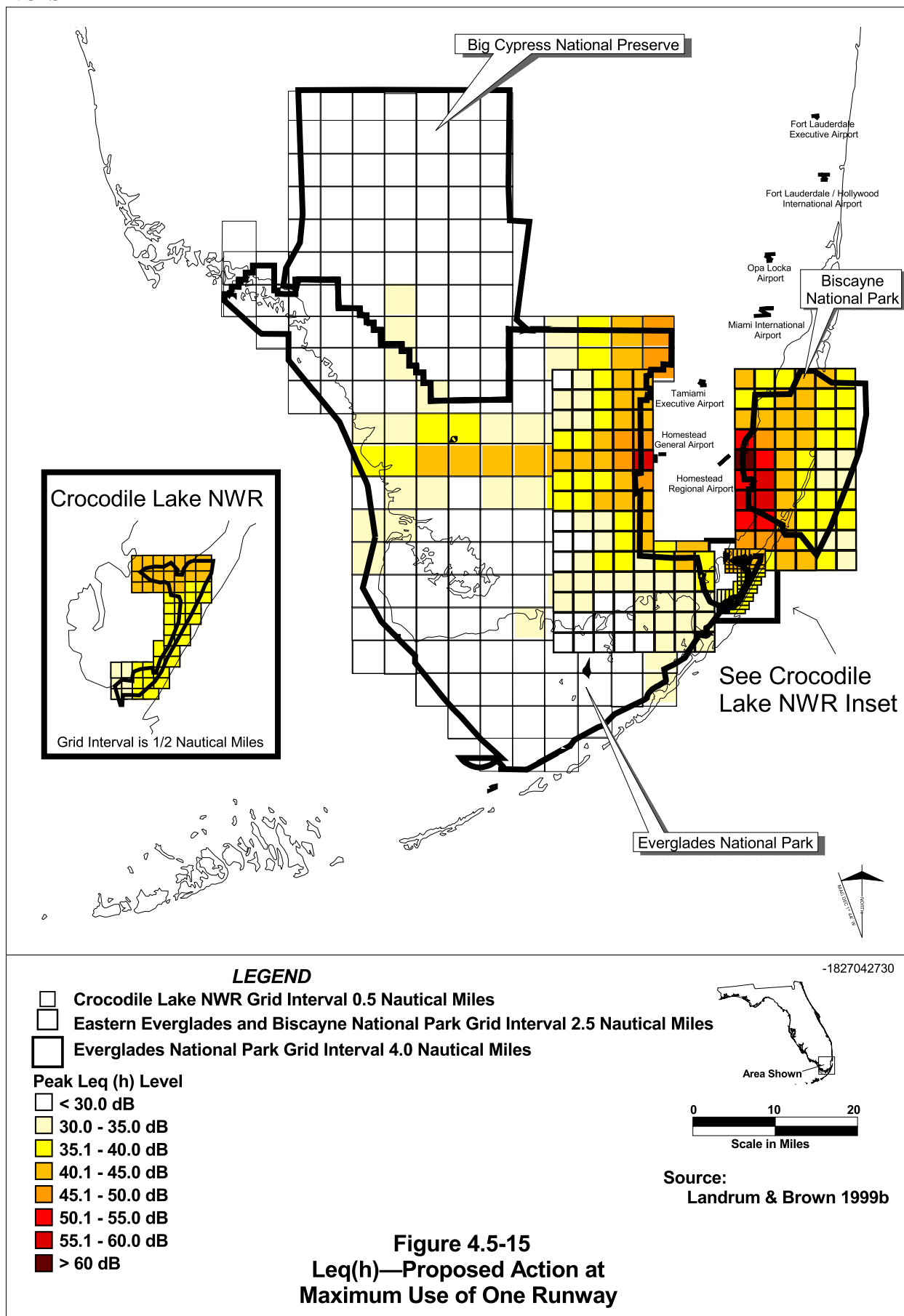
Measure- ment Point <sup>1</sup>	Proposed Action				Commercial Spaceport				Mixed Use/No Action			
	2000	2005	2015	Max Use	2000	2005	2015	Max Use	2000	2005	2015	Max Use
MA	79.9	80.4	79.9	79.9	79.9	85.8	85.8	85.8	79.9	79.9	79.9	79.9
MAA	30.9	32.1	32.1	32.1	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9
MAC	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0
MAD	72.6	72.6	72.6	72.6	72.6	72.6	72.6	72.6	72.6	72.6	72.6	72.6
MAE	35.6	38.5	38.5	38.5	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0
MB	63.9	63.9	63.9	63.9	63.9	63.9	63.9	63.9	63.9	63.9	63.9	63.9
MC	66.8	67.8	66.2	66.2	66.8	66.8	64.1	64.1	66.8	66.8	64.1	64.1
MD	66.6	69.7	69.0	66.6	66.6	66.6	66.6	66.6	66.6	66.6	66.6	66.6
ME	74.9	74.9	74.9	74.9	74.9	74.9	74.9	74.9	74.9	74.9	74.9	74.9
MF	94.7	94.7	94.7	94.1	94.7	94.7	94.7	94.7	94.7	94.7	94.7	94.7
MG	94.0	94.0	94.0	94.0	94.0	94.0	94.0	94.0	94.0	94.0	94.0	94.0
MH	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7	85.7
MI	77.0	77.0	77.0	77.0	77.0	77.0	77.0	77.0	77.0	77.0	77.0	77.0
MJ	69.9	69.9	66.8	66.8	69.9	76.1	76.1	76.1	69.9	69.9	66.8	66.8
MK	62.3	62.3	62.3	62.3	55.3	55.3	55.3	55.3	55.3	55.3	55.3	55.3
ML	74.5	74.5	74.5	74.5	74.5	74.5	74.5	74.5	74.5	74.5	74.5	74.5
MM	82.4	82.4	82.4	82.4	82.4	82.4	82.4	82.4	82.4	82.4	82.4	82.4
MN	42.7	51.3	51.3	51.3	42.7	42.7	42.7	42.7	42.7	42.7	42.7	42.7
MO	64.8	64.9	64.9	64.9	64.8	64.8	63.1	63.1	64.8	64.8	63.1	63.1
MP	81.5	81.5	81.5	81.5	81.5	81.5	81.5	81.5	81.5	81.5	81.5	81.5
MQ	63.1	63.1	63.1	63.1	63.1	63.1	63.1	63.1	63.1	63.1	63.1	63.1
MR	62.4	62.4	62.4	63.4	61.5	61.5	61.5	61.5	61.5	61.5	61.5	61.5
MS	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0	47.0
MT	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.6	39.6
MU	56.8	59.4	56.8	56.8	56.8	56.8	56.8	56.8	56.8	56.8	56.8	56.8
MV	78.2	78.2	78.2	78.2	78.2	78.2	78.2	78.2	78.2	78.2	78.2	78.2
MW	72.4	72.4	72.4	72.4	72.4	72.4	72.4	72.4	72.4	72.4	72.4	72.4
MX	57.8	61.9	61.9	61.9	57.8	57.8	57.8	57.8	57.8	57.8	57.8	57.8
MY	45.8	51.5	51.5	51.5	33.9	33.9	33.9	33.9	33.9	33.9	33.9	33.9
SD1	70.6	70.6	70.6	70.6	70.6	70.6	70.6	70.6	70.6	70.6	70.6	70.6
SD2	56.6	58.2	58.2	58.2	52.1	52.1	52.1	52.1	52.1	52.1	52.1	52.1
SD3	61.3	61.3	61.3	61.3	61.3	61.3	61.3	61.3	61.3	61.3	61.3	61.3
SD4	41.5	41.5	41.5	41.5	41.5	41.5	41.5	41.5	41.5	41.5	41.5	41.5
SD5	52.9	54.8	54.8	54.8	42.5	42.5	42.5	42.5	42.5	42.5	42.5	42.5
SD6	23.5	32.7	32.7	32.7	19.6	19.6	24.8	24.8	19.6	19.6	24.8	24.8
SD7	35.1	40.8	40.8	40.8	18.7	18.7	24.4	24.4	18.7	18.7	24.4	24.4
SD8	27.7	30.8	30.8	30.8	21.9	21.9	27.7	27.7	21.9	21.9	27.7	27.7

Source: **Landrum & Brown 1999b.**

Note: <sup>1</sup> See Figure 3.5-4 for location of measurement points.



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There are peak Leq(h) increases from the Proposed Action that are less than 5 dB above both the projected baseline and the traditional ambient that are apparent in the absolute peak Leq(h) values mapped on Figure 4.5-15. Compared to the existing condition (see Figure 3.5-15), the maximum use of the single runway projects increases in absolute peak Leq(h) values. This would include Everglades NP along the concentrated approach overflights from the WORPP and FAMIN fixes and on the eastern edge of the park along the VFR flyway. Compared to existing conditions, peak Leq(h) absolute values would also be higher under the downwind approach and departure routes south of the airport in southeastern Everglades NP and Crocodile Lake NWR, and in Biscayne NP under the departure route to Caribbean destinations. The increases in peak Leq(h) reflect more time of exposure than louder peak noise levels. In most areas of the national parks and refuges that are more than a few miles from the airport, these absolute peak Leq(h) values from aircraft noise would still be below traditional ambient levels (i.e., all sounds except aircraft).

**Table 4.5-7** lists computed Leq(h) levels for the Proposed Action and alternatives at the sites where ambient noise levels were measured and also shows the traditional ambient levels for those points.

**Time Above Ambient.** The TAamb metric has been selected to provide an indication of the amount of time during the average day that aircraft are likely to be above the traditional ambient level. As such, it is the metric most sensitive to changes in the number of aircraft operations, and captures the effect down to very low levels. It describes cumulative effects as increases in the number of minutes per day that aircraft are likely to be louder than ambient, and focuses on the duration of the noise exposure more than on its magnitude (loudness). The unit of measurement is therefore minutes rather than decibels. Decibel units are involved in the TA assessment, but only to define the traditional ambient levels as the threshold for calculating the amount of time above.

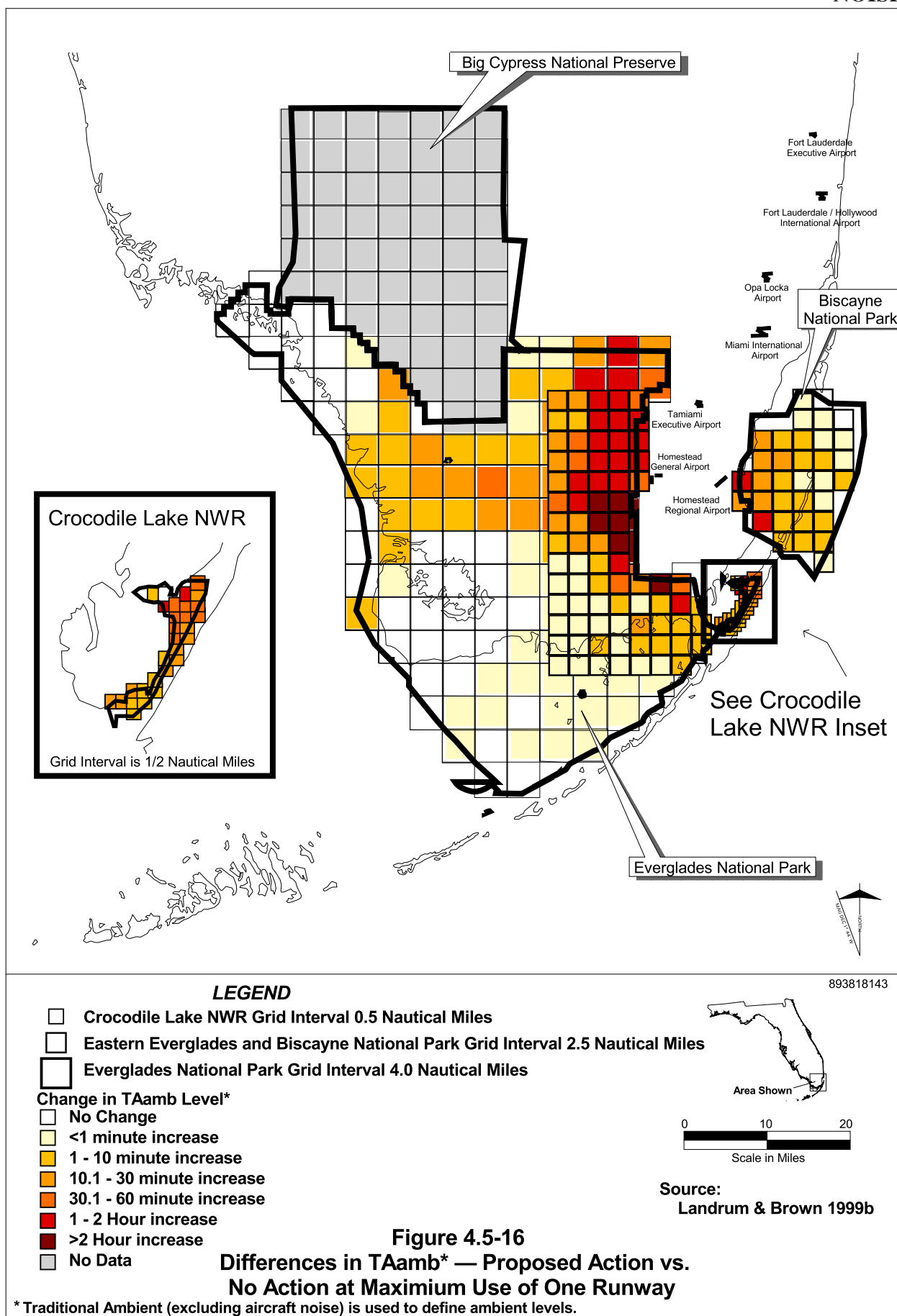
TAamb levels were computed for 305 points covering Everglades NP, Biscayne NP, Crocodile Lake NWR, and selected monitoring and supplemental analysis locations. Because no ambient noise levels are available for Big Cypress National Preserve, except at a few specific measurement sites, none of the 305 points apply to that area. Computed changes in TAamb durations from the Proposed Action at maximum use are graphically depicted in **Figure 4.5-16**. The sensitivity of the TAamb metric to increasing aircraft activity is immediately evident. Large areas of Biscayne NP, Everglades NP, and Crocodile Lake NWR are projected to experience increases in TAamb with maximum use of the single runway. The greatest increases of two hours or more per day would be along the approach to Runway 5 close to the airport in Everglades NP.

These areas would be affected by east departures on Runway 5 as they climbed into the right turn to the south and continued 270 degrees to a north heading, passing to the west of HST and gaining sufficient altitude to pass over the MIA airspace to the north. Arrivals to Runway 5 would pass under these departing aircraft west of HST over east Everglades NP. This overlapping of aviation activity with departures at higher altitudes and arrivals at lower altitudes accounts for the concentration of areas that would experience more than an hour of additional TAamb in east Everglades NP. The trail of darker cells (10 to 60 minute increases) cutting across the central portion of west Everglades NP is a result of east flow arrivals from the north and west in areas where there has been very little previous military activity.

**Table 4.5-7. Modeled Leq(h) Levels (in dB) at Measurement Points**

Measurement Point <sup>1</sup>	Traditional Ambient Sound Level	Proposed Action				Commercial Spaceport				Mixed Use/No Action			
		2000	2005	2015	Max Use	2000	2005	2015	Max Use	2000	2005	2015	Max Use
MA	51.8	46.8	47.8	49.6	49.3	46.6	50.5	52.6	52.6	46.6	46.6	46.4	46.4
MAA	45.4	9.3	11.3	13.8	15.0	7.7	8.2	9.6	9.6	7.7	8.2	9.6	9.7
MAC	40.8	35.0	35.8	37.5	37.0	34.8	34.8	35.0	35.0	34.8	34.8	34.9	34.9
MAD	39.2	35.2	36.3	38.5	37.9	35.0	35.0	35.2	35.2	35.0	35.0	35.1	35.1
MAE	43.5	15.2	16.2	18.2	19.6	14.2	14.1	15.2	15.2	14.2	14.1	15.1	15.2
MB	54.2	35.7	38.3	40.7	43.4	27.8	28.4	28.2	28.2	27.8	28.4	28.1	28.2
MC	48.2	36.5	37.5	37.1	38.2	36.0	36.6	34.6	34.6	36.0	36.3	33.6	33.6
MD	49.8	36.7	38.5	41.2	41.0	35.9	36.1	36.1	36.1	35.9	36.1	36.0	36.0
ME	51.6	30.8	33.4	36.2	37.5	28.1	28.3	28.6	28.6	28.1	28.2	28.5	28.5
MF	47.3	55.6	56.1	57.0	56.4	55.1	55.3	55.5	55.5	55.1	55.1	55.0	55.0
MG	56.2	55.0	55.6	56.7	55.9	54.3	54.5	54.6	54.6	54.3	54.3	54.2	54.2
MH	45.1	58.1	58.2	58.4	58.4	58.0	58.0	58.0	58.0	58.0	58.0	58.0	58.0
MI	48.6	34.3	35.5	36.8	37.3	33.9	34.3	34.1	34.1	33.9	34.1	33.7	33.7
MJ	54.9	41.9	42.2	39.1	39.3	41.9	44.5	45.1	45.1	41.9	42.1	38.6	38.6
MK	46.5	32.3	34.7	37.0	39.4	24.2	24.4	24.6	24.6	24.2	24.4	24.6	24.8
ML	56.2	40.1	40.5	38.5	39.0	39.9	41.7	41.5	41.5	39.9	40.1	37.1	37.1
MM	54.9	47.8	48.1	48.8	45.5	42.8	42.8	42.8	42.8	42.8	42.8	42.8	42.8
MN	45.7	26.5	26.8	28.2	28.6	26.2	26.1	26.7	26.7	26.2	26.1	26.7	26.8
MO	41.0	40.4	41.2	41.8	42.2	39.8	40.5	40.1	40.1	39.8	40.5	40.1	40.1
MP	49.6	39.5	40.7	40.9	42.0	39.1	39.8	38.8	38.8	39.1	39.5	37.9	37.9
MQ	47.2	15.8	17.4	19.1	19.5	15.4	15.6	15.9	15.9	15.4	15.5	15.8	15.8
MR	36.0	34.4	37.0	39.4	42.1	25.6	25.8	26.1	26.1	25.6	25.8	26.0	26.1
MS	49.3	19.7	20.7	21.6	22.2	19.4	20.0	20.1	20.1	19.4	20.0	20.0	20.0
MT	42.0	12.7	15.6	18.4	19.1	11.4	12.0	13.0	13.0	11.4	12.0	12.9	12.9
MU	46.7	23.5	25.5	27.4	27.9	21.8	22.0	22.2	22.2	21.8	21.9	22.1	22.1
MV	31.2	40.2	41.3	42.5	43.9	35.5	35.6	35.9	35.9	35.5	35.6	35.9	36.0
MW	41.3	35.3	36.8	39.4	38.7	35.0	35.1	35.2	35.2	35.0	35.0	35.2	35.2
MX	39.9	25.0	28.8	31.7	31.7	23.6	23.7	23.9	23.9	23.6	23.7	23.8	23.8
MY	45.8	9.9	15.6	18.5	18.9	6.6	7.4	8.6	8.6	6.6	7.3	8.4	8.4
SD1	46.2	29.9	31.5	32.9	34.5	22.6	22.6	22.7	22.7	22.6	22.6	22.7	22.7
SD2	39.7	29.0	32.7	35.2	37.1	22.8	23.5	23.5	23.5	22.8	23.5	23.5	23.6
SD3	44.6	20.9	21.9	23.3	23.8	20.5	20.7	20.8	20.8	20.5	20.6	20.7	20.8
SD4	43.2	9.6	13.2	16.1	16.7	7.8	8.4	9.6	9.6	7.8	8.2	9.2	9.2
SD5	39.0	21.5	25.2	28.2	29.9	15.4	15.8	16.7	16.7	15.4	15.8	16.6	16.7
SD6	34.0	8.8	10.8	13.5	15.1	7.1	7.1	9.0	9.0	7.1	7.1	9.0	9.1
SD7	33.7	6.5	8.4	10.7	13.1	0.3	1.1	4.0	4.0	0.3	1.1	3.9	3.9
SD8	34.1	5.6	7.1	9.8	10.8	4.4	5.1	7.6	7.6	4.4	5.1	7.6	7.6

Source: **Landrum & Brown 1999b.**Note: <sup>1</sup> See Figure 3.5-4 for location of measurement points.



## NOISE

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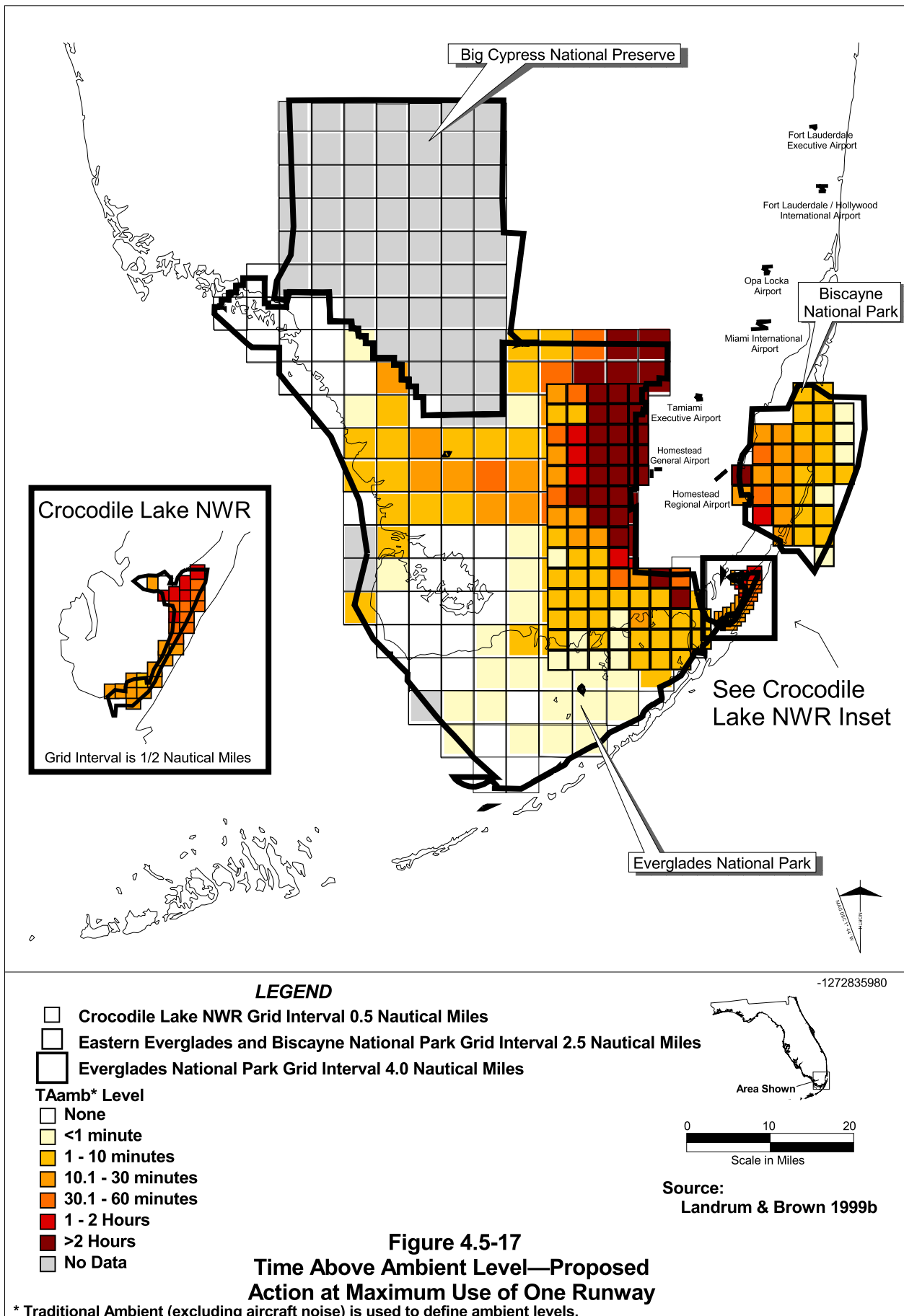
The effects of the Proposed Action on TAamb over the 2000 to 2015 time period can be summarized as follows: in 2000, the areas with the longest TAamb would be located along the VFR flyway leading to HST passing Kendall-Tamiami and Homestead General Aviation Airports. Areas under the flight paths approaching HST and MIA from the WORPP/FAMIN fixes would also experience increases. An area to the southwest of HST would experience smaller increases under the MNATE departure corridor for propeller aircraft. Over Biscayne NP and Crocodile Lake NWR, durations of TAamb are projected to increase with the introduction of commercial traffic at HST. Increases in most of Biscayne NP would be less than 1 minute per day, with increases of up to 10 minutes per day generally closer to the airport, and an increase of up to 30 minutes per day in one grid. Increases in Crocodile Lake NWR would generally be up to 10 minutes per day in the northern portion of the refuge and up to 1 minute per day in the southern portion.

By 2005, each of those areas would be anticipated to receive longer TAamb as more traffic was introduced along the flight paths. The area under the jet departure path to MNATE is forecast to experience longer TAamb, as would more of Biscayne NP. By 2015, the growth of operations at HST and other general aviation airports in the region could result in total exposure times along the VFR flyway growing to exceed an hour or more at several locations. This level of exposure would also be expected along the principal flight tracks leading to and from HST during easterly flow. Other areas previously affected would continue to experience a lengthening of the period of exposure to TAamb as the number of operations increased.

By maximum use of the one runway at HST, the following general patterns of TAamb increases are projected (see Figure 4.5-16). In Biscayne NP, projected increases would generally amount to 10 minutes or less per day in the central and eastern portions of the park and between 10 to 30 minutes per day in the western portion of the park. Two areas along the western shoreline are projected to receive TAamb increases of between 1 and 2 hours. In Everglades NP, projected increases would generally be of the longest duration (i.e., over 2 hours) in grids closest to the runway, with increases between 1 and 2 hours along the VFR flyway on the eastern edge of the park west and northwest of HST, and increases between 1 to 30 minutes under the approaches from the WORPP and FAMIN fixes. Increases of less than 1 minute are projected in south and southeast Everglades NP, and no increases are projected in the central and far northwest portions of the park. In Crocodile NWR, projected TAamb increases are generally in the 1 to 30 minute per day range, with higher increases (30 to 62 minutes) in the northern portion of the refuge.

**Figure 4.5-17** shows total TAamb levels at maximum use of a one-runway airport and can be compared to current TAamb levels in Figure 3.5-16. **Table 4.5-8** presents the traditional ambient levels and TAamb for the Proposed Action and alternatives at the locations where ambient noise levels were measured.

**Overall Findings.** Overall, the data developed on LAmax, Leq(h), and TAamb indicate that projected increases in noise level and duration of exposure from the Proposed Action are generally highest in areas that currently have the lowest noise exposures. The lower the absolute level, the greater the potential for incremental increases above baseline conditions.



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**Table 4.5-8. Modeled TAamb (in minutes) at Measurement Points**

Measurement Point <sup>1</sup>	Traditional Ambient Sound Level (dB)	Proposed Action				Commercial Spaceport				Mixed Use/No Action			
		2000	2005	2015	Max Use	2000	2005	2015	Max Use	2000	2005	2015	Max Use
MA	51.8	16.4	18.9	31.8	36.2	14.6	15.9	15.0	15.0	14.6	15.1	13.2	13.2
MAA	45.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MAC	40.8	4.0	5.9	20.2	16.0	4.2	4.0	4.0	4.0	4.2	4.0	4.0	0.4
MAD	39.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MAE	43.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MB	54.2	17.4	25.0	57.9	102.5	0.9	1.3	1.3	1.3	0.9	1.3	1.3	1.4
MC	48.2	5.5	6.5	5.1	6.2	5.1	6.2	3.8	3.8	5.1	5.8	3.0	3.0
MD	49.8	5.6	6.8	11.8	14.0	5.2	5.8	5.9	5.9	5.2	5.6	5.6	5.6
ME	51.6	0.4	0.6	1.7	2.6	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
MF	47.3	76.4	89.2	151.7	188.3	51.7	53.5	53.8	53.8	51.7	52.9	52.3	52.3
MG	56.2	27.6	29.8	45.1	47.7	19.1	19.2	19.7	19.7	19.1	18.8	18.8	18.8
MH	45.1	60.2	69.3	108.5	134.5	35.8	36.7	37.1	37.1	35.8	36.5	36.6	36.6
MI	48.6	2.4	2.6	4.1	4.7	2.3	2.4	2.6	2.6	2.3	2.2	2.1	2.1
MJ	54.9	7.0	8.0	2.9	2.9	7.0	8.6	4.2	4.2	7.0	8.0	2.9	2.9
MK	46.5	3.2	5.2	12.5	23.1	0.0	0.2	0.2	0.2	0.0	0.2	0.2	0.2
ML	56.2	5.0	5.5	2.1	2.1	5.0	6.1	3.1	3.1	5.0	5.5	2.0	2.0
MM	54.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MN	45.7	0.0	0.0	0.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MO	41.0	25.0	35.0	49.0	58.1	31.5	26.3	27.9	27.9	31.5	26.3	27.9	30.1
MP	49.6	10.1	11.8	12.2	14.6	9.6	11.2	9.1	9.1	9.6	10.7	8.0	8.0
MQ	47.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
MR	36.0	23.7	31.6	70.4	112.2	5.4	5.6	6.1	6.1	5.4	5.6	6.0	6.1
MS	49.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MT	42.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MU	46.7	0.3	0.6	0.9	1.4	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.1
MV	31.2	74.4	86.2	131.6	165.3	51.3	54.4	64.0	64.0	51.3	54.2	63.5	67.5
MW	41.3	10.0	13.9	38.0	47.1	8.9	9.1	9.2	9.2	8.9	8.9	8.9	8.9
MX	39.9	2.1	3.7	12.0	12.3	1.3	1.5	1.5	1.5	1.3	1.5	1.5	1.5
MY	45.8	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SD1	46.2	2.1	3.0	5.2	7.2	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
SD2	39.7	6.2	10.4	27.4	46.0	0.1	0.3	0.3	0.3	0.1	0.3	0.3	0.4
SD3	44.6	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
SD4	43.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SD5	39.0	1.1	2.1	6.8	10.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SD6	34.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SD7	33.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SD8	34.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Source: **Landrum & Brown 1999b.**

Note: <sup>1</sup> See Figure 3.5-4 for location of measurement points.

NA Not available

For the LA<sub>max</sub> and Leq(h) metrics, large computed increases in noise levels were computed in areas with very low baseline levels. A number of factors contribute to this effect. First, most of the area is parks and refuges and those areas are intended to be quiet. Second, at locations that are relatively close to the airport, baseline levels are clearly dominated by the existing military aircraft operations with respect to both peak noise levels and hourly averaged noise levels. This dominance exists on both the east and west side of the airport for the Leq(h) metric, but for the LA<sub>max</sub> metric the dominance is slightly smaller on the west side. This is because the military aircraft are at least 20 dB louder than the civil aircraft on departure, but are equivalent or only slightly louder on approach. This is the primary reason the Leq(h) metric shows no major increases in the central portions of Biscayne NP and Crocodile Lake NWR under the Proposed Action.

To the west, civil approaches would generally occur at lower altitudes and would be dominant across west Everglades NP and the central portion of east Everglades NP. In west Everglades NP and Big Cypress National Preserve, civil aircraft would be dominant because military aircraft are not using the airspace. However, the civil aircraft in those locations would be at high altitudes and using low levels of thrust. Consequently, the actual noise levels would be relatively low, with some computed increases below the measured traditional ambient levels.

The largest changes computed were in the amount of time above ambient. Ambient noise levels tend to be low, and consequently TA<sub>amb</sub> is very sensitive to changes in noise levels and the number of events occurring at low levels. As a result, the analysis found that the likelihood of detecting the presence of aircraft would be expected to increase proportionately with the increase in civil aircraft operations. Unlike LA<sub>max</sub> and Leq(h) findings, however, the largest increases in TA<sub>amb</sub> from the Proposed Action would be closest to the airport, where the departure and arrival paths converge.

In summary, Figures 4.5-12, 4.5-14, and 4.5-16 show that differences in LA<sub>max</sub> are concentrated in locations under proposed arrival tracks for civil aircraft, and there is almost no change in Leq(h) projected above the projected baseline and traditional ambient levels as a result of the Proposed Action. The largest differences over current conditions are depicted in TA<sub>amb</sub>, and with a few exceptions, those differences are concentrated in the areas closest to the airfield.

The potential effects of noise on the national parks and refuges appear to fall into three general categories:

- Effect on park visitors;
- Effect on animals, birds, and fish; and
- Impairment of the natural soundscape as a park resource.

Many people visit Biscayne NP, Everglades NP, and Big Cypress National Preserve. (Crocodile Lake NWR is closed to public use; access is by Special Use Permit only.) Studies in national parks by FAA, NPS, and Air Force show a correlation between increasing noise levels and visitor annoyance. Visitor annoyance is affected by the volume and intensity of noise (energy level), the amount of time aircraft are heard (duration), and the number of times that aircraft are heard (frequency). The strongest effects seem to be in response to energy level and duration.

Studies also indicate variability in park visitors' reactions to noise. It depends on where they are, what they are doing, their expectations regarding the park experience, and how much other noise they are hearing (both natural and man-made) including how much noise they are generating themselves. Generally, visitors are considered to be less sensitive to aircraft noise in areas of parks where there is substantial human activity and more sensitive to aircraft noise in areas where there is minimal human

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activity and where natural sounds dominate. Visitors in groups or accompanied by children tend to be less sensitive to noise than people who are not surrounded by others.

Section 4.6 describes various studies and reports that have addressed visitor reactions to noise in national parks and recreation areas. Statistics in these studies and reports cannot be used to predict the percentage of visitors in the national parks around Homestead that would be annoyed by aircraft noise. More research is needed to develop generalized criteria for predicting visitor reactions to noise in national parks comparable to the body of data that has been developed for community noise. Such research should be targeted towards verifying the best metric(s) to use, establishing statistical confidence in relationships between increases in noise and park visitor annoyance, revealing differences in visitor annoyance based on park use and type of visitor activity, and reaching consensus on the measurement and role of ambient noise in parks.

With respect to potential noise effects on animals, birds, and fish, the projected increases in exposure to aircraft noise are not at levels that have been found in wildlife studies to affect behavior or reproductive success to a degree that suggests a potential for long-term population effects. Noise impacts are not anticipated to affect the viability or success of any species or habitat in the national parks or refuges, as assessed in greater detail in Section 4.11.

Natural sounds are identified as a resource by the NPS. Natural sounds include the wind blowing through the trees, the lapping of water, the calls of birds, the sounds of insects, and other unaltered sounds of nature. The NPS includes the management of natural sounds and soundscapes within the National Park System as part of its legal mandate for protecting park resources unimpaired. Refer to Sections 3.5 and 3.6 for a more complete description by NPS of the value of a national park soundscape and the ongoing work on a Soundscape Management Plan for Biscayne NP.

Biscayne NP, the closest national park to Homestead, currently has an abundance of man-made noises (mostly mechanical) at many sites where noise was measured. It is 95 percent water. The Intracoastal Waterway runs through the park, and motorboats are the predominant way in which visitors travel through and enjoy the park. The extent to which a soundscape plan may be able to remove or reduce man-made noises such as boats, mechanical equipment, and visitor noises is currently unknown. There is presently no basis on which to quantitatively predict that noise levels in Biscayne NP, even assuming the exclusion of aircraft, will be quieter in the future than the current levels. It should also be noted that the natural ambient sound level is not always the lowest relative to other ambient values. At some of the sites where ambient was measured, the sounds of nature at close range, in particular insect activity, were so loud that they effectively masked all other sounds that occurred at greater distances from the noise receiver. Refer to Table 3.5-1 for a comparison of the different ambients that were measured.

Reasonable people can disagree about the practical achievement of natural ambient in all areas of all national parks, but can probably agree that it is environmentally preferable to have less man-made mechanical noise in natural areas of national parks rather than more. The Proposed Action would add more aircraft noise to the south Florida national parks and refuges, which is contrary to NPS noise goals. However, the FAA cannot identify or quantify an “impairment” on park “resources” independent from the effects of noise on people and wildlife, previously discussed. Noise does not produce an effect apart from human and animal hearing and reactions. Noise does not linger in the environment as a permanent impact or impairment.



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***Florida Keys National Marine Sanctuary***

Two points were selected in FKNMS, one in the northern part of the sanctuary and one farther south, to provide a sense of the level of aircraft noise that these areas could be exposed to under the Proposed Action. At the northern location, DNL was modeled at 34 dB with the Proposed Action at maximum use, compared to a DNL of 25 dB under the projected baseline. LA<sub>max</sub> at this location would not change from the projected baseline of 65 dB. At the southern location, DNL was modeled to increase from 8 dB under the projected baseline to 17 dB with the Proposed Action at maximum use. LA<sub>max</sub> at that location would be 52 dB, compared to a projected baseline of 30 dB. See Appendix E for more discussion of noise at these locations.

***State Parks***

Sample points were modeled at John Pennekamp and Bill Baggs Cape Florida State Parks and at Key Largo Hammocks State Botanical Site. DNL at John Pennekamp State Park for the Proposed Action at maximum use was modeled at 38 dB, an increase of 1 dB over the projected baseline. LA<sub>max</sub> would remain the same at 79 dB. At Bill Baggs Cape Florida State Park, both DNL and LA<sub>max</sub> for the Proposed Action at maximum use would remain the same as the projected baseline DNL of 42 dB and LA<sub>max</sub> of 70 dB. At Key Largo Hammocks State Botanical Site, peak hour Leq would increase from 34 to 38 dB for the Proposed Action at maximum use. The corresponding DNL value at maximum use would be 35 dB. LA<sub>max</sub> would remain the same at 73 dB. See Section 4.14 and Appendix E (including the Addendum) for more discussion of noise at these locations.

***South Florida Water Management District Lands***

A grid (grid B) was superimposed over a map of the SFWMD lands nearest to Homestead. LA<sub>max</sub>, Leq(h), and DNL noise level information was calculated for each grid. At maximum use of the Proposed Action, LA<sub>max</sub> would remain the same as the projected baseline throughout these areas. Within the Southern Glades Wildlife and Environmental Area, Leq(h) would increase at maximum use to a range of 34–50 dB, with decibel values decreasing as distance from the runway increases. By comparison, the projected baseline Leq(h) range would be 31–43 dB. In the Model Lands Basin, the Proposed Action maximum use Leq(h) range would be 36–58 dB, compared to the projected baseline range of 29–58 dB. In Frog Pond, the Proposed Action maximum use Leq(h) range would be 44–56 dB, compared to the projected baseline range of 39–56 dB. DNL values show similar patterns of aircraft noise to Leq(h), although DNL values are somewhat lower because Leq(h) calculates cumulative noise based on the busiest hour of the day. See Section 4.14 and the Addendum to Appendix E for more discussion of noise in SFWMD lands. The effects of noise on the Cape Sable seaside sparrow are addressed in Section 4.11.

**Cumulative Impacts**

Cumulative impacts involve the assessment of the effects of regional air traffic from other airports in the ROI combined with HST air traffic. (Estimates of future air traffic at other airports are provided in Appendix E.) With respect to LA<sub>max</sub>, the contributions from other airports over the analysis years would be small, ranging from a high of 80 dB to a low of 20 dB. The higher LA<sub>max</sub> levels are concentrated in the northern portion of Everglades and Biscayne NPs, as these areas are influenced by traffic from MIA. Above LA<sub>max</sub> of 30 dB, the increase in noise levels over the period of analysis is estimated to be less than 3 dB, and therefore the influence of other regional air traffic on cumulative noise levels when considering the Proposed Action would be very small.

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A similar pattern emerges when assessing changes in Leq(h) contributed by other airports. At maximum use of one runway at HST, Leq(h) levels range from about 56 dB to zero, with only 20 points above 40 dB and 80 above 30 dB. Above 30 dB, the average increase in noise level due to other airports is estimated to be less than 2 dB. Cumulative effects resulting from the addition of the noise contributions from other airports to the Proposed Action levels are therefore considered to be minor for Leq(h).

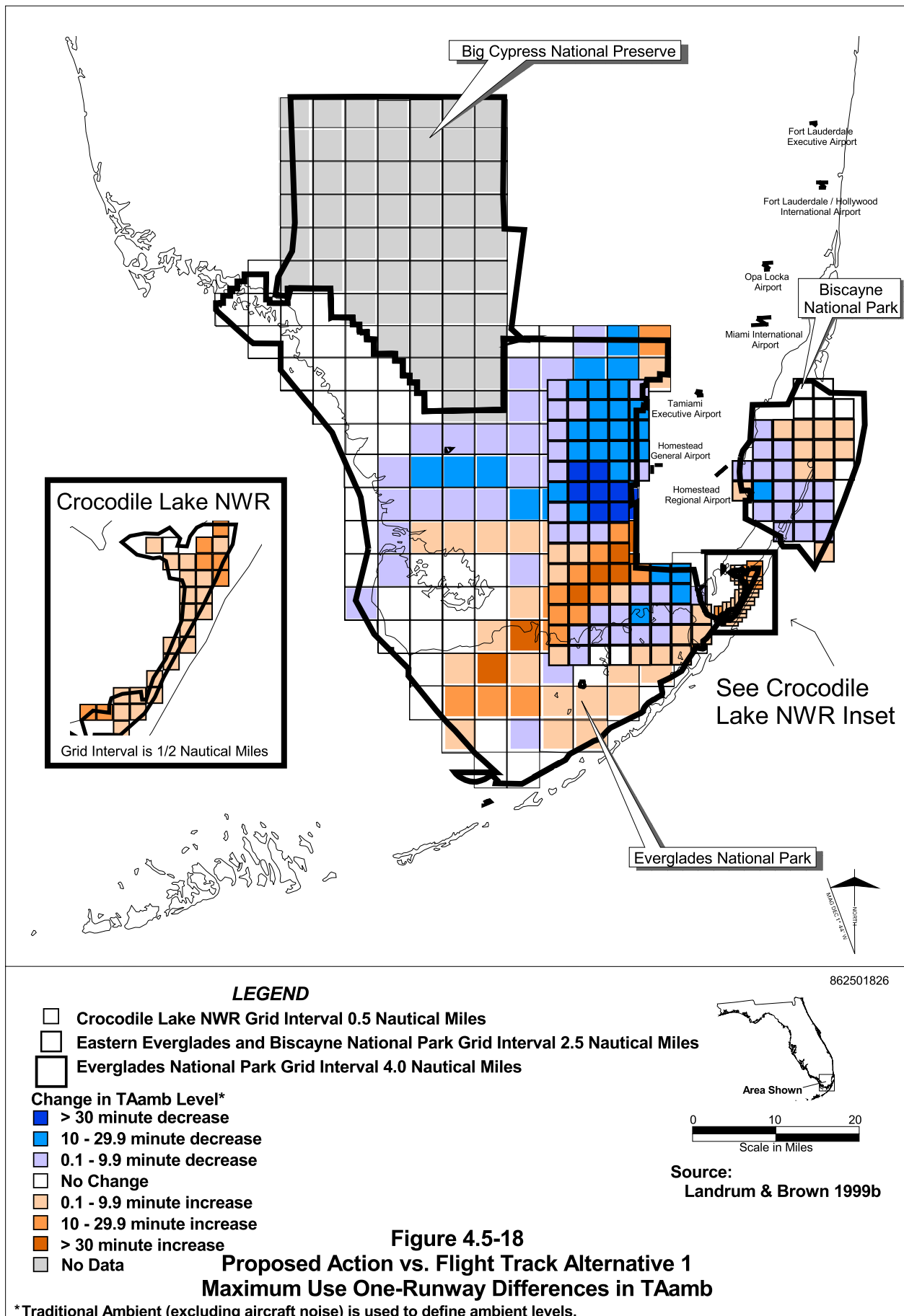
For the TAamb metric, the effect of other airports is more noteworthy, but contributions remain small on a relative basis over the analysis period. Over the analysis period, an overall increase in TAamb of 33 percent is forecast for all applicable points. The largest increase is projected to occur in the northern portions of Everglades and Biscayne NPs as they come under the influence of increasing traffic from MIA. The largest increase in this area is calculated to be from about 370 minutes in 1997 to 520 minutes under maximum use of a one-runway HST. Over a broader area, the relative contribution of other airports is projected to decrease over time under the Proposed Action. In 2000, 41 percent of the forecast TAamb is from other airports, but this decreases to 24 percent as operations at HST increase to their maximum one runway use.

### Mitigation Measures

A number of possible flight track options for reducing noise levels in the national parks and refuges were considered in the development of three sound attenuation flight path alternatives as potential mitigation measures for the Proposed Action. NPS requested that consideration be given to flight paths that avoid the national parks altogether, but this was found to be infeasible. The three alternatives analyzed were developed in consultation with the National Park Service and FAA regional airspace managers. No alternative can eliminate aircraft overflights of national parks and refuges, as NPS would prefer. Three of the four national properties are particularly close to Homestead, at least in part, and the south Florida airspace dictates certain operating parameters for Homestead in relation to other aviation traffic. Even existing and projected future conditions will continue to place traffic using other airports and military and government flights using Homestead over the national parks and refuges. In FAA's judgement, the three alternatives analyzed represent the best available changes in flight path locations, consistent with safety and flight efficiency. In the view of NPS, these would continue to impair the soundscape in the national parks. A summary of the alternatives and their effects on the distribution and level of noise in the national parks and refuges is presented below.

**Noise Abatement Flight Path Alternative No. 1.** This noise abatement alternative includes a number of components (see Figure 2.11-1). In each case, the individual component routes would reduce noise effects in some areas and increase them in others. L<sub>A</sub>max levels would not change, but there would be a shift in location associated with moving the FAMIN approach corridor farther south and the MNATE departure to the east. These changes do not translate into appreciable differences in Leq(h). No change of more than 5 dB was calculated at any grid point by 2005, and only three points indicated changes in Leq(h) of more than 5 dB by 2015.

The metric that best illustrates the effects of the noise abatement measures is TAamb. **Figure 4.5-18** shows the differences in TAamb between the abatement flight paths and the unmitigated Proposed Action flight paths at maximum use. Along the WORPP approach west of HST in northeastern Everglades NP, under the MNATE departure in southeastern Everglades NP, and in the western half of Biscayne NP, the TAamb would be less than with the unmitigated flight tracks. In contrast, the area along the extended centerline approach to Runway 5 from the relocated FAMIN approach, along the relocated FAMIN



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approach course to Runway 23, along the far eastern edge of northeast Everglades NP, in the northeastern portion of Biscayne NP, and within Crocodile Lake NWR, the TAamb would increase with the noise abatement flight tracks. At most locations, the degree of change expected in the earliest year would be less than one minute, but as more operations were introduced to the area, the changes would be higher, as shown in Figure 4.5-18.

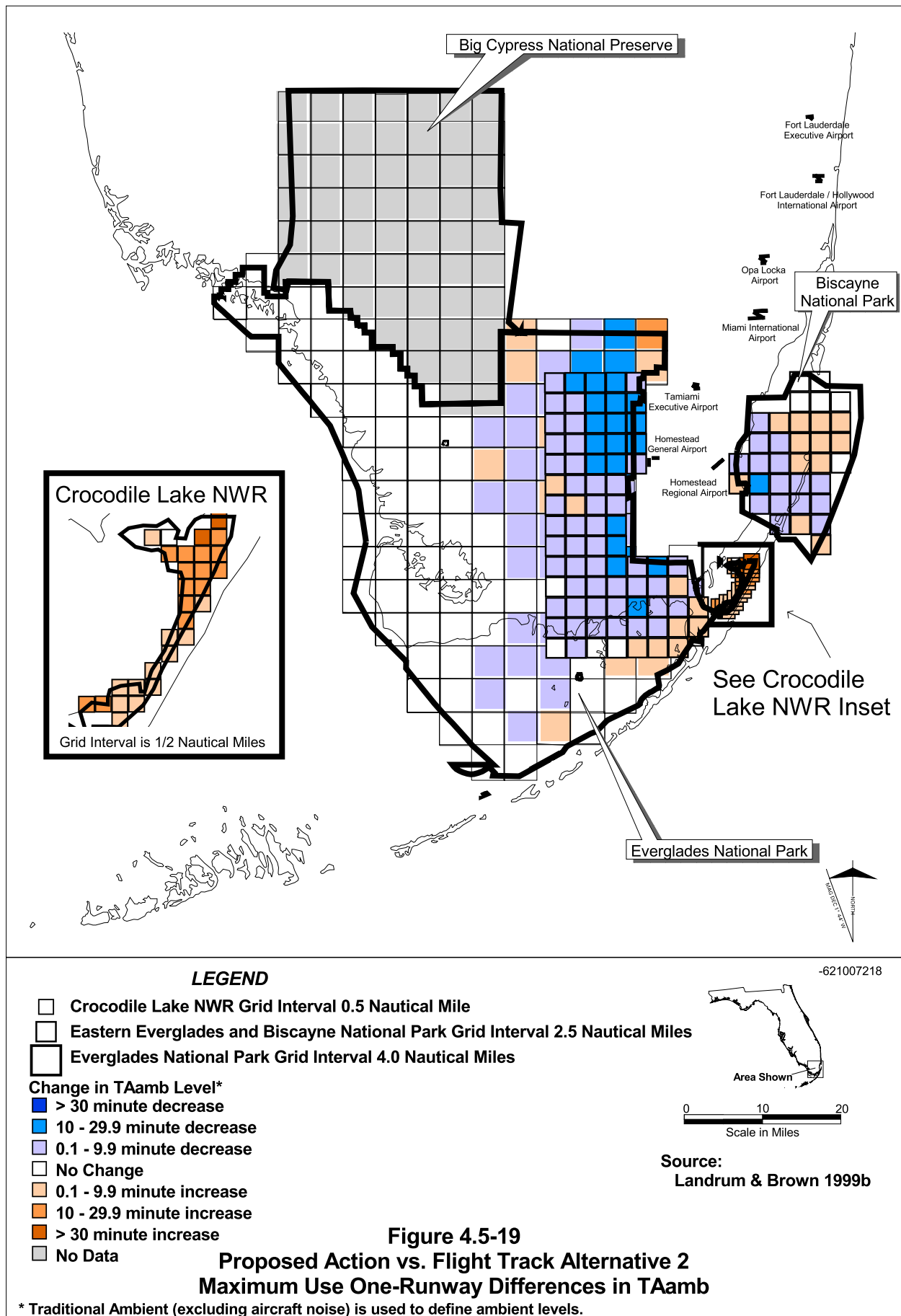
The increased exposure southwest of the airport would be the result of relocating both FAMIN and JUNUR jet approaches to long straight-in arrival courses. The increase over Crocodile Lake NWR and part of the decrease in Biscayne NP would be associated with the relocation of the EEONS departure path to follow the southbound climb track from its current location across Elliot Key. The area of reduced exposure times between the straight-in approach to Runway 5 and Crocodile Lake NWR would be associated with the relocation of MNATE departures to the southeast, a move reflected in increased exposure over the Keys south of Crocodile Lake NWR. The northeast portion of Biscayne NP would experience increases in TAamb because the approach route for jets would be moved eastward under this scenario, which in turn would result in lower TAamb over the central part of the park.

The substantial reductions in TAamb shown along the northeast edge of Everglades NP is attributable to moving the IFR corridor for small aircraft several miles to the east and outside the park. The relocation of the jet departure route to the HEDLY fix also plays a role in this reduction, but the aircraft using that route would be expected to be above 18,000 feet MSL by the time they reach the area. The southwest portion of Biscayne NP would be exposed to less noise principally because the JUNUR approach by jets would be relocated to a straight-in alignment and SKIPS/VALLY departures from Runway 23 would be relocated south of the park.

**Noise Abatement Flight Path Alternative No. 2.** This noise abatement scenario would incorporate several of the same routes as evaluated under abatement alternative No. 1 and modify several others (see Figure 2.11-2). Modeling of this scenario resulted in virtually no changes in LMax and Leq(h). The TAamb analysis indicated that the east half of Everglades NP would experience a general reduction in noise exposure under this alternative, as would much of Biscayne NP. Crocodile Lake NWR and a few scattered areas would experience increases of generally less than 3 minutes per day. **Figure 4.5-19** shows the computed differences in TAamb at maximum use, compared to the unmitigated Proposed Action flight paths.

The areas exposed to more TAamb under this abatement alternative lie under the relocated MNATE departure route for propeller aircraft, along the eastern edge of northeast Everglades NP, in the east half of Biscayne NP under the relocated jet approach from the northeast, and along the west side of Biscayne NP under the south departure climb route. The increased exposure shown in Crocodile Lake NWR and along the west side of Biscayne NP is related to the rerouting of the SKIPS departure to follow the VALLY route over the top of HST prior to turning on course, as well as the southward rerouting of the EEONS departures in east and west flow and the SKIPS and VALLY departures in west flow.

Decreases in TAamb shown in Figure 4.5-19 in northeast Everglades NP are attributable to the relocation of IFR general aviation traffic in the north-south flight corridor to a route east of the park. Reductions over southern and southeastern Everglades NP are related to the relocation of the MNATE departure courses from widely scattered tracks across Florida Bay to more definitive courses to the east. In Biscayne NP, the reduction of TAamb in the north half of the park is associated with rerouting the SKIPS departure from Runway 5, while the reduction in the south half of the park is related to relocation of the EEONS departure from a route across Elliot Key to a southerly course.



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**Noise Abatement Flight Path Alternative No. 3.** This scenario incorporates many of the potential routes tested under the other abatement scenarios, as well as several additional modifications to arrival routes and to one departure route (see Figure 2.11-3). This abatement alternative would not result in appreciable changes in either L<sub>Amax</sub> or Leq(h). Again, the changes are principally noticeable in TAamb calculations.

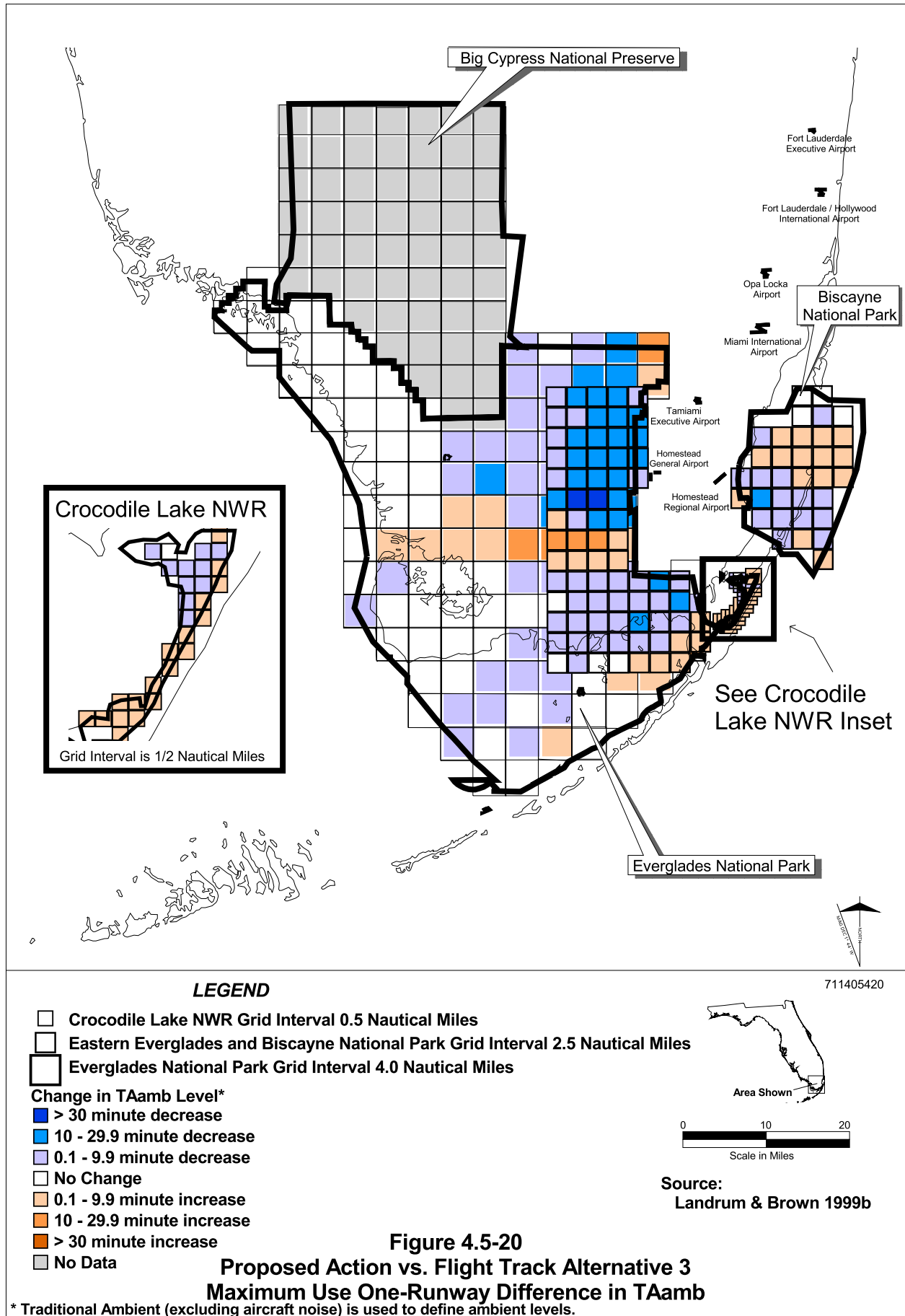
**Figure 4.5-20** shows differences in TAamb with this scenario, compared to the unmitigated Proposed Action flight paths at maximum use. West of the airport, the L<sub>Amax</sub> noise levels would be expected to increase, reflecting a relocation of the FAMIN approach route for east flow operations to a position south of its unmitigated course. A decrease in noise levels west of this location would also result from the relocation of the FAMIN track to a more southerly position. Leq(h) levels would differ little from the unmitigated Proposed Action conditions.

The changes in TAamb are shown in Figure 4.5-20. The areas that could be expected to experience increased exposure time to noise above traditional ambient levels with implementation of this alternative would be located in five areas and related to five different flight track measures. Increases are estimated to amount to less than 10 minutes per day except for a few areas in Everglades NP where they would fall within the range of 10 to 30 daily minutes of increase. Increased exposure time in the north half of Biscayne NP would result initially from the relocation of the jet approach route from the northeast over HEATT and, in later years, by the addition of VALLY departure traffic to the SKIPS departure route. Over Crocodile Lake NWR, noise exposure time could be expected to increase as a result of the relocation of the EEONS departure from Runway 23. Over the southeastern portion of Everglades NP, the prop departures to MNATE would increase exposure time. Along the east edge of the northeast portion of Everglades NP, the time of exposure above traditional ambient levels would be expected to increase as a result of the relocation of IFR traffic from the VFR flyway to a course several miles to the east. To the west of the airport, the movement of the FAMIN approach by several miles to the south to separate it from the WORPP approach in both east and west flow would result in the increase of noise exposure time in the area.

In contrast, exposure time above traditional ambient levels would be reduced in four principal areas. Over northeast Everglades NP, the time would be reduced substantially compared to the unmitigated Proposed Action conditions, based on the eastward movement of IFR general aviation traffic to a route east of the park. Southwest of HST, the exposure time would be reduced by the consolidation of MNATE prop departure routes from a broadly scattered array to a more confined routing adjacent to or under the jet departure route to that fix. West of the airport, the separation of the WORPP and FAMIN approach routes would result in a shift to the south of a portion of the noise and a commensurate decrease in the exposure times along the WORPP routing. Finally, the southern half of Biscayne NP would experience less time of aircraft noise above traditional ambient levels under this alternative, as aircraft were rerouted from EEONS and VALLY departure courses and from JUNUR approach courses.

**Table 4.5-9** shows the noise effects of the three noise abatement flight track alternatives on community and other park locations.

Other potential mitigation measures are discussed above in the Mitigation Measures section of Section 4.5.2.1.



**Table 4.5-9. Comparison of DNL, LAmax, and Time Above With Proposed Flight Tracks  
and Three Noise Abatement Flight Track Alternatives**

Site Designation	Site Name	Proximate Grid Point	Proposed Action Flight Tracks	Flight Track Alt. 1	Alternative Change	Flight Track Alt. 2	Alternative Change	Flight Track Alt. 3	Alternative Change
<b>DNL (dB)</b>									
BBP	Bill Baggs Cape Florida State Park	D131	42	42	0	42	0	42	0
ORX	Ocean Reef	D90,C1213	39	40	1	40	1	40	1
ACX	Angler's Club	D90,C1214	40	41	1	41	1	41	1
RFP	Redland Fruit and Spice Park	B125	40	40	0	40	0	40	0
HCC	Homestead Community College	F58,F75	42	42	0	42	0	42	0
KGX	Keys Gate	F71	51	51	0	51	0	51	0
FCH	Florida City City Hall	F38	43	43	0	43	0	43	0
CKL	Key Largo	B115,B134	31	32	1	32	1	32	1
NHA	Nursing Home	NHA	44	44	0	44	0	44	0
MH1	South Dade Center	F177,F178	70	70	0	70	0	70	0
NJA	Naranja Housing Area	F217	45	45	0	45	0	45	0
HTA	Homeless Trust Housing	F215	54	54	0	54	0	54	0
HSH	Homestead High School	F90	43	43	0	43	0	43	0
JPP	John Pennekamp Coral Reef State Park	D100	38	39	1	39	1	39	1
FK1	Florida Keys National Marine Sanctuary 1	A233	17	22	5	23	6	22	5
FK2	Florida Keys National Marine Sanctuary 2	D135	34	32	-2	32	-2	32	-2
<b>LAmax (dB)</b>									
BBP	Bill Baggs Cape Florida State Park	D131	70	70	0	70	0	70	0
ORX	Ocean Reef	D90,C1213	77	77	0	77	0	77	0
ACX	Angler's Club	D90,C1214	77	77	0	77	0	77	0
RFP	Redland Fruit and Spice Park	B125	74	74	0	74	0	74	0
HCC	Homestead Community College	F58,F75	71	71	0	71	0	71	0
KGX	Keys Gate	F71	97	97	0	97	0	97	0
FCH	Florida City City Hall	F38	72	72	0	72	0	72	0
CKL	Key Largo	B115,B134	69	69	0	69	0	69	0



Site Designation	Site Name	Proximate Grid Point	Proposed Action Flight Tracks	Flight Track Alt. 1	Alternative Change	Flight Track Alt. 2	Alternative Change	Flight Track Alt. 3	Alternative Change
NHA	Nursing Home	NHA	83	83	0	83	0	83	0
MH1	South Dade Center	F177,F178	107	107	0	107	0	107	0
NJA	Naranja Housing Area	F217	81	81	0	81	0	81	0
HTA	Homeless Trust Housing	F215	83	83	0	83	0	83	0
HSH	Homestead High School	F90	80	80	0	80	0	80	0
JPP	John Pennekamp Coral Reef State Park	D100	79	79	0	79	0	79	0
FK1	Florida Keys National Marine Sanctuary 1	A233	52	52	0	52	0	52	0
FK2	Florida Keys National Marine Sanctuary 2	D135	72	72	0	72	0	72	0
<b>TA (minutes)<sup>1,2</sup></b>									
BBP (55)	Bill Baggs Cape Florida State Park	D131	7	7	0	7	0	7	0
ORX (65)	Ocean Reef	D90,C1213	<1	<1	0	<1	0	<1	0
ACX (65)	Angler's Club	D90,C1214	<1	<1	0	<1	0	<1	0
RFP (65)	Redland Fruit and Spice Park	B125	<1	<1	0	<1	0	<1	0
HCC (65)	Homestead Community College	F58,F75	1	1	0	1	0	1	0
KGX (65)	Keys Gate	F71	5	5	0	5	0	5	0
FCH (65)	Florida City City Hall	F38	1	1	0	1	0	1	0
CKL (65)	Key Largo	B115,B134	0	0	0	0	0	0	0
NHA (65)	Nursing Home	F107	2	2	0	2	0	2	0
MH1 (65)	South Dade Center	F177,F178	217	217	0	217	0	217	0
NJA (65)	Naranja Housing Area	F217	6	6	0	6	0	6	0
HTA (65)	Homeless Trust Housing	F215	19	19	0	19	0	19	0
HSH (65)	Homestead High School	F90	2	2	0	2	0	2	0

Notes: <sup>1</sup> Time Above is indicated in minutes above levels shown in parentheses next to site designation.

<sup>2</sup> Time Above not calculated for John Pennekamp State Park or FKNMS.

### Possible Future Expansion

As difficult as it is to predict aircraft noise characteristics and airport operations far into the future, it is even more difficult to predict future air traffic control parameters that would enable reasonable assumptions to be made about the location of aircraft along flight paths in far future years. Technology is advancing at a truly rapid pace in this arena. The primary navigation system coming on line in the 21<sup>st</sup> century will be a Global Navigation Satellite System to replace the current ground-based navigation system. It will provide a quality of aircraft positioning information never before available and will permit greater precision in directing aircraft operations. A concept called “free flight” has been established as the key direction for evolution of the National Airspace System. Free flight is designed ultimately to permit aircraft to fly the most direct routes between takeoff and landing instead of having to fly routes structured around ground-based navigation systems. The uncertainties inherent in new technologies make quantitative predictions far into the future unreliable. They would be obsolete by the time the future years are approached.

Beyond the immediate airport environs, few changes would be anticipated in the early years of a second runway. Since the runways would be parallel and only 3,500 feet apart, the direction and general location of aircraft departures and arrivals would be the same as with one runway. Aircraft arrival noise would shift slightly to the southeast near the airport upon final approach. The grid point analysis performed for the maximum one-runway condition is also the best available prediction of noise effects over the national parks and refuges for the early years of a second runway. The total numbers of aircraft operations on flight tracks and types of aircraft would be expected to be approximately the same.

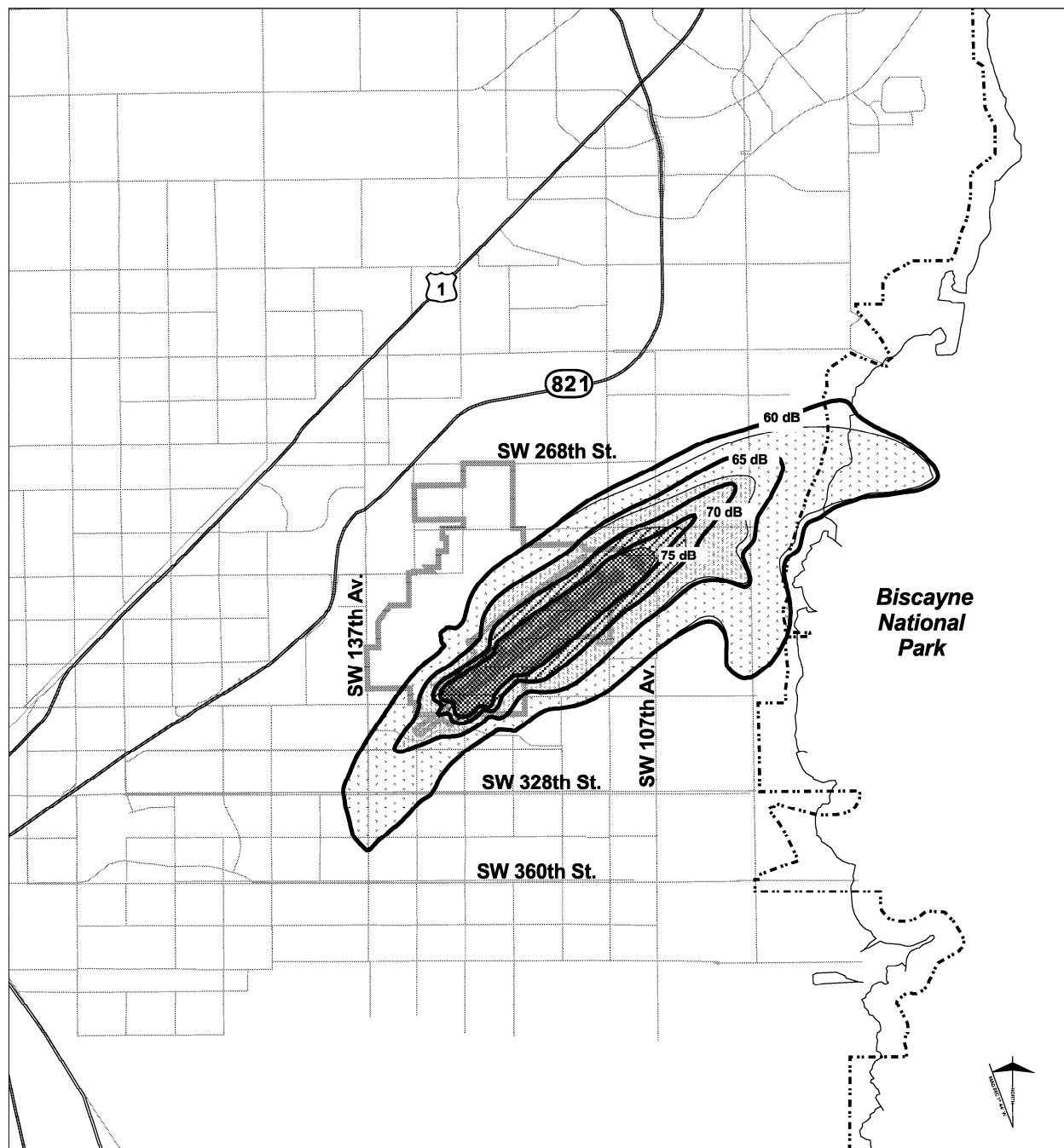
As aircraft activity grew on a two-runway system at HST, the assumption is that there would be increased numbers of aircraft flights over the national parks and refuges. Modifications to airspace in the area would be anticipated to handle additional traffic (not only for HST, but also for MIA and other airports), as well as to incorporate technological advances. Aircraft departure noise could assume a somewhat different pattern over Biscayne NP, with departures more balanced on two runways and a divergent departure from the southerly runway at times of simultaneous departures. Increases in numbers of aircraft arrivals can be assumed for the eastern portion of Everglades NP that would lie directly southwest of the centerlines of the runways. Any noise increases, either in TAamb or Leq(h), would be assumed to be related to increased numbers of aircraft operations and/or modifications to flight tracks, rather than to louder aircraft.

### 4.5.3 Commercial Spaceport Alternative

The Commercial Spaceport alternative would differ from the Proposed Action both in the character of the aircraft (launch vehicle) operating from Homestead, and in the number and frequency of operations. As a result, the effects on the surrounding communities and on the national parks and refuges would be different.

#### 4.5.3.1 Community Noise

**DNL Contours.** Figure 4.5-21 displays the modeled DNL contours at 60 dB and above for this alternative in 2005, compared to the projected baseline for the same year. As can be seen, the contours are computed to be virtually identical southwest of the northeast end of the runway. To the northeast of the airport, the Commercial Spaceport contours are larger, exhibiting increases of several decibels in some locations. The computed 75 dB contour of the Commercial Spaceport alternative extends beyond

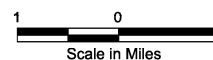


**LEGEND**

**60 dB Proposed Action DNL Contour**  
**Projected Baseline DNL**

- 60 - 65 db
- 65 - 70 db
- 70 - 75 db
- > 75 db

- Former Homestead AFB
- National Park Boundary
- Street
- U.S. Highway
- State Highway



Derived from:  
 Landrum & Brown 1999b

**Figure 4.5-21**  
**Comparison of Commercial Spaceport Alternative**  
**and Projected Baseline DNL Contours (2005)**

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the 70 dB baseline contour, and the 70 dB contour for the Commercial Spaceport alternative extends nearly to the 65 dB baseline contour. The 65 dB contour is shown to be larger than the baseline, but remains west of Biscayne NP.

By 2015, the Spaceport is projected to reach its full forecast activity level. **Figure 4.5-22** presents the DNL contours for 2015 (which is the same as full buildout). Land areas within the 60–65, 65–70, 70–75, and above 75 dB contours are estimated to be 4,103, 1,600, 812, and 890 acres, respectively. No schools would be located within the DNL 60 dB contour.

The increase in DNL levels under the Commercial Spaceport alternative would exceed that of the Proposed Action to the northeast of the airport. **Figure 4.5-23** indicates the areas that are projected to experience increases in DNL of 1.5 dB or more inside the 65 dB contour by 2005. A small area within the 60–65 dB contour is projected to experience increases of 3.0 dB or more. In both cases, the areas affected would be west of the Biscayne NP shoreline on lands that are currently largely undeveloped.

**Figure 4.5-24** shows areas projected to be exposed to DNL increases of 1.5 and 3.0 dB by 2015. The area projected to experience an increase of 1.5 dB within the 65 dB contour is larger than in 2005. To the northeast of the airport, two areas within the 60–65 dB contour are projected to experience increases of 3 dB or more. One area is shown to reach into the northwest portion of Biscayne NP near Black Point.

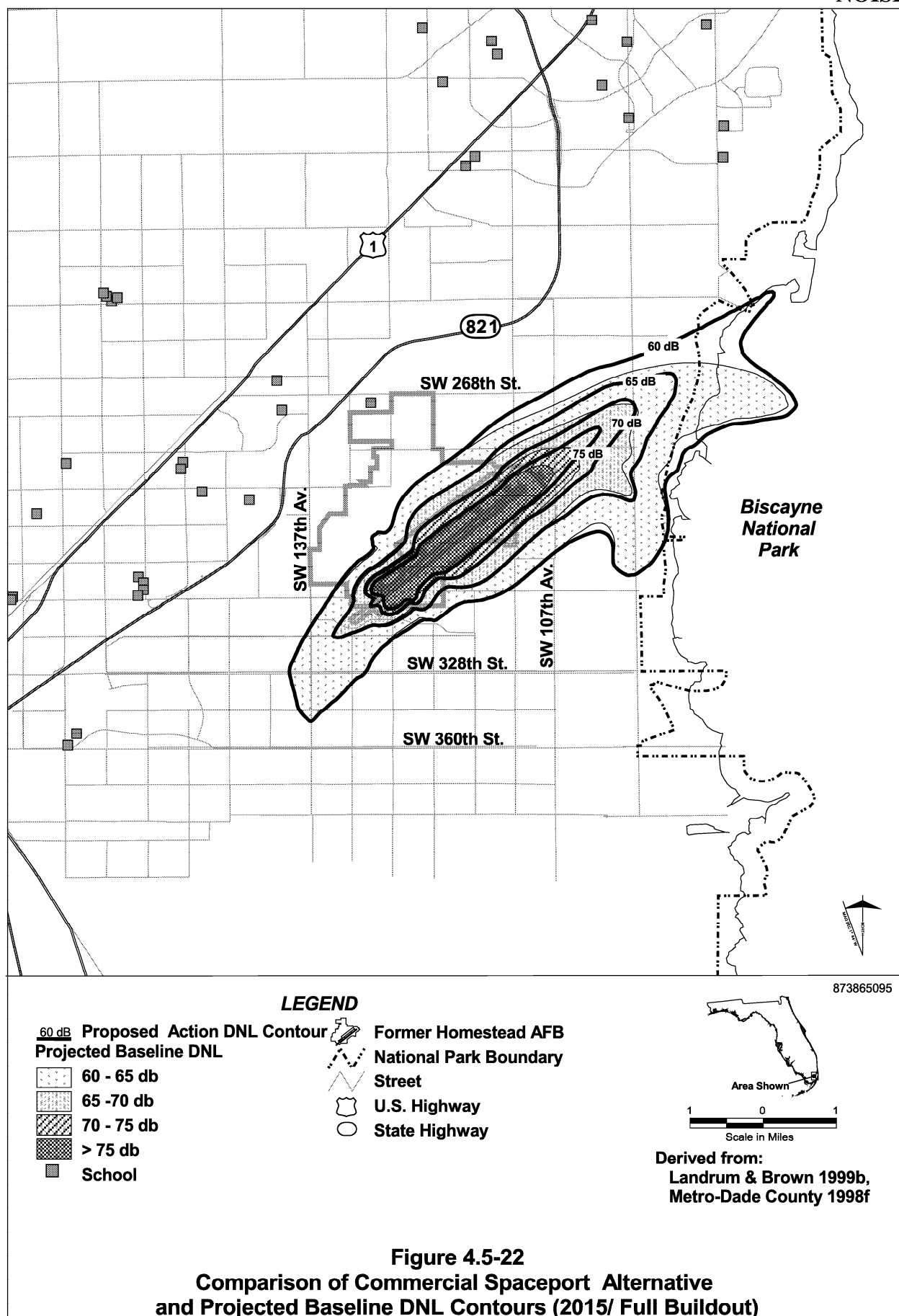
**Table 4.5-10** indicates the land area, number of dwelling units, and population that would be exposed to DNL 60 dB and higher under the Commercial Spaceport alternative as modeled for this analysis.

**SEL Contours.** SEL contours were modeled for two potential space vehicle configurations, the Astroliner towed by a Boeing 747 as proposed by Kelly Space and Technology, Inc., and the Aerospacecraft (ASC) proposed by Space Access LLC.

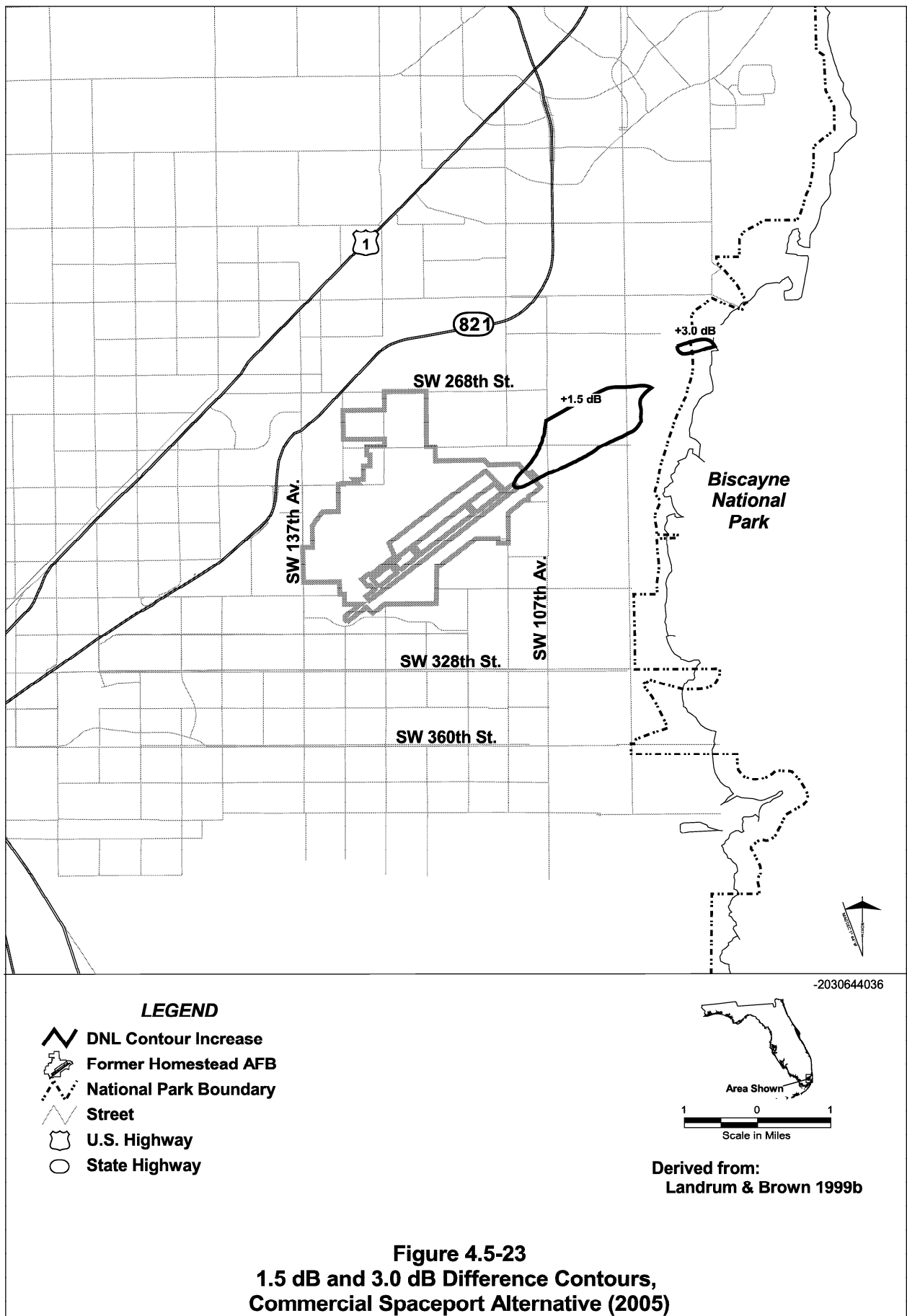
For this analysis, the Kelly Space and Technology system was represented by two Boeing 747 aircraft taking off simultaneously (or as if one Boeing 747 had eight engines), with two separate landings. **Figure 4.5-25** provides the SEL footprint for a dual takeoff and single landing of the Astroliner system. The departure pattern is long and narrow, reflecting a straight-out course, climbing very slowly. The 85 dB contour extends across Biscayne NP to Key Biscayne, where the aircraft are estimated to be at an altitude of about 7,000 feet. The 90 dB contour reaches about 45,000 feet into Biscayne NP, with the 95 and 100 dB contours extending just beyond the shoreline at Black Point. To the southwest, the 85 dB contour extends about 45,000 feet from the landing threshold, ending several miles east of Everglades NP.

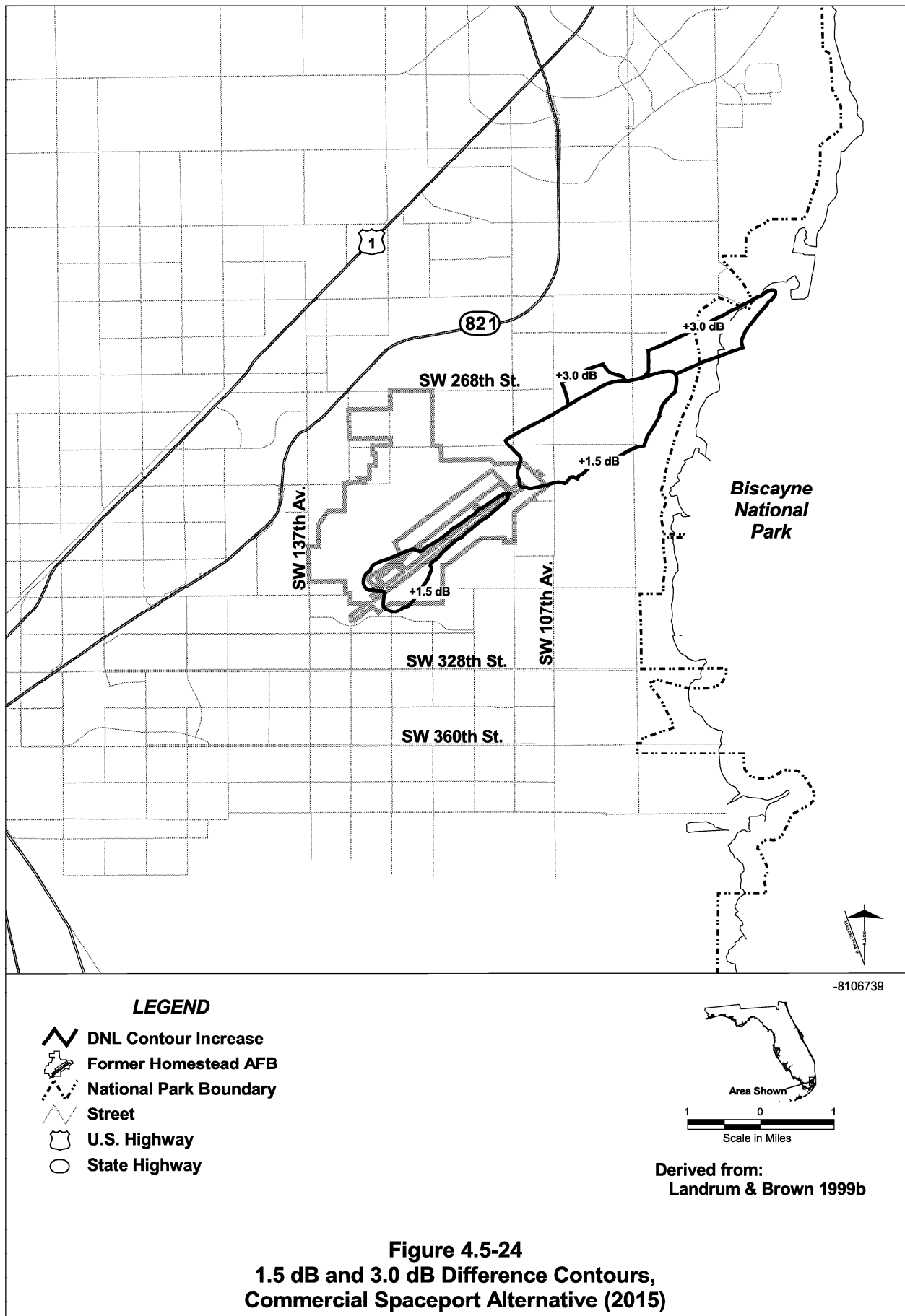
For the Space Access system, the Concorde aircraft was used for the noise analysis. It is the only readily available supersonic aircraft in the INM of comparable design to the ASC. Given the heavy weight anticipated for the ASC, the heaviest Concorde available in the INM was used for the noise computations. The ASC was assumed to depart under full power and return to the airport unpowered. For noise modeling purposes, this effectively equates to a takeoff without a landing. **Figure 4.5-26** displays the SEL footprint that would be expected for one departure operation of the ASC.

The SEL footprint is located almost entirely northeast of the airport. The 100 dB contour extends completely across the north half of Biscayne NP, reflecting the vehicle's slow ascent. It appears to start climbing more rapidly about 28 miles into flight, as indicated by the close spacing of the 85, 90, and 95 dB contours. The pattern is several miles wide along most of its length, reflecting the loudness of the aircraft.



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**Table 4.5-10. Dwelling Units and Population Within DNL Contours—Commercial Spaceport Alternative**

DNL Contour	Current Operations		Commercial Spaceport Alternative					
			2000		2005		2015/Full Buildout	
	Units	Pop	Units	Pop	Units	Pop	Units	Pop
<b>Existing Residents</b>								
60–65 dB	202	1,148	212	1,188	205	1,172	212	1,201
65–70 dB	95	656	95	656	99	663	100	664
70–75 dB	0	0	0	0	4	9	2	16
Above 75 dB	0	0	0	0	0	0	1	2
Total Above 60 dB	297	1,804	307	1,844	308	1,844	315	1,883
<b>Projected Growth<sup>1</sup></b>								
60–65 dB	NA	NA	234	1,243	254	1,291	312	1,463
65–70 dB	NA	NA	98	666	111	696	133	760
70–75 dB	NA	NA	0	0	7	16	19	51
Above 75 dB	NA	NA	0	0	0	0	3	7
Total Above 60 dB	NA	NA	332	1,909	372	2,003	467	2,281

Source: **Landrum & Brown 1999b.**Note: <sup>1</sup> Assumes growth in vicinity of HST is not controlled.

NA Not applicable

**Community Grid Point Analysis.** Table 4.5-11 presents modeled DNL, LA<sub>max</sub>, and TA<sub>amb</sub> levels for the 12 sample community grid points at full buildout of the Commercial Spaceport alternative, compared to current conditions.

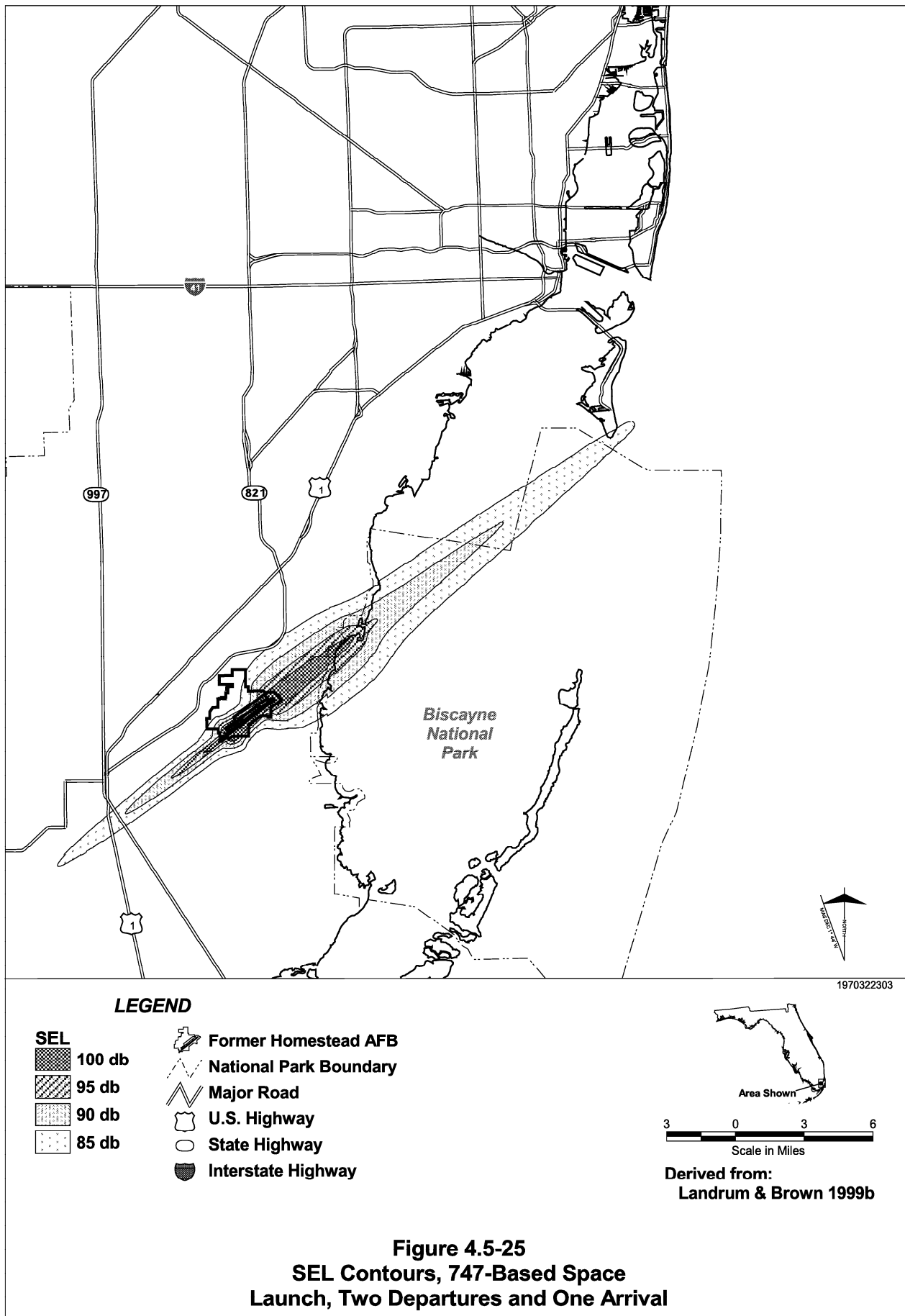
### Combined Commercial Spaceport/Airport

INM computer modeling was not performed separately for a combined Commercial Spaceport/Airport. This is because, as described in Section 2.3, the number of conventional civil aircraft operations that could be accommodated in this option is assumed to be limited. Little or no change in DNL would be expected due to the dominance of the military aircraft and space launch vehicles in the noise environment.

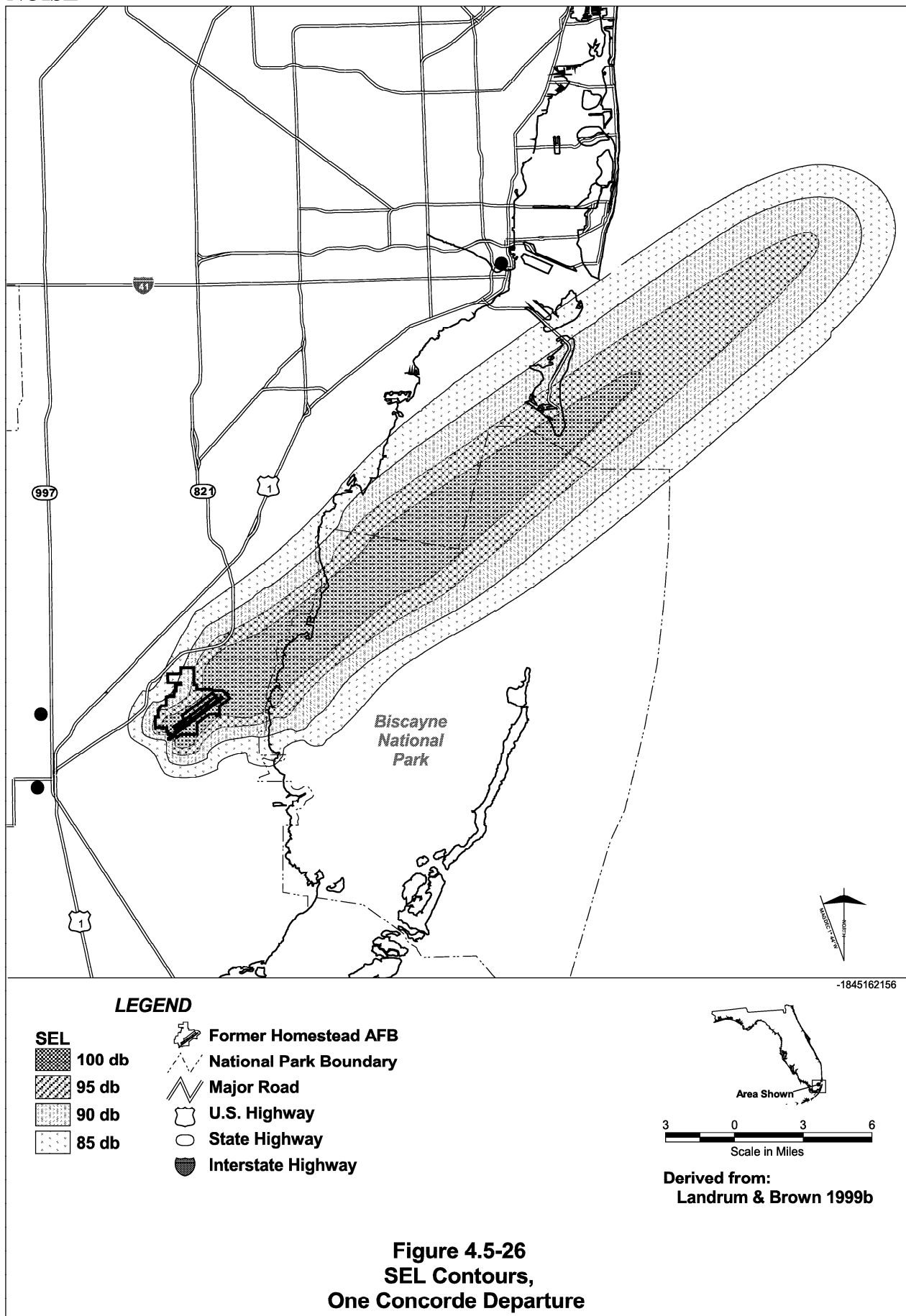
### Cumulative Impacts

Cumulative impacts involve the assessment of the effects of regional air traffic from other airports combined with HST air traffic. Within the DNL 60 dB contour for the Commercial Spaceport alternative in 2015, all DNL levels attributable to other airports in the region would be below DNL 50 dB. Cumulative effects would therefore be less than 1 dB.





# NOISE



**Table 4.5-11. Sample Community Noise Levels—Commercial Spaceport Alternative at Full Buildout**

Location	Map Designation <sup>1</sup>	DNL (dB)		LAmax (dB)		Time Above <sup>2</sup> (minutes)	
		Commercial Spaceport Alternative	Projected Baseline/ No Action	Commercial Spaceport Alternative	Projected Baseline/ No Action	Commercial Spaceport Alternative	Projected Baseline/ No Action
Miami-Dade County Community College—Homestead Campus	HCC	40	39	71	71	1	1
Keys Gate Community	KGX	43	43	97	97	2	2
South Dade Center	MH1	71	70	107	107	90	86
Naranja	NJA	47	45	82	78	6	5
Homeless Trust Center	HTA	56	54	89	83	17	16
Homestead High School	HSB	43	43	80	80	2	2
Nursing Home	NHA	44	44	83	90	2	2
Florida City City Hall	FCH	39	39	72	72	1	1
Redland	RFP	37	37	74	74	<1	<1
Ocean Reef Community	ORX	35	35	77	77	<1	<1
Angler's Club	ACX	35	35	77	77	<1	<1
Key Largo	CKL	23	23	69	69	0	0

Source: Landrum & Brown.

Notes: <sup>1</sup> See Figure 3.5-8.

<sup>2</sup> Time above DNL 65 dB.

<1 Less than 1

### Mitigation Measures

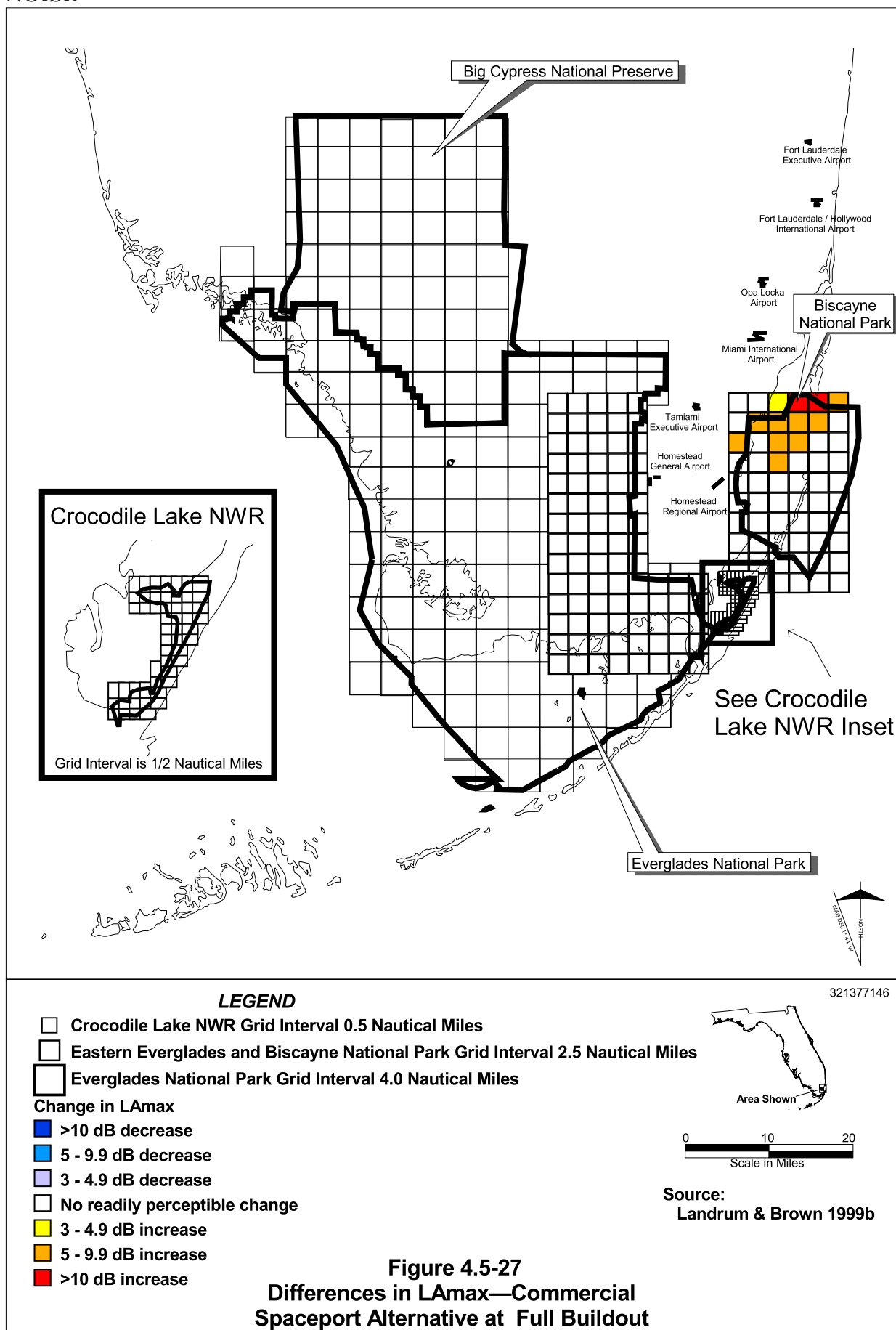
Because planning for this alternative is in the very early stages, mitigations in flight paths or airspace could not be identified. A more specific analysis would be prepared to support licensing requirements if this alternative were selected, and specific mitigation measures would be developed as part of the analysis.

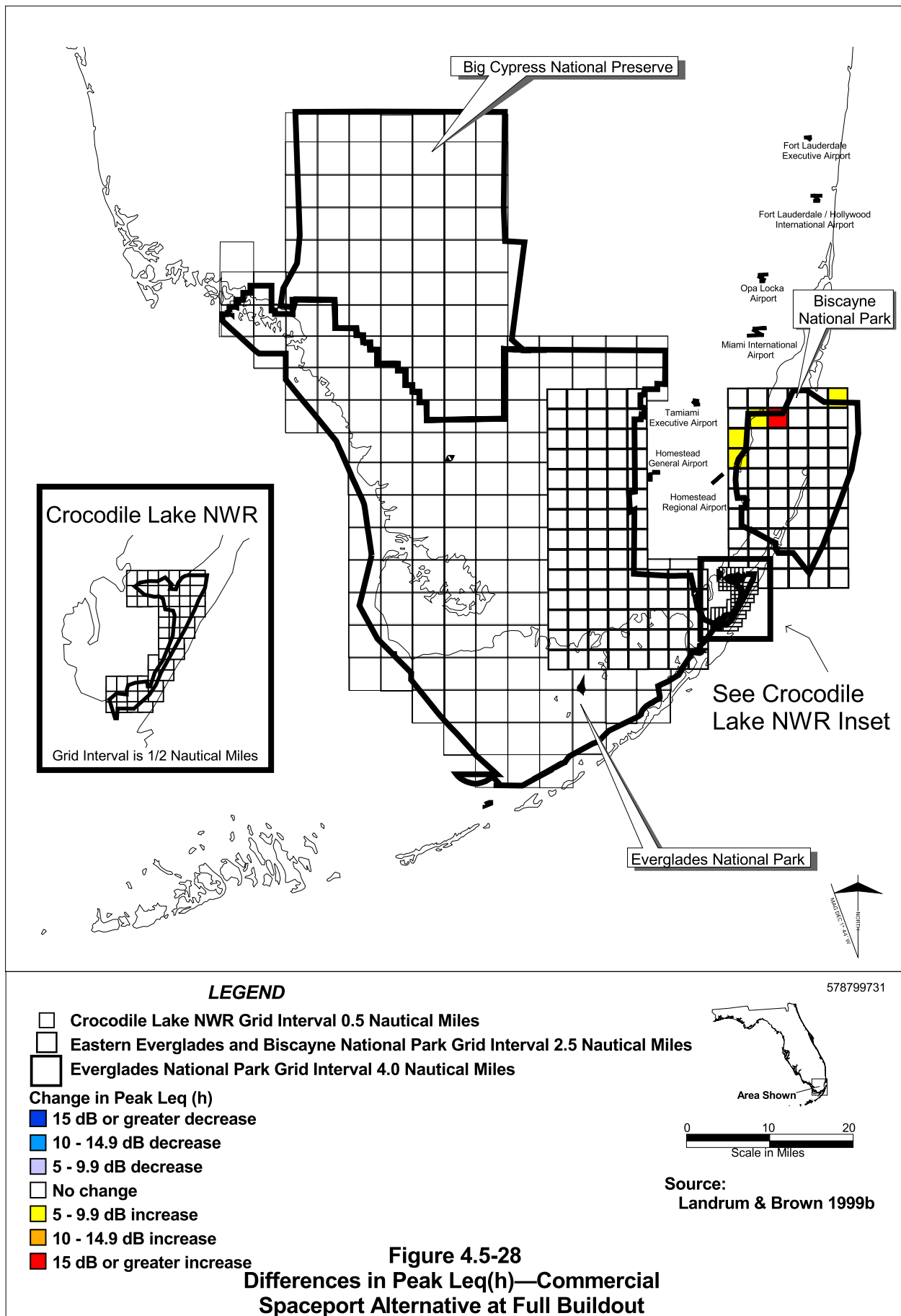
Residential areas exposed to DNL 65 dB and above could be evaluated to determine whether interior noise levels could be reduced through structural noise reduction measures. Relocation of residents could be considered in these areas, and land use restrictions could be adopted by Miami-Dade County to prohibit future residential development in high noise areas.

#### 4.5.3.2 National Parks and Refuges

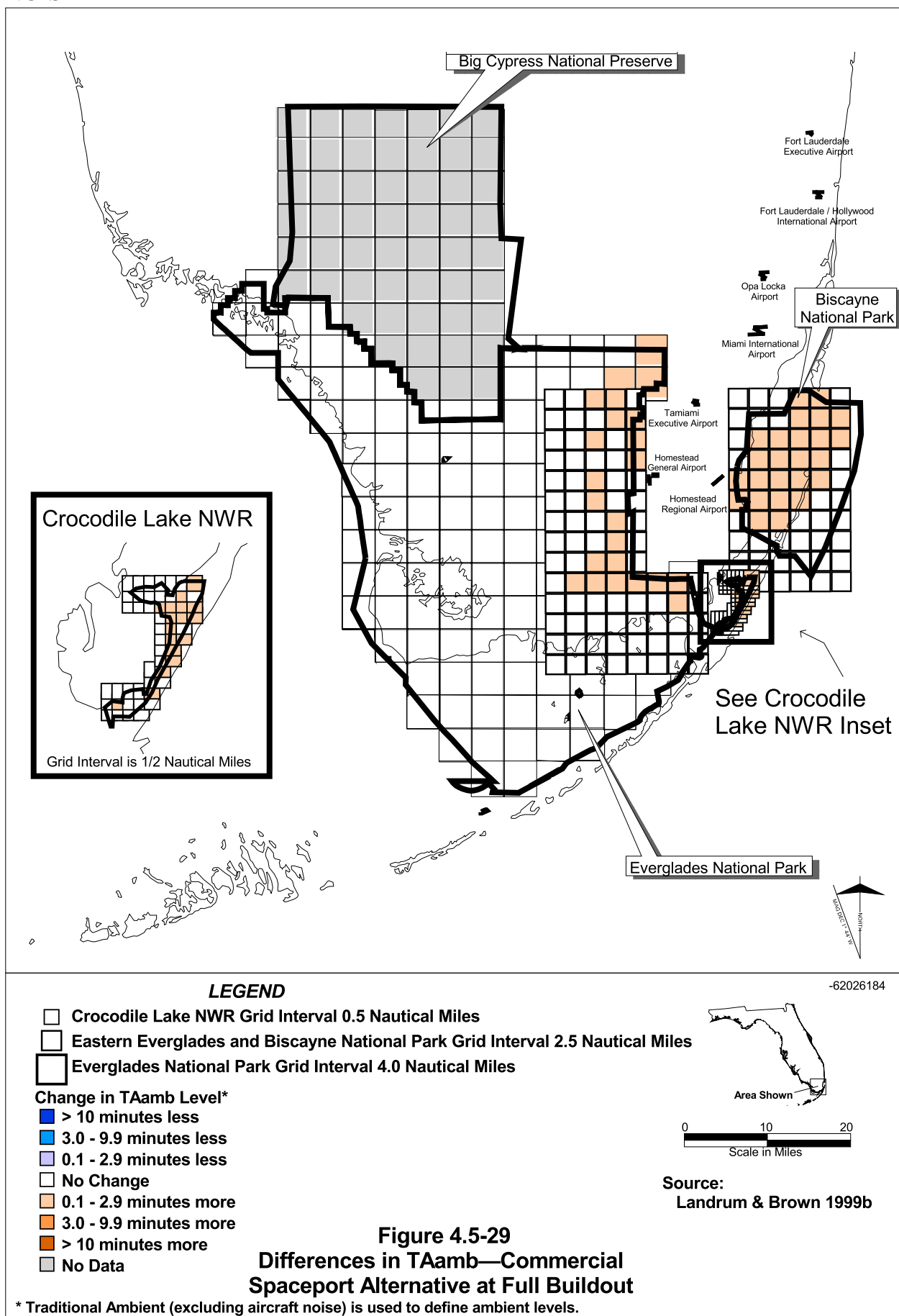
A full grid point assessment was conducted to ascertain the broad area effects of the Commercial Spaceport alternative. Detailed mapping and discussion are provided in the Technical Memorandum (Landrum & Brown 1999b). This section presents a summary of the findings based on the results computed for LAmax, Leq(h), and TAamb. For each metric, the same years are used as were reported for the Proposed Action to facilitate comparison. Changes in noise levels compared to the projected baseline are graphically depicted in **Figures 4.5-27, 4.5-28, and 4.5-29** for the LAmax, Leq(h), and TAamb metrics at full buildout (reached by 2015), respectively.

# NOISE





# NOISE



The only area computed to experience an increase in LA<sub>max</sub> of more than 5 dB by 2005 is the northwest side of Biscayne NP, where the space vehicle departures are projected. This would further intensify by 2015 and full buildout. Similarly, changes to the Leq(h) levels attributable to the implementation of the Commercial Spaceport alternative indicate an intensification of the peak hour noise level northeast of the airport. The Leq(h) is expected to increase by 5 dB or more at five points in 2015/full buildout (Figure 4.5-28). Because Leq(h) is a function of the average daily traffic level, the data may overpredict the peak hour noise level for this alternative, particularly if other operations have to be discontinued during departure and arrival periods. These data, then, are considered to be a worst-case estimate of the effect on Leq(h) of the Commercial Spaceport alternative. As shown in Figure 4.5-29, increases in the TA<sub>amb</sub> over the projected baseline would be expected to be concentrated in the immediate vicinity of the airfield and under the departure path. In all cases, the estimated increase in TA<sub>amb</sub> averages less than 3 minutes per day, accounting for the low number of forecast Spaceport operations.

### ***Florida Keys National Marine Sanctuary***

At the northern sample point examined in FKNMS, DNL in 2015 (same as full buildout) was modeled at 25 dB, which represents no change from the projected baseline. LA<sub>max</sub> would also remain the same as the projected baseline of 72 dB. At the southern sample point, DNL would remain the same as the projected baseline of 8 dB, and LA<sub>max</sub> would also remain the same at 30 dB. See Appendix E for more discussion of noise at these locations.

### ***State Parks***

DNL at John Pennekamp State Park for the Commercial Spaceport alternative in 2015/full buildout was modeled at 37 dB, which would represent no change from the projected baseline. LA<sub>max</sub> would also remain the same as the projected baseline at 79 dB. Bill Baggs Cape Florida State Park would experience an increase in DNL and LA<sub>max</sub>. DNL in 2015/full buildout was modeled at 48 dB, compared to a projected baseline of 42 dB. LA<sub>max</sub> would increase to 86 dB from a projected baseline of 70 dB. See Appendix E for more discussion of noise at these locations.

### **Combined Commercial Spaceport/Airport**

Adding limited conventional civil aviation to spaceport operations at Homestead could result in noise exposures from conventional civil aircraft operations similar to those reported for the Proposed Action in 2005 (see Section 4.5.2.2), because the maximum number of conventional operations would likely be limited by Spaceport operations at locations overflowed by both Spaceport and conventional operations, LA<sub>max</sub> could be expected to be dominated by launch vehicles, and TA<sub>amb</sub> would likely be higher than for the Spaceport without conventional civil operations.

### **Cumulative Impacts**

Cumulative impacts involve the assessment of the effects of regional air traffic from other airports combined with HST air traffic. The cumulative impacts of the Commercial Spaceport alternative would be smaller than for the Proposed Action, because the influence of space launch vehicles is assumed to be concentrated over a much smaller area aligned with Runway 5 departures. Along this flight path, the first 3 miles would be dominated by military aircraft operations, while at greater distances, they would become increasingly dominated by MIA traffic. In the extended over-water areas under the space launch vehicle flight path, the launch vehicles are estimated to be more than 10 dB above the noise levels associated with MIA traffic for the LA<sub>max</sub> and Leq(h) metrics, and cumulative effects would be less than 1 dB.

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The Commercial Spaceport alternative is estimated to contribute a maximum of 4.8 minutes over an average day to TAamb at point F-177 in 2015. Point F-177 is at the approach end of Runway 5 and would be influenced by launch vehicle run-ups and acceleration after brake release on takeoff. All other increases are estimated to be less than 3.5 minutes.

### **Mitigation Measures**

Because planning for this alternative is in the very early stages, no mitigation measures were identified. This would be performed as part of more detailed analyses for licensing.

#### **4.5.4 Mixed Use Alternative**

The Mixed Use alternative would not involve any additional civil aviation activity at former Homestead AFB. Noise effects from continued military and government operations would be the same as projected baseline conditions and same as the No Action alternative.

Although this reuse alternative would not include increased aircraft noise, the reuse developer or Miami-Dade County could voluntarily relocate the residents currently exposed to aircraft noise levels of DNL 65 dB and higher from military and government operations. The county could impose land use controls to prevent future development of residential and other incompatible land uses in areas that would continue to be exposed to these elevated noise levels.

#### **4.5.5 No Action Alternative**

Aviation noise levels under the No Action alternative would remain the same as projected for the baseline conditions.

#### **4.5.6 Independent Land Use Concepts**

None of the independent land use concepts would affect aviation noise levels.



## 4.6 LAND USE AND AESTHETICS

### 4.6.1 Introduction

This section describes the potential impacts of the Proposed Action and alternatives on land use and visual resources. Topics considered in this section include community land use, special use areas, agriculture, and aesthetics. The impact analysis focuses on:

- Compatibility of reuse construction and operations with existing land uses and visual resources.
- Consistency of land use development with the objectives of applicable land use plans, policies, and controls, including plans and policies for national parks, refuges, and preserves; state lands and parks; and local jurisdictions.
- Effects of secondary development on surrounding land uses.
- Effects of reuse-related activities on recreation, particularly on use and enjoyment of national and state parks in the ROI.
- Effects of reuse alternatives on conversion of agricultural lands to development.
- Impacts on sensitive visual resources in the ROI.

Miami-Dade County lies within the Florida Coastal Management Program. This program consists of 23 Florida Statutes administered by eleven state agencies and four water management districts. Each agency is required to ensure that federal activities comply with the specific statutes and authorities within its jurisdiction. The Florida Department of Community Affairs reviewed the Draft SEIS and notified the Air Force that, at this stage, the proposed transfer of former Homestead AFB is consistent with the enforceable policies included in the Florida Coastal Management Program (**Department of Community Affairs 2000**).

### 4.6.2 Community Land Use

This section discusses the impact of the Proposed Action and alternatives on existing land use, land ownership, and general plans and zoning, including southern Miami-Dade County, former Homestead AFB, and portions of Monroe County. This section also discusses a smaller, more focused area defined by the Transportation Analysis Districts (numbers 84, 85, 86, 87, and 88) adjacent to and including the former base (see Figure 3.5-1). Chapter 163 of the Florida Statute requires consistency between local plans, applicable regional plans, the State Comprehensive Plan, and all development regulations and orders.

#### 4.6.2.1 *Proposed Action*

**Miami-Dade County.** Under the Proposed Action, land use on the disposal property is expected to change from largely vacant land to primarily industrial and industrial-type (aviation support) uses, with some commercial uses. Miami-Dade County has prepared a master plan for HST, adopted an amendment to the CDMP, and developed an Airport Layout Plan for the aviation portion of the site. Should the Proposed Action be implemented, it is likely a specific plan and additional plan amendments would be developed by the county, and the existing plan would be superseded. Subsequent to transfer, the areas would be rezoned by Miami-Dade County prior to development.

On-site land uses would be mixed under the Proposed Action, as industrial and commercial development increased on the disposal property in areas adjacent to the previously conveyed property. Most land uses

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would be generally compatible, but the residential uses associated with the Homeless Trust Center could be exposed to noise and traffic from nearby industrial activities.

The dominant land use adjacent to the disposal property is agriculture. Most existing development occurs west and north of former Homestead AFB and along U.S. Highway 1 and includes residential, commercial, and industrial land uses. Development of the disposal property is not expected to affect agricultural lands, but secondary development related to the Proposed Action, including additional airport-related facilities and adjunct commercial and industrial businesses, could extend beyond the airport property. Secondary development could occur on both agricultural and unprotected vacant lands (as defined in the county Traffic Analysis Zones) in the surrounding area.

Commercial and industrial development would be expected to continue to expand initially in areas already designated for those uses. The CDMP anticipates that projected development can be accommodated within the UDB through 2005. The CDMP provides for the 2015 Urban Expansion Area for growth outside the UDB. Urban infrastructure and services could be planned for eventual extension into the UEA between 2005 and 2015. Any development outside the UEA must be consistent with the CDMP and applicable implementing ordinances. The growth forecasts accounted for in the CDMP would be adequate to accommodate the estimated off-site development projected as part of the Proposed Action, assuming a moderate level of baseline growth.

Residential development is located north and west of the former base and within the cities of Homestead and Florida City. New residential development attributable to increased employment associated with the Proposed Action is not anticipated to exceed the forecasts of the existing regional plans. Section 4.1.4.1 discusses estimated housing impacts of the Proposed Action. Residential uses in TADs adjacent to HST may experience more urbanization and mixed land uses as a result of off-site commercial development associated with the airport. There could also be a potential for incompatible land use adjacencies if industrial development expanded near residential areas.

In addition to potential impacts on land use patterns and plans, areas in the immediate vicinity of HST could be affected by a number of changes associated with development and operations of the former base property. During construction, properties adjacent to the construction areas would be temporarily exposed to increased noise and fugitive dust from construction traffic and activities. After construction is complete, increased industrial and commercial activity could be expected to generate additional traffic on local roads and increased noise associated with truck traffic and other heavy equipment in aviation support and industrial areas. As described in Section 4.2, vehicle traffic along certain roadways is projected to increase and could affect levels of service.

Noise from aircraft operations would also increase. Under the Proposed Action, the overall land area in the airport vicinity within the Day-Night Average Sound Level contours indicating significant noise exposure (DNL 65 dB and above) and moderate noise exposure (DNL 60–65 dB) would be expected to change very little from existing conditions. Currently, an estimated 6,458 acres is located within the DNL 60 dB contour. The total land area within the DNL 60 dB contour is calculated to increase by 262 acres by 2005, another 1,069 acres by 2015, and an additional 237 acres at maximum use of one runway. By maximum use, the total area exposed to DNL 60 dB and above is estimated to be 1,568 acres (24 percent) more than the projected baseline conditions (**Landrum & Brown 1999b**).

At most areas newly exposed to DNL 65 dB or higher, the increase would be less than 1.5 dB. An area within the 65 dB contour directly southwest of the runway, and out about a mile, could experience increases exceeding 1.5 dB (in DNL) by 2015 under the approach path to the runway (see Figure 4.5-6). Southwest of that is an area that extends for about another mile that would be exposed to DNL between 60 and 65 dB, and where the increase in noise level would be more than 3 dB (in DNL). These areas are

zoned as agricultural, recreational, commercial, and vacant unprotected lands. The land is currently mostly vacant, although the South Dade Center housing area is adjacent to the southwest boundary of the former base with an estimated 311 dwelling units. A portion of this housing area would be within the modeled DNL 65 dB contour and could be exposed to increases in DNLs of more than 1.5 dB.

**Monroe County.** The Proposed Action is not anticipated to have land use impacts on Monroe County. Flights would increase by an estimated 16 percent over portions of Monroe County. The increase in average noise levels is not expected to produce overall increases in community sensitivity to noise because of the altitude of the overflights and the low DNL exposure levels compared to existing conditions and normal community ambient noise levels. The Ocean Reef Communities and Angler's Club area could be exposed to relatively low DNLs from aircraft overflights of about 39–40 dB (compared to 35 dB currently), and the City of Key Largo could be exposed to DNL of 31 dB (compared to 22 dB currently) at maximum use of a single runway.

### **Cumulative Impacts**

The South Florida Ecosystem Restoration Project and the Central and Southern Florida Project Comprehensive Review Study could affect the way land is used and management plans are prepared. For example, as a result of the Florida Keys Carrying Capacity Study, adoption of new comprehensive plan goals and objectives may be necessary to protect the natural ecology of the south Florida and Florida Bay. In order to implement these objectives, zoning and land use regulations may change, thereby affecting growth and development.

The widening of U.S. Highway 1 would improve the level of service along that route. This improvement could provide more opportunities for commercial development along the highway corridor. The high level of population growth forecast by Miami-Dade County, if it occurred, would also increase the pressure for development. The combination of these pressures could promote a change from a primarily rural landscape to a more urbanized environment. Because so much of south Florida is protected from development, the increased development is likely to be concentrated in higher densities in unprotected areas, even more so if ecosystem restoration and Restudy initiatives are implemented and remove more land from development. The result could ultimately be a land use pattern characterized by highly urbanized areas and protected natural areas, with a loss of lower-density rural agricultural areas. The development of a commercial airport at former Homestead AFB could contribute to increased urbanization in the immediate vicinity of the airport, but if high-growth population forecasts are realized, the increased urbanization would occur with or without the Proposed Action.

### **Mitigation Measures**

There is a potential for noise from industrial development and vehicle traffic associated with the Proposed Action to affect the Homeless Trust Center. The airport developer could mitigate these effects by constructing landscape barriers to reduce noise and visual intrusions and by constructing major truck routes to avoid this area.

The concept of a land buffer between HST and Biscayne NP has been put forth by several entities. The effects of such a buffer on land use plans and policies would depend on how the buffer was implemented. Currently, the land within the area analyzed as a buffer by NPS is identified in the CDMP as agriculture and open land, and the establishment of a buffer would not be expected to change those land uses (potential effects on agriculture are discussed in more detail in Section 4.6.4). In fact, a buffer could assist in preserving these areas and protecting them from urban encroachment. As analyzed by NPS, however, the buffer would prohibit development in a portion of the UEA northeast of the base. That would

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eliminate some of the area currently identified for development and could increase development pressures and densities in areas within the current UDB.

Depending on the implementation details, the buffer could potentially interfere with some aspects of the proposed development of HST and its possible expansion in the future. Specifically, the extension of the Turnpike interchange at 112<sup>th</sup> Avenue would be in the UEA, and the area tentatively identified for a second runway is also within the buffer analyzed by NPS. More generally, the buffer could inhibit any expansion of the airport or associated secondary development to the south and east. Consequently, development would be concentrated north and west of the airport, in areas currently dominated by residential uses. Those areas could become more exposed to land use conflicts and potential incompatible adjacencies.

These potential incompatibilities could be mitigated in Miami-Dade County's planning process and land use controls. To avoid the potentially deleterious effects of uncontrolled secondary development in the vicinity of the airport, areas for this development could be specifically identified in the CDMP. Transportation routes to commercial and industrial areas could be planned and designed to minimize traffic through residential areas, and noise attenuation measures such as greenbelt buffers and, if necessary, noise barriers along major roadways could be implemented. Currently, the CDMP addresses development of HST primarily within the airport boundaries. To reduce potential adverse effects from secondary development, future CDMP amendments could take a broader, more comprehensive approach to the area surrounding the airport to better control and channel associated off-site development.

The noise abatement flight paths evaluated (see Figures 2.11-1 through 2.11-3) would not noticeably affect the areas around HST exposed to DNL 60 dB and above. DNL is not expected to change noticeably at Ocean Reef or the Angler's Club with any of the three noise abatement flight path alternatives. More discussion of these flight paths is contained in Section 4.5. Other potential mitigations to reduce aircraft noise are also described in Section 4.5.

### **Possible Future Expansion**

Future expansion of the airport to include a second runway would require acquisition of an estimated 1,060 acres of additional property to the south and east of the existing runway, outside the UDB. The expansion would require further amendments to the CDMP. In addition to the airport expansion itself, a larger airport with more service would likely stimulate further secondary development off site and increase traffic in the area. These activities could affect existing land uses near the airport.

#### **4.6.2.2      *Commercial Spaceport Alternative***

**Miami-Dade County.** The existing CDMP does not include a plan for developing former Homestead AFB as a Commercial Spaceport. If this alternative were implemented, such a plan would need to be prepared and used to support amendments to the CDMP and applicable implementing ordinances (e.g., zoning). On-site development under this alternative would be similar to the Proposed Action but less intensive. In particular, there is assumed to be less commercial development and associated traffic. The potential for land use conflicts between industrial and residential areas could be similar to the Proposed Action.

Under this alternative, the overall land area affected by high average noise levels is forecast to change little from the baseline. Some areas could be exposed to slightly higher DNLs than under the Proposed Action. The increase in total land area within the DNL 60 dB contour is calculated to increase by 435 acres (about 22 percent) by 2005 and then by another 512 acres by 2015/full buildout.

The land areas most affected by noise would be northeast of the base in currently agricultural, vacant, recreation, and national park lands. Areas where noise levels have been identified to increase 3 dB within the 60 dB contour and 1.5 dB over the 65 dB contour are currently either vacant or in agricultural use and are outside the UDB. A few isolated residents could experience changes in DNL exceeding 3 dB.

The TADs surrounding the former base could be expected to experience secondary development associated with the spaceport. The level of development is anticipated to be less than under the Proposed Action and would likely include more office and industrial type development and less retail commercial development. Vehicle traffic would be expected to be less without the passenger traffic associated with a commercial airport.

**Monroe County.** The Commercial Spaceport alternative would not be expected to affect land use in Monroe County. Spaceport operations are assumed to be oriented primarily to the northeast, not toward Monroe County. DNL at Ocean Reef and the Angler's Club, as well as at Key Largo, would remain essentially the same as current conditions.

### **Combined Commercial Spaceport/Airport**

A combined Commercial Spaceport/Airport would result in industrial and commercial development similar to but less intense than the Proposed Action. The CDMP would have to be amended to accommodate this development. Noise contours would not be appreciably different from those calculated for the spaceport without a civil airport component. Secondary development and vehicle traffic in the TADs adjacent to the spaceport/airport would likely be higher than projected for the spaceport alone, but unlikely to reach levels projected for the Proposed Action.

### **Cumulative Impacts**

The cumulative impacts under this alternative would be essentially the same as described for the Proposed Action.

### **Mitigation Measures**

Potential mitigation measures and their effects would be as described for the Proposed Action. The noise abatement flight paths would only be applicable to a combined Commercial Spaceport/Airport.

#### **4.6.2.3      *Mixed Use Alternative***

**Miami-Dade County.** The effects of this alternative on land use depend on how the alternative would be implemented and would differ among the Market-Driven development, the Collier-Hoover proposal, and the original Collier and Hoover plans. Any of these options would require amendments to the CDMP with associated amendments to the applicable implementing ordinances.

All four approaches to this alternative are assumed to include some type of residential use on former base property. The residential emphasis would be generally compatible with some of the activities on the previously conveyed property, including the Job Corps and Homeless Trust Centers. The potential for incompatible land use adjacencies would still exist with commercial and industrial development and existing military uses.

The Collier-Hoover proposal would include three primary activity areas. At the northwestern end of the disposal property would be a luxury RV park interspersed with a golf course. These residential and recreational uses would be adjacent to existing residential areas and would be generally compatible with

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those land uses. If the RV park generated high levels of traffic and noise, it could adversely affect adjacent housing areas.

The second main area would be the commercial hub in the center of the site. This area would include the aquarium and other principal visitor attractions. It would be adjacent to the Homeless Trust Center and the Job Corps Training Center. As a major visitor attraction, the commercial hub would have the potential to generate large amounts of traffic and associated noise that could affect adjacent land uses. The Collier-Hoover proposal includes plans to limit personal vehicle traffic to peripheral parking lots and use electric vehicles to move visitors within the site. This combined with landscaping would reduce the potential for noise and traffic impacts and increase the safety of residents at the Homeless Trust Center.

The third main activity area of the Collier-Hoover proposal is a commercial/industrial area interspersed with golf courses and waterways and landscaping. This area is envisioned as an office-industrial park type setting. The adjacent land uses would include the airfield, Homestead ARS, and other previously conveyed industrial and institutional properties. The land uses proposed in the Collier-Hoover plan would be compatible with those activities.

The Collier-Hoover proposal currently includes plans to develop a golf course on a portion of the property previously conveyed to Miami-Dade County for a regional park. The plan includes offsetting adjacent acreage that the proponent proposes to exchange for that property. If the exchange is accomplished, the regional park should be able to be developed for public use as planned.

The original Collier proposal would provide for lower planned density, involve fewer daily vehicular trips, and place an overall emphasis on recreational and commercial land uses. It is expected to include some office and industrial development and an RV park, but no permanent residential development. If the RV park generated high levels of traffic and noise, it could affect adjacent housing areas. CDMP amendments would be required for this proposal and may include provisions to reduce potential adverse effects on adjacent land uses.

The original Hoover plan includes research and education facilities, which would be generally compatible with the projected residential land uses in the northern portion of the disposal property and previously conveyed areas like the Homeless Trust Center. High visitor use assumed in connection with this scenario could be expected to increase vehicle traffic through areas adjacent to the site, and could adversely affect adjacent residential areas.

Under this alternative, the aircraft-related noise levels and the land areas affected would not change from the baseline conditions.

**Monroe County.** The Mixed Use Alternative would not be expected to affect land use in Monroe County.

### **Cumulative Impacts**

The cumulative impacts of the Mixed Use alternative in combination with other projects and developments in the ROI would be similar to those described for the Proposed Action. The contribution of reuse of the disposal property to cumulative growth and development would be less than with the Proposed Action.

### **Mitigation Measures**

Potential mitigation measures and their effects would be as described for the Proposed Action. In particular, the developers of the Collier-Hoover plan could include measures in their final design to

reduce potential noise and safety impacts from high visitor traffic on the Homeless Trust Center through traffic separation and landscaping. The noise abatement flight paths would not apply to this alternative.

#### **4.6.2.4      *No Action Alternative***

The No Action alternative assumes that the Air Force would retain ownership of all of the disposal property (1,632 acres). The airfield, 915 acres, would continue to be used for military and other government aircraft operations. The remaining 717 acres of disposal property would be maintained in caretaker status. The land use on this property would remain primarily vacant open lands. No impacts on the surrounding land uses are anticipated. Aircraft-related noise levels would remain the same as the baseline conditions.

#### **4.6.2.5      *Independent Land Use Concepts***

The independent land use concepts are similar to land uses associated with the Proposed Action and other reuse alternatives. Implementation of one or more of the independent land use concepts would not be expected to impact existing land uses.

### **4.6.3          *Special Use Areas***

Southern Florida attracts visitors drawn to its unique natural resources. Biscayne NP, Everglades NP, Big Cypress National Preserve, and Florida Keys National Marine Sanctuary are located within a few hours' drive of one another. These areas provide a variety of recreation experiences (hiking, nature-watching, boating, snorkeling, scuba diving, fishing, etc.) in a unique natural setting. The Proposed Action and alternatives may affect these areas and their visitors through population growth and aircraft overflights.

The potential for reuse of former Homestead AFB to affect the natural resources of these areas, which lie at the heart of their preservation values and attraction to visitors, is discussed in Sections 4.8 (Air Quality), 4.10 (Water Resources), and 4.11 (Biological Resources). The discussion in this Land Use section focuses on the relationship of the Proposed Action and alternatives to the plans and policies established for these areas, and on potential impacts on park visitor experiences.

#### **4.6.3.1      *Proposed Action***

Construction associated with the Proposed Action is not expected to directly affect Biscayne NP, Everglades NP, Big Cypress National Preserve, Florida Keys National Marine Sanctuary, Crocodile Lake National Wildlife Refuge, John Pennekamp State Park, or Bill Baggs Cape Florida State Park. Encroachment on those areas is discouraged in the Miami-Dade County CDMP, which provides for future growth within the UDB and UEA. The Save Our Rivers program and the county's EEL program, which focus on preserving environmentally sensitive areas, also contribute to the protection of sensitive resources areas.

While there may be some increased pressures on recreational resources in the ROI from population immigration stimulated by the Proposed Action, particularly locally popular areas such as John Pennekamp State Park, Section 4.1 indicates that population increases attributable to the Proposed Action are not expected to be a substantial contributor to regional population growth. The aspects of the Proposed Action with the most potential for affecting special use areas in the ROI are related to aircraft operations.

Limited research exists that specifically addresses impacts of aircraft overflights on visitors to national parks and recreation areas. In 1987, Public Law 100-91 directed NPS and the U.S. Forest Service to conduct studies of aircraft overflights that might be affecting visitors of national parks and National

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Forest System wilderness areas, and to report the results to Congress. The *Report on Effects of Aircraft Overflights on the National Park System* (NPS 1995) and the *Potential Impacts of Aircraft Overflights of National Forest System Wildernesses* (USFS 1992) are among the only large-scale studies in which a concerted effort has been made to apply quantitative methods to the problems of measuring outdoor recreationists' reactions to aircraft noise exposure in wilderness-type environments, including national parks.

The NPS report identified problems associated with aircraft overflights over particular parks and distinguished between impacts caused by sightseeing aircraft, military aircraft, commercial aviation, general aviation, and other forms of aviation that affect those parks. Reactions varied widely among individuals, depending upon their expectations and the context in which the event occurred. The study found that aircraft overflights produce impacts on national park resources and visitors. These impacts are not uniform throughout the national park system and depend on the air traffic a specific park is exposed to and on the local park management objectives.

NPS-sponsored studies supporting the report to Congress suggested that visitors to national parks have different expectations and tolerances for intrusions during their visits than they would in other areas, including the places they live. Respondents to NPS visitor surveys ranked enjoyment of natural quiet and viewing natural scenery as equally important reasons for visiting some national parks. NPS has also expressed the belief that adverse reactions to noise intrusions occur at lower sound levels in park settings than in residential or recreation areas around airports (Fidell 1997).

Information contained in the NPS study (NPS 1995) indicated that the vast majority of park visitors enjoyed and were satisfied with their outdoor recreational experiences. About a fifth of all park visitors recalled hearing airplane noise (including visitors to parks with frequent low-altitude commercial air tour flights). Two to 3 percent of visitors thought aircraft noise had an impact on them, and less than 2 percent of visitors believed that aircraft noise interfered with enjoyment of their visits or was annoying. Among park visitors who expressed annoyance of any degree, most reported they were slightly or moderately annoyed. The study also found that duration of aircraft overflights can affect a visitor's experience in a natural area. The longer the visibility or sound of the aircraft, the greater the potential for the visitor to be annoyed.

NPS surmised that negative reactions to aircraft noise would be stronger among people who spend more time in isolated areas, such as wilderness areas, and may have different expectations about solitude. When questioned by mail after their park visits, about a third of wilderness permit holders recalled some annoyance or intrusion from aircraft noise during their outdoor recreation experiences.

The major emphasis of the USFS study (USFS 1992) was to determine the effects of aircraft overflights on visitor enjoyment in remote wilderness areas. Wilderness visitors were interviewed during and shortly after their wilderness visits to assess the impact from exposure to aircraft overflights while using wilderness areas. This approach was used instead of conducting a more general poll of public opinion about a hypothetical question of whether aircraft overflights are compatible with the wilderness experience. Some key findings of the study included the following:

- Aircraft noise intrusions did not appreciably impair the surveyed wilderness users' overall enjoyment of their visits to wilderness areas or reduce their reported likelihood of repeat visits.
- The majority of the users interviewed were not annoyed by overflights. The visitors, in general, did not notice aircraft even when they were present. This was especially true for high-altitude aircraft. Low-altitude, high-speed aircraft were reported as the most annoying type of aircraft heard or seen. This was attributed to the "startle effect" that occurs when a very loud noise (e.g., low-altitude jet



aircraft) is experienced in a setting where it is not expected (e.g., a wilderness area) and when there is no visual or audible warning of the noise source.<sup>1</sup>

- Annoyance associated with aircraft overflights was more strongly related to noise exposure than to the visibility of the aircraft or the condensation trail. Aircraft were rarely noticed unless accompanied by noise.

Different settings were used for the study to account for the many different landscapes comprising wilderness areas. Respondents were also exposed to a number of different types of aircraft. For example, those interviewed in the Golden Trout Wilderness were susceptible to overflights by military aircraft flying during the day and at night at very low altitudes producing sound exposure levels above 100 dB.

More respondents reported that they did not notice any aircraft at all during their wilderness visits than reported noticing any particular type of aircraft. The aircraft noticed most often were high-altitude jet aircraft. About 10 to 13 percent of the respondents reported noticing both helicopters and low flying jets during their wilderness visits.

USFS believes that aircraft noise is becoming more intrusive and distracting from the recreation visit. Reports to National Forest System field units from visitors indicated an increase in incidents of intrusion from tourism flights on the solitude and quality of visits to wilderness and other scenic and recreation areas (USFS 1992).

The most recent research on noise effects on parks visitors has been conducted by FAA and NPS at Bryce Canyon National Park. In *Development of Noise Dose/Response Relationships for the National Parks Overflight Rule: Bryce Canyon National Park Study* (July 1998), it was found that a correlation existed between aircraft noise levels and the percentage of park visitors that were annoyed (Fleming et al. 1998).

In that study, the primary subject was aircraft operated for sightseeing and tours, as opposed to commercial airport traffic. The sites examined were considered to be “front country” trails, meaning that they were used by relatively high volumes of visitors for short hikes of one hour or less.

The FAA and NPS are in the process of conducting joint research to establish noise standards for assessing aircraft noise over national parks to support Public Law 100-91. FAA’s *National Park Overflights Rule Noise Research Plan* of February 1998 (FAA 1998b) provides a description of the proposed research elements and how they will lead to noise standards and assessment criteria. The research plan calls for additional research regarding dose-response relationships at “backcountry” sites, but it has not yet been completed.

All of the studies described above involved specific geographic areas and conditions. Conditions and expectations could be expected to differ in Biscayne and Everglades NPs. No systematic visitor surveys dealing with noise have been conducted at either park. The following paragraphs provide some general observations that could apply to visitors in these types of areas.

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<sup>1</sup> The startle effect often occurs in canyon regions or thickly forested areas where a low-flying jet may not be heard until it suddenly appears directly overhead. In primitive wilderness areas, where visitors experience quiet periods, the startle effect can decrease the wilderness experience by disturbing the tranquility and solitude of the outdoor setting. On open plateaus, where vegetation is low and visibility is uninterrupted, the visual effects of low-flying aircraft may also impair the sense of solitude and naturalness for individuals seeking a primitive recreation experience. However, the intrusions from any single overflight are transitory and would not necessarily impair the overall opportunity for a visitor to find solitude.

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When aircraft fly over outdoor recreational areas within large parcels of airspace, the experience of aircraft noise during a typical visit can take the following form:

- For any given visit to an area where noise from other recreation visitors, cars, wildlife, etc., is common, visitors would be less likely to notice aircraft noise, particularly if it is far enough away as to be only slightly audible, even in areas with low natural noise levels. Within the national park areas, this would be expected to include high-use areas and visitor centers.
- For a visit to more remote areas with high visitor use, noise from distant aircraft operations may be noticeable to outdoor recreationists when they are not hiking, talking, or making any other noises themselves. Factors that could be expected to affect visitor annoyance in these areas would be aircraft altitude, distance, noise level, and frequency of overflight.
- For visitors in outstanding natural areas and primitive areas, noise from aircraft operating within a few miles, although not particularly loud, may intrude to some degree on enjoyment of solitude and natural quiet.
- For visitors in outstanding natural areas and primitive areas, aircraft flying directly overhead at low altitudes could be considered invasive. On such occasions, a visitor would hear a very loud noise for a short period of time. This noise would probably be annoying and may be startling as well.

Perceptions and reactions can vary greatly from individual to individual, depending upon expectations and the context in which the event occurs.

Independent of visitor expectations and reactions, the natural soundscape of a national park is a resource that NPS is mandated to preserve. Any increase in noise is considered by NPS as incompatible with goals to preserve and enhance the natural soundscape. Increased aircraft noise generated by the Proposed Action could be expected to have a diminishing effect on the natural soundscape. It would complicate NPS initiatives to manage the natural soundscape and could either frustrate some goals or require greater reductions in other noise sources to achieve those goals.

The highest noise effects would be expected in areas closest to approach and departure tracks to and from HST, especially where aircraft would be at lower altitudes. This might occur in certain areas of Biscayne NP and the eastern edge of Everglades NP. Areas underlying airspace where aircraft would not regularly concentrate would probably experience fewer effects. Such conditions would be expected in areas of Everglades NP farthest from HST and in Big Cypress National Preserve where flight activity would be at higher altitudes.

The FAA's approach to impact analyses involving noise focuses on the effects of aircraft noise on people (i.e., visitors) and wildlife. In the absence of identifiable adverse impacts on these receptors, FAA does not identify and cannot quantify an impairment of park resources. FAA's view is that noise does not produce an effect apart from human and animal hearing and reactions, and that it does not linger in the environment as a permanent impact or impairment.

The following sections discuss anticipated noise levels from aircraft overflights for the Proposed Action at a few key locations within the special use areas in the ROI. More detailed information on noise levels throughout these areas is provided in Section 4.5. Section 4.11 specifically discusses noise effects on wildlife within these areas.

To provide a sense of the effect of individual operations, seven locations were selected to provide more detailed descriptive information on aircraft overflights and noise levels: five in Biscayne NP, one in Everglades NP, and one in Crocodile Lake NWR. **Table 4.6-1** provides information on average daily operations (in 2015), estimated altitude, slant distance, and SEL for the five largest user groups of flight tracks from HST passing over the points examined: the F-16 military fighter, MD-80 narrow-body passenger jet, turboprop passenger aircraft (e.g., Dash-8, ATR-42), BEC-58 multi-engine general aviation aircraft, and single-engine general aviation aircraft. No other aircraft is projected to have an average of more than 12 operations per day in the vicinity of any location, and most others would have less than three average daily operations. The points are shown by their letter designators on Figure 3.5-4. The year 2015 was selected because it is within a foreseeable time frame with a reasonable probability of occurring. Maximum use has considerable uncertainty, especially with respect to timing.

***Biscayne National Park.*** Table 2.2-6 shows forecast average daily numbers of jet and propeller aircraft operations by flight track for each year analyzed. By 2015, approximately half of all operations would be expected to fly over some portion of Biscayne NP. Most operations would be in east flow, with an estimated 137 departures per day over Biscayne NP in 2015. The proposed east flow departure tracks include routes directly east, southeast, and northeast over Biscayne NP, Crocodile Lake NWR, and a portion of Florida Keys National Marine Sanctuary. In addition, aircraft headed northwest and southwest would loop to the south around the western shoreline of Biscayne NP.

The five noise point locations examined in Biscayne NP cover the expanse of the park from east to west and north to south. They include the Visitor Center at Convoy Point, Mangrove Key in the southwest portion of the park, Elliot Key on the eastern shore of Biscayne Bay, Soldier Key at the northern end of the park, and Pacific Reef at the eastern edge of the park.

An average of approximately 105 operations per day are estimated to use flight tracks that would pass in the vicinity of the Biscayne NP Visitor Center in 2015. The most operations are projected to be flown by general aviation aircraft. The most common large commercial jet is expected to be the MD-80, with an estimated 19 average daily operations. As Table 4.6-1 shows, the altitudes of these aircraft in this area would likely range from about 900 to over 6,000 feet. Estimated slant distances would range from 1,300 feet to more than 18,000 feet away (slant distance is the straight-line distance between the aircraft and the ground, considering both altitude and side distance). The loudest aircraft would continue to be the F-16. The MD-80 would be the loudest commercial aircraft. It would be at similar distances from the Visitor Center as the F-16. It is also projected to have the highest number of operations. General aviation aircraft could represent about a third of total operations in this area. They generate lower individual noise levels than larger commercial aircraft, but because they tend to fly at lower altitudes, the resulting SELs on the ground can be similar.

SEL levels calculated at Mangrove Key are slightly lower overall than at the Visitor Center, reflecting increasing altitudes at the greater distances. At an average of 65 per day, the number of operations is also projected to be less. A larger percentage of aircraft forecast to fly over this area are general aviation aircraft.

Elliot Key is forecast to experience the highest number of aircraft events of the seven locations analyzed, with an estimated total daily average of 232 in 2015. The wide range of slant distances shown in Table 4.6-1 indicates that aircraft on a number of flight tracks at various distances from the point would be heard at Elliot Key. Turboprop aircraft are shown to be the dominant aircraft type, followed by single-engine general aviation aircraft. The F-16 is still projected to be the loudest aircraft heard in this location, with lower SELs for civil aircraft reflecting their generally higher altitudes.

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**Table 4.6-1. Select Aircraft Overflight Data for Sample Points (2015)**

Location <sup>1</sup>	Aircraft				
	F-16	MD-80	Turboprop	BEC-58	GA
<b>Biscayne NP Visitor Center (Point MG)</b>					
Average Daily Operations	15	19	13	13	20
Altitude (feet)	1,500–6,400	1,700–5,000	3,700–5,000	900–3,800	900–3,700
Slant Distance (feet)	3100–18,400	3,400–18,300	4,100–8,900	1,300–10,500	1,300–4,400
SEL (dB)	75.0–103.6	68.8–86.7	64.3–71.3	65.7–79.5	68.0–75.3
<b>Mangrove Key (Point MH)</b>					
Average Daily Operations	11	13	5	10	18
Altitude (feet)	2,000–5,200	5,000–5,700	5,000–5,400	900–5,000	900
Slant Distance (feet)	3,500–10,800	5,200–7,100	5,300–6,300	4,200–5,300	4,200
SEL (dB)	70.3–103.1	72.2–81.0	68.1–73.0	70.0–72.1	65.8
<b>Elliot Key (Point MI)</b>					
Average Daily Operations	16	32	64	26	46
Altitude (feet)	2,000–6,600	3,900–7,100	3,000–7,000	900–11,300	900–5,000
Slant Distance (feet)	3,200–52,000	7,000–48,000	7,000–48,000	7,900–37,400	7,900–55,800
SEL (dB)	49.6–76.5	43.6–65.2	41.3–67.8	43.9–66.8	45.6–58.8
<b>Soldier Key (Point ML)</b>					
Average Daily Operations	15	26	43	21	30
Altitude (feet)	1,200–15,000	3,000–26,400	3,000–9,000	900–7,000	900–5,700
Slant Distance (feet)	4,200–82,400	7,500–69,700	7,000–74,300	4,900–79,800	4,700–72,600
SEL (dB)	43.9–72.4	44.6–67.1	38.9–68.4	38.7–72.0	35.3–65.5
<b>Pacific Reef (Point ME)</b>					
Average Daily Operations	13	23	45	16	28
Altitude (feet)	4,000–6,800	6,000–14,800	3,000–10,900	900–7,000	900–5,000
Slant Distance (feet)	5,000–60,700	6,000–70,500	6,000–65,200	4,000–70,500	4,000–49,400
SEL (dB)	52.0–71.8	44.8–69.7	45.0–68.4	45.3–70.1	40.3–62.4
<b>Hidden Lake, Everglades NP (Point MR)</b>					
Average Daily Operations	6	18	25	17	17
Altitude (feet)	1,500–9,000	3,900–20,300	2,600–4,500	3000	3000
Slant Distance (feet)	14,000–54,900	4,300–65,000	4,300–34,000	3,000–14,800	3,000–12,500
SEL (dB)	47.3–57.5	49.4–65.8	47.7–71.0	56.5–74.1	53.5–67.1
<b>Hardwood Hammock (Point MW)</b>					
Average Daily Operations	13	16	28	14	27
Altitude (feet)	4,000–8,000	8,100–11,700	4,000–11,800	4,000–7,400	4,000–10,800
Slant Distance (feet)	5,600–40,600	11,800–48,100	10,000–45,300	9,600–31,700	7,900–26,200
SEL (dB)	43.1–83.9	52.7–75.0	46.5–65.6	48.5–66.2	44.5–68.2

Source: SAIC, Landrum & Brown.

Note: <sup>1</sup> See Figure 3.5-4.

dB decibel

GA General Aviation (single-engine)

SEL Sound Exposure Level

The range of slant distances and SELs for Soldier Key is even larger than shown for Elliot Key, again indicating that aircraft on various flight tracks and at various distances would be heard at this location. Total average daily operations are estimated to be somewhat less (165). The distribution of operations by aircraft type is similar to Elliot Key, as is the range of SEL levels.

The total number of average daily operations (153) and range of altitudes, distances, and SELs forecast for Pacific Reef are similar to those for Soldier Key.

Other noise metrics for these locations, including Maximum Sound Level, Peak Hour Equivalent Sound Level, and Time Above traditional ambient levels are provided in Section 4.5 (see Tables 4.5-5, 4.5-6, and 4.5-7).

Visitors at Biscayne NP would be exposed to more aircraft events under the Proposed Action. It is surmised that visitors in power boats would be less likely to notice aircraft noise over their own motors. In the northern area of the park where bone fishing is popular, as well as in the southern, more remote areas, the overflights might be considered intrusive by visitors. In these areas, the natural ambient sounds made by wildlife and lapping waves would be more prevalent.

Biscayne NP is preparing a Soundscape Preservation and Noise Management Plan. Increased noise from aircraft associated with the Proposed Action could make it more difficult for the park to accomplish the goals it sets forth in the plan, especially efforts to reduce noise intrusions and return to a more natural sound environment.

***Everglades National Park.*** As shown in Table 4.6-1, overflight and SEL data were calculated for five aircraft types that are forecast to represent the main users of flight tracks overflying Everglades NP. These data are provided for point MR, located at Hidden Lake on the eastern boundary of the park. Aircraft that may be heard from this location could be traveling on a number of flight tracks at various distances from the point. As Table 4.6-1 shows, at this location, the loudest events are not expected to be associated with military aircraft. That is because the flight tracks used by military aircraft do not pass near this point. The flight tracks forecast to be used by the commercial passenger aircraft would be closer, as reflected in the higher SELs shown for the MD-80 and turboprops. A forecasted 100 average daily operation may be heard from this location.

At Everglades NP, the wilderness, primitive, and outstanding natural areas would also see an increase in aircraft overflights under the Proposed Action. Visitors to these areas could experience a decrease in solitude, thereby affecting that aspect of their recreation experience. For those visitors seeking a wilderness experience, the overflights may or may not be perceived as annoying and incompatible with the surrounding area. One view of a wilderness experience is that any reminder of civilization or society, however slight or brief, can completely nullify the experience for an entire wilderness visit. In this absolute sense, reminders of civilization that eliminate the experience of solitude could include encountering other visitors at trailheads, hearing sounds or seeing tracks generated by other outdoor recreationists within the wilderness, finding fire rings or other signs of prior campsite use, seeing signs of trail maintenance or constructed stream crossings, as well as hearing an overflying aircraft or even seeing a high-altitude aircraft condensation trail. In this case, solitude and naturalness are important aspects of a wilderness experience, and it is likely that such an expectation would be compromised by any non-indigenous noise exposure.

Conversely, a wilderness experience is not necessarily limited to a single facet or interpretation, but rather a range of expectations. Individuals with their own personal perceptions may recognize or classify activities as wilderness experiences simply as a function of location (e.g., areas outside traditional urban settings) or according to the type and nature of the activity (e.g., activities undertaken for recreation or

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social events by individuals or groups). Solitude or the total absence of civilization may be considered desirable but perhaps not practical in conjunction with many experiences. In these instances, non-indigenous noise exposure may not infringe upon wilderness experiences.

Any discussion of wilderness must distinguish between the management and protection of wilderness resources and character and the wilderness experience. There are directives to manage and preserve the wilderness. The wilderness experience on the other hand, is highly personal, it often varies based on expectations, and it is not limited to areas within the National Wilderness Preservation System. NPS responsibility is to preserve the wilderness character and wilderness resource so that the wilderness experience is intact, as well as to educate the visitor as to the nature of wilderness in order to help define the wilderness experience.

While there are no guidelines for use by NPS to evaluate impacts to wilderness resulting from external activities, there are guidelines under which NPS must judge its own proposals. In evaluating proposals having the potential to impact wilderness resources, NPS must take into consideration wilderness characteristics and values, including the primeval character and influence of the wilderness; the preservation of natural conditions (including the lack of human made noise); and assurances that there will be outstanding opportunities for solitude, that the public will be provided with a primitive and unconfined type of recreational experience, and that wilderness will be preserved and used in an unimpaired condition. The principle of non-degradation is applied to wilderness management, and the condition of a wilderness area is measured and assessed against its own unimpaired standard. Under this standard, increases in aircraft noise from the Proposed Action would be expected to degrade the wilderness resources. To date, no studies have been completed to quantify the effect of noise on wilderness characteristics.

Everglades NP has not planned a separate soundscape management plan but intends to address soundscape preservation in amendments to the park's General Management Plan. Depending on the goals incorporated in those amendments, the concerns of the Proposed Action could be similar to those at Biscayne NP.

***Crocodile Lake National Wildlife Refuge.*** Overflight and SEL data are provided for one point (Hardwood Hammock) in Crocodile Lake (see Table 4.6-1). A total of 124 average daily operations are forecast to pass over the area. Like the points examined in Biscayne NP, the highest SEL is for the F-16. The loudest civil aircraft shown is the MD-80. Commercial turboprop and general aviation aircraft dominate the number of operations and have similar SELs ranging from about 45 to 68 dB. Crocodile Lake NWR is not open to visitors.

***Big Cypress National Preserve.*** Noise levels over Big Cypress National Preserve would vary in relation to flight tracks. Noise levels would be similar to the western portion of Everglades NP in the areas closest to the flight tracks.

***Florida Keys National Marine Sanctuary.*** Two points were examined within FKNMS to provide information on a range of potential noise levels under the Proposed Action. One point is proximate to grid A233 on the noise grid analysis (see Figure 3.5-8) and the other is proximate to grid D135 (see Figure 3.5-11). L<sub>Amax</sub> levels at those points were calculated to range from 52 to 65 dB under the Proposed Action at maximum use of one runway. DNL levels were calculated at 17–34 dB, and Leq(h) at 19–37 dB. Whether calculated in DNL or Leq(h), cumulative noise exposure is projected to remain well below the estimated traditional ambient sound level. TA<sub>amb</sub> estimates indicate 0–3 minutes of increase on an average day. These levels are relatively low and not anticipated to impair use or management of the sanctuary.

**State Parks.** DNL and L<sub>A</sub>max were calculated for a point in John Pennekamp State Park and for Bill Baggs Cape Florida State Park under the Proposed Action at maximum use. DNL was modeled at 38 dB and L<sub>A</sub>max at 79 dB in John Pennekamp State Park. Peak Leq(h) is estimated at 42 dB at maximum use. Cumulative noise levels are projected to remain below the estimated average traditional ambient level. T<sub>A</sub>amb could increase by 4–7 minutes on an average day.

At Bill Baggs Cape Florida State Park, DNL was calculated at 42 dB and L<sub>A</sub>max at 70 dB. A peak Leq(h) increase from 41.5 to 41.8 dB would not be noticeable. Cumulative noise exposure from HST operations would remain below measured traditional ambient noise levels in nearby areas. Bill Baggs Cape Florida State Park is exposed to more noise from MIA than from current or projected operations at HST. It would experience no time above ambient due to the Proposed Action.

In summary, noise exposure from the Proposed Action, using any metric, is not anticipated to adversely affect the use or management of John Pennekamp or Bill Baggs State Parks.

**South Florida Water Management District Lands.** SFWMD owns lands between Everglades and Biscayne National Parks that provide a wildlife corridor between the two parks and offer a number of recreational opportunities. Development at former Homestead AFB is not anticipated to adversely affect these holdings. There would be increases in cumulative aircraft noise levels as evaluated in the Addendum to Appendix E and in Sections 4.5 and 4.14. L<sub>A</sub>max levels are not projected to change in these areas. In 2015, Leq(h) levels are projected to range from a low of 34.6 dB in the southwest corner of the Southern Glades to a high of 57.9 dB in the Model Lands Basin south of the former base. (The higher number represents a 0.1 dB change from the projected baseline.) DNL levels in 2015 are projected to range from a low of 31.3 dB to a high of 53.3 dB, at the same locations. (See the Addendum to Appendix E for more detailed discussion of SFWMD lands.) The potential for aircraft noise to affect the wildlife in these areas is addressed in Section 4.11.

Prescribed burning is an important land management tool in some of these areas, especially the Southern Glades Wildlife and Environmental Area. As noted in Section 4.4, it is not anticipated that the Proposed Action would interfere with this practice, although coordination between the proposed airport and SFWMD managers would probably be needed.

**Key Largo Hammocks State Botanical Site.** Development at former Homestead AFB would not be expected to adversely affect this site through construction or site operation because of its distance from the site. The area would be overflowed by civil aircraft. Minor increases in cumulative aircraft noise levels are evaluated in the Addendum to Appendix E and in Sections 4.5 and 4.14.

### **Cumulative Impacts**

The implementation of the L-31E Flowway Distribution Project, other ecosystem restoration and Restudy initiatives, and Miami-Dade County's proposed STDA would be expected to benefit both Biscayne and Everglades NPs. Direct benefits could include improved surface water distribution and indirect benefits could include protection of certain lands from development, especially in the area between HST and Biscayne NP. Additional development associated with the Proposed Action could dampen these benefits to a small degree.

Population increases would affect land use in the ROI independent of reuse of former Homestead AFB. If a high rate of growth occurred, the national parks in the area could experience increased encroachment by urbanization. Existing protections of wetlands and environmentally sensitive areas limit the potential for urbanization to completely overtake adjacent lands.

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The cumulative population growth in the ROI could result in increased visitation at local parks, preserves, and sanctuaries. This would increase pressures on the national and state parks to balance providing visitors with a quality recreation experience and preserving natural areas and habitats. With increased visitor pressures, this balance could shift toward fewer opportunities for wilderness experiences, increased visitor restrictions to preserve natural habitats, or, conversely, degradation of wildlife habitat and other natural resources. However, Biscayne NP and Everglades NP in particular attract visitors nationally and internationally, and it is not known to what extent local population increases would affect visitation to those parks. Section 4.1 indicates the Proposed Action's contribution to a high population growth would be relatively modest.

### **Mitigation Measures**

A buffer between HST and Biscayne NP would be expected to have a beneficial effect on the park by preventing encroachment from development, especially if growth in south Florida were as high as projected in the Miami-Dade County high-growth forecasts. A significant portion of the area that might be considered for a buffer is already protected through restrictions on development of wetlands and the Model Lands program. A consolidated buffer would prevent scattered infill in areas not already protected.

A description of potential noise abatement flight paths and their effects is included in Section 4.5.2.2.

### **Possible Future Expansion**

Future expansion of the airport to include a second runway would require acquisition of additional property to the south and east of the existing runway. While special use areas such as Biscayne and Everglades NPs have defined boundaries, increased urban encroachment could affect park resources. A second runway could exacerbate impacts from continued population growth. Potential noise effects from use of a second runway are discussed in Section 4.5.

#### **4.6.3.2      *Commercial Spaceport Alternative***

The impacts from direct and secondary development associated with the Commercial Spaceport alternative would be similar to the Proposed Action. The amount of secondary growth projected for this alternative is less, but the difference to special use areas would not be measurable. Indirect effects from noise would differ in some areas.

Most areas within Biscayne and Everglades NPs, Big Cypress National Preserve, Crocodile Lake NWR, John Pennekamp State Park, and SFWMD lands currently overflowed by military and other government aircraft operating from Homestead ARS would not experience any change in maximum sound levels or frequency of overflight. Changes in noise levels would be confined to areas directly under and near the flight paths of the commercial space vehicles, currently assumed to be primarily northeast of the runway. Unlike conventional commercial aircraft, the commercial space vehicles could be louder than the military aircraft, and the northernmost portion of Biscayne NP could experience an increase in maximum sound levels. As depicted in Figure 4.5-27, higher SELs from potential spacecraft could be expected to be concentrated in the northern portion of Biscayne NP. Bill Baggs Cape Florida State Park could experience SELs of over 100 dB during space vehicle operations, forecast to occur a few times per week at full buildout. Although noise levels could be louder in a narrow area, the frequency of events would be low and intermittent. Noise levels outside of Biscayne NP would be very similar to baseline conditions.



### **Combined Commercial Spaceport/Airport**

The airport component of a combined Commercial Spaceport/Airport would be similar to the Proposed Action. The impacts of aircraft overflights would be somewhat less in 2015 and at full buildout because the growth of the airport is expected to be constrained by the presence of the spaceport. Some visitors to the national parks could still expect to be disturbed, and the increased aircraft noise could make it more difficult for the parks to achieve their soundscape preservation and enhancement goals.

#### **Cumulative Impacts**

The cumulative impacts from the Commercial Spaceport alternatives in combination with other projects and developments in the ROI would be similar to those described for the Proposed Action.

#### **Mitigation Measures**

The discussion of mitigation measures under the Proposed Action would generally be applicable to the Commercial Spaceport alternative as well. The noise abatement flight paths would only apply to a combined Commercial Spaceport/Airport. No other mitigation measures have been identified for this alternative.

#### **4.6.3.3      *Mixed Use Alternative***

The Mixed Use alternative is not expected to noticeably affect special land use areas. Aircraft operations would remain the same as baseline, and secondary development is anticipated to be less than with the Proposed Action.

#### **Cumulative Impacts**

As noted for the Proposed Action, population growth and associated development in south Florida would affect land use in the ROI independent of the reuse of former Homestead AFB. The Mixed Use alternative is not anticipated to contribute measurably to cumulative impacts on special use areas as described above.

#### **Mitigation Measures**

A buffer between the former base and Biscayne NP would have the same beneficial effects under this alternative as described for the Proposed Action. The noise abatement flight paths would not apply to this alternative. No other mitigation measures have been identified for this alternative.

#### **4.6.3.4      *No Action Alternative***

Under the No Action alternative, the effects of former Homestead AFB would not change from baseline conditions. Cumulatively, high population growth in the region would have essentially the same overall effects as described for the reuse alternatives.

#### **4.6.3.5      *Independent Land Use Concepts***

It is not anticipated that the independent land use concepts uses would change the effects on special use areas described above for the reuse alternatives.

### 4.6.4 Agriculture

Agriculture is a land use of special interest to area residents. Miami-Dade County land use policies specifically address the preservation of agricultural lands. Agricultural lands in southern Miami-Dade County are superior for growing traditional and tropical vegetables, tree crops, and commercial ornamental horticulture. Impacts on agriculture were assessed according to whether the Proposed Action and alternatives could result in a reduction in agricultural lands.

#### 4.6.4.1 *Proposed Action*

On-site development at HST would not directly affect agricultural lands. Related off-site development could encroach into agricultural lands, especially within the UDB. Agricultural lands are not expected to be substantially affected by the first phase of development (2000–2005), although normal variations in agricultural use may occur in response to market conditions, weather-related changes, and other factors independent of the Proposed Action.

By 2015, secondary development associated with the Proposed Action could begin to have more of an effect on agriculture in the surrounding area. This development would be expected to occur first on lands closest to the airport, including areas along SW 288<sup>th</sup> Street and SW 112<sup>th</sup> Street. It is possible that development pressures would result in conversion of agricultural lands to residential, commercial, and industrial uses. Beyond the immediate vicinity of the airport, it is less likely that lands designated in the CDMP for preservation as agricultural would be affected.

The CDMP was amended in July 1998 to modify some aspects of the development of former Homestead AFB. The amendments included two items related to agricultural lands: a program to acquire land or development rights in agricultural areas east and southeast of the former base, and a commitment to maintain the UDB consistent with agreed-upon requirements of the area-wide land use and water management plan. In addition, the CDMP is already based on an aggressive growth forecast that exceeds the projections for the Proposed Action and is assumed, therefore, to be able to accommodate the additional growth without requiring changes in planned land uses, at least until 2015. Additional residential development may occur on agricultural lands where the current zoning permits one dwelling unit per 5 acres.

There is a risk of introduction of agricultural pests into southern Miami-Dade County by the importation of infected or infested agricultural material by passengers or in cargo entering HST. This could occur despite the best efforts of the U.S. Department of Agriculture and Florida Department of Agriculture and Consumer Services' passenger and cargo inspection services, primarily because it is extraordinarily difficult to effectively inspect all arriving passengers' luggage and all arriving containers of agricultural products. The recent introduction of the Medfly and citrus canker underscores the potential magnitude of the risk.

While Medfly and citrus canker are generally accepted as the two greatest threats because of apparently new infestations in the 1990s, the recent eradication of Medfly from Miami-Dade County indicates that citrus canker, which has infected a wider area since 1996, is apparently the more potentially damaging. The introduction of a new locus of infestation at HST would not be expected to increase the affected area, which already extends to the southern end of Miami-Dade County, but it could make it more difficult to eliminate this pest. Although Medfly was eliminated from primarily residential areas in Miami in the recent past, its establishment in the more rural, agricultural south county could increase the difficulty with which it can be eradicated and increase the risk of substantial economic damage to the agriculture industry.

### **Cumulative Impacts**

The implementation of the L-31E Flowway Redistribution Project and the STDA could affect agriculture both directly and indirectly. Direct effects could include removing agricultural lands from production in the areas used for the projects themselves. The STDA may be confined to lands currently owned by Miami-Dade County, in which case it would not affect agricultural use. The flowway redistribution project would eliminate any agricultural use of areas that would be inundated by sheet flow of stormwater runoff. Indirectly, the redistribution project, as well as other potential ecosystem restoration projects, is expected to raise the water table in the region, which could make some crops nonviable in certain areas.

Under the county's high-growth forecasts, the population of south Miami-Dade County could increase substantially over the baseline. If that occurred, the loss of agricultural lands through implementation of the Proposed Action and ecosystem restoration projects could be further exacerbated by a high level of population growth in the ROI. It is estimated this could result in development of almost 20,000 additional acres. The Proposed Action's contribution to this increased development would be about 10 percent.

It is estimated that there are about 31,000 acres of unprotected vacant land in all of south Miami-Dade County, 9,000 acres of which are within the UDB. This suggests that agricultural lands, especially those within the UDB, would likely be developed to accommodate some of the growth. There are an estimated 64,000 acres of agricultural land in the county south of Eureka Drive, about 10,000 of which are within the UDB. While it cannot be precisely determined how much of this land would be converted to development, it is reasonable to assume that, cumulatively, virtually all of the undeveloped land within the UDB will eventually be developed for residential, commercial, and industrial uses. Although development outside the UDB is currently restricted to residential uses at one residence per 5 acres, with increased population pressures, the UDB could be expected to expand, further exposing agricultural lands to development, unless incentives are implemented to increase density within urbanized areas of the UDB and inhibit expansion into agricultural areas.

### **Mitigation Measures**

A buffer between HST and Biscayne NP would be expected to incorporate land currently used for agricultural production. Miami-Dade County has estimated that the buffer area analyzed by NPS (see Figure 2.9-1) contains about 4,900 acres that have recently been used for agriculture (**Miami-Dade County 2000c**). The impact of this action on agricultural lands would depend on how the buffer was implemented. A strategy designed to maintain agricultural use would have less impact than one that removed lands from agricultural production (e.g., through direct purchase).

Purchase of development rights is one implementation mechanism that has been mentioned. This could help maintain agricultural use in some cases, most likely among tropical fruit and nursery farmers who have significant investments in infrastructure and multi-year crops. The benefit would be less for row-crop farmers, who have expressed concern about adverse effects of loss of development potential on their ability to obtain loans to support their enterprises. Such potentially adverse effects could be offset by accompanying the purchase of development rights with other incentives and supports to farmers to help ensure the continued economic viability of agriculture in south Florida. This could be addressed in the county's agriculture retention policies currently under development.

Transfer of development rights is another mechanism that has been discussed. This approach, if implemented judiciously, could benefit agriculture by providing incentives both to maintain agricultural lands and to increase densities in urbanized areas. Increased densities within the UDB would help reduce the demand for land to accommodate increased growth and development. It would, however, have the effect of reducing the rural character of areas around Homestead that are within the UDB.

### **Possible Future Expansion**

The possible future expansion of HST to add a second runway would involve removing existing agricultural lands from production for airport use. This would reduce the amount of agricultural land in southern Miami-Dade County to a minor degree. The entire area currently identified for the expansion is a little over 1,000 acres, which is less than 2 percent of the agricultural land in south Miami-Dade County.

#### **4.6.4.2      *Commercial Spaceport Alternative***

The impacts of the Commercial Spaceport alternative on agriculture would be similar to those described for the Proposed Action, although secondary development is expected to be somewhat less.

### **Combined Commercial Spaceport/Airport**

A combined Commercial Spaceport/Airport would result in off-site industrial and commercial development similar to but less intense than the Proposed Action. The potential consequences of pest introduction through HST would be the same as described for the Proposed Action. The risk of infestation would be lower, however, because the volume of passenger and cargo traffic from foreign lands would likely be substantially lower under this alternative than under the Proposed Action.

### **Cumulative Impacts**

Cumulative impacts with the Commercial Spaceport alternative would be essentially the same as described for the Proposed Action. Although population growth and development would be less under this alternative, the reuse of former Homestead AFB is expected to be a minor contributor to growth in south Florida under any alternative, if high-growth forecasts are realized.

### **Mitigation Measures**

The effects of the proposed buffer between former Homestead AFB and Biscayne NP would be the same under this alternative as under the Proposed Action. No other mitigation measures have been identified.

#### **4.6.4.3      *Mixed Use Alternative***

Secondary development associated with the Mixed Use alternative could affect agricultural lands by converting them to development. The impact would be less than estimated for the Proposed Action.

### **Cumulative Impacts**

The cumulative impacts of the Mixed Use alternative in combination with other projects and potential development in the ROI would be essentially the same as described for the Proposed Action. The contribution of reuse of former base property would be somewhat less under the Mixed Use alternative.

### **Mitigation Measures**

If a buffer between the former base and Biscayne NP were implemented with the Mixed Use alternative, the effects would be essentially the same as described for the Proposed Action. No other mitigation measures are identified.

#### **4.6.4.4      *No Action Alternative***

Under the No Action alternative, agriculture in the ROI would not be affected by reuse of former Homestead AFB, although other activities planned in the region, as well as general population growth and associated development, could continue to reduce the amount of agricultural lands.

#### **4.6.4.5      *Independent Land Use Concepts***

One of the independent land use concepts identified is a plant nursery. The northwest area of the former base would be the logical location for such a use because of its separation from more developed areas. This land use would not be expected to affect overall agricultural activity in the area except to slightly increase the amount of land in agricultural use in south Miami-Dade County. The other independent land use concepts, developed individually or collectively, would not affect agricultural land uses.

#### **4.6.5          *Aesthetics***

The primary potential sources of impacts on sensitive visual resources from reuse of former Homestead AFB are aircraft overflights during the day and at night and on-site lighting at night, especially from airport and major industrial activities.

##### **4.6.5.1      *Proposed Action***

The areas in the ROI most sensitive to aesthetics impacts are the national parks, preserves, and sanctuaries. Biscayne NP would experience the greatest effects because of its close proximity to former Homestead AFB. The airfield is located about 2 miles from the visitor's center at Biscayne NP. Boaters and other visitors can see the control tower from Biscayne Bay and would see commercial aircraft arriving and departing on a regular basis. Visitors seeking a quiet experience would be more likely to be affected than other boaters who might not hear the aircraft over the motor of the boat. Without the attention-getting effect of the accompanying sound, the aircraft would be less noticeable.

Commercial and military aircraft overflights are transitory in a landscape. The nature of the impact depends on the sensitivity of the resource affected, the distance from which the aircraft are viewed and heard, and the length of time they are visible and audible. Altitude relative to the viewer also plays a role in determining impacts from aircraft overflights. People's eyes are typically drawn to the horizon more than overhead, and they are therefore less likely to notice aircraft at higher altitudes. In areas of heavy forest, vegetation would screen most views of the passing aircraft. In open areas where vegetation is low and visibility uninterrupted, aircraft would be more visible. The environment, including whether it is open water (which tends to amplify sound) or heavily vegetated, (which tends to absorb sound) can also affect the aesthetic impact of noise from overflying aircraft.

The projected frequency of aircraft operations was reviewed to assess potential impacts on visual resources. Under the Proposed Action, aircraft operations from HST are estimated to increase from about 54 per day currently to a total of about 200 a day by 2005, 400 a day by 2015, and over 600 a day at maximum use of the one runway. Most operations would be in east flow. East flow departure tracks include routes directly east, southeast, and northeast over Biscayne NP.

Departures and arrivals over Biscayne NP are estimated to increase to 83 per day in 2005 and about 350 per day at maximum use (**Landrum & Brown 1999b**). These operations would be distributed across multiple flight tracks passing over different parts of the park. The number of departing aircraft flying directly east over Biscayne NP is projected to increase from about 4 per day by 2005 to about 50 per day with maximum operations. The number of aircraft headed southeast over the bay could increase from less

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then 3 per day in 2005 to 26 per day at maximum use. There could be an estimated increase from 1–2 aircraft per day in 2005 to 23–24 per day at maximum use along the flight track headed northeast over the bay. Aircraft headed northwest and southwest would also loop to the south around the western shoreline of Biscayne Bay.

The increase in flights per day could affect the scenic viewshed of the area. While some visitors may notice aircraft without the accompanying noise, most people's attention would likely be drawn skyward by the noise from aircraft operations. It is anticipated that departing commercial aircraft would be at altitudes above 1,500 feet as they entered the airspace over Biscayne NP and would exit the airspace at much higher altitudes. Arrivals would be at similar altitudes in reverse. This air traffic is projected to result in an increase in the time noise levels are above traditional ambient levels by less than 10 minutes per day in the eastern and central areas of Biscayne NP, between 10 and 30 minutes per day along the western shoreline, and between 1 and 2 hours per day in two areas of the park close to HST at maximum use of one runway under the Proposed Action. Therefore, visitors could expect to hear and see aircraft more frequently than they do currently.

During outdoor activities such as sailing, sea kayaking, nature viewing, and bone fishing, where the environmental setting is an important part of the experience, aircraft and the condensation trails could be perceived as intrusive. Except those who are indoors or underwater, visitors could regularly see aircraft as a part of their visit. That occurs currently because aircraft from various airports in the region fly over the park, but the frequency would increase with the Proposed Action.

HST would be about 2 miles from Biscayne NP at its closest location. The airfield is currently lit for military and government operations and there are other sources of lighting (e.g., industrial areas, commercial enterprises, and parking lots). The overall effect of additional on-site lighting on horizon views at night would likely be minimal. Lights from aircraft, particularly during the winter months, would be more readily seen and could affect visitors' enjoyment of night activities. The increase in aircraft overflight during hours of darkness would mean increased visibility of aircraft lights over certain areas of the parks, which may be perceived as intrusive by some park visitors and is regarded by NPS as a degradation of the night sky.

Most of Everglades NP and Big Cypress National Preserve are less likely to be affected because the aircraft overflights would be more dispersed and at higher altitudes over these areas. Big Cypress National Preserve in particular is forecast to experience relatively few overflights and at high altitudes. Aircraft overflights would be less noticeable in most of these areas. Exceptions would be along the eastern edge of Everglades NP and areas underlying approach paths that converged over the park. These areas could experience frequent overflights. The goal of the National Park Service is to preserve and enhance the natural soundscape and night sky at all national park properties, and any intrusion could be viewed as incompatible with NPS plans and policies.

Crocodile Lake National Wildlife Refuge is not open to visitors. Therefore, the Proposed Action would not be expected to affect visitor views at this location.

### **Cumulative Impacts**

Other projects and developments that could affect visual resources include the widening of U.S. Highway 1 and the potential for accelerated population growth under the high-growth forecasts. The ecosystem restoration initiatives would not affect the visual environment, although they could contribute to maintaining the existing natural and rural landscape in areas adjacent to the national parks.

The widening of U.S. Highway 1 would improve the level of service along the route. This could provide more opportunities for commercial development along portions of the highway corridor, although much of that area is unsuitable for development and currently protected. Therefore, this change is not expected to greatly affect the surrounding area, much of which is already commercially developed.

With population growth, the increase in residential, commercial, and industrial areas would cause the area to appear more developed and more urban. Most of the vacant unprotected lands could be expected to be developed. This type of development within the UDB is planned for within the CDMP. While the overall landscape would change from a rural to a more urbanized environment, no impacts on sensitive visual resources are expected. The Proposed Action would contribute marginally to this effect.

### **Mitigation Measures**

Noise abatement flight paths that avoid overflight of areas most sensitive to visual impacts would reduce the potential for adverse impacts. At the same time, areas underlying the noise abatement paths would be exposed to more aircraft lights. Implementation of a buffer zone could reduce the potential for visual intrusions to encroach on Biscayne NP.

The Miami-Dade County Aviation Department could consider the effects of increased lighting at HST, especially in vehicle parking areas, in the design of the airport to identify potential measures to reduce visibility from Biscayne NP.

### **Possible Future Expansion**

The development of a second runway at HST would increase overflights over visually sensitive areas of Biscayne and Everglades NPs. The number of overflights could nearly double. This increase would exacerbate impacts on visual resources. Effects at Big Cypress National Preserve and the western portions of Everglades NP would still likely be low due to the altitude of aircraft over those areas.

#### **4.6.5.2      *Commercial Spaceport Alternative***

Under this alternative, fewer visually sensitive areas would be affected by aircraft overflights than under the Proposed Action. The flight tracks for the commercial spacecraft are anticipated to be concentrated over the northern portion of Biscayne NP and to a lesser extent the southern portion of Everglades NP. The noise levels generated by departing space vehicles could be louder than conventional aircraft, drawing more attention. However, the frequency of overflight would be much less than under the Proposed Action.

### **Combined Commercial Spaceport/Airport**

A combined Commercial Spaceport/Airport could result in industrial and commercial development similar to but less intense than the Proposed Action. The flight tracks for conventional civil aircraft would be the same as under the Proposed Action. However, the number of overflights would be fewer and the opportunity for visual impacts would be less.

### **Cumulative Impacts**

Cumulative impacts with this alternative would be essentially the same as the Proposed Action except that anticipated population growth and development would be slightly less.

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### **Mitigation Measures**

No mitigation measures have been identified to reduce aesthetics effects from the Commercial Spaceport alternative.

#### **4.6.5.3      *Mixed Use Alternative***

The Mixed Use alternative is not expected to affect sensitive visual resources. Aircraft operations would remain the same as baseline; therefore, there would be no change in exposure to aircraft overflights at the national parks.

### **Cumulative Impacts**

Cumulative aesthetics impacts under this alternative would be about the same as under the Proposed Action. Population growth and development would be slightly less.

### **Mitigation Measures**

No mitigation measures are suggested to reduce effects of the Mixed Use alternative on aesthetics.

#### **4.6.5.4      *No Action Alternative***

The No Action alternative assumes that the Air Force would retain ownership of all remaining property and 717 acres of surplus property would be maintained in caretaker status. The surplus property would remain primarily vacant open land. Weeds and overgrown vegetation could prevail in the vacant areas without regular landscape maintenance. However, the overall impact on the visual environment would be minor. Aircraft operations at Homestead ARS would not change from baseline conditions. Areas of Biscayne NP, Everglades NP, and Big Cypress National Preserve would continue to be overflown by aircraft from Homestead ARS and other airports in the region, which are currently part of the visual environment.

#### **4.6.5.5      *Independent Land Use Concepts***

The independent land use concepts are generally similar to land uses contained in the Proposed Action and alternatives. These land uses would have no additional aesthetics impacts on sensitive resources.



## **4.7 HAZARDOUS MATERIALS, HAZARDOUS WASTE, AND PETROLEUM PRODUCTS**

This section addresses the potential impacts associated with hazardous materials and waste management and existing contaminated sites at former Homestead AFB. Hazardous materials, hazardous wastes, and IRP sites are discussed in this section.

### **4.7.1 Introduction**

Regulatory standards and guidelines have been applied in evaluating the potential impacts that may be caused by hazardous materials use and waste generation. The analysis considered the following:

- The potential for generation of 100 kg (or more) of hazardous waste or 1 kg (or more) of an acutely hazardous waste in a calendar month, resulting in increased regulatory requirements.
- The potential for a spill or release of a reportable quantity of a hazardous substance as defined by the USEPA in 40 CFR Part 302.
- Manufacturing, use, or storage of a compound that requires notification of the pertinent regulatory agency according to the Emergency Planning and Community Right-to-Know Act.
- Potential for exposure of the environment or public to any hazardous material and/or waste through release or disposal practices.

### **4.7.2 Hazardous Materials and Petroleum Products**

Hazardous materials and petroleum products would be used in varying amounts under the Proposed Action and each of the alternatives. Estimates of the amounts and types of hazardous materials and their potential impacts are described below.

#### **4.7.2.1 Proposed Action**

The types of hazardous materials likely to be used for activities within each land use under the Proposed Action are identified in **Table 4.7-1**. The hazardous materials used in the airfield and aviation support area would be similar to those used at Homestead ARS for aircraft fueling and ground equipment maintenance.

If the Proposed Action were implemented, the airport owner/operator and any other users would be responsible for management of their hazardous materials according to applicable regulations, chiefly, those of the Occupational Safety and Health Act (OSHA) (29 CFR). Each user would have to comply with SARA, Section 311, Title III, which requires that local communities be informed of the use of hazardous materials. The AFRC will continue to be responsible for the management of hazardous materials on the retained areas.

The Environmental Management Information System, the Air Force tracking system currently used for managing hazardous materials at Homestead ARS, will continue to be used by the military. The non-military users would need to institute their own hazardous materials management systems.

It is estimated that aircraft operations associated with the Proposed Action could increase hazardous material use an estimated fourfold over the projected baseline in 2005, eightfold in 2015, and twelvefold at full buildout based on aircraft operations. The additional use of hazardous materials would increase the number of hazardous material transports in the surrounding area. Spills that occurred during

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**Table 4.7-1. Hazardous Materials Use—Proposed Action**

Land Use	Operation Process	Hazardous Materials
Airfield	Aircraft refueling; use of runways, taxiways, airport terminal parking, administration offices, corporate and private aviation facilities, aircraft parking	Aviation fuels, propylene glycol, ethylene glycol, heating oils, pesticides
Aviation Support	Operations associated with aircraft maintenance and manufacturing, aeronautics research and development, air transportation-related industry and warehousing, law enforcement, airline maintenance, fire and emergency response services, other governmental administrative services	Fuels, solvents, paints, POL, hydraulic fluids, degreasers, corrosives, heavy metals, reactives, thinners, paints, glycols, ignitables, heating oils, plating chemicals, cyanides, laboratory chemicals, aerosols, pesticides
Industrial	Activities associated with light industry, research and development, warehousing, and manufacturing	Solvents, heavy metals, POL, corrosives, catalysts, aerosols, fuels, heating oils, ignitables, pesticides
Commercial	Activities associated with offices, light industry, research and development and higher value warehousing, retail, service industries, restaurants	Fuels, solvents, corrosives, POL, ignitables, heating oils, pesticides, dry cleaning chemicals
Recreation/Open Space	Maintenance of recreational facilities and grounds	Pesticides, fertilizers, chlorine, heating oils, paints, thinners, cleaners, solvents, aerosols, POL

Source: SAIC.

POL petroleum, oils, and lubricants

transportation would generally be contained with absorbents by the local fire department to prevent contaminants from reaching surrounding soils or the storm sewer. There could be some risk of soil or water contamination that would require clean up.

The handling of small volumes of hazardous materials (paints, solvents, and lubricants) poses the risk of spills and the potential for contamination of soils and surface or groundwater on the former base. Most of hazardous materials would likely be handled in less than five-gallon lots, so the potential for wide-spread contamination is limited should a spill occur. Small spills can usually be cleaned up quickly and relatively thoroughly without sophisticated equipment. By government regulation under OSHA, CAA, or RCRA, the use of large volumes of hazardous materials would generally be in buildings or spaces specifically designed to contain released materials and protect worker health. The potential for long-lasting contamination by large volumes of these materials would likely be small.

Fuels, on the other hand, are handled and stored in large volumes. By government regulation (40 CFR 112), facilities that handle large quantities of petroleum products are required to develop Spill Prevention, Control, and Countermeasure Plans. For large above-ground storage tanks, these plans must address controls such as berms enclosing an impervious area that would contain the entire volume of the tank were it to leak its entire contents. Contained liquids could then be pumped into tank trucks for relocation to on-site or off-site storage tanks. Leaks or catastrophic loss of fuel in tanks would generally have isolated localized impacts. Under certain circumstances, fire is possible when leaks occur, and with a large volume of spilled fuel, the fire could last several hours and emit substantial quantities of air pollutants. Off-site impacts of fires (smoke, elevated concentrations of air pollutants) are likely to be temporary, but they could also last several hours.

Spills are most likely to occur when the temporary connection between a tanker truck (or hydrant fueling system) and an aircraft fails during refueling. The result could be a small spray leak or the release of large amounts of fuel. Spray leaks would probably be much more frequent than large-volume leaks. These leaks would be most likely to occur at passenger gates, and the fuel would be released onto concrete. Cracked concrete would allow fuel to leak to the soil underneath, potentially contaminating groundwater as well. Most small-volume spills would probably evaporate within a relatively short period of time (within a few hours), but a residual could remain on the concrete and could be carried by stormwater runoff to the on-site canal system. Large-volume spills would most likely enter the canal system directly. See Section 4.10.1 for discussion of the fate of spilled fuels that enter the canal system.

Under extreme weather conditions (such as hurricanes), there is a potential for any aircraft that was not relocated to another airfield to be damaged in such a way that its fuel tanks would rupture, releasing all fuels on board. Such catastrophic releases would almost always be associated with very high seawater levels that could reach the base. See Section 4.11 for a discussion of the potential effects of such releases.

The Proposed Action could stimulate population in-migration in the surrounding area. This increased population could support additional service industries which use hazardous materials and petroleum products (e.g., gasoline stations, photography laboratories, and dry cleaners). Based on the current population-based densities of these service industries in Miami-Dade County, an estimate of the additional number of facilities that could exist in 2015 is shown in **Table 4.7-2**. The Proposed Action could also result in related secondary development outside the former base boundaries. Rental car maintenance and aviation support industries would be expected to use the most hazardous materials and petroleum products.

**Table 4.7-2. Estimated Additional Off-Site Industrial Facilities to Support  
Reuse-Related Population Increases (2015)**

Facility Type	Projected Baseline <sup>1</sup>	Alternative			
		Proposed Action <sup>2</sup>	Commercial Spaceport <sup>3</sup>	Mixed Use <sup>4</sup>	No Action
Automotive Service Centers	570	25	3–6	2–4	0
Photograph Lab	174	8	1–2	1	0
Paint Shops	102	5	0–1	0–1	0
Dry Cleaners	58	2	0–1	0	0
Print Shops	7	0	0	0	0
Metal Working Shops	1	0	0	0	0

Source: SAIC.

Notes: <sup>1</sup> Based on estimated population of 239,592 in south Miami-Dade County.

<sup>2</sup> Based on an estimated population in-migration of 10,597.

<sup>3</sup> Based on an estimated population in-migration between 1,153 (Commercial Spaceport) and 2,541 (combined Commercial Spaceport/Airport).

<sup>4</sup> Based on an estimated population in-migration between 1,023 (original Collier proposal) and 1,682 (original Hoover plan). Market-Driven development and Collier-Hoover proposal fall within this range.

### Cumulative Impacts

The high level of population growth forecast by Miami-Dade County could also lead to additional service industries that use hazardous materials and petroleum products (e.g., gasoline stations, photography laboratories, and dry cleaners). An estimate of the additional hazardous materials facilities that could exist

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in the southern part of the county in 2015 with the Proposed Action in combination with cumulative population growth is provided in **Table 4.7-3**.

**Table 4.7-3. Estimated Additional Industrial Facilities Associated With Cumulative Growth (2015)**

Facility Type	Projected Baseline <sup>1</sup>	Alternative			
		Proposed Action <sup>2</sup>	Commercial Spaceport <sup>3</sup>	Mixed Use <sup>4</sup>	No Action <sup>5</sup>
Automotive Service Centers	570	588	583-586	583-584	580
Photograph Lab	174	176	178-179	178	177
Paint Shops	102	105	104-105	104	104
Dry Cleaners	58	60	59	59	59
Print Shops	7	7	7	7	7
Metal Working Shops	1	1	1	0	1

Source: SAIC.

- Notes:
- <sup>1</sup> Based on moderate-growth population of 239,592 in south Miami-Dade County.
  - <sup>2</sup> Based on an estimated population in-migration of 3,156 in addition to high-growth population increase of 243,782 in south Miami-Dade County between 1995 and 2015.
  - <sup>3</sup> Based on an estimated population in-migration between 1,153 (Commercial Spaceport) and 2,541 (combined Commercial Spaceport/Airport) in addition to high-growth population increase.
  - <sup>4</sup> Based on an estimated population in-migration of between 1,023 (original Collier proposal) and 1,682 (original Hoover plan) in addition to high-growth population increase. Market-driven development and Collier-Hoover proposal fall within this range.
  - <sup>5</sup> Based on an estimated population increase of 243,782.

### Mitigation Measures

The careful implementation of controls on the use of hazardous materials as required by government regulation would minimize, but not prevent, the potential adverse effects of releases of hazardous materials. Effective training programs, spill/release response drills, and regular inspections of facilities where hazardous materials are stored or used could help reduce the probability of accidental spills or release. The use of best management practices during hazardous material transfers that ensure tight and secure connections or containment of accidentally released materials would also reduce the potential for soil or water contamination. These measures would need to be implemented by the airport operator, all on-site users, and transporters of hazardous materials that served the site. Although they should be effective in reducing risks, some level of risk would remain under the best of circumstances.

### Possible Future Expansion

Based on estimated annual aircraft operations with the second runway at full capacity, a nineteenfold increase in the use of hazardous materials above current baseline levels could occur. This does not, however, account for potential decreases in the use of hazardous materials as technology evolves.

#### 4.7.2.2 Commercial Spaceport Alternative

A Commercial Spaceport would be expected to use the same hazardous materials shown for the Proposed Action in Table 4.7-1. In addition, this alternative would involve some unique materials, including liquid hydrogen, liquid oxygen, and solid and liquid rocket propellants, including hydrazine and nitrogen tetroxide. The processing, handling, storage, and use of these substances is discussed in Section 2.3.1.1.

Although the projected aircraft operations in 2000, 2005, 2015, and full buildout would be less than under the Proposed Action, considerable amounts of fuel (e.g., liquid oxygen and hydrogen) would be used by the commercial space vehicles. These fuels are more of an explosive hazard than a soil/groundwater contamination hazard. Spaceport tenants in the aviation support and industrial areas would use hazardous materials and petroleum products for equipment repairs and fabrication. It is not currently envisioned that cryogenic fuels and propellants would be manufactured on the site. Therefore, they would need to be transported to the site. Regulatory requirements are in place for transport of these fuels to minimize the risk of mishap. However, some risk of a release during transport would remain.

Spacecraft fuels potentially used at the site include liquid gases (oxygen, hydrogen, air), hypergolic fuels (hydrazine and nitrogen tetroxide), and solid fuels (primarily aluminum and perchlorates in a binder). The liquid gases and other gases would be stored in pressure tanks. The risk of accidental release of these materials would be small, and large releases would probably involve a storage tank failure. Tank failures could also create a potentially explosive condition. Except for the solid fuels, all other fuels would be in a gaseous form if released to the environment.

Hydrogen would provide an explosion risk depending on how and how rapidly it was released. Explosions involving gases would probably have similar consequences as explosions generated by launch accidents for vertical space launch vehicles. A hydrogen explosion could result in a fireball that would rapidly rise and be dispersed. Since the combustion product would be water, there would be essentially no residual contamination other than the damage caused by the explosion itself.

Hydrazine and nitrogen tetroxide, if released together, could also pose an explosion risk because when mixed they spontaneously ignite. An explosion cloud involving hydrazine and nitrogen tetroxide would probably behave similarly to a hydrogen explosion cloud. Combustion products would probably be primarily carbon monoxide, carbon dioxide, and nitrogen oxides. If either hydrazine or nitrogen tetroxide were released separately, it would probably have a relatively small explosive risk and would be carried by winds and be dispersed. Because both chemicals are toxic, there could be a potential for human and animal impacts. Standard procedures, similar to those currently in place at Cape Canaveral Air Station and Vandenberg AFB for loading hypergolic fuels into space vehicles (double containment of potentially leaked fuels and worker protection) would minimize the potential risk.

Solid rocket fuels would be transported to the site contained in rocket motors and could pose an explosive risk. Should a rocket motor explode aluminum oxides and hydrogen chloride gas could be released. Because of the heat of the explosion cloud, most of the hydrogen chloride would rise rapidly and be dispersed. Rainfall during or shortly following an explosion could result in the deposition of hydrochloric acid under the explosion cloud. The size of solid rocket motors would generally be small, so the magnitude of hydrochloric acid deposition would also likely be small.

As with the Proposed Action, population in-migration stimulated by the Commercial Spaceport alternative could lead to a population increase in the surrounding area, supporting additional service industries that use hazardous materials and petroleum products (e.g., gasoline stations, photography laboratories, and dry cleaners). The estimated number of additional hazardous materials facilities is shown in Table 4.7-2.

### **Combined Commercial Spaceport/Airport**

A combined Commercial Spaceport/Airport would involve additional amounts of aviation fuels and maintenance fluids in addition to the materials described above. Management issues and potential impacts would be as described for the Proposed Action. Additional population in-migration could also increase the number of industrial facilities in the area, as reflected in Table 4.7-2.

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### Cumulative Impacts

The high level of population growth forecast by Miami-Dade County could support additional service industries that use hazardous materials and petroleum products. The estimated additional number of facilities using hazardous materials in the southern part of the county is shown in Table 4.7-3.

### Mitigation Measures

Mitigation measures for the Commercial Spaceport alternative would be essential the same as for the Proposed Action. The focus of spill response capabilities would be directed more toward reducing risks from explosion of pressurized tanks.

#### 4.7.2.3 *Mixed Use Alternative*

The industrial and commercial activities that might locate at former Homestead AFB under the Mixed Use alternative would be expected to be similar to those shown for the Proposed Action in Table 4.7-1. The total volume of hazardous materials for the Mixed Use alternative would be significantly less than for the Proposed Action due to the absence of airfield and aviation support activities.

Use of hazardous materials and petroleum products in residential, commercial, and recreational areas is expected to be minimal. The volume of hazardous materials used in the industrial areas would depend upon the type of manufacturing facilities constructed. Under Market-Driven development, each parcel owner and operator would be responsible for managing its own hazardous material storage and use. Because hazardous material use is likely to be considerably smaller than under the Proposed Action or Commercial Spaceport alternative, the release of very large volumes of hazardous materials would be unlikely. Under Market-Driven development, the lack of a centralized management organization for hazardous materials could increase the frequency of small releases.

The Collier-Hoover proposal, as well as the original Collier proposal and original Hoover plan, could entail a centralized hazardous materials management program. The effectiveness of such a program would depend in part on the autonomy granted to individual industrial and commercial operations that might be associated with these plans and the similarity of hazardous materials stored or used. Coordinated spill/release responses would probably be more difficult to organize under any of the Mixed Use scenarios than under the Proposed Action or Commercial Spaceport alternative.

The Collier-Hoover proposal would entail use of pesticides and petroleum products in the maintenance of a proposed 273.7 acres of golf courses. Pesticide usage, in accordance with the Audubon International Signature Program, would be limited. A conservative (high) estimate of pesticide usage would be 6,843 pounds per year of non-persistent pesticides. A similarly conservative estimate of petroleum usage would be 65,700 gallons per year for mowing and other maintenance activities.

Considering the estimated increased generation of solid waste, the on-site use of hazardous materials with this alternative is estimated to increase by a factor of 1.5 in 2005, 2.5 in 2015, and 5 at full buildout.

The Mixed Use alternative could also stimulate population in-migration that could lead to an increase in population in the surrounding area, which could support additional service industries that use hazardous materials and petroleum products (e.g., gasoline stations, photography laboratories, and dry cleaners). The estimated number of additional hazardous materials facilities is shown in Table 4.7-2.

## **Cumulative Impacts**

The high level of population growth forecast by Miami-Dade County could support additional service industries that use hazardous materials and petroleum products. The estimated number of additional hazardous materials facilities in the southern part of the county is shown in Table 4.7-3.

## **Mitigation Measures**

A centralized hazardous materials management organization could provide a larger resource base for spill/release response actions, potentially reducing the impacts of a spill, and encouraging safe handling of hazardous materials, thereby reducing the risk of a spill. This could also reduce the costs of environmental and health and safety training.

### **4.7.2.4      *No Action Alternative***

Under this alternative, minimal preventive maintenance activities would be performed as needed on the land in caretaker status. The hazardous materials used would likely include small quantities of fuels, paints, and corrosives. The quantities of hazardous materials used for caretaker activities are expected to be less than that currently used by AFBCA to maintain the property.

If population grew at the high rate forecast by Miami-Dade County, additional service industries that use hazardous materials and petroleum products would still be expected to be established in the south county area, as shown in Table 4.7-3.

### **4.7.2.5      *Independent Land Use Concepts***

The Independent Land Use Concepts and their possible hazardous materials use are listed in **Table 4.7-4**. Quantifying the impact of any of the land use concepts is difficult because specific details are not available to allow estimates of the volume of hazardous materials. However, in general, the aircraft maintenance facility would use higher quantities of hazardous materials, while the other land use concepts would be expected to use minimal amounts of hazardous materials.

## **4.7.3          Hazardous and Petroleum Waste**

Hazardous wastes would be generated in varying amounts under the Proposed Action and alternatives. Estimates of the amounts and types of hazardous wastes and their potential impacts are provided below.

### **4.7.3.1      *Proposed Action***

Under the Proposed Action, industrial areas would generate hazardous waste based on the types of industrial, manufacturing, or maintenance facilities operated. Warehousing would generate virtually no hazardous wastes, while some manufacturing processes could generate large quantities of hazardous wastes. Commercial and recreation uses are unlikely to produce significant quantities of hazardous wastes. However, operations such as maintenance and repair shops within large commercial establishments may produce sufficient quantities of hazardous waste to be subject to the RCRA regulations. Maintenance activities at a recreation area may involve waste solvents or pesticides that are considered hazardous wastes.

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**Table 4.7-4. Potential Hazardous Materials Use—Independent Land Use Concepts**

Land Use	Operations Process	Hazardous Materials
Agriculture	Nursery operations	Pesticides, fertilizers, fuels
Aircraft Maintenance Facility	Repair and overhaul of aircraft components and systems; aircraft painting and refinishing; service and repair of electronic and hydraulic systems	Fuels, solvents, paints, POL, hydraulic fluids, degreasers, corrosives, heavy metals, reactives, thinners, paints, glycols, ignitables, heating oils, plating chemicals, cyanides, laboratory chemicals, aerosols, pesticides
Back Office Operations	Building maintenance	Paints, corrosives, pesticides
Cemetery	Grounds maintenance	Fuels, pesticides, fertilizers
Corrections Complex	Building and grounds maintenance	Fuels, pesticides, fertilizers, corrosives, paints
Education Complex	Building and grounds maintenance	Fuels, pesticides, fertilizers, corrosives, paints
Film/Television Production Studio	Building maintenance	Paints, corrosives, pesticides
Research Facilities	Variable, depending on type of research	Variable depending on type of research
Small Package and Mail Distribution Center	Building maintenance	Paints, corrosives, pesticides
Structural Insulated Panels Manufacturing	Insulated panel manufacturing	Glues, paints, corrosives, pesticides
Theme Park	Building and grounds maintenance	Fuels, pesticides, fertilizers, corrosives, paints, POL
World Teleconference Center	Building maintenance	Paints, corrosives, pesticides

Source: SAIC.

POL petroleum, oils, and lubricants

Hazardous waste management would become the responsibility of the new owners/operators. Proficiency in handling these wastes and spill response capabilities are required by RCRA (40 CFR 264–265), CERCLA, and OSHA (29 CFR 1910.120) regulations. Mutual aid agreements with surrounding communities may require additional scrutiny and training of emergency staff.

Airport operations under the Proposed Action would include shops for maintenance of aircraft and ground equipment. It is expected that the types of wastes generated by these activities would be similar to those generated when the base was fully functioning. Waste volumes would be expected to increase proportionally. In order to approximate the volume of hazardous waste generated at full buildout (231,274 aircraft operations per year), the Zurich Airport Authority in Switzerland was used as a comparison. The Zurich Airport had 276,131 airport operations in 1997 and has a similar mix of commercial passenger flights and air freight as the Proposed Action. Based on waste management studies at the airport, 16 percent of the total waste generated from the airfield and aviation support activities were classified as hazardous wastes (**Zurich Airport Authority 1998**). This value was also used to estimate hazardous waste generation at HST.

Hazardous waste generation is estimated to increase above baseline levels by 255 tons/year in 2005, 1,435 tons/year in 2015, and 2,490 tons/year at full buildout (**Table 4.7-5**). If the hazardous waste generated were similar to that currently generated at Homestead ARS, most of the solvents, fuels, and oils



would be expected to be recycled off site (95 percent of the total hazardous waste volume), while the remaining hazardous wastes, such as paint wastes, lithium batteries, and aerosols, would be disposed of off site (5 percent of the total hazardous waste volume).

**Table 4.7-5. Estimated Increases in Hazardous Waste Generation at Former Homestead AFB**

Year	Projected Baseline (tons/year)	Alternative (tons/year)		
		Proposed Action	Commercial Spaceport	Mixed Use
2005	6,445	255	187	20
2015	7,667	1,435	438	49
Full Buildout	NA	2,490	578	128

Source: SAIC.

NA Not available

Implementation of the Proposed Action could generate significant amounts of hazardous wastes (up to 70 times the current generation rates at full buildout). This amount could be reduced with future technological changes. Although most of the hazardous wastes could be expected to be recycled rather than disposed of, they would still have to be transported off site for processing. This would increase the traffic of commercial chemical tanker trucks and HAZMAT vehicles in the roads leading to and from the former base.

As noted in Section 4.7.2.1, population increases potentially associated with the Proposed Action could support additional service industries which generate small quantities of hazardous wastes (e.g., gasoline stations, photography laboratories, and dry cleaners). Each new resident is estimated to generate 39 pounds/year of hazardous waste indirectly (from service industries in the surrounding area) and 25 pounds/year of hazardous waste directly (from household hazardous materials use). The estimated quantities of additional wastes that could be generated by population in-migration attributable to the Proposed Action are shown in **Table 4.7-6**.

### **Cumulative Impacts**

Under Miami-Dade County's high-growth population forecasts, the total hazardous waste generation south of Eureka Drive could increase by 9,337 tons/year by 2015 (see Table 4.7-6).

### **Mitigation Measures**

Appropriate mitigation measures for hazardous waste include those described for hazardous materials in Section 4.7.2.1. In addition, an aggressive pollution prevention waste minimization program by the airport operator could reduce the quantity of hazardous waste generated.

To mitigate potential impacts from off-site development, collection days for hazardous household products, such as paints, pesticides, and cleaners, could be scheduled to reduce landfill and stormwater discharge concerns. Articles in the local newspapers and classes offered by community educational programs could increase public awareness of recycling, appropriate use of pesticides, waste minimization, and waste disposal.

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**Table 4.7-6. Estimated Additional Off-Site Hazardous Waste Generated by Reuse-Related and Cumulative Population Increases (2015)**

	Projected Baseline <sup>1</sup> (tons/year)	Alternative (tons/year)			
		Proposed Action	Commercial Spaceport	Mixed Use	No Action
Reuse-Related Hazardous Waste	7,667	339 <sup>2</sup>	37–81 <sup>3</sup>	33–54 <sup>4</sup>	0
Cumulative Increase in Hazardous Waste	7,667	9,337 <sup>5</sup>	7,838–7,882 <sup>5</sup>	7,834–7,854 <sup>5</sup>	7,801 <sup>6</sup>

Source: SAIC.

Notes: <sup>1</sup> Based on an estimated population of 239,592 in south Miami-Dade County.

<sup>2</sup> Based on an estimated population in-migration of 10,597.

<sup>3</sup> Based on an estimated population in-migration of between 1,153 (Commercial Spaceport) and 2,541 (combined Commercial Spaceport/Airport).

<sup>4</sup> Based on an estimated population in-migration of between 1,023 (original Collier proposal) and 1,682 (original Hoover plan). Market-Driven development and Collier-Hoover proposal fall within this range.

<sup>5</sup> Based on an estimated reuse-related in-migration in combination with high-growth population increase of 243,782 in south Miami-Dade County between 1995 and 2015.

<sup>6</sup> Based on an estimated population increase of 243,782.

### Possible Future Expansion

Based on estimated annual aircraft operations with the second runway at full capacity, a 60 percent increase in the generation of hazardous wastes above the full capacity use of a single runway could occur (to 3,985 tons/year above baseline). This estimate does not account for potential reductions in hazardous waste generation likely with future technological changes.

#### 4.7.3.2 Commercial Spaceport Alternative

The types of hazardous wastes generated by the Commercial Spaceport alternative would include the hazardous materials used for spaceport operations, described in Section 4.7.2.2. Most of the hazardous wastes would be generated from space vehicles, supporting aircraft, and ground equipment maintenance.

The exact amounts of hazardous wastes that would be generated under the Commercial Spaceport alternative are not known. However, if the hazardous waste generation rate is assumed to be similar to the aviation hazardous waste generation rate of 16 percent used for the Proposed Action, hazardous waste generation could increase above projected baseline levels by 578 tons/year at full buildout (see Table 4.7-5). If the hazardous wastes generated by the Commercial Spaceport alternative were similar to those currently generated, most of the solvents, fuels, and oils would be recycled off site (estimated at 95 percent of the total hazardous waste volume), while the remaining hazardous wastes, such as paint wastes, lithium batteries, and aerosols, would be disposed of off site.

Implementation of the Commercial Spaceport alternative would generate significant amounts of hazardous wastes (up to 17 times the current generation rates at full buildout). Although most of these wastes would be expected to be recycled rather than disposed of, they would still have to be transported off site for processing. This would greatly increase the traffic of commercial chemical tanker trucks and HAZMAT vehicles on the roads leading to the former base.

Population in-migration stimulated by the Commercial Spaceport alternative could support additional service industries that generate small quantities of hazardous wastes. Assuming that each new resident

generated, directly and indirectly, 64 pounds/year of hazardous waste, 37 tons/year could be generated south of Eureka Drive by 2015 (see Table 4.7-6).

### **Combined Commercial Spaceport/Airport**

Commercial airlines generate hazardous wastes during aircraft and ground equipment maintenance. This hazardous waste generation rate is assumed to be similar to the aviation hazardous waste generation rate of 16 percent and would result in a combined generation of about 81 tons/year in 2015. If the hazardous wastes generated in the combined Commercial Spaceport/Airport option were similar to those currently generated, about 95 percent of the solvents, fuels, and oils would be recycled off site, while the remaining hazardous wastes, such as paint wastes, lithium batteries, and aerosols, would be disposed of off site.

### **Cumulative Impacts**

Under Miami-Dade County's high-growth forecasts, the total hazardous waste generation south of Eureka Drive could be expected to increase by between 7,838 and 7,882 tons/year by 2015 (see Table 4.7-6).

### **Mitigation Measures**

The mitigation measures described for the Proposed Action would also be appropriate for this alternative.

#### **4.7.3.3      *Mixed Use Alternative***

The volume of hazardous wastes generated under the Mixed Use alternative would be expected to be substantially less than under the Proposed Action or Commercial Spaceport alternative. If the hazardous waste generation rate is assumed to be similar to the 1997 Miami-Dade County-wide hazardous waste generation rate per employee, hazardous waste generation could increase above projected baseline levels by an estimated 128 tons/year at full buildout for the Market-Driven scenario (see Table 4.7-5). No information is available on quantities of hazardous waste that might be generated by the Collier-Hoover proposal or the original Collier and Hoover plans. They are likely to be similar to the industrial, commercial, and recreation uses of the Proposed Action. Although the precise nature of the wastes is not known, it is expected that the majority would be disposed of off site, but some could be recycled. Nevertheless, all hazardous wastes would have to be transported off site for processing. This would increase the traffic of commercial chemical tanker trucks and HAZMAT vehicles on the roads leading to the former base.

Population in-migration stimulated by the Mixed Use alternative could support additional service industries that generate small quantities of hazardous wastes. Assuming that each new resident generated, directly and indirectly, 64 pounds per year of hazardous waste, between 33 and 54 tons/year of additional hazardous waste could be generated south of Eureka Drive by 2015 (see Table 4.7-6).

### **Cumulative Impacts**

Under Miami-Dade County's high-growth forecasts, the total hazardous waste generation south of Eureka Drive could increase by between 7,834 and 7,854 tons/year by 2015 (see Table 4.7-6).

### **Mitigation Measures**

The mitigation measures suggested for hazardous materials in Section 4.7.2.1 would also be appropriate for hazardous waste. In addition, a centralized hazardous waste management organization for the site could assist in the development of effective pollution prevention/waste minimization programs, provide a

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larger resource base for spill/release response actions, and encourage the safe handling of hazardous wastes. All of these measures would help reduce the generation of hazardous waste and potentially reduce the adverse effects of a spill, should one occur. However, they would not completely eliminate the risk of a spill.

### **4.7.3.4**      *No Action Alternative*

Under this alternative, minimal amounts of preventive maintenance activities would be performed. The hazardous wastes generated could include waste fuels, paints, and corrosives. The quantities of hazardous wastes generated by the caretaker activities would be less than that currently generated by the AFBCA to maintain the property.

The high level of population growth forecast by Miami-Dade County could still result in an increase in hazardous waste generation south of Eureka Drive, estimated at 7,801 tons/year in 2015 (see Table 4.7-6).

### **4.7.3.5**      *Independent Land Use Concepts*

The hazardous wastes likely to be generated by the Independent Land Use Concepts would derive from the hazardous materials identified in Table 4.7-1. Sufficient information is not available to allow estimates of the volume of hazardous wastes that would be generated by any given use, but in general, the aircraft maintenance facility would be expected to generate the highest quantities of hazardous wastes, while the other land use concepts would be expected to generate minimal amounts of hazardous wastes.

## **4.7.4**      **Installation Restoration Program Sites**

The management of the IRP sites will not vary among the reuse alternatives. However, continuing monitoring of some of the sites may affect implementation of reuse plans. IRP activities would continue to be coordinated by Air Force personnel. Proposed land uses could be affected by ongoing or future restoration activities.

Assessment activities are in various stages of completion, with some sites undergoing interim cleanup measures and remedial design, while other sites are still being investigated. Ongoing coordination between the Air Force and FDEP would continue to ensure that land development does not inhibit completion of environmental remedial activities. Most remedial actions should be complete by 2015.

### **4.7.4.1**      *Proposed Action*

The IRP sites within each land use area of the Proposed Action are listed in **Table 4.7-7**. The location and extent of contamination associated with each IRP site is approximate, based on gross mapping. The IRP sites within each land use are briefly discussed below.

Eight IRP sites are located within the airfield, ten IRP sites are located within the proposed aviation support area, and two IRP sites are located within the proposed industrial area. OU-9, Boundary Canal, extends through both the aviation and industrial areas, and OU-18, landfill, is only partially located within the industrial area. There are no IRP sites in the proposed commercial or recreation/open space areas.

Table 4.7-7. IRP Sites Within Land Use Areas—Proposed Action

Land Use	IRP Sites
Airfield	OU-9 (partial), OU-10, OU-11, OU-16 SS-15B, SS-20 (Hardfill Area), SS-21 FT-09
Aviation Support	OU-6, OU-14, OU-20/21, OU-22, OU-26, OU-28, OU-30, OU-31 SS-15A, SS-20 (Buildings 711 & 766)
Industrial	OU-9 (partial), OU-18 (partial)
Commercial	None
Recreation/Open Space	None

Source: SAIC.

**Airfield.** Eight IRP sites (including portions of the Boundary Canal) are in the airfield area. Site SS-15B (Flightline Pumphouses) contains contaminants above the reference levels from a former leak of JP-4 in the underground pipelines. Currently, this area is under a remedial action (groundwater treatment) with long-term monitoring in the future. However, groundwater remediation efforts should not affect the continued use of the airfield. Site OU-11 (Military Canal) is undergoing a Feasibility Study to determine the appropriate remedial action. Because Military Canal is outside the former base boundaries, the remediation of the canal should not directly affect airfield operations. Remedial actions that may occur in the canal are not expected to substantially impact the operation of the airfield. The resolution of OU-9 is awaiting decisions concerning OU-11. The remaining five IRP sites have been investigated and/or remediated and are all recommended for no further action.

**Aviation Support.** Ten IRP sites are located in the proposed aviation support area. Sites OU-26 (Aviation Fabrication Shop), OU-28 (Propulsion Maintenance Facility), and SS-20 (Buildings 711 and 766) contain soil contaminants above reference levels. Remedial actions are ongoing at these sites. Remedial actions have already been completed at OU-6 (Oil Spills at Aircraft Wash Rack) and closeout is anticipated. Investigation has been completed at SS-15A (Apron) and remedial action is being implemented. Feasibility studies are ongoing at OU-20/21 (Hazardous Materials Storage Area), OU-30 (Former Contractor Storage Area), and OU-31 (Nondestructive Inspection Laboratory). These sites involve a relatively small portion of the proposed aviation support area and are not expected to substantially impact reuse. No further action has been recommended at sites OU-14 (Drum Storage Area) and OU-22 (AGE Maintenance).

**Industrial.** Portions of OU-9 (Boundary Canal) and OU-18 (Construction Debris Landfill) are located in the proposed industrial land use. Both sites were investigated and no contaminants were found above reference levels in OU-9, whereas contaminants were found above reference levels in the soils at OU-18. Remedial action is ongoing at the landfill. However, only a relatively small portion of the landfill is located within the proposed industrial area, and this is not expected to substantially impact reuse. The resolution of OU-9 is awaiting decisions concerning OU-11.

Existing infrastructure, such as remediation equipment, conveyance piping, and monitoring wells, could limit the type of development occurring on land parcels identified in the Proposed Action. Proposed demolition, renovation, and new construction activities would be closely coordinated and monitored to ensure existing environmental infrastructure is not damaged or access restricted.

The existence of IRP sites would typically not affect the reuse of existing facilities unless further assessment concludes that risks to the health of facility occupants would be unacceptable. New

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construction activities, however, may be limited by the existence of IRP sites until the sites are sufficiently remediated. The potential for construction delays would tend to be greater for soils-related IRP sites than for groundwater-related sites. For example, new construction may be limited in areas involving soil contaminants (e.g., the OU-18 landfill). Limitations on new construction above a groundwater contamination plume (e.g., the SS-15B underground pipelines) would be necessary only if the construction involved exposure of groundwater-bearing strata or if cleanup activities could cause a change in subsurface physical characteristics that would render a location unsuitable as a building site.

Remedial activities associated with the contaminated groundwater plume at SS-15B in the vicinity of the runway are not expected to impact flightline operations. Remediation and long-term monitoring associated with this site would be the responsibility of the Air Force and should not result in long-term impacts to airfield use. Minor disruptions to daily activities could occur (e.g., short-term interruptions of activities to conduct monitoring).

Development in the surrounding area should not affect or be affected by the investigation or remediation of IRP sites at former Homestead AFB.

### **Cumulative Impacts**

The Air Force is now conducting a Feasibility Study to determine the most appropriate method to use for the remediation of Military Canal (OU-11) sediments. Based on the outcome of this study and regulatory and public review, a remediation method will be selected and implemented. Remediation activities could start as early as fiscal year 2001.

The proposed filling of Military Canal from Biscayne Bay to approximately L-31E as part of the Flowway Distribution Project. This would eliminate direct contact between the canal and the bay.

### **Mitigation Measures**

A proactive land use planning approach to reuse would require coordination and enforcement among all pertinent parties in order to reduce potential delays in development on the disposal property. Land use impacts could be mitigated by implementing a phased construction schedule. Such an approach would allow redevelopment to begin in areas without IRP sites, and areas with IRP sites could be developed in subsequent project phases. Active coordination between the Air Force and the Miami-Dade County Aviation Department would mitigate potential problems.

### **Possible Future Expansion**

Based on possible expansion plans, the north end of the possible second runway would cut across a portion (approximately 1,000 feet) of Military Canal. This would require alteration of the canal to redirect the flow either around or underneath the runway. Any action taken on the canal sediments would be expected to be completed prior to the consideration of a second runway.

#### **4.7.4.2      *Commercial Spaceport Alternative***

The IRP sites within each land use area of the Commercial Spaceport alternative are listed in **Table 4.7-8**. The boundaries of each land use are similar to those identified in the Proposed Action. The potential impacts and mitigation measures would be essentially the same as described for the Proposed Action.

**Table 4.7-8. IRP Sites Within Land Use Areas—Commercial Spaceport Alternative**

Land Use	IRP Sites
Airfield	OU-9 (partial), OU-10, OU-11, OU-16 SS-15B, SS-20 (Hardfill Area), SS-21 FT-09
Aviation Support	OU-6, OU-14, OU-20/21, OU-22, OU-26, OU-28, OU-30, OU-31 SS-15A, SS-20 (Buildings 711 & 766)
Industrial	OU-9 (partial), OU-18 (partial)
Commercial	None
Recreation/Open Space	None

Source: SAIC.

**4.7.4.3 Mixed Use Alternative**

The IRP sites within each land use area of the Market-Driven scenario of the Mixed Use alternative are listed in **Table 4.7-9**. The industrial/commercial area would contain the same IRP sites shown within the aviation support and industrial areas of the Proposed Action; no IRP sites would be present within the commercial or recreation/open space areas. Property transfer and reuse could be delayed in the areas affected by IRP investigation and remediation activities, as described for the Proposed Action.

**Table 4.7-9. IRP Sites Within Land Use Areas—Market-Driven Development**

Land Use	IRP Sites
Industrial/Commercial	OU-6, OU-9 (partial), OU-14, OU-18 (partial), OU-20/21, OU-22, OU-26, OU-28, OU-30, OU-31 SS-15A, SS-20 (Building 711 & 766)
Commercial	None
Recreation/Open Space	None

Source: SAIC.

The IRP sites within the commercial, commercial/industrial, and recreational land uses of the Collier-Hoover proposal are listed in **Table 4.7-10**. Property transfer and reuse could be delayed in the areas affected by IRP investigation and remediation activities, as described for the Proposed Action. In addition, the sites are being cleaned to certain land use standards that may be appropriate for industrial use but not for recreation or water use. This may require adjustments to the Collier-Hoover plan or changes in the remediation approach to certain sites. Based on the information furnished by the proponent, it appears there would be no land use conflicts, but the waterways included in the plan may need to be engineered to avoid certain IRP sites, and any sewage treatment facility would need to be sited to preclude conflict with clean-up standards.

**4.7.4.4 No Action Alternative**

The IRP would have no impact on caretaker operations under the No Action alternative.

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**Table 4.7-10. IRP Sites Within Land Use Areas—Collier-Hoover Proposal**

<b>Land Use</b>	<b>IRP Sites</b>
Commercial	OU-29
Commercial/Industrial	OU-6, OU-9 (partial), OU-14, OU-20/21, OU-22 (partial), OU-30, OU-31, SS-15A (partial), SS-20 (Buildings 711 & 766)
Recreation/Open Space	OU-18, OU-22, OU-26, OU-28, SS-15A (partial)

Source: SAIC.

**4.7.4.5      *Independent Land Use Concepts***

The impact of the Independent Land Use Concepts on any particular IRP site cannot be evaluated unless the location of the activity is known. For example, the land required for a theme park could involve most of the IRP sites, whereas a mail distribution center might avoid all of the IRP sites. Some land uses are incompatible for particular IRP sites. For example, the cemetery should not be located over the OU-18 landfill. IRP activities could delay property transfer and reuse in certain areas under consideration for the land use concepts.



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## 4.8 AIR QUALITY

### 4.8.1 Introduction

Air emissions from the Proposed Action and reuse alternatives were evaluated in accordance with applicable air quality standards and regulations. The analysis determined air quality impacts from emissions estimated to be generated by both mobile and stationary sources during 2000, 2005, and 2015 for the Proposed Action and each of the reuse alternatives. Because Miami-Dade County is a maintenance area for ozone, the General Conformity Rule of the Clean Air Act applies to FAA actions and decisions concerning reuse of former Homestead AFB.

The analysis consisted of several parts: development of an emissions inventory, an air quality impact analysis, a roadway intersection analysis, and a determination of the impacts on nearby Everglades and Biscayne National Parks. The FAA's Emissions and Dispersion Modeling System (EDMS) air quality model was used to develop the operational emissions inventory and estimate the air quality impacts resulting from each alternative. EDMS was specifically designed for use in evaluating the air quality impacts of airports and Air Force bases and is a USEPA-approved air quality model required by FAA to be used in the analysis of air quality impacts associated with the development of airports. A second air quality model (CAL3HQC) was used to calculate potential worst-case carbon monoxide concentrations at several roadway intersections that are predicted to be highly congested in future years.

Emissions from construction activities associated with the Proposed Action were assessed for potential conformity issues. The Proposed Action represents the highest expected level of construction emissions for any of the alternatives. Emissions of volatile organic compounds, oxides of nitrogen, carbon monoxide, and respirable particulate matter less than 10 microns in diameter were calculated using emission factors from the *CEQA* [California Environmental Quality Act] *Air Quality Handbook (South Coast Air Quality Management District 1993)* for all airfield and aviation support construction activities over which FAA has some control as a federal agency subject to Clean Air Act conformity requirements. The emissions were divided between exhaust emissions (on-site construction equipment, material handling, and workers' travel) and fugitive dust emissions (e.g., from grading activities).

The exhaust emissions were calculated by using estimates of new facility construction during two phases of development (2000–2005 and 2005–2015) for each land use category (airfield, aviation support, industrial, commercial, institutional, open space, and retained and previously conveyed areas). Fugitive dust emissions were calculated based on the area of ground disturbance from demolition, removal of pavement, and site preparation for new facilities and pavement during the same phases of development.

A screening-level model was used to calculate atmospheric deposition rates to determine potential nitrogen loading at Everglades and Biscayne NPs due to the Proposed Action. The model used to calculate the atmospheric deposition of nitrogen provides very conservative results and probably overestimates deposition rates, by potentially an order of magnitude. To determine how the model results would likely compare to actual measured nitrogen deposition, the model was applied to current  $\text{NO}_x$  concentrations to predict nitrogen deposition in Everglades NP. The results were then compared to the annual average measured atmospheric deposition of nitrates at Everglades NP from 1994 through 1998 (*NADP 1998*). The model predicted rates that were 30 times greater than the measured rates.

Comments on the Draft SEIS raised concern about the potential for the deposition of soot and oily films from aircraft engine exhausts. This concern has also been raised at a number of other airports. The soot that is alleged to come from jet engine emissions is apparently more related to ground vehicles than aircraft. Recent studies have looked at this issue at Chicago's O'Hare Airport; at Boston's Logan Airport;

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at the Charlotte, North Carolina Airport; and at the Fort Lauderdale Airport (**KM Chng Environmental 1999, KM Chng Environmental 1997, TRC 1997**). The most comprehensive of these studies compared the “chemical fingerprint” of ambient air samples taken near the airport with wipe samples from the exhaust of jet aircraft engines and with jet fuel. The deposited particles collected in ambient air samples near the airport bore little chemical resemblance to jet engine fuel or soot from the jet engine exhaust. It was concluded in all of these studies that the soot and oily deposits were chemically more closely related to motor vehicle exhaust and other urban sources than to aircraft emissions or fuels.

### 4.8.2 Air Pollutant Emissions

#### 4.8.2.1 Proposed Action

**Construction Emissions.** Estimates of the potential exhaust and fugitive dust emissions resulting from construction activities of airfield and aviation support projects for the Proposed Action are presented in **Table 4.8-1**. The estimated construction emissions reflect the quantity of emissions expected to occur prior to each milestone year. The timing of these emissions is uncertain, but they would be spread over a number of years. The emissions would also be generated at different locations around the site. These estimated emissions do not take into consideration the reduction in NO<sub>x</sub> emissions in future years resulting from the recently promulgated controls on heavy-duty diesel engines, which will take effect in 2004 (**McElveen 1999**). Construction CO and VOC emissions would represent less than 3 percent of total emissions of CO and VOC on the former base. NO<sub>x</sub> emissions would represent between 11 and 16 percent of total NO<sub>x</sub> emissions, and PM<sub>10</sub> emissions would represent between 51 and 60 percent of total PM<sub>10</sub> emissions.

**Table 4.8-1. Total Estimated Proposed Action Construction Emissions by Phase of Development**

Year	Pollutant Emissions (tons)			
	CO	VOC	NO <sub>x</sub>	PM <sub>10</sub>
Prior to 2005	19.9	6.2	91.3	9.6
2006–2015	54.4	17.0	250.0	20.7

Source: SAIC.

**Operational Emissions.** An emission inventory was developed for operations associated with the Proposed Action for 2000, 2005, and 2015. The emissions inventory included:

- Aircraft (military, U.S. Customs, commercial passenger, general aviation, cargo, and aircraft maintenance);
- Ground support equipment (GSE), aerospace ground equipment (AGE), and auxiliary power units (APUs);
- Roadways;
- Parking lots; and
- Stationary sources.

Emissions for all of these categories were calculated using the EDMS model, except for stationary sources. Stationary sources were assumed to be similar, on a floor area basis, to existing Homestead ARS stationary sources. Homestead ARS includes a range of office, accommodation, and maintenance areas

that would be reflective of similar facilities that would be built for the Proposed Action and other alternatives. An estimate of stationary source emissions in 2005 and 2015 was made by calculating a ratio of the expected increase in area of new and reused facilities divided by the area of existing facilities and multiplying that ratio by the current Homestead ARS stationary source emissions. For example, for the Proposed Action in 2005, new and reused facilities are projected to be 1.6 times the area of current Homestead ARS facilities (see Table 2.2-2), so the estimated stationary source emissions were assumed to be 1.6 times the current emissions at Homestead ARS (**AFRC 1998a**). One unusual stationary source currently in the Homestead ARS emission inventory, the hush house used for aircraft engine testing, was not included in this calculation because hush houses are specific to military installations and not expected to be representative of reuse activities.

Emissions for each aircraft type were based on the number of projected operations and emission factors for the engines used on the aircraft. For the Proposed Action, the expected types of aircraft and estimated number of operations for each aircraft are provided in Table 2.2-5 for 2000, 2005, and 2015. In some cases, several candidate aircraft are given within a category (e.g., narrowbody or widebody jets). The most modern and generally lowest-emitting aircraft were chosen within each category, because it is expected that aircraft emissions will decline for a given aircraft type over the next 20 years. This approach probably still overestimated the emissions from the next generation of aircraft engines which will come into use during this time period. GSE/AGE and APU are associated with specific aircraft types and have an operational period associated with each aircraft type. Emissions from this equipment are calculated by the EDMS model after the aircraft types and flight frequencies are specified.

Motor vehicle emissions for each year were also calculated in the EDMS model, based on USEPA's MOBILE5a emissions model. The primary input variable was the increase in the number of vehicle miles traveled (VMT). VMT was estimated by multiplying the expected population increase by a VMT/person factor, derived from a transportation modeling study conducted by the Miami-Dade County Metropolitan Planning Organization (**Dade County 1987**). It was assumed, as a worst-case analysis, that all of the estimated increase in VMT was due to airport-related trips. Additional trips to the airport that might occur were considered to be redirected trips from other destinations, such as Miami International Airport, and would not contribute to an increase in the VMT for Miami-Dade County. Because all vehicle travel by the existing and projected baseline population is already accounted for in the county's projected emissions, only the reuse-related increase in population would be additive. A summary of the operations emissions inventory for the Proposed Action is presented in **Table 4.8-2**.

**Table 4.8-2. Operational Emissions Inventory for Disposal Property—Proposed Action**

Year	Emissions (tons/year)				
	CO	VOC	NO <sub>x</sub>	SO <sub>2</sub>	PM <sub>10</sub>
2000	344	9	4	0.2	<0.1
2005	629	27	45	2.1	0.8
2015	2,182	130	392	17.0	5.4

Source: SAIC.  
< less than

These emissions include on-site emissions associated with the Proposed Action and transportation associated with reuse-related secondary development. They do not include air emissions from home-based activities conducted by employees at the airport (e.g., small two-cycle lawn mower engines,

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barbecues, natural gas-fired water heaters), malls, fast food facilities, and light industry, but the relative contribution of these sources would be minor.

For each of the three analysis periods, aircraft-related emissions (aircraft and GSE/AGE/APU) were the largest contributor to the total emissions inventory. **Table 4.8-3** shows the percentage of the total emissions inventory estimated to be contributed by each source in 2015.

**Table 4.8-3. Percentage of Operational Emissions by Major Source Category—Proposed Action (2015)**

Source Category	Percent Contribution to Total Emissions Inventory				
	CO	VOC	NO <sub>x</sub>	SO <sub>2</sub>	PM <sub>10</sub>
Aircraft	37.2	33.2	61.9	71.5	0.0
GSE/AGE/APU	39.3	16.1	19.7	11.4	49.8
Roadways	16.1	32.2	12.1	15.3	38.0
Parking Lots	7.2	5.2	1.7	1.4	4.7
Stationary Sources	0.02	5.2	4.4	0.1	7.5

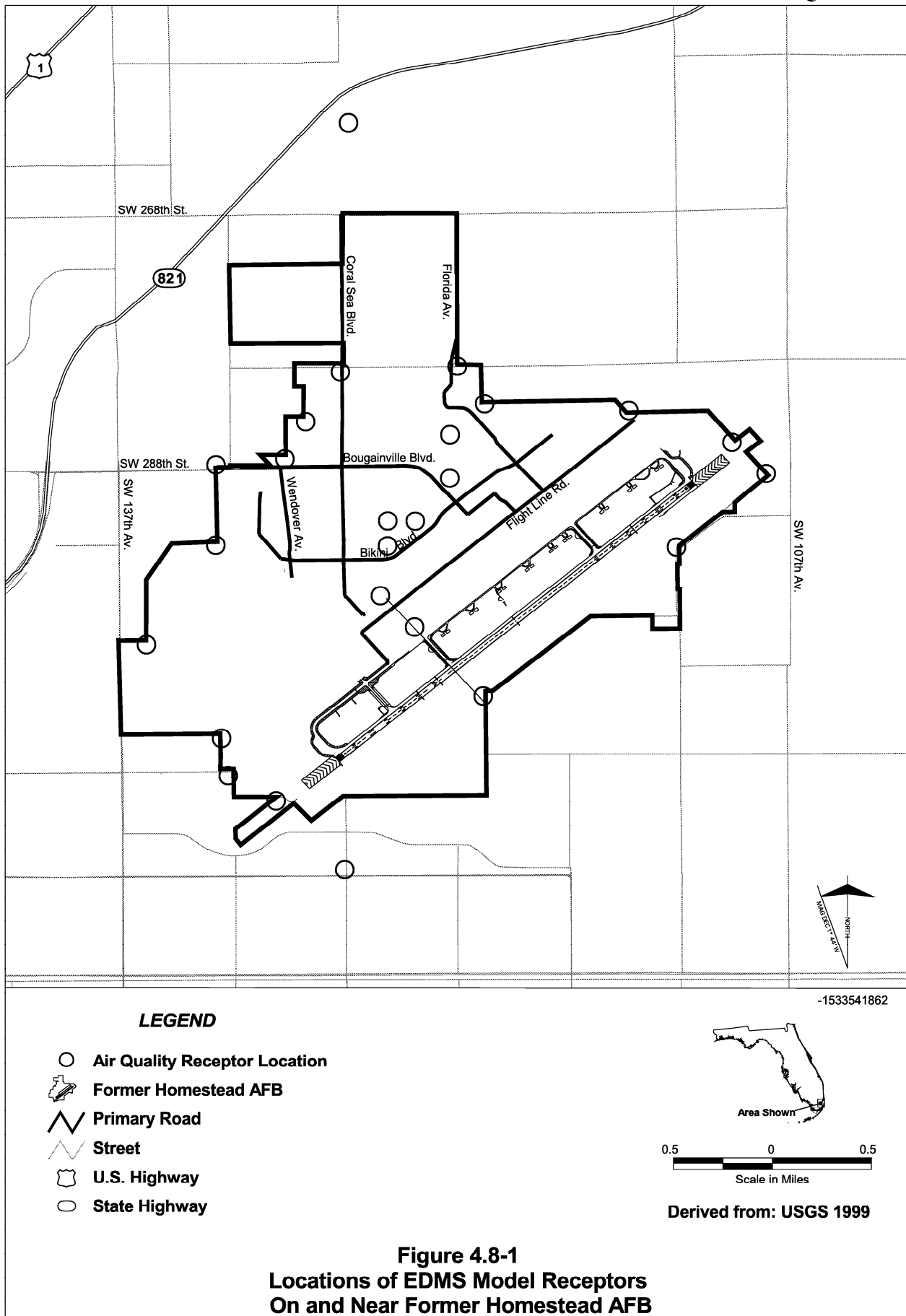
Source: SAIC.

This emissions inventory takes into account expected future reductions in air emissions from motor vehicles, as determined by USEPA's current version of the MOBILE model, due to more restrictive regulations and better vehicle emission control systems. However, aircraft emissions are based on emission factors from existing engines, and it is possible that improvements in engine controls will reduce emissions from aircraft by 2015. Therefore, the aircraft emissions used in this analysis can be considered conservatively high.

**Air Quality Impacts.** The EDMS model was run for the Proposed Action in 2015, with each of the most recent five years of quality assured meteorological data (1991–1995), using a set of receptors expected to have the highest impact. The model used hourly meteorological data collected at the nearest National Weather Service station (Miami International Airport). Preliminary modeling runs were used to determine which year of meteorological data would produce the highest concentrations. This resulted in 1995 meteorological data being used for all subsequent air quality modeling runs.

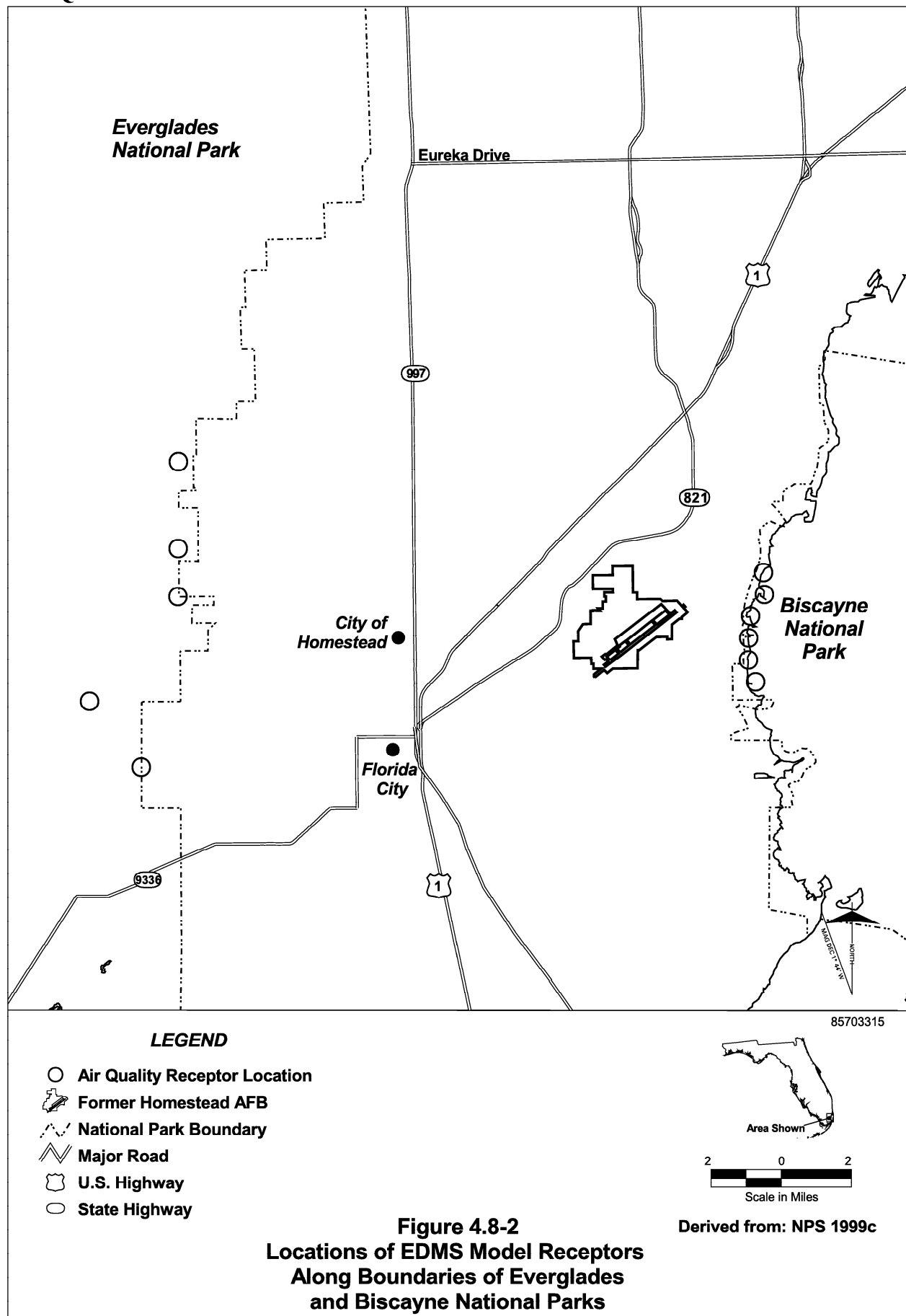
The EDMS model was used to predict concentrations at 32 receptors: 25 receptors were located along the boundary of former Homestead AFB or within the public access areas on the former base, 3 receptors were located along the closest boundary of Everglades NP, and 4 receptors were located along the closest boundary of Biscayne NP. **Figures 4.8-1** and **4.8-2** show the locations of the receptors.

The model was used to calculate ambient concentrations for the four criteria pollutants predicted by the EDMS model (CO, SO<sub>2</sub>, NO<sub>2</sub>, and PM<sub>10</sub>) and was run for three time periods (2000, 2005, and 2015). The low SO<sub>2</sub> and PM<sub>10</sub> emissions projected for the Proposed Action would be expected to result in low ambient air quality impacts (a maximum increase of 8 percent of the NAAQS at the worst-case receptor). Therefore, the remainder of the analyses focused on the results of the CO and NO<sub>2</sub> estimates. The results of the EDMS model runs for the Proposed Action are presented in **Table 4.8-4**. The table shows that impacts of the Proposed Action are not expected to result in exceedances of the NAAQS at any time.



**Figure 4.8-1**  
**Locations of EDMS Model Receptors**  
**On and Near Former Homestead AFB**

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**Table 4.8-4. Increased Ambient Air Concentrations Resulting from Proposed Action Emissions**

Year	Predicted Concentrations and National Ambient Air Quality Standards					
	CO (ppm) <sup>1</sup>				NO <sub>2</sub> (µg/m <sup>3</sup> ) <sup>2</sup>	
	Concentration (1 hour)	NAAQS (1 hour)	Concentration (8 hour)	NAAQS (8 hour)	Concentration (AAM)	NAAQS (AAM)
2000	2.2	35	2.1	9	10.1	100
2005	3.1	35	2.8	9	13.2	100
2015	3.3	35	3.2	9	27.6	100

Source: SAIC.

Notes: <sup>1</sup> CO predicted concentrations include an estimated 8 hour ambient background concentration of 2 ppm (**Dade County 1987**).<sup>2</sup> NO<sub>2</sub> predicted concentrations include an ambient background concentration of 10 µg/m<sup>3</sup>.

AAM Annual Arithmetic Mean

µg/m<sup>3</sup> micrograms per cubic meter

ppm parts per million

NO<sub>x</sub> is the pollutant generated under the Proposed Action most likely to contribute to exceedance of the ozone NAAQS, because NO<sub>x</sub> emissions generated by the Proposed Action would comprise a larger proportion of Miami-Dade County's mobile source emission budget than VOC emissions. Total NO<sub>x</sub> emissions have been projected by Miami-Dade County only until 2005. Assuming that the countywide NO<sub>x</sub> emissions in 2015 would be as high as the projected emissions in 2005, the Proposed Action (including construction and operations) is estimated to generate about 0.6 percent of countywide NO<sub>x</sub> emissions in 2015.

**Roadway Intersection Analysis.** Because motor vehicles are a major source of air pollutants, a separate, more detailed air quality analysis was conducted for roadway intersections that are predicted to become the most highly congested. The roadway analysis focused on intersections because of the potentially high pollutant concentrations that result from motor vehicle exhaust in stopped and slow-moving traffic. Carbon monoxide is the pollutant of greatest concern because it is the pollutant emitted in the largest quantity by motor vehicles for which short-term health standards exist.

The CAL3HQC air dispersion computer model was used in the roadway analysis to estimate CO concentrations from motor vehicles. The CAL3HQC model is approved by USEPA for estimating CO concentrations at intersections. It evaluates the atmospheric dispersion of pollutants using a worst-case set of meteorological conditions. Model receptors were located around the intersections and roadways.

Emission factors for CO exhaust from idling motor vehicles were calculated with a USEPA-approved methodology for using MOBILE5a emission factors (**USEPA 1993b**). CO concentrations predicted by the CAL3HQC model were compared to 1 hour and 8 hour ambient air quality standards. A background CO concentration of 2.0 ppm was included in the impact analysis to represent the ambient background levels identified by Miami-Dade County for suburban areas (**Dade County 1987**). One hour concentrations were converted to 8 hour equivalents using a USEPA conversion factor (**USEPA 1977**).

The modeling evaluated two roadway intersections expected to be the most heavily congested, based on estimated motor vehicle traffic volumes and level of service: SW 288<sup>th</sup> Street between the former base and Florida's Turnpike and U.S. Highway 1 between SW 112<sup>th</sup> Avenue and SW 137<sup>th</sup> Avenue. If the NAAQS for CO would not be exceeded in the year with the highest traffic volume and level of service, then the other years and the intersections with lower volumes would also be expected to be within the

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NAAQS. The year 2015 was identified in the transportation analysis as having the highest traffic volumes and poorest level of service.

The roadway intersection analysis did not identify any ground-level CO concentrations that exceeded either the 1 hour or the 8 hour ambient air quality standard at the intersections evaluated. The results are presented in **Table 4.8-5**.

**Table 4.8-5. CO Concentrations Modeled at Roadway Intersections—Proposed Action (2015)**

Intersection	Concentration 1 hour (ppm)	NAAQS 1 hour (ppm)	Concentration 8 hour (ppm)	NAAQS 8 hour (ppm)
SW 288 <sup>th</sup> Street & SW 137 <sup>th</sup> Avenue	12.1	35	7.3	9
U.S. Highway 1 & SW 112 <sup>th</sup> Avenue	4.8	35	2.9	9

Source: SAIC.

ppm parts per million

### Cumulative Impacts

FDEP has projected emissions rates for VOCs and NO<sub>x</sub> through 2005. Emissions for 2015 have only been projected for motor vehicles (see Section 3.8.3.2). These projections are believed to be based on Miami-Dade County's high-growth population forecasts. Therefore, the air quality analysis in this section already incorporates cumulative impacts.

### Mitigation Measures

The air quality mitigation measures described below would be in addition to the motor vehicle emission controls that USEPA will be phasing in over the next decade and potential emission reductions from more efficient and better controlled aircraft engines.

One of the major focal points in reducing air emissions from the Proposed Action would be to limit the increase in VMT from motor vehicles using the airport. The methods used to control VMT growth fall into the general category of Transportation Control Measures (TCM). TCM measures could include:

- Reducing single occupant vehicles by keeping airport parking rates high.
- Encouraging high occupancy vehicles by maintaining exclusive bus and carpool lanes and installing Park-and-Ride parking lots.
- Providing viable options for passengers using the airport, such as convenient bus service, parking shuttles, or a light rail line from Miami.

To reduce other traffic congestion in the vicinity of Homestead, additional TCM measures that could be implemented include:

- Installing bikeways.
- Improving roadways to speed traffic.
- Installing intelligent traffic signal systems.



Aircraft and related operations (GSE/AGE/APU) are expected to be a major source of air emissions from the Proposed Action. These emissions could be reduced by encouraging the use of larger aircraft (which may decrease emissions per passenger) and by using electric-powered GSE/AGE/APU equipment. Terminal development by Miami-Dade County could also provide central power and air conditioning at each gate to reduce the need to use aircraft APUs. Air quality monitoring could be performed by Miami-Dade County at HST during construction and operations to identify problem areas that may warrant further action.

### **Possible Future Expansion**

The possible expansion of HST, including the addition of a second runway, would be expected to increase the total amount of air emissions by:

- Increasing the number of aircraft using the facility;
- Increasing the number of motor vehicles traveling to and from the airport to drop off and pickup passengers, take employees to and from work, and other work-related activities; and
- Increasing the number of businesses at the site.

It is not possible at this time to quantify the increases in emissions caused by the addition of a second runway because they would depend on the number and type of additional aircraft and motor vehicles using the expanded facility. Further analysis would have to be performed once estimates of air traffic and ground activity could be defined.

#### **4.8.2.2      *Commercial Spaceport Alternative***

**Construction Emissions.** The impacts of construction activities on air quality would be similar to those described for the Proposed Action.

**Operational Emissions.** An emission inventory was developed for the Commercial Spaceport alternative for 2000, 2005, and 2015. Emissions factors for aircraft and motor vehicles were calculated as described for the Proposed Action. Emissions factors from the two proposed spacecraft types were not available, so their emissions were estimated by using the emission factors for a Boeing 747. In the case of the Eclipse Astroliner tow-launch system, the use of emission factors from a Boeing 747 should provide a good estimate of spacecraft emissions, because a Boeing 747 is planned for towing the Astroliner to the launch altitude of 20,000 feet. For the Space Access Aerospacecraft system, the use of emissions from a Boeing 747 provide a conservative estimate because the ASC engines are expected to be powered by engines using liquid hydrogen and liquid air or liquid oxygen, which burn much cleaner than kerosene-type jet fuels used by Boeing 747s. A summary of the emissions inventory for the Commercial Spaceport alternative is presented in **Table 4.8-6**.

These estimates include emissions from new activity associated with the Commercial Spaceport alternative and transportation associated with reuse-related secondary development. They do not include air emissions from home-based activities, malls, fast food facilities, and light industry, but the relative contribution of these sources is expected to be minor.

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**Table 4.8-6. Operational Emissions Inventory for Disposal Property—Commercial Spaceport Alternative**

Year	Emissions (tons/year)				
	CO	VOC	NO <sub>x</sub>	SO <sub>2</sub>	PM <sub>10</sub>
2000	1	1	2	<0.1	<0.1
2005	118	16	19	0.6	0.5
2015	241	30	59	2.2	1.2

Source: SAIC.  
< less than

For each of the analysis periods, aircraft-related emissions were estimated to be the largest contributor to the total emissions inventory for NO<sub>x</sub> and SO<sub>2</sub>, while roadways dominated the emissions of CO, VOCs, and PM<sub>10</sub>. **Table 4.8-7** shows the percentage of the total emissions inventory estimated to be contributed by each source in 2015.

**Table 4.8-7. Percentage of Operational Emissions by Major Source Category—Commercial Spaceport Alternative (2015)**

Source Category	Percent Contribution to Total Emissions Inventory				
	CO	VOC	NO <sub>x</sub>	SO <sub>2</sub>	PM <sub>10</sub>
Spacecraft	5.6	3.6	45.5	45.5	0.0
GSE/AGE/APU	4.7	1.2	3.0	1.8	5.6
Roadways	53.2	51.6	29.5	44.6	64.5
Parking Lots	35.6	32.3	6.4	6.3	11.9
Stationary Sources	0.9	11.4	15.6	1.9	18.0

Source: SAIC.

**Air Quality Impacts.** The results of the EDMS model runs for the Commercial Spaceport alternative are presented in **Table 4.8-8**. The table shows that predicted concentrations would be less than with the Proposed Action, and impacts of the Commercial Spaceport alternative are not expected to result in exceedances of the NAAQS during any time period.

Like the Proposed Action, NO<sub>x</sub> is the pollutant generated under the Commercial Spaceport alternative most likely to contribute to exceedance of the NAAQS. Total NO<sub>x</sub> emissions have only been projected through 2005. Assuming countywide NO<sub>x</sub> emissions in 2015 would be as high as the projected emissions in 2005, the Commercial Spaceport alternative (construction and operations) is estimated to generate about 0.12 percent of countywide NO<sub>x</sub> emissions in 2015.

**Table 4.8-8. Increased Ambient Air Concentrations Resulting from Commercial Spaceport Alternative Emissions**

Year	Predicted Concentrations and National Ambient Air Quality Standards					
	CO (ppm) <sup>1</sup>				NO <sub>2</sub> (µg/m <sup>3</sup> ) <sup>2</sup>	
	Concentration (1 hour)	NAAQS (1 hour)	Concentration (8 hour)	NAAQS (8 hour)	Concentration (AAM)	NAAQS (AAM)
2000	2.0	35	2.0	9	10.0	100
2005	2.2	35	2.1	9	12.7	100
2015	2.3	35	2.2	9	14.3	100

Source: SAIC.

Notes: <sup>1</sup> CO predicted concentrations include an estimated 8 hour ambient background concentration of 2 ppm (Dade County 1987).<sup>2</sup> NO<sub>2</sub> predicted concentrations include an ambient background concentration of 10 µg/m<sup>3</sup>.

AAM Annual Arithmetic Mean

µg/m<sup>3</sup> micrograms per cubic meter

ppm parts per million

**Roadway Intersection Analysis.** The roadway intersection analysis for the Commercial Spaceport alternative used the approach described in the Proposed Action. No ground-level CO concentrations were calculated to exceed either the 1 hour or the 8 hour ambient air quality standard at the intersections evaluated. The results for the receptors showing the highest 1 hour and 8 hour CO concentrations are presented in **Table 4.8-9**.

**Table 4.8-9. CO Concentrations Modeled at Roadway Intersections—Commercial Spaceport Alternative (2015)**

Intersection	Concentration 1 hour (ppm)	NAAQS 1 hour (ppm)	Concentration 8 hour (ppm)	NAAQS 8 hour (ppm)
SW 288 <sup>th</sup> Street & SW 137 <sup>th</sup> Avenue	9.8	35	5.8	9
U.S. Highway 1 & SW 112 <sup>th</sup> Avenue	4.7	35	2.8	9

Source: SAIC.

ppm parts per million

### Combined Commercial Spaceport/Airport

An emissions inventory was developed for a combined Commercial Spaceport/Airport, using the same approach that was used for the Commercial Spaceport alternative. A summary of the emissions inventory is presented in **Table 4.8-10**. These estimates include the emissions estimated for the spaceport, plus additional conventional commercial aircraft.

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**Table 4.8-10. Operational Emissions Inventory for Disposal Property—Combined Commercial Spaceport/Airport**

Year	Emissions (tons/year)				
	CO	VOC	NO <sub>x</sub>	SO <sub>2</sub>	PM <sub>10</sub>
2000	1	1	2	<0.1	<0.1
2005	521	47	62	2.9	1.4
2015	812	81	144	6.4	2.8

Source: SAIC.  
< less than

The results of the EDMS model runs for the combined Commercial Spaceport/Airport are presented in **Table 4.8-11**. The table shows that the impacts of a combined Commercial Spaceport/Airport would be less than the Proposed Action and are not expected to result in exceedances of the NAAQS during any of the time periods analyzed. NO<sub>x</sub> emissions in 2015 are estimated to be about 0.23 percent of projected countywide NO<sub>x</sub>, assuming countywide emissions in 2015 are the same as projected for 2005.

**Table 4.8-11. Increased Ambient Air Concentrations Resulting From Combined Commercial Spaceport/Airport Emissions**

Year	Predicted Concentrations and National Ambient Air Quality Standards					
	CO (ppm) <sup>1</sup>				NO <sub>2</sub> (µg/m <sup>3</sup> ) <sup>2</sup>	
	Concentration (1 hour)	NAAQS (1 hour)	Concentration (8 hour)	NAAQS (8 hour)	Concentration (AAM)	NAAQS (AAM)
2000	2.0	35	2.0	9	10.0	100
2005	2.4	35	2.3	9	17.1	100
2015	2.7	35	2.4	9	19.5	100

Source: SAIC.

Notes: <sup>1</sup> CO predicted concentrations include an estimated 8 hour ambient background concentration of 2 ppm (**Dade County 1987**).

<sup>2</sup> NO<sub>2</sub> predicted concentrations include an ambient background concentration of 10 µg/m<sup>3</sup>.

AAM Annual Arithmetic Mean  
µg/m<sup>3</sup> micrograms per cubic meter  
ppm parts per million

The results of the roadway intersection analysis for a combined Commercial Spaceport/Airport estimated concentrations that would be higher than the spaceport alone, but lower than the Proposed Action. No ground-level CO concentrations would be expected to exceed either the 1 hour or the 8 hour ambient air quality standard at the intersections evaluated.

### Cumulative Impacts

The FDEP emission projections for Miami-Dade County are believed to be based on the county's high-growth population forecasts, so the analysis in this section already incorporates cumulative impacts.

### Mitigation Measures

Although the emissions associated with the Commercial Spaceport alternative would be less than the Proposed Action, many of the same mitigation measures could apply, particularly if a combined Commercial Spaceport/Airport were established.

#### 4.8.2.3 Mixed Use Alternative

**Construction Emissions.** The impacts of construction activities associated with the Mixed Use alternative on air quality are assumed to be similar to those described for the Proposed Action. The type and intensity of construction might vary, but the general activities and equipment used would be the same.

**Operational Emissions.** An emissions inventory developed for the Mixed Use alternative is summarized in **Table 4.8-12**, based on the Market-Driven development scenario. Separate emissions inventories were not prepared for the Collier-Hoover proposal, the original Collier proposal, or the original Hoover plan. The land uses for those scenarios would be similar to the Market-Driven scenario, so the emissions would probably not differ substantially from the values in Table 4.8-12.

**Table 4.8-12. Operational Emissions Inventory for Disposal Property—Mixed Use Alternative (Market-Driven)**

Year	Emissions (tons/year)				
	CO	VOC	NO <sub>x</sub>	SO <sub>2</sub>	PM <sub>10</sub>
2000	1	1	2	<0.1	<0.1
2005	105	16	17	0.4	0.6
2015	271	40	41	1.1	1.4

Source: SAIC.  
< less than

These emissions include the emissions from activities on the disposal property and transportation associated with reuse-related secondary development. Emissions from home-based activities, malls, fast food facilities, and light industry were not included, but the relative contribution of these sources would be minor.

**Air Quality Impacts.** The results of the EDMS model runs for the Market-Driven scenario of the Mixed Use alternative are presented below in **Table 4.8-13**. The table shows that the impacts of the Market-Driven scenario are not expected to result in exceedances of the NAAQS during any of the time periods analyzed. Given that the emission sources associated with the other scenarios are expected to be similar, the impacts of other scenarios are also anticipated to be similar.

NO<sub>x</sub> emissions for this alternative in 2015 are estimated to be 0.01 percent of countywide NO<sub>x</sub> emissions, assuming countywide emissions in 2015 are the same as projected for 2005.

**Table 4.8-13. Increased Ambient Air Concentrations from Mixed Use Alternative (Market-Driven) Emissions**

Year	Predicted Concentrations and National Ambient Air Quality Standards					
	CO (ppm) <sup>1</sup>				NO <sub>2</sub> (µg/m <sup>3</sup> ) <sup>2</sup>	
	Concentration (1 hour)	NAAQS (1 hour)	Concentration (8 hour)	NAAQS (8 hour)	Concentration (AAM)	NAAQS (AAM)
2000	2.0	35	2.0	9	10.0	100
2005	2.4	35	2.3	9	14.4	100
2015	3.0	35	2.8	9	21.5	100

Source: SAIC.

Notes: <sup>1</sup> CO predicted concentrations include an estimated 8 hour ambient background concentration of 2 ppm (Dade County 1987).

<sup>2</sup> NO<sub>2</sub> predicted concentrations include an ambient background concentration of 10 µg/m<sup>3</sup>.

AAM Annual Arithmetic Mean

µg/m<sup>3</sup> micrograms per cubic meter

ppm parts per million

**Roadway Intersection Analysis.** CO concentrations from ground vehicle traffic associated with the Mixed Use alternative could vary substantially based on the option implemented. **Table 4.8-14** shows the results for the Market-Driven development, and **Table 4.8-15** for the Collier-Hoover proposal. No calculated ground-level CO concentrations were found to exceed either the 1 hour or the 8 hour ambient air quality standard at the intersections evaluated.

**Table 4.8-14. CO Concentrations Modeled at Roadway Intersections—Market-Driven Mixed Use Alternative (2015)**

Intersection	Concentration 1 hour (ppm)	NAAQS 1 hour (ppm)	Concentration 8 hour (ppm)	NAAQS 8 hour (ppm)
SW 288 <sup>th</sup> Street & SW 137 <sup>th</sup> Avenue	9.7	35	5.8	9
U.S. Highway 1 & SW 112 <sup>th</sup> Avenue	4.7	35	2.8	9

Source: SAIC.

ppm parts per million

**Table 4.8-15. CO Concentrations Modeled at Roadway Intersections—Collier-Hoover Mixed Use Alternative (2015)**

Intersection	Concentration 1 hour (ppm)	NAAQS 1 hour (ppm)	Concentration 8 hour (ppm)	NAAQS 8 hour (ppm)
SW 288 <sup>th</sup> Street & SW 137 <sup>th</sup> Avenue	8.8	35	5.3	9
U.S. Highway 1 & SW 112 <sup>th</sup> Avenue	3.1	35	1.9	9

Source: SAIC.

ppm parts per million

## Cumulative Impacts

The FDEP emissions projections for Miami-Dade County are believed to be based on the county's high-growth population forecasts, so the analysis in this section already incorporates cumulative impacts.

## Mitigation Measures

The airport-related mitigation measures identified for the Proposed Action would not be applicable to the Mixed Use alternative, but the other measures could apply.

### 4.8.2.4 *No Action Alternative*

Air quality under the No Action alternative would remain the same as under projected baseline conditions. There would be no additional air pollutant emissions from reuse of the disposal property at former Homestead AFB.

### 4.8.2.5 *Independent Land Use Concepts*

Air quality impacts from the independent land use concepts could vary considerably, and it is not possible to quantify the air pollutant emissions without more detailed information. Agriculture operations or a cemetery would likely have a minimal air quality impact. A theme park could draw thousands of visitors and result in emissions comparable to or greater than the Proposed Action and other alternatives assessed. The other land use concepts would likely result in air quality impacts that would be similar to those identified for the other reuse alternatives.

## 4.8.3 Conformity With the Clean Air Act

### 4.8.3.1 *Proposed Action*

A federal agency proposing an action in a NAAQS nonattainment or maintenance area must ensure that the action conforms to the SIP's purpose of "eliminating or reducing the severity and number of violations of the ambient air quality standards and achieving expeditious attainment of such standards." Miami-Dade County is a maintenance area for ozone. Therefore, the General Conformity Rule potentially applies to FAA actions concerning the disposal property at former Homestead AFB. The determination of conformity is governed by the following principles:

- The action will not cause or contribute to any new violations of the NAAQS in the area;
- The action will not increase the frequency or severity of any existing violations of any NAAQS; and
- The action will not delay timely attainment of any air quality standard, required interim emission reductions, or milestones.

A conformity determination is also generally required if the estimated emissions of the action exceed 10 percent of the regional emissions budget. If the Proposed Action is selected, FAA would make the required conformity determination. To determine if USEPA's General Conformity Rule applies to an action, the estimated emission increases resulting from the action over the No Action alternative are compared with USEPA's *de minimis* exemption levels for conformity determinations. The emissions increases include both direct emissions (e.g., construction activities) and indirect emissions (e.g., increased aircraft operations in the future). In this case, the *de minimis* emission levels are 100 tons per year of the ozone precursors NO<sub>x</sub> and VOCs. A conformity determination is required for the Proposed

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Action because the estimated increase in NO<sub>x</sub> emissions for 2015 (shown in Tables 4.8-1 and 4.8-2) over the No Action alternative would exceed the 100 tons per year *de minimis* level. The total emissions shown in Table 4.8-1 resulting from construction activities for a particular period, such as 2005 or 2015, were converted to an annual emissions rate by assuming that the construction activities were uniformly spread over the number of years in the period. NO<sub>x</sub> emissions for operations are estimated to range from 45 tons per year in 2005 to 392 tons per year in 2015.

One method of demonstrating conformity would be to find offsetting emissions, but this is unlikely because the project-related direct and indirect NO<sub>x</sub> emissions in 2015 (Tables 4.8-1 and 4.8-2) total about 417 tons per year. However, there may be another way of demonstrating that the Proposed Action would not cause or contribute to any new violations of the ozone NAAQS in Miami-Dade County. The county and the state established NO<sub>x</sub> and VOC emissions budgets for mobile sources in Miami-Dade County as part of an ozone maintenance plan. This maintenance plan is designed to ensure that the county remains in attainment of the ozone NAAQS and has been incorporated into the Florida SIP. If the increased emissions of the Proposed Action can be added to the projected county NO<sub>x</sub> and VOC mobile emissions without causing an exceedance of the county mobile-source emissions budgets and the state agrees to such an allocation of the SIP budget, then it will have been demonstrated that the Proposed Action would not contribute to new violations of the ozone NAAQS.

The NO<sub>x</sub> and VOC mobile emissions budgets for Miami-Dade County, along with the projected countywide emissions for these pollutants for 2000, 2005, and 2015, are presented in **Tables 4.8-16** and **4.8-17**, respectively. The tables also show the estimated increase in direct and indirect NO<sub>x</sub> and VOC emissions resulting from the Proposed Action for the same years.

Table 4.8-16 illustrates that through 2015, the projected NO<sub>x</sub> emissions from the Proposed Action are estimated to consume a maximum of 13 percent of the available NO<sub>x</sub> emissions in Miami-Dade County's mobile source emissions budget, after current projections are accounted for. Projected VOC emissions are estimated to consume less than 1 percent of the available VOC emissions budget. The Proposed Action would not be expected to prevent the county from meeting its NO<sub>x</sub> or VOC emissions budgets or meeting the ozone NAAQS.

**Table 4.8-16. Comparison of Proposed Action Emissions and Mobile NO<sub>x</sub> Emissions Budget**

Year	Annual NO <sub>x</sub> Emissions (tons)				Proposed Action Percent of Available Mobile NO <sub>x</sub> Emissions Budget
	Approved Mobile NO <sub>x</sub> Emissions Budget	Projected County Mobile NO <sub>x</sub> Emissions	Mobile NO <sub>x</sub> Emissions Remaining in Budget	Projected NO <sub>x</sub> Emissions from Proposed Action	
2000	40,814	39,654	1,160	4	0.3%
2005	40,814	37,712	3,102	45	2.0%
2015	40,814	37,588	3,226	392	12.2%

Source: SAIC.



**Table 4.8-17. Comparison of Proposed Action Emissions and Mobile VOC Emissions Budget**

Year	Annual VOC Emissions (tons)				Proposed Action Percent of Available Mobile VOC Emissions Budget
	Approved Mobile VOC Emissions Budget	Projected County Mobile VOC Emissions	Mobile VOC Emissions Remaining in Budget	Projected VOC Emissions from Proposed Action	
2000	54,301	28,127	26,174	9	0.03%
2005	54,301	27,280	27,021	27	0.10%
2015	54,301	30,021	24,280	130	0.54%

Source: SAIC.

It is very likely that the current projections of Miami-Dade County NO<sub>x</sub> emissions in 2015 are actually overstated because of new mobile source emission control regulations that start to take effect in 2004 (McElveen 1999). These new controls include:

- USEPA regulations that would mandate the use of low-sulfur gasoline and reduce the sulfur content of gasoline from 300 to 30 ppm, expected to be finalized soon. The lowered sulfur content would reduce NO<sub>x</sub> emissions from motor vehicles because the sulfur in current fuels gradually “poisons” the catalyst in a vehicle’s catalytic converter so that it becomes less efficient at removing NO<sub>x</sub> emissions.
- Another regulation that mandates NO<sub>x</sub> emissions controls on heavy-duty diesel engines used in large trucks. This regulation has been promulgated and is scheduled for implementation in 2004.
- Tier 2 emission controls that would mandate tighter emission controls on passenger cars by 2004, expected to be promulgated by USEPA soon.

USEPA plans to release a new version of its mobile source model that would incorporate all of these added NO<sub>x</sub> emission controls (Mobile 6) by the end of 1999. Until then, it is not possible to determine the reduction of NO<sub>x</sub> emissions that these added controls would achieve. However, a senior staff member of the mobile sources section of FDEP has stated that he expects the new regulations will lower NO<sub>x</sub> emissions dramatically in the 2015–2020 time frame (McElveen 1999).

As one example of the level of reductions expected from these new regulations, USEPA’s Office of Mobile Sources has released on its Web site a computer model, called the “Complex Model,” that estimates the reduction in NO<sub>x</sub> emissions by the use of low-sulfur gasoline. The model estimates that low sulfur fuel would reduce NO<sub>x</sub> emissions by 11.5 percent, which would be 11.8 tons of Miami-Dade County’s projected 2015 NO<sub>x</sub> emissions of 102.98 tons per day. These results substantiate the expectation that the new mobile source emission control regulations would result in dramatic reductions of NO<sub>x</sub> emissions in the 2015–2020 time frame.

Miami-Dade County’s emissions inventory also does not take into consideration advances in combustion technology and control systems for aircraft engines that could be introduced prior to 2015 and result in significant reductions of NO<sub>x</sub> emissions from aircraft engines. This would supplement the emissions reductions for motor vehicles discussed above. In addition, it appears the county’s emission inventory is based on the county’s high growth population forecasts. Were more moderate growth to occur, the remaining emissions in the budget could be larger than shown in Table 4.8-16.

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Therefore, this conformity analysis demonstrates that, through 2015, the Proposed Action would be expected to conform to the sections of the Florida SIP applicable to Miami-Dade County. The results of the conformity analysis provide the input for making a conformity determination. The determination requires certain documentation to be provided to USEPA, FDEP, and Miami-Dade County, as well as notification of the general public.

### **Cumulative Impacts**

The SIP is cumulative in that it includes all reasonably foreseeable emission sources, except for sources that are specifically excluded because they will be accounted for elsewhere (e.g., major stationary sources that are required to get permits). The conformity analysis on the preceding pages thus already represents a cumulative analysis of all relevant mobile emissions sources in that area.

Staff of the Miami-Dade County Metropolitan Planning Organization (MPO) (Roa 1999) have indicated that the transportation growth projections made by the MPO had been criticized as being too high. Because the motor vehicle emissions used in the analysis of the Proposed Action were based on the MPO growth projections, which already reflect high-growth forecasts, they represent cumulative impacts for mobile sources, the only emissions projections available for Miami-Dade County.

### **Possible Future Expansion**

Any possible expansion of HST to two runways would be expected to occur well after the last date that Miami-Dade County has projected emissions. Therefore, no conformity analysis could be conducted or is required at this time. An analysis of conformity with the Clean Air Act would have to be performed prior to construction if federal approval or funding is involved.

#### **4.8.3.2      *Commercial Spaceport Alternative***

The NO<sub>x</sub> and VOC emissions from the Commercial Spaceport alternative (Table 4.8-6) are projected to be lower than from the Proposed Action during each of the periods studied. The Commercial Spaceport alternative would conform to the SIP because the Proposed Action is projected to conform to the SIP, and emissions from the Commercial Spaceport alternative are projected to be a small fraction of the emissions from the Proposed Action.

### **Combined Commercial Spaceport/Airport**

The NO<sub>x</sub> and VOC emissions from a combined Commercial Spaceport/Airport (Table 4.8-10) are also projected to be lower than the Proposed Action in 2015. The Combined Commercial Spaceport/Airport alternative would conform to the SIP because the Proposed Action is projected to conform to the SIP, and emissions from the Combined Commercial Spaceport/Airport are projected to be less than the emissions from the Proposed Action.

### **Cumulative Impacts**

As noted for the Proposed Action, the Miami-Dade County data on emissions for mobile sources is believed to already incorporate high population growth forecasts and therefore represents cumulative impacts.

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#### **4.8.3.3      *Mixed Use Alternative***

A conformity determination is not be required for the Mixed Use alternative because the development of the disposal property would not involve federal action, and the Air Force's disposal action is not subject to the General Conformity Rule. For comparison with the other reuse alternatives, however, the VOC and NO<sub>x</sub> emissions from the Mixed Use alternative (Table 4.8-12) are projected to be lower than the Proposed Action during each of the periods studied. The Mixed Use alternative would conform to the SIP because the Proposed Action is projected to conform to the SIP, and emissions from the Mixed Use alternative are projected to be a fraction of the emissions from the Proposed Action.

#### **Cumulative Impacts**

As noted for the Proposed Action, the Miami-Dade County data on emissions for mobile sources is believed to already incorporate high population growth forecasts and therefore represents cumulative impacts.

#### **4.8.3.4      *No Action Alternative***

A conformity determination is not required for the No Action alternative. Emissions from continued military and government use and use of conveyed property have already been incorporated into Miami-Dade County's emissions inventories by the Miami-Dade County Metropolitan Planning Organization.

#### **4.8.3.5      *Independent Land Use Concepts***

The Proposed Action and alternatives have been shown to result in air quality impacts that would not exceed the NAAQS and would maintain the county's conformity with the Florida SIP. Consequently, it is unlikely that any of the independent land use concepts would cause unacceptable or adverse air quality impacts. The only possible exception would be a large, high-density, high-visitation rate theme park located at former Homestead AFB. If federal funds were used to enhance the road network associated with such a theme park, a transportation conformity determination addressing the impacts of additional traffic might be required.

#### **4.8.4            *Air Quality Impacts in Areas of Special Concern***

The National Park Service has expressed concern that air pollutant emissions from reuse of former Homestead AFB could affect air quality in Biscayne and Everglades NPs, and that possible increases in nitrogen compounds and polycyclic aromatic hydrocarbons deposited in the parks could increase the rate of eutrophication and degrade water quality.

Everglades NP is also a Class I Prevention of Significant Deterioration area. PSD and New Source Review regulations for Class I areas only apply to stationary sources that emit 100 tons of criteria pollutants per year. No stationary sources identified in connection with the Proposed Action and alternatives are expected to exceed this level. However, air pollutant emissions associated with reuse of the disposal property at the former base could reduce the remaining PSD increments and make permitting of a future major stationary source more difficult.

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### 4.8.4.1 Proposed Action

General air quality impacts from the Proposed Action are addressed in Section 4.8.2. That section concluded that reuse-related impacts would not result in exceedance of the NAAQS. Therefore, the Proposed Action is not anticipated to appreciably degrade air quality in Biscayne and Everglades NPs.

**Table 4.8-18** presents the maximum ambient NO<sub>2</sub> concentrations that were predicted by the EDMS model at the highest receptors located in Everglades NP and Biscayne NP. The table shows that the ambient levels of NO<sub>2</sub> concentrations from the Proposed Action at both national parks are estimated to be a very small fraction of the NAAQS for NO<sub>2</sub>.

**Table 4.8-18. Maximum Predicted Increase in Ambient NO<sub>2</sub> Concentrations at Everglades and Biscayne NPs Resulting from the Proposed Action**

Year	Concentration at Biscayne NP AAM (µg/m <sup>3</sup> )	Concentration at Everglades NP AAM (µg/m <sup>3</sup> )	NAAQS AAM (µg/m <sup>3</sup> )
2000	0.007	0.002	100
2005	0.041	0.015	100
2015	0.335	0.089	100

Source: SAIC.

AAM Annual Arithmetic Mean

µg/m<sup>3</sup> micrograms per cubic meter

To address possible nitrogen deposition from the Proposed Action, the analytical approach recommended in a Phase I report by an Interagency Workgroup (USEPA, NPS, U.S. Forest Service, and USFWS) (**USEPA 1993a**) was used. Annual average NO<sub>2</sub> concentrations predicted by the EDMS model at the highest receptors located in each of the two parks were used to calculate a deposition rate for nitric acid (HNO<sub>3</sub>), using an algorithm presented in the Interagency Workgroup report. The Phase II Interagency Workgroup report suggests that presenting the deposition rates in kilograms/hectare per year as nitrogen (N) is the preferred approach (**USEPA 1998a**). **Table 4.8-19** presents the maximum increases in deposition rates estimated to occur in each park in 2000, 2005, and 2015. Based on these estimates, in 2015, nitrogen deposition in Everglades NP could increase by a maximum of 6 percent over 1994–1998 deposition rates and by 23 percent in Biscayne NP, assuming no NO<sub>x</sub> reductions in future aircraft.

**Table 4.8-19. Estimated Increases in Maximum Atmospheric Nitrogen Deposition Rates at Closest Edges of Biscayne and Everglades NPs—Proposed Action**

Year	Nitrogen Deposition Rate (kg/hectare-yr)	
	Biscayne NP	Everglades NP
2000	0.03	0.01
2005	0.20	0.07
2015	1.61	0.43

Source: SAIC.

kg/hectare-yr kilogram per hectare per year

The Phase II report indicated that this screening level calculation is extremely conservative, so deposition rates calculated using this approach should be high. As noted in Section 4.8.1, a comparison of model results for current deposition rates to measured rates in Everglades NP found the model's predictions to be 30 times greater than the measured results. In addition, discussions with NPS technical air quality staff (Notar 1999) indicated that acid deposition screening calculations are primarily intended for use in determining impacts at receptors located at extended distances (50 kilometers and beyond) from sources. Deposition values near a source should be much smaller than the screening-level calculations shown above, because it takes time to convert emissions (primarily nitric oxide or NO) into NO<sub>2</sub>, combine with water vapor to become HNO<sub>3</sub>, and then be deposited. At distances of a few miles, these reactions cannot be completed, so the values provided above are very conservative (yielding higher values than would actually be expected to occur). The potential effects of these levels of nitrogen deposition on water quality are addressed in Section 4.10.

Polycyclic aromatic hydrocarbons are toxic organic compounds that are found in petroleum products and are emitted in the exhaust from motor vehicles, aircraft, and industrial boilers. Data on PAHs are extremely limited, but it is expected that they are widely dispersed in the environments of all industrial countries, with higher concentrations of PAHs in soils and water body sediments near sources such as roadways, airports, and major industrial boilers. There are few data on the transport and fate of PAHs, but they apparently settle slowly in air, are very insoluble in water, and readily attach to particles such as soil and dust. It is assumed that emissions near the ground result in deposition on the land surface, and depending on the ability of the land surface to be moved by stormwater runoff (i.e., erosion potential or level of surface dust), they remain where they settle or are washed to nearby ditches, canals, streams, or rivers. In water bodies, PAHs tend to settle to bottom sediments and are not moved unless the sediment particles to which they are attached also move.

PAHs are considered hazardous air pollutants by USEPA, but emissions from aircraft engines are not regulated, and PAHs are not included in the NAAQS. The USEPA has developed water quality criteria for a few of the myriad PAH compounds now known, and the criteria fall in the thousandths of a microgram per liter (parts per trillion) range. Limited data indicate that water concentrations of PAHs do not often exceed these water quality criteria. The USEPA has been developing sediment quality criteria over the last few years, but no sediment quality criteria have yet been officially proposed. It is expected that PAH sediment quality criteria, when they are promulgated, would be in the parts per trillion range or lower and that more widespread measurements of PAHs in sediments would more frequently exceed sediment quality criteria than water column measurements exceed water quality criteria.

Increased activity of aircraft and other mobile sources associated with the Proposed Action would increase the generation of PAHs in the vicinity of former Homestead AFB. Emissions from ground level sources could settle to the ground and be carried in runoff to the drainage system on the former base. Emissions from aircraft after takeoff would be dispersed by winds above the earth's surface and would settle very slowly. The result is that any PAHs released from aircraft during flight would be widely distributed (e.g., over tens to hundreds of square miles) at extremely low concentrations before reaching the earth.

Emission rates of PAHs are rarely included in emissions inventories, so very few data are available to indicate the relative magnitudes of PAH emissions from potential sources. Assuming that NO<sub>x</sub>, a pollutant also generated by the combustion of fossil fuels, is a reasonable surrogate for PAH generation, the Proposed Action would be responsible for the generation of less than 0.6 percent of the PAH emissions in Miami-Dade County in 2015. The proximity of Homestead to Biscayne Bay would cause the contribution of PAHs to the bay to be at a higher percentage than expressed as its share of the Miami-Dade County area.

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### Cumulative Impacts

A cumulative impact analysis of nitrogen deposition and PAHs in Biscayne and Everglades NPs could not be performed. The model used to predict nitrogen deposition associated with the Proposed Action requires data on the spatial distribution of emission sources in the specific area of analysis in order to predict the increase in ambient concentrations of  $\text{NO}_x$  at target receptors, such as at the western edge of Biscayne Bay. Because projected cumulative emissions data in the airshed are available only on a countywide basis, it is not possible to predict cumulative increases in nitrogen deposition at specific sub-county locations like Biscayne Bay and the Everglades. Given that the model prediction for the Proposed Action appears to be a substantial overestimation, it is not expected the cumulative deposition rate could exceed the estimated deposition rates.

### Possible Future Expansion

Detailed information on operations and aircraft fleet mix is not available for a possible two-runway airport, so nitrogen deposition could not be calculated. Government and industry efforts to improve engine combustion have a goal to reduce emissions of  $\text{NO}_x$ , which should reduce future deposition rates.

#### 4.8.4.2 Commercial Spaceport Alternative

Nitrogen deposition at Biscayne and Everglades NPs under the Commercial Spaceport alternative were estimated using the same approach described for the Proposed Action. **Table 4.8-20** presents the maximum estimated nitrogen deposition rates that would occur in each of the parks. The results presented in Table 4.8-20 represent very conservative (high) estimates of increases in nitrogen deposition at these locations. Even so, estimated nitrogen deposition would be very small for all periods. In 2015, nitrogen deposition in Everglades NP could increase by approximately 1 percent over 1994–1998 deposition rates and by 3 percent in Biscayne NP.

**Table 4.8-20. Estimated Increases in Maximum Atmospheric Deposition Rates of Nitrogen at Closest Edges of Biscayne and Everglades NPs—Commercial Spaceport Alternative**

Year	Nitrogen Deposition Rate (kg/hectare-yr)	
	Biscayne NP	Everglades NP
2000	0.01	0.00
2005	0.07	0.03
2015	0.22	0.07

Source: SAIC.

kg/hectare-yr      kilogram per hectare per year

Mobile sources associated with the Commercial Spaceport alternative would increase the generation of PAHs in the vicinity of former Homestead AFB. The generation of PAHs under the Commercial Spaceport alternative is estimated to be about 15 percent of those generated under the Proposed Action. Assuming that  $\text{NO}_x$  emissions are a suitable surrogate for PAH emissions, the Commercial Spaceport alternative would be responsible for less than 0.12 percent of the PAH emissions in Miami-Dade County in 2015.

### Combined Commercial Spaceport/Airport

**Table 4.8-21** presents the maximum nitrogen deposition rates estimated to occur in the parks with a combined Commercial Spaceport/Airport. The results presented in Table 4.8-21, which represent very conservative (high) estimates of nitrogen deposition at these locations, indicate that estimated increases in nitrogen deposition would be very small for all periods. In 2015, nitrogen deposition in Everglades NP could increase by approximately 2.5 percent over 1994–1998 deposition rates and by 8.9 percent in Biscayne NP.

**Table 4.8-21. Estimated Increases in Maximum Atmospheric Deposition Rates of Nitrogen at Closest Edges of Biscayne and Everglades NPs—Combined Commercial Spaceport/Airport**

Year	Nitrogen Deposition Rate (kg/hectare-yr)	
	Biscayne NP	Everglades NP
2000	0.01	0.00
2005	0.27	0.09
2015	0.63	0.18

Source: SAIC.

kg/hectare-yr      kilogram per hectare per year

Aircraft and other mobile sources associated with a combined Commercial Spaceport/Airport would increase the generation of PAHs in the vicinity of former Homestead AFB. The amount is estimated to be about 23 percent of PAHs generated under the Proposed Action. Assuming that NO<sub>x</sub> emissions are a suitable surrogate for PAH emissions, the Combined Commercial Spaceport/Airport could be responsible for the generation of less than 0.24 percent of the Miami-Dade County PAH emissions in 2015.

### Cumulative Impacts

As noted for the Proposed Action, a cumulative impacts analysis of nitrogen deposition and PAHs in Biscayne and Everglades NPs could not be performed.

#### 4.8.4.3 Mixed Use Alternative

Although aircraft operations would not increase under this alternative, nitrogen deposition at Biscayne and Everglades NPs were estimated using the same approach described for the Proposed Action. **Table 4.8-22** presents the maximum estimated nitrogen deposition rates that would occur in the parks. The results represent very conservative (high) estimates, but increase in nitrogen deposition is nevertheless projected to be very small for all time periods. In 2015, nitrogen deposition in Everglades NP could increase by approximately 1.1 percent over 1994–1998 deposition rates and by 2.8 percent in Biscayne NP.

Mobile sources associated with the Mixed Use alternative would increase the generation of PAHs in the vicinity of former Homestead AFB. The generation of PAHs is estimated to be about 16 percent of those generated under the Proposed Action. The aircraft contribution to PAH emissions would be the same as that of the No Action alternative. Assuming that NO<sub>x</sub> emissions are a suitable surrogate for PAH emissions, the Mixed Use alternative would be responsible for generating less than 0.1 percent of the PAH emissions in Miami-Dade County in 2015.

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**Table 4.8-22. Estimated Increases in Maximum Atmospheric Deposition Rates of Nitrogen at Closest Edges of Biscayne and Everglades NPs—Mixed Use Alternative**

Year	Nitrogen Deposition Rate (kg/hectare-yr)	
	Biscayne NP	Everglades NP
2000	0.01	0.00
2005	0.08	0.04
2015	0.20	0.08

Source: SAIC.

kg/hectare-yr      kilogram per hectare per year

### Cumulative Impacts

As noted for the Proposed Action, a cumulative impacts analysis of nitrogen deposition and PAHs in Biscayne and Everglades NPs could not be performed.

#### **4.8.4.4      *No Action Alternative***

Nitrogen deposition rates would not increase in either Biscayne or Everglades NP under the No Action alternative, because there would be no change in activity levels on the former base.

#### **4.8.4.5      *Independent Land Use Concepts***

None of the independent land use concepts is expected to appreciably increase nitrogen deposition in the national parks or generation of PAHs.



## **4.9 EARTH RESOURCES**

### **4.9.1 Introduction**

This section describes the environmental consequences and cumulative effects on geology and soils that may occur as a result of implementing the Proposed Action and alternatives. These evaluations are qualitative, with consideration given to the number of acres disturbed for each alternative and the general location of earth disturbance estimated from the land use analysis. The projected land development was evaluated against existing resource conditions to identify what soil resources might be permanently altered in such a way as to prevent their use as cropland or wetland. Potential for erosion is increased as more soils are disturbed during earthmoving activities. Of special concern is the disturbance of canal banks which are then vulnerable to invasive plants (**Coffin 1999**).

Some construction activities, such as building and road construction, affect land in such a way as to preclude future agricultural use. Topsoil, and often subsoil, is removed during this type of construction. Not all development eliminates the possibility of future agricultural production. Parks and some types of parking areas may not permanently eliminate the potential for future agricultural land use.

### **4.9.2 Geology**

No impacts to geology have been identified.

### **4.9.3 Soils**

#### **4.9.3.1 Proposed Action**

Most of the land at former Homestead AFB has been disturbed, so the natural soil profiles and characteristics have changed. The only relatively undisturbed soils within the disposal property are approximately 200 acres of Biscayne marl soils located south, southeast, and northeast of the runway, most of which would not be affected by proposed construction.

Secondary development is anticipated to occur mostly within the UDB, on soils such as the Krome and Cardsound series. There are approximately 9,000 acres of vacant, unprotected land and 10,000 acres of agricultural land designated as unique farmland within the UDB. Parcels closest to existing utilities, roads, and services are most likely to be developed for commercial and residential uses. Secondary development associated with the Proposed Action could affect an estimated 2,000 acres of undeveloped land by 2015. Agricultural land, also identified as unique farmland, is estimated to comprise about 40 percent of the land that could be developed.

All unaltered soils in the ROI have severe limitations for building, but sites with deeper water tables that require less drainage and fill would be easier to develop. Soils such as Krome very gravelly loam, Cardsound-Rock outcrop complex, and Chekika very gravelly loam, which are most suited for building, are also some of the best cropland in the ROI. Some conversion of these soils outside the UDB for residential and commercial development can be expected and would result in a small reduction in the acreage of unique farmland. Commercial businesses stimulated by the proposed airport may develop in corridors along the main access roads and Turnpike interchanges serving the airport. Soils in these areas within the UDB include Krome very gravelly loam and drained Perrine and Biscayne marls. Construction in these areas has the potential to remove additional unique farmlands from agricultural production, as well as result in the drainage and fill of some wetland soils.

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In the ROI as a whole, the projected secondary development associated with the Proposed Action is anticipated to result in less than a 1 percent reduction in the total acreage of unique farmlands and the conversion of a smaller amount of wetland soils by drainage or fill.

### **Cumulative Impacts**

By 2015, the combined effects of implementing the Proposed Action, along with the effects of a high level of population growth, the Restudy, construction of the STDA, and widening of Highway 1, would be to decrease the amount of unique farmland in the ROI. A rough estimate of the amount of farmland that might be developed was generated based on forecasts of population growth and land use generated by Miami-Dade County. It is conceivable that almost half of the farmland within the UDB and between 5 and 10 percent of all the farmland in the south county could be converted to development by 2015.

Commercial, industrial, and residential construction would likely result in draining or filling in of some of the hydric soils, which are protected by federal laws and the focus of south Florida ecosystem initiatives. The extent to which wetlands could be affected is impossible to predict because it would depend on site-specific development plans. Implementation of the South Florida Ecosystem Restoration Project, the Restudy, and other similar programs would help preserve wetlands.

### **Mitigation Measures**

The establishment of a buffer between the proposed airport and Biscayne NP could reduce the potential for conversion of agricultural land within the buffer. An agricultural land protection program could reduce the permanent conversion of unique farmlands to non-agricultural uses. There are many local, state, and federal programs across the country that could be used as models for such a program.

### **Possible Future Expansion**

Future airport expansion could involve acquiring approximately 860 acres on the south/southeast side of the existing airfield for construction of a second runway and using about 200 acres on the northeast side of the existing property for parking. Portions of Boundary, Military, and Mowry Canals would need to be relocated to accommodate the expansion. The acreage to be acquired is located outside the UDB on drained Biscayne and Perrine soils that are currently in agricultural production. Airport expansion would be expected to remove about 1,060 acres of unique farmlands from agricultural production.

If Mowry, Boundary, and Military canals were relocated, best management practices for erosion control from the FDEP standards and specifications would need to be followed, including stabilizing and reseeding canal banks to reduce erosion and sedimentation in the surface water flowing to Biscayne Bay, and to reduce invasion by exotic plants (Coffin 1999). Other standards could also be in effect at that time.

#### **4.9.3.2      *Commercial Spaceport Alternative***

The impacts on soil resources from on-site development for the Commercial Spaceport alternative would be less than under the Proposed Action. Fewer acres are expected to be disturbed on the disposal property. In general, since most of the soils have already been disturbed, there would be no impact from new construction.

Secondary development associated with this alternative would be less than estimated for the Proposed Action. Although there could be construction for industrial uses, the lower level of population in-migration would result in less commercial and residential development, which is likely to result in fewer acres of agricultural land being converted to nonagricultural uses.

### **Combined Commercial Spaceport/Airport**

With a combined Commercial Spaceport/Airport, overall development would be more intensive than with a spaceport only, but the total amount of earth disturbance would still be expected to be less than for the Proposed Action. Secondary development could include increased residential development to accommodate in-migrants and possibly additional commercial properties. This could cause a small reduction of the overall amount of unique farmland.

### **Cumulative Impacts**

The potential cumulative impacts of the Commercial Spaceport alternative would be similar to those described for the Proposed Action. The contribution of the Commercial Spaceport alternative to the cumulative conversion of farmland would be less because less secondary development is anticipated.

### **Mitigation Measures**

Potential mitigation measures for the Commercial Spaceport alternative could be the same as discussed for the Proposed Action.

#### **4.9.3.3      *Mixed Use Alternative***

The impacts to soil resources from on-site development for the Mixed Use alternative could range from less than to comparable to the Proposed Action. In general, since most of the soils have already been disturbed, there would be no impact from new construction. Secondary development associated with this alternative would be less than the Proposed Action but more than the Commercial Spaceport alternative.

The impacts of soil resources would be higher under the Collier-Hoover proposal than the Market-Driven scenario, due to the extent of earth disturbance and site development. Because the soils have been previously filled and disturbed, site-specific soil and geologic evaluations would be needed to verify the conditions and ensure that rock outcrops and solution cavities would not interfere with the proposed construction of lakes and waterways. Preliminary analysis has not identified any solution cavities that could be a problem, but if any were discovered during final siting and design, the layout of these features may need to be adjusted.

### **Cumulative Impacts**

The potential cumulative impacts of the Mixed Use alternative would be similar to those described for the Proposed Action. The contribution of this alternative to the cumulative conversion of farmland would be less because less secondary development is anticipated.

### **Mitigation Measures**

Potential mitigation measures for the Mixed Use alternative could be the same as discussed for the Proposed Action.

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### **4.9.3.4      *No Action Alternative***

There would be no construction on the disposal property under the No Action alternative. Therefore, no additional agricultural land would be taken out of production and no hydric soils would be affected as a result of this alternative. Conversion of farmland would still be expected to occur due to ongoing population growth and development in the region.

### **4.9.3.5      *Independent Land Use Concepts***

Use of the surplus property as a plant nursery area could help preserve agricultural production in the ROI. Site-specific soil evaluations would be needed to determine the best areas for agricultural use because most of the soils on former Homestead AFB have been disturbed or filled. Natural soils adjacent to the northwest part of the base are mapped as Krome very gravelly loam, one of the best for agricultural production in the ROI.

The other independent land uses would be expected to involve minimal construction on already disturbed soils. These uses would have little impact on soil resources. No additional agricultural land would be taken out of production and no hydric soils would be affected as a result of these concepts.

## **4.10 WATER RESOURCES**

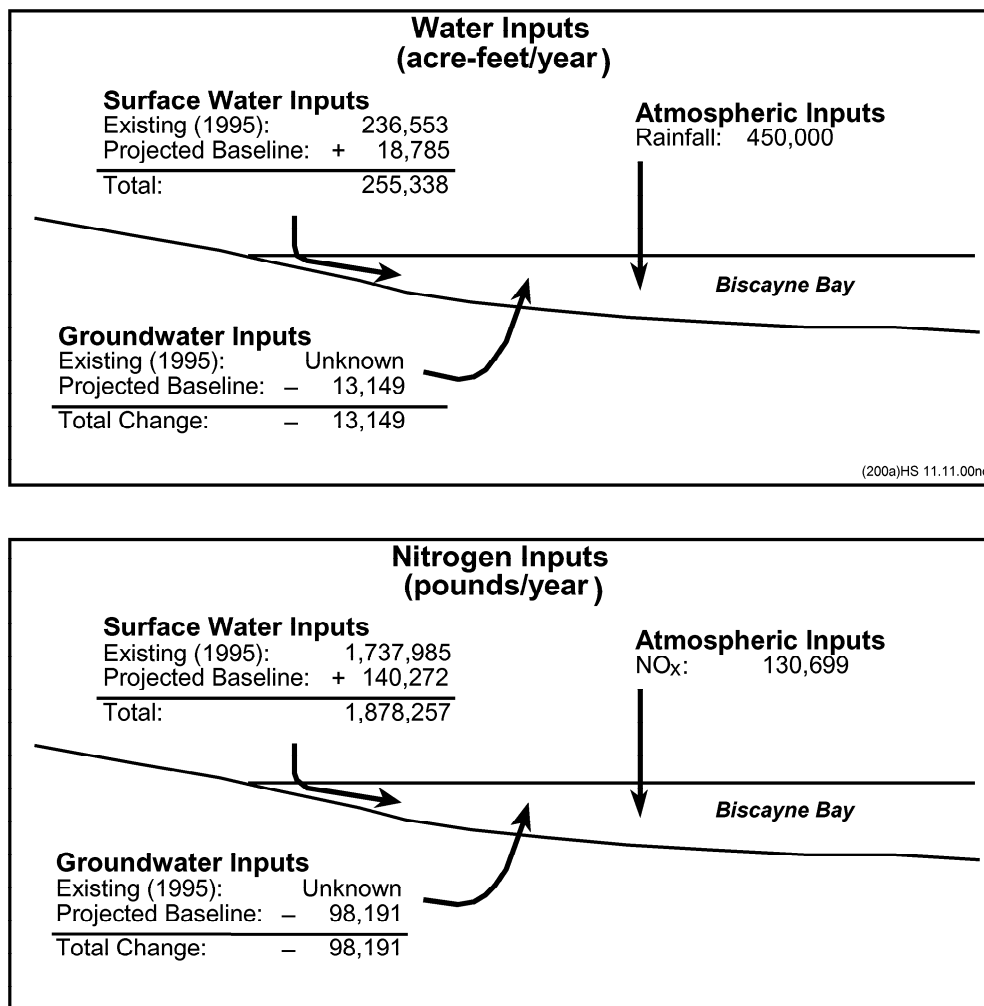
### **4.10.1 Introduction**

The direct effects of the Proposed Action and alternatives on water resources were evaluated using numerical models. Each alternative was modeled for its anticipated effects on the surface water system using the Surface Water Management Model. The impacts on the groundwater system were then qualitatively evaluated based on baseline groundwater model results presented in Section 3.10 and the surface water model results for each alternative. The effects of increased drawdown associated with population growth in the area were also modeled. Indirect effects were evaluated by estimating changes in surface water and groundwater discharges and loadings associated with changes in impervious surface from secondary development in the area. The following sections discuss the anticipated effects of the Proposed Action and alternatives on surface water and groundwater.

The impacts of the Proposed Action and alternatives on water resources would be related to three factors: (1) proposed changes in the stormwater management system on the former base, (2) increased runoff associated with additional paving and buildings both on site (direct) and off site (secondary), and (3) increases in atmospheric nitrogen deposition from air emissions associated with the reuse of former Homestead AFB. The Proposed Action encompasses changes in aspects of the drainage system at the former base identified in the Surface Water Management Master Plan prepared by Miami-Dade County for the site. These changes are also assumed to occur in the Commercial Spaceport alternative. For modeling purposes, the drainage system under the Market-Driven scenario of the Mixed Use alternative and the No Action alternative is assumed to remain similar to or the same as currently exists. The Collier-Hoover proposal, as well as the original proposal from Collier Resources Company and the original Hoover plan, would be required to acquire a permit and implement a stormwater management system similar to the Proposed Action's. The estimated changes associated with the Collier-Hoover proposal are based on this assumption, as insufficient information was available about the proposal's stormwater management system to model it using SWMM.

As shown in Section 3.10, both surface water and groundwater in the vicinity of former Homestead AFB drain into Biscayne Bay. Biscayne Bay receives water from surface water, groundwater, and rainfall (**Figure 4.10-1**). Understanding the total effect of redevelopment of the former base on water quality in Biscayne Bay requires consideration of both on-site and off-site development. For most alternatives, on-site development is expected to involve implementation of a stormwater management plan designed to reduce surface water discharges to Biscayne Bay by retaining more of the stormwater runoff on the site. Retained stormwater percolates through the soil and becomes groundwater or evaporates. Therefore, reducing surface water discharges increases the amount of groundwater that enters the bay.

Conversely, secondary development off site is expected to be incremental and dispersed. It is not known what stormwater management systems may be implemented in connection with secondary development, so for analysis purposes, it was assumed no special management would be used. Because secondary development would increase the amount of impervious surface (through buildings and pavement), it would result in increased stormwater runoff and, consequently, in surface water discharges to Biscayne Bay. More rainfall would become runoff, reducing groundwater inputs into the bay.



**Figure 4.10-1  
Existing and Projected Baseline Water and Nitrogen Inputs  
to Biscayne Bay by 2015**

Thus, the on-site development (including a stormwater management system) and the secondary development (with no specific stormwater retention) would have opposite effects, with one decreasing surface water and increasing groundwater flows, and the other increasing surface water and decreasing groundwater flows. The analysis of resulting impacts on Biscayne Bay therefore considers the net effect of the two. **Table 4.10-1** presents the net effects of flows to Biscayne Bay for the Proposed Action and alternatives in 2015. These are added to projected baseline flows, which are estimated to change from current flows due to baseline growth and development (see Figure 4.10-1). The context for the baseline flows is the combined discharge from Military, Mowry, and Princeton Canals, which are estimated to comprise about 60 percent of total surface water discharges to southern Biscayne Bay.

**Table 4.10-1. Net Changes in Water Flows to Biscayne Bay by 2015**

<b>Alternative</b>	<b>Surface Water (acre-feet/year)<sup>1,2</sup></b>	<b>Groundwater (acre-feet/year)<sup>1</sup></b>	<b>Net Change (acre-feet/year)</b>	<b>Percent Change<sup>3</sup></b>
Existing (1995)	236,553	NA		
Projected Baseline Change	18,785	(13,149)	5,636	2.4%
Projected Baseline	255,338	NA		
Proposed Action	5,108	(3,664)	1,445	0.6% <sup>4</sup>
Commercial Spaceport	346	(336)	9	<0.1% <sup>4</sup>
Market-Driven	2,439	(1,707)	732	0.3% <sup>4</sup>
Collier-Hoover	2,927	(1,627)	1,300	0.5% <sup>4</sup>

Source: SAIC.

Notes: <sup>1</sup> Includes direct on-site and secondary off-site development.

<sup>2</sup> Combined surface water flows from Military, Mowry, and Princeton Canals.

<sup>3</sup> Percent change in surface water flow from Military, Mowry, and Princeton Canals, which comprise approximately 60 percent of total surface water flows to southern Biscayne Bay.

<sup>4</sup> Percentage increase over projected baseline.

NA Not available

Table 4.10-1 shows the estimated increase in discharges from the three canals associated with baseline population growth between 1995 and 2015, assuming a moderate growth rate. The changes in surface water discharges estimated for the Proposed Action and alternatives are compared to this projected baseline. The increases associated with each alternative except the Market-Driven scenario are attributable to reuse-related secondary development. They can therefore be viewed, for comparison purposes, as equivalent to some level of baseline population growth.

Because the magnitude of current groundwater inputs to Biscayne Bay is not known, only changes can be presented; totals are not available. Therefore, the percentage changes in Table 4.10-1 are relative to surface water flows only; existing groundwater inputs are not factored into these calculations. The percentages of change are consequently higher than they would be if groundwater inputs were included.

The SWMM was also used to estimate changes in chemical loads in surface water discharges. These calculations were limited to chemicals, primarily metals, for which measured baseline data were available, as reported in Section 3.10.

Concerns have been expressed about the increase in nitrogen inputs to Biscayne Bay due to redevelopment of former Homestead AFB. Nitrogen inputs would come from three main sources: surface water discharges, groundwater discharges, and atmospheric deposition of air emissions. The changes in surface and groundwater flows described above would affect the amount and form of nitrogen inputs to the bay. In particular, nitrogen in groundwater generally takes the form of ammonia, and un-ionized ammonia (a fraction of total ammonia) is toxic. Figure 4.10-1 illustrates projected baseline inputs of nitrogen to Biscayne Bay in 2015.

Two methods were used to estimate the change in nitrogen loads in groundwater from the Proposed Action and alternatives. To estimate changes in direct inputs from the former base, nitrogen loads were calculated based on the SWMM results for the surface water modeling. The SWMM calculated both total nitrogen washoff and the estimated nitrogen loads that would be discharged through surface water. Groundwater loads were then calculated as the difference between the amount of nitrogen washed off impervious surface and the nitrogen discharged through surface water. This probably overestimates the

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groundwater loads because some nitrogen would be taken up by plants. The extent to which this would occur is not known and would depend on the nature of the land surface in the drainages.

To estimate changes in nitrogen loads in groundwater from secondary development, it was assumed that the change in loads would be proportional to the change in groundwater flows. Secondary development associated with the Proposed Action and alternatives would consist of residential, commercial, and industrial land uses that are similar to existing development in the area; therefore, nitrogen loads, along with loads of other chemicals, can also be expected to be similar.

The net change in nitrogen loads in groundwater associated with each alternative is comprised of the changes in direct inputs and secondary inputs. Like the surface water inputs, these two sources tended to have opposite effects (except under the Market-Driven scenario), with increases in direct inputs and decreases in secondary inputs.

**Table 4.10-2** presents estimated net changes in nitrogen inputs from all sources for the Proposed Action and alternatives in 2015. Airborne nitrogen inputs for the Proposed Action reflect increased aircraft emissions associated with a commercial airport (see Section 4.8). Like Table 4.10-1, the percent changes in Table 4.10-2 are relative to surface water loads only, since the magnitude of current groundwater loads is not known.

**Table 4.10-2. Net Changes in Nitrogen Inputs to Biscayne Bay by 2015**

Alternative	Surface Water (pounds/year) <sup>1,2</sup>	Groundwater (pounds/year) <sup>1</sup>	Atmospheric (pounds/year)	Net Change (pounds/year)	Percent Change <sup>3</sup>
Existing (1995)	1,737,985	NA	130,699		
Projected Baseline Change	140,272	(98,191)	—	42,081	2.4%
Projected Baseline	1,878,257	NA	130,699	NA	
Proposed Action	46,984	(9,792)	29,768	66,960	3.6% <sup>4</sup>
Commercial Spaceport	11,405	8,834	4,057	24,296	1.3% <sup>4</sup>
Market-Driven	22,590	(9,548)	3,693	16,735	0.9% <sup>4</sup>
Collier-Hoover	30,695	1,870	3,693	32,518	1.7% <sup>4</sup>

Source: SAIC.

Notes: <sup>1</sup> Includes direct on-site and secondary off-site development.

<sup>2</sup> Combined surface water loads from Military, Mowry, and Princeton Canals.

<sup>3</sup> Percent change in surface water load.

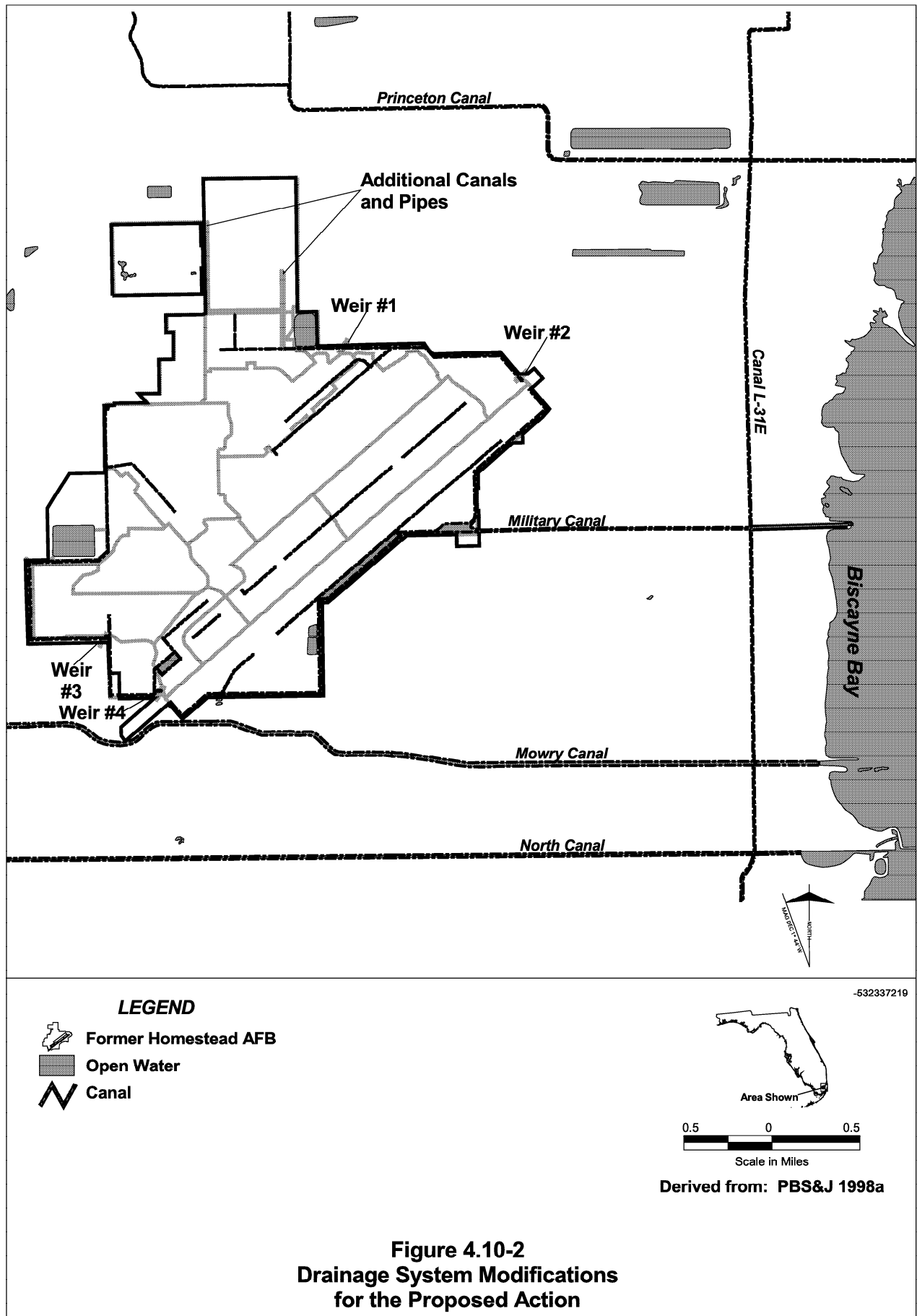
<sup>4</sup> Percentage change over projected baseline.

NA Not available

### 4.10.2 Surface Water

**Figure 4.10-2** shows the 18 major drainage basins on the former base, indicating the location of major proposed modifications to the drainage system assumed to be incorporated into the Proposed Action. Within each drainage basin are a number of sub-basins and connections that control the discharge of surface water to the Boundary Canal system and subsequently discharge to Military Canal. **Table 4.10-3** identifies the assumptions and parameters used in the SWMM model for each modeled alternative.





**Table 4.10-3. Summary of SWMM Parameters for Each Modeled Alternative**

<b>SWMM Input</b>	<b>Proposed Action</b>	<b>Commercial Spaceport</b>	<b>Mixed Use (Market-Driven)</b>	<b>No Action</b>
Hydraulic Characteristics	Percent impervious surface modified by projected land use.	Percent impervious surface modified by projected land use.	Percent impervious surface modified by projected land use.	Existing percent impervious surface.
Drainage Network	Inclusion of weirs in canals and increasing water storage capacity by 2005; connection of former golf course to canal system by 2015.	Inclusion of weirs in boundary canals and increasing water storage capacity by 2005; connection of former golf course to canal system by 2015.	Existing configuration.	Existing configuration.
Contaminant Loadings	Buildup of dust and dirt based on population/ employment density associated with alternative and no initial loading.	Buildup of dust and dirt based on population/ employment density associated with alternative and no initial loading.	Buildup of dust and dirt based on population/ employment density associated with alternative and no initial loading.	Buildup of dust and dirt based on existing situation.

Source: SAIC.

#### **4.10.2.1 Proposed Action**

The implementation of the Proposed Action would result in a net increase in surface water flows and loads to Biscayne Bay and a net decrease of groundwater flows and loads to the bay. As shown in Table 4.10-1, the Proposed Action would change water inputs to Biscayne Bay in 2015 by about 0.6 percent of projected baseline inputs through Military, Mowry, and Princeton Canals. Since these three canals comprise about 60 percent of surface water inputs to southern Biscayne Bay, the Proposed Action increase would comprise about 0.4 percent of total surface water discharges to the southern bay and a smaller percentage of all freshwater sources, including groundwater and rainfall.

The Proposed Action would change nitrogen inputs to Biscayne Bay by approximately 3.6 percent of projected baseline surface water discharges through Military, Mowry, and Princeton Canals, about 2.2 percent of total surface water nitrogen inputs to southern Biscayne Bay, and a smaller fraction of total nitrogen inputs including groundwater sources and existing atmospheric deposition. Details of the changes in surface water flows and loads are presented in the following paragraphs. Details of the changes in groundwater flows and loads are presented in Section 4.10.3.1.

The basis for the design of the stormwater management system was taken from the Homestead Regional Airport Surface Water Management Master Plan (**PBS&J 1998a**). This plan and a permit application for stormwater discharges would need to be submitted to, and approved by, SFWMD prior to implementation. During the approval process, substantial changes may be made to this plan, but it is expected that the performance of any approved stormwater management system would be similar to that described here. The plan developed by the county initially involves changes in the portion of the site drainage that discharges to the Boundary Canal, assumed to be in place by 2005. A portion of the disposal property, the site of the former golf course, currently does not drain into Boundary Canal but into Princeton Canal. Since this area is not programmed for development by the county until after 2005, it has been assumed that its drainage will not have changed by 2005. It is incorporated into the system

that discharges into Military Canal for the 2015 analysis. Thus, the estimated discharges from Military Canal to Biscayne Bay for that year introduce runoff from a new area not heretofore included in Military Canal discharges. This can, in turn, be expected to reduce discharges through Princeton Canal.

The results of the flow modeling (**Table 4.10-4**) indicate an increase in total runoff of 13 percent over baseline by 2005 and 43 percent by 2015, reflecting the increasing percentage of impervious area and the hydraulic connection to the former golf course by 2015. However, because of the construction of French drains, additional above-ground storage, and flow-controlling weirs, it is estimated that there would be a 31 percent reduction in the volume of water discharged to Military Canal in 2005, and total discharge is estimated to be approximately 28 percent below baseline levels in 2015.

**Table 4.10-4. SWMM Flow and Discharge Results by Modeled Alternative**

Alternative	Year	Acre-Feet/Year	
		On-Site Total Runoff	Discharge to Biscayne Bay
Projected Baseline/ No Action	2000	4,591	5,133
	2005	4,591	5,133
	2015	4,591	5,133
Proposed Action	2000	4,591	5,133
	2005	5,188	3,542
	2015	6,565 <sup>1</sup>	3,696 <sup>1</sup>
Commercial Spaceport	2000	4,591	5,133
	2005	4,912	3,542
	2015	5,968 <sup>1</sup>	3,644 <sup>1</sup>
Mixed Use (Market-Driven) <sup>2</sup>	2000	4,591	5,133
	2005	5,004	5,338
	2015	5,280	5,595

Source: SAIC.

Notes: <sup>1</sup> Includes runoff from former golf course newly connected to the stormwater management system.

<sup>2</sup> Assumes no stormwater management system. With a system, reductions in discharges to Biscayne Bay would be similar to the Proposed Action and Commercial Spaceport alternative.

The chemical loading per acre would increase under the Proposed Action because of proposed increases in the acreage of parking lots, roads, ramps, aprons, walkways, and buildings, but the loading to Military Canal would decrease because additional surface and subsurface storage would retain both water and contaminants. The SWMM modeling results of chemical loading to Military Canal from on-site runoff are shown in **Table 4.10-5** as “direct” inputs. The direct surface water loading of metals under the Proposed Action is projected to decrease 37 percent with the addition of the stormwater management system by 2005, and decrease 23 percent in 2015 with the addition of the former golf course to the stormwater management system, compared to baseline loadings. Similarly, nutrient loadings are estimated to decrease 34 percent in 2005 and 19 percent in 2015 relative to baseline conditions. Most of these contaminants would accumulate on the former base, but water-soluble chemicals such as ammonia, nitrates, and nitrites are likely to be transferred to groundwater.

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**Table 4.10-5. Changes in Surface Water Flows and Loads to Biscayne Bay  
Under the Proposed Action**

Year		Flow (acre- feet/year)	Nitrogen (pounds/ year)	Phosphorus (pounds/ year)	Cadmium (pounds/ year)	Copper (pounds/ year)	Lead (pounds/ year)	Zinc (pounds/ year)
2000	Projected Baseline <sup>1</sup>	241,251	1,773,068	3,920	54	773	382	3,445
	Proposed Action							
	Direct	0	0	0	0	0	0	0
	Secondary	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	0
	Percent Change <sup>2</sup>	0	0	0	0	0	0	0
2005	Projected Baseline <sup>1</sup>	245,945	1,808,121	3,995	55	788	390	3,512
	Proposed Action							
	Direct	(1,591)	(3,347)	(59)	(1)	(7)	(2)	(32)
	Secondary	789	5,891	13	0	3	1	11
	Total	(802)	2,543	(46)	(1)	(5)	(0)	(20)
	Percent Change <sup>2</sup>	(0.3)	0.1	(1.2)	(1.9)	(0.6)	(0.1)	(0.6)
2015	Projected Baseline <sup>1</sup>	255,338	1,878,257	4,144	57	818	405	3,645
	Proposed Action							
	Direct	(1,437)	(1,892)	(33)	(1)	(4)	(1)	(19)
	Secondary	6,545	48,876	104	1	21	10	93
	Total	5,108	46,984	71	1	16	9	74
	Percent Change <sup>2</sup>	2.0%	2.5%	1.7%	1.2%	2.0%	2.3%	2.0%

Source: SAIC.

Notes: <sup>1</sup> Includes Military, Mowry, and Princeton Canals.

<sup>2</sup> Percent change in inputs from Military, Mowry, and Princeton Canals, which comprise about 60 percent of total discharges to southern Biscayne Bay.

Some numbers not exact due to rounding.

< less than

Secondary development associated with reuse of former Homestead AFB would convert some existing off-site undeveloped and agricultural land to residential, commercial, and industrial uses. This would increase the amount of impervious surface in the area, thereby increasing the amount of rainwater runoff per storm event. Depending on how this stormwater is managed, some of it would be lost through evapotranspiration, and some of it would infiltrate to groundwater. The remainder would be discharged into Biscayne Bay.

Stormwater runoff from secondary development in the immediate vicinity of former Homestead AFB would be discharged to Biscayne Bay through Princeton and Mowry Canals. It is assumed that approximately 5 acre-feet of new runoff per year would be generated for each new impervious acre of secondary development. This results in conservatively high estimates because it is assumed that all rainfall on new impervious surfaces would be discharged into Biscayne Bay. Based on the estimated extent of secondary development associated with the Proposed Action, approximately 789 acre-feet of runoff could be generated by 2005 and 6,545 acre-feet by 2015. If all of the runoff were discharged into the bay, it could increase the combined discharge of Princeton, Mowry, and Military Canals over the projected baseline by 0.3 percent by 2005 and 2.6 percent by 2015. In 2015, the increase in the combined discharge of these canals would be 1.5 percent of total projected baseline surface water discharges to southern Biscayne Bay (assuming the three canals comprise 60 percent of the total discharges). This

discharge could increase the number of times that the salinity control structures would need to be opened on these canals and/or increase the volume of water released at each opening.

The net effect of both direct and secondary development is estimated to be a reduction of 802 acre-feet per year in surface water discharge by 2005 and an increase of 5,108 acre-feet per year by 2015. As Table 4.10-1 shows, baseline population growth (assuming a moderate growth rate), is anticipated to increase surface water discharges from Mowry and Princeton Canals by 18,784 acre-feet over the 20 years between 1995 and 2015, which is an average of 939 acre-feet per year. Based on this rate, the net increase in surface water discharge associated with the Proposed Action in 2015 would be equivalent to an additional 5.4 years of baseline population growth in the area.

The runoff from secondary development would also pick up nutrients and toxic chemicals as it flowed off of the newly developed land, increasing the discharge of nutrients and toxic chemicals to the bay. Estimates are included in Table 4.10-5. The estimates are conservative (high) and range from 1.7 to 2.5 percent of projected baseline loads from Military, Mowry, and Princeton Canals in 2015. If the other canals that discharge into southern Biscayne Bay are assumed to have similar chemical loads, this translates into 0.7 to 1.5 percent increases in total inputs to southern Biscayne Bay.

Fuel and other spills that occurred on the airport site generally would be expected to be contained within the confines of the former base for two reasons: first, a spill contingency plan would be in place designed to contain spills as quickly as possible after they occurred; and second, even if a spill were not rapidly contained and spilled material entered the stormwater management system, it would remain in the canals and reservoirs on and around the site. Most spills would be expected to be of small volume because only small volumes of hazardous material would be used at one time. Fuel, the only material likely to be used in large quantities, would float on the water in the stormwater management system where it could be cleaned up. Because water is pumped from below the surface of the reservoir into Military Canal, it is unlikely that spilled fuel would be discharged to Military Canal. Should a spill occur during (or because of) a hurricane, however, there is a possibility that Biscayne Bay water could reach at least the eastern portion of the airport, as occurred during Hurricane Andrew. Under these circumstances, the spilled fuel would be dispersed over a fairly wide area, including the land area east and southeast of the site and Biscayne Bay.

Aircraft air pollutant emissions include nitrogen oxides that could eventually settle to the surface. Total increased atmospheric nitrogen deposition into the Biscayne NP portion of Biscayne Bay due to the Proposed Action was estimated from predicted nitrogen deposition rates at the western edge of the bay. As discussed in Section 4.8.4.1, estimated deposition rates are very conservative (high by an order of magnitude). Atmospheric nitrogen concentrations would be expected to be highest nearest the airport and decrease with distance. The rate of decrease is assumed to be proportional to the decrease in atmospheric concentration of nitrogen oxides at greater distances from the site. Based on test model runs of atmospheric nitrogen concentrations proceeding eastward from the airport over the bay, the deposition rate averaged over the entire Biscayne NP portion of the bay is estimated to be about 23 percent of the shoreline deposition rate. Using an area of about 90,000 acres as the Biscayne NP part of the bay, total annual deposition is estimated to increase about 29,768 pounds per year by 2015 with the Proposed Action, averaging about 0.33 pound per acre (equivalent to about 0.37 kilograms per hectare) per year. This would be equivalent to about 1.6 percent of the combined projected baseline nitrogen input of Princeton, Mowry, and Military Canals, or about 1 percent of total existing water inputs to southern Biscayne Bay. Nearshore deposition rates are estimated to be about 4.3 times higher, at 1.43 pounds per acre (1.61 kilograms per hectare) per year.

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Considering all sources of nitrogen inputs to Biscayne Bay from the Proposed Action (see Table 4.10-2), the net change in 2015 is estimated to be an increase of 66,960 pounds per year, or 3.6 percent of projected baseline loads from Military, Mowry, and Princeton Canals.

Aircraft also emit polycyclic aromatic hydrocarbons (see Section 4.8.4.1). PAH deposition would increase under the Proposed Action, but the location and rate of the deposition cannot be estimated with the current state of scientific knowledge and data. It is expected that there would be increased PAHs in surface water runoff from the former base associated with increased emissions from mobile sources. Because they sorb strongly to soils and sediments, PAHs in surface water would more than likely be retained in the Boundary Canal system on the former base.

### **Cumulative Impacts**

Two potential future developments in south Miami-Dade County could combine with the Proposed Action to considerably alter the pattern of surface water flow to Biscayne Bay from land near the former base. If the county's high-growth population projections were realized, the associated development would substantially increase surface water discharges to the bay. If the L-31E Flowway Distribution and STDA projects were implemented, further substantial changes could occur. These changes, and the Proposed Action's contribution to future conditions, are discussed below.

A large increase in local population, as forecast in the high-growth projections, and the resulting conversion of undeveloped and agricultural land to a mixture of commercial, industrial, and residential uses, would increase stormwater runoff and associated pollutant loads. Depending on the methods used to manage stormwater, the acreage developed could generate an estimated 42,048 additional acre-feet of runoff by 2015. This is a conservative (high) estimate that assumes all rain falling on new impervious surface would be discharged to Biscayne Bay. Some of this runoff would actually infiltrate to groundwater and some would evaporate, but the remainder would be discharged. If all of the additional runoff were discharged as surface water, the surface water input through Military, Mowry, and Princeton Canals could increase to an estimated 302,494 acre-feet per year by 2015. The Proposed Action's contribution to the total discharge is estimated to be about 1.7 percent in 2015.

Estimated cumulative chemical loadings in 2015 are shown in **Table 4.10-6**. The Proposed Action's contribution to the estimated total chemical loads in 2015 would range from 1.0 to 2.1 percent.

Implementation of the proposed L-31E Flowway Redistribution Project and associated STDA would cause the greatest changes in the hydrologic regime east of former Homestead AFB. The flowway project would entail building a new canal between canal L-31E and former Homestead AFB, which would retain overland flow from upstream areas and receive additional flows from Princeton and Mowry Canals. High-quality sewage treatment plant wastewater would provide an additional water source to Princeton Canal. Inflows entering the new canal would raise the water table above the ground surface, causing overland sheet flow east of the canal toward L-31E and Biscayne Bay. Culverts would be built into the berm east of L-31E, as part of another project, to allow this surface flow to discharge to Biscayne Bay. At the same time, the end of Military Canal would be filled in, and the water currently being discharged from the canal would be routed through the new canal/treatment system. Similarly, the operating regimes for release of water from both Princeton and Mowry Canals to Biscayne Bay would be changed, retaining a greater amount of runoff for discharge to the new canal/treatment system or infiltration to groundwater. At the same time, however, the total volume of water that might be received by southern Miami-Dade County could be reduced by up to 40 percent, substantially reducing the freshwater surface water inflow to Biscayne Bay through Princeton and Mowry Canals.

**Table 4.10-6. Cumulative Surface Water Flows and Loads to Biscayne Bay by 2015**

<b>Alternative<sup>1</sup></b>	<b>Flow (acre- feet/year)</b>	<b>Nitrogen (pounds/ year)</b>	<b>Phosphorus (pounds/ year)</b>	<b>Cadmium (pounds/ year)</b>	<b>Copper (pounds/ year)</b>	<b>Lead (pounds/ year)</b>	<b>Zinc (pounds/ year)</b>
High-Growth Increase Over Projected Baseline	42,048	313,987	667	9	134	67	598
High-Growth <sup>2</sup>	297,386	2,192,244	4,811	66	952	472	4,243
Proposed Action	302,494	2,239,228	4,882	67	969	481	4,317
Commercial Spaceport	297,732	2,203,649	4,800	66	953	474	4,247
Market-Driven	299,825	2,214,834	4,980	69	972	478	4,332
Collier-Hoover	300,313	2,222,939	4,847	66	962	478	4,286

Source: SAIC.

Notes: <sup>1</sup> Levels reported for each alternative include projected baseline, reuse-related direct and secondary development, and high growth increases.

<sup>2</sup> Without reuse of former Homestead AFB; same as No Action alternative.

All inputs are for Military, Mowry, and Princeton Canals.

If all components of the proposed L-31E project were implemented, the impact to Biscayne Bay would be a reduction in the volume of freshwater discharged through Princeton, Mowry, and Military Canals; enhancement of sheet flow to the bay; and general improvement in the quality of water being discharged. Estimates of the volume and quality of water that would enter the bay are not available, but overland sheet flow would remove a substantial fraction of metals, many hydrocarbons, PAHs, and some nutrients from the surface water discharge.

### **Mitigation Measures**

Some mitigation measures that would reduce the discharge of pollutants in surface water have been assumed for the Proposed Action as Miami-Dade County has committed to them. The primary mitigation is the retention of as much surface water runoff as possible. Pollutants that sorb to soils and sediments, such as metals, many organics, and phosphorus, would be retained on or near the former base with the retained runoff, while water-soluble pollutants, such as ammonia, nitrates, and nitrites, would enter the groundwater.

Further reductions in pollutant loadings could be accomplished by incorporating a stormwater treatment and distribution area into the design of the stormwater management system for HST. The STDA could be on site or off site. An STDA would allow water to flow over a vegetated land surface, and nutrients (and some toxic chemicals) would be taken up by plants. Metals and other pollutants that sorb to soils would also be removed from the water to some extent. The amount would depend on the area used for the STDA. It is possible an STDA that covers most of the area east of the former base would be sufficiently effective in both evening out pulses of flow and removing nutrients and toxic chemicals that it could render an on-site stormwater management system unnecessary. Military Canal could be used to transport stormwater to the STDA, and keeping the flow control structure closed or backfilling the end of the canal would prevent direct discharge to Biscayne Bay. An off-site STDA could be designed to also receive inputs from Mowry and/or Princeton Canals, thereby also reducing the effects of secondary and cumulative development.

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Aggressive pollution prevention and spill prevention and management programs, including reductions in the use of fertilizers on landscaped areas, could reduce nutrient inputs, particularly nitrogen species, to Biscayne Bay. An integrated pest management program and reductions in the use of conventionally fueled motor vehicles (e.g., alternatively fueled vehicles for on-site transportation) would also have some marginal benefits.

### **Possible Future Expansion**

The development of a second runway at former Homestead AFB would convert approximately 1,060 acres of undeveloped land into airfield and aviation support facilities. It is expected that runoff from this area would be added to the on-site stormwater management system and discharged through Military Canal to Biscayne Bay. If all the additional runoff were discharged through Military Canal, discharges to the bay could increase by up to 2,700 acre-feet per year, or 59 percent, over current discharges from the former base. More precise discharge volumes would be determined in future environmental analysis that will be required if construction of a second runway is proposed.

#### **4.10.2.2    *Commercial Spaceport Alternative***

As shown in Table 4.10-1, the Commercial Spaceport alternative is projected to change total water inputs to Biscayne Bay in 2015 by less than 0.004 percent of projected baseline inputs through Military, Mowry, and Princeton Canals. Table 4.10-2 shows that the Commercial Spaceport alternative is projected to change total nitrogen inputs to Biscayne Bay by approximately 1.3 percent of projected baseline surface water discharges through Military, Mowry, and Princeton Canals. This equates to about 0.8 percent of total surface water nitrogen inputs to southern Biscayne Bay, and a smaller fraction of total nitrogen inputs that include groundwater sources and existing atmospheric deposition. Details of the changes in surface water flows and loads are presented in the following paragraphs. Details of the changes in groundwater flows and loads are presented in Section 4.10.3.2. Changes in surface water flows and loads for this alternative are presented in **Table 4.10-7**.

The increase in impervious surface under the Commercial Spaceport alternative is estimated to result in an increase in direct runoff of 7 percent over baseline in 2005 and 30 percent in 2015, with the addition of runoff from the former golf course area to the canal system. Assuming that stormwater controls for this alternative would need to be as stringent as for the Proposed Action, it is estimated the volume of water discharged to Military Canal would decrease by 31 percent in 2005 and by 29 percent in 2015 because of the stormwater management system.

Estimated chemical transport in surface water to Biscayne Bay from the former base under this alternative is summarized in Table 4.10-7. The overall loading of metals is anticipated to decrease 29 percent with the addition of the stormwater management system in 2005 and 27 percent by 2015 with the addition of the former golf course to the stormwater system. Similarly, it is estimated that surface water nutrient loads would decrease 28 percent by 2005 and 23 percent by 2015.

Off-site secondary development and associated conversion of undeveloped land to residential, commercial, and industrial uses would increase the amount of surface runoff in the area around the spaceport. It is estimated that approximately 708 acre-feet of additional runoff could be generated by secondary development by 2005 and 1,835 acre-feet by 2015 under this alternative. If all the runoff were discharged into Biscayne Bay, the combined discharge of Princeton and Mowry Canals would increase by 0.3 percent by 2005 and 0.7 percent over the projected baseline by 2015. Considering both direct and



**Table 4.10-7. Changes in Surface Water Flows and Loads to Biscayne Bay Under the Commercial Spaceport Alternative**

Year		Flow (acre- feet/year)	Nitrogen (pounds/ year)	Phosphorus (pounds/ year)	Cadmium (pounds/ year)	Copper (pounds/ year)	Lead (pounds/ year)	Zinc (pounds/ year)
2000	Projected Baseline <sup>1</sup>	241,251	1,773,068	3,920	54	77	382	3,445
	Commercial Spaceport							
	Direct	0	0	0	0	0	0	0
	Secondary	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	0
	Percent Change <sup>2</sup>	0	0	0	0	0	0	0
2005	Projected Baseline <sup>1</sup>	245,945	1,808,121	3,995	55	788	390	3,512
	Commercial Spaceport							
	Direct	(1,591)	(2,719)	(48)	(1)	(6)	(1)	(26)
	Secondary	708	5,286	11	0	2	1	10
	Total	(883)	2,567	(37)	(1)	(4)	(0)	16
	Percent Change <sup>2</sup>	(0.4)	0.1	(0.9)	(1.5)	(0.5)	(0.1)	(0.5)
2015	Projected Baseline <sup>1</sup>	255,338	1,878,257	4,144	57	818	405	3,645
	Commercial Spaceport							
	Direct	(1,489)	(2,294)	(40)	(1)	(5)	(1)	(23)
	Secondary	1,835	13,699	29	0	6	3	26
	Total	346	11,405	(11)	0	1	2	3
	Percent Change <sup>2</sup>	0.1	0.6	(0.3)	0.9	0.1	0.4	0.1

Source: SAIC.

Notes: <sup>1</sup> Includes Military, Mowry, and Princeton Canals.

<sup>2</sup> Percent change in inputs from Military, Mowry, and Princeton Canals, which comprise about 60 percent of total discharges to southern Biscayne Bay.

Some numbers not exact due to rounding.

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secondary effects, it is estimated that the Commercial Spaceport would cause a slight (0.1 percent) net increase in surface water flows to Biscayne Bay by 2015. Changes in chemical loads would range from –0.3 to 0.9 percent of projected baseline loads from Military, Mowry, and Princeton Canals in 2015.

The net effect of both direct and secondary development is estimated to be a reduction in surface water discharge of 883 acre-feet per year by 2005 and an increase of 346 acre-feet per year by 2015. In 2015, this would be equivalent to an additional 0.4 year of baseline population growth in the area (assuming a moderate rate of growth).

Using the same assumptions as described for the Proposed Action, total increased atmospheric nitrogen deposition from the Commercial Spaceport alternative into the Biscayne NP portion of Biscayne Bay in 2015 is estimated to increase 4,057 pounds per year by 2015, or about 0.2 percent of the projected baseline nitrogen input from Mowry, Princeton, and Military Canals combined. This would result in an average deposition rate over Biscayne Bay of about 0.05 pounds per acre and a nearshore deposition rate of about 0.19 pounds per acre (0.22 kilograms per hectare) per year.

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Considering all sources of nitrogen inputs to Biscayne Bay from the Commercial Spaceport alternative (see Table 4.10-2), the net change in 2015 is estimated to be an increase of 24,296 pounds per year, or 1.3 percent of projected baseline loads from the three canals.

While there would be some increase in the amount of PAHs generated under this alternative, the magnitude is estimated to be about 15 percent of those generated under the Proposed Action. Since most of the additional PAH generation would occur at or near ground level at the airport, most of the additional PAHs would probably remain on or near the former base because they probably would remain in sediments in the on-site canal system and would not likely be pumped into Military Canal.

### **Combined Commercial Spaceport/Airport**

It is estimated a combined Commercial Spaceport/Airport would generate approximately 1,800 additional acre-feet of direct stormwater runoff by 2005 and 3,100 acre-feet by 2015. SWMM was not run for on-site changes in stormwater generation for the combined Commercial Spaceport/Airport, but direct discharges and chemical loads would be expected to be similar to those for the Commercial Spaceport alone because a similar on-site surface water management system would likely be implemented. Secondary development, however, would be higher than the spaceport alone and cause increases in surface water discharges and decreases in groundwater discharges. Secondary discharges are estimated to increase by 4,157 acre-feet per year by 2015. Assuming the direct discharges are the same as estimated for the Commercial Spaceport alone, the net change would be an increase of 2,668 acre-feet per year by 2015. Pollutant inputs to Biscayne Bay would be expected to increase in proportion to the increase in secondary surface water discharges.

The impacts from on-site spills of fuel and other hazardous materials would be the same as described for the Proposed Action.

Using the same assumptions as described for the Proposed Action, total increased atmospheric nitrogen deposition into the Biscayne NP portion of Biscayne Bay from a combined Commercial Spaceport/Airport in 2015 is estimated to be 11,633 pounds per year, or about 0.6 percent of the combined projected baseline nitrogen input from Mowry, Princeton, and Military Canals. Average deposition rates would be about 0.13 pounds per acre and nearshore rates about 0.56 pounds per acre (0.63 kilograms per hectare) per year.

The combined Commercial Spaceport/Airport would generate PAH emissions similar to the Proposed Action because of inclusion of aircraft activity. While the PAHs emitted at altitude would tend to be widely distributed, potentially over hundreds of square miles, the PAHs emitted at ground level would tend to remain at or near the site in the stormwater management system.

### **Cumulative Impacts**

The consequences of the Commercial Spaceport alternative in conjunction with the high-growth forecasts for south Miami-Dade County are presented in Table 4.10-6. The Commercial Spaceport is estimated to change total flows and loads in southern Miami-Dade County by fractions of 1 percent.

The impacts of the L-31E Flowway Redistribution Project and STDA would be the same as described for the Proposed Action.

## **Mitigation Measures**

Potential mitigation measures for the Commercial Spaceport alternative would be the same as described for the Proposed Action.

### **4.10.2.3    *Mixed Use Alternative***

The impacts of the Mixed Use alternative on water resources would be related primarily to increased runoff associated with additional paving and buildings on (direct) and off (secondary) the former base. Without an increase in aircraft operations, atmospheric nitrogen deposition would be a minor component. This would result in a net increase in surface water flows and loads to Biscayne Bay and a net decrease in groundwater flows and loads to the bay. A conservative (high) estimate of changes in flows by 2015 are shown in Table 4.10-1 for the Market-Driven and Collier-Hoover scenarios. Estimates of changes in nitrogen loads by 2015 are shown in Table 4.10-2. The Market-Driven scenario is estimated to change water inputs to Biscayne Bay in 2015 by less than 0.3 percent of projected baseline inputs through Military, Mowry, and Princeton Canals. Nitrogen inputs to Biscayne Bay would change by approximately 0.9 percent of projected baseline surface water discharges through Military, Mowry, and Princeton Canals (about 0.5 percent of total surface water nitrogen inputs to southern Biscayne Bay and a smaller fraction of total nitrogen inputs that include groundwater sources and existing atmospheric deposition). The Collier-Hoover proposal is estimated to change net flows by about 0.5 percent and nitrogen inputs by 1.7 percent of the combined projected baseline flows of the three canals (0.4 percent of total flows and 1 percent of total nitrogen inputs). Details of the changes in surface water flows and loads are presented in the following paragraphs. Details of the changes in groundwater flows and loads are presented in Section 4.10.3.3.

Market-Driven development could result in an estimated increase in total direct runoff of 9 percent by 2005 and 15 percent by 2015 over baseline, reflecting the increasing percent of impervious area associated with on-site development. Assuming there may be no site-wide stormwater management system, discharges to Biscayne Bay would also be expected to increase, unlike the Proposed Action and Commercial Spaceport alternative. Using this assumption, direct discharges to Military Canal would be estimated to increase by 4 percent in 2005 and 9 percent in 2015.

The amount of secondary development expected under this scenario would be less than with the Proposed Action. It is estimated that approximately 789 acre-feet of additional runoff could be generated by 2005 and 1,977 acre-feet by 2015.

If all of the additional direct and secondary runoff were discharged to Biscayne Bay, the total increase in stormwater generated by the Market-Driven scenario could increase the combined discharge of Military, Princeton, and Mowry Canals by 0.4 percent in 2005 and 0.9 percent in 2015. In 2015, this would be equivalent to the increase in surface water discharges associated with an additional 2.6 years of baseline population growth in the area, assuming a moderate growth rate.

Estimated chemical transport to Biscayne Bay under the Market-Driven scenario is summarized in **Table 4.10-8**. The overall loading of metals without a stormwater management system is estimated to increase by between 1.6 and 4.8 percent by 2015 compared to the projected baseline. Similarly, nutrient loadings, compared to baseline, could increase by 1.2 percent in 2015.

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**Table 4.10-8. Changes in Surface Water Flows and Loads to Biscayne Bay Under Market-Driven Development**

Year		Flow (acre- feet/year)	Nitrogen (pounds/ year)	Phosphorus (pounds/ year)	Cadmium (pounds/ year)	Copper (pounds/ year)	Lead (pounds/ year)	Zinc (pounds/ year)
2000	Projected Baseline <sup>1</sup>	241,251	1,773,068	3,920	54	77	382	3,445
	Market-Driven							
	Direct	0	0	0	0	0	0	0
	Secondary	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	0
	Percent Change <sup>2</sup>	0	0	0	0	0	0	0
2005	Projected Baseline <sup>1</sup>	245,945	1,808,121	3,995	55	788	390	3,512
	Market-Driven							
	Direct	205	3,529	62	1	6	1	25
	Secondary	789	5,889	13	0	3	1	11
	Total	994	9,418	78	1	8	3	36
	Percent Change <sup>2</sup>	0.4	0.5	1.9	2.1	1.0	0.7	1.0
2015	Projected Baseline <sup>1</sup>	255,338	1,878,257	4,144	57	818	405	3,645
	Market-Driven							
	Direct	462	7,830	137	2	14	3	60
	Secondary	1,977	14,760	31	<1	6	3	28
	Total	2,439	22,589	169	3	20	6	89
	Percent Change <sup>2</sup>	0.9	1.2	4.1	4.8	2.5	1.6	2.4

Source: SAIC.

Notes: <sup>1</sup> Includes Military, Mowry, and Princeton Canals.

<sup>2</sup> Percent change in inputs from Military, Mowry, and Princeton Canals, which comprise about 60 percent of total discharges to southern Biscayne Bay.

Some numbers not exact due to rounding.

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The Collier-Hoover proposal, like the original Collier and Hoover plans, would require a stormwater management system. The Collier-Hoover proposal includes a plan to retain substantial amounts of stormwater on site and would use up to 379,465 gallons per day (510 acre-feet per year) of treated sewage for irrigation. Insufficient information is provided in the proposal to develop a SWMM configuration for the proposal, so approximations were used to estimate overall surface water flows and chemical loads.

The Collier-Hoover proposal provides for at least 720 acre-feet of water storage on the former base, the highest level of any alternative. Since some of this storage would be below the water table, it is not clear what the net storage would be. For purposes of analysis, it was assumed that water retention would be at least as high as the Proposed Action's, but it could be higher. The reclaimed wastewater that would be used for irrigation was assumed to enter groundwater, although a sizable fraction of it would evaporate, particularly if it were applied through spraying, the most common application method in southern Florida.

Chemical loads in direct surface water flows for the Collier-Hoover proposal (Table 4.10-9) were assumed to be the same as for the Proposed Action, although it is likely that vegetation in the wetlands and canals would remove some and, depending on retention times, perhaps most of the chemicals in the water. The overall impacts of the Collier-Hoover proposal are therefore overstated, but the extent to which they are overstated cannot be precisely calculated.

**Table 4.10-9. Changes in Surface Water Flows and Loads to Biscayne Bay Under the Collier-Hoover Proposal**

Year		Flow (acre- feet/year)	Nitrogen (pounds/ year)	Phosphorus (pounds/ year)	Cadmium (pounds/ year)	Copper (pounds/ year)	Lead (pounds/ year)	Zinc (pounds/ year)
2000	Projected Baseline <sup>1</sup>	241,251	1,773,068	3,920	54	77	382	3,445
	Collier-Hoover							
	Direct	0	0	0	0	0	0	0
	Secondary	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	0
	Percent Change <sup>2</sup>	0	0	0	0	0	0	0
2005	Projected Baseline <sup>1</sup>	245,945	1,808,121	3,995	55	788	390	3,512
	Collier-Hoover							
	Direct <sup>3</sup>	(1,591)	(3,348)	(59)	(1)	(7)	(2)	(32)
	Secondary	3,049	22,771	48	1	10	5	43
	Total	1,458	19,424	(10)	(1)	3	3	12
	Percent Change <sup>2</sup>	0.6	1.1	(0.3)	(1.0)	0.3	0.8	0.3
2015	Projected Baseline <sup>1</sup>	255,338	1,878,257	4,144	57	818	405	3,645
	Collier-Hoover							
	Direct <sup>3</sup>	(1,437)	(1,892)	(33)	(1)	(4)	(1)	(19)
	Secondary	4,364	32,587	69	1	14	7	62
	Total	2,927	30,695	36	0	9	6	43
	Percent Change <sup>2</sup>	1.1	1.6	0.9	0.4	1.2	1.5	1.2

Source: SAIC.

Notes: <sup>1</sup> Includes Military, Mowry, and Princeton Canals.

<sup>2</sup> Percent change in inputs from Military, Mowry, and Princeton Canals, which comprise about 60 percent of total discharges to southern Biscayne Bay.

<sup>3</sup> Assumes same effects as the stormwater management system for the Proposed Action.

Some numbers not exact due to rounding.

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The Collier-Hoover proposal is estimated to change net surface water inputs to Biscayne Bay in 2015 by 1.1 percent over projected baseline inputs through Military, Mowry, and Princeton Canals. This would be equivalent to the increase in surface water discharges associated with an additional 3.1 years of baseline population growth in the area, assuming a moderate growth rate.

Nitrogen inputs to Biscayne Bay would change by approximately 1.6 percent of projected baseline surface water discharges through Military, Mowry, and Princeton Canals (about 1.0 percent of total surface water nitrogen inputs to southern Biscayne Bay, and a smaller fraction of total nitrogen inputs that include groundwater sources and existing atmospheric deposition).

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Atmospheric nitrogen deposition is assumed to be the same for the Market-Driven and Collier-Hoover scenarios. Using the same assumptions as described for the Proposed Action, total increased atmospheric nitrogen deposition into the Biscayne NP portion of Biscayne Bay from the Mixed Use alternative was estimated to increase 3,693 pounds per year by 2015, or about 0.2 percent of the combined projected baseline nitrogen input from Mowry, Princeton, and Military Canals. This would result in an average deposition rate of about 0.04 pounds per acre and a nearshore rate of about 0.18 pounds per acre (0.20 kilograms per hectare) per year.

Considering all sources of nitrogen inputs to Biscayne Bay from the Mixed Use alternative (see Table 4.10-2), the net change in 2015 is estimated to be an increase of 16,735 pounds per year for the Market-Driven scenario and 32,578 pounds per year for the Collier-Hoover scenario, or 0.9 to 1.7 percent of projected baseline loads from the three canals.

PAH generation under the Mixed Use alternative is estimated to be about 16 percent of the generation under the Proposed Action. The majority of the increased PAHs would be emitted at ground level and thus would tend to remain on or near the site in the stormwater canals.

### **Cumulative Impacts**

The consequences of the Mixed Use alternative (Market-Driven and Collier-Hoover scenarios) in conjunction with the high-growth population forecasts for south Miami-Dade County by 2015 are presented in Table 4.10-6. The project's contribution to total stormwater flow in southern Miami-Dade County is estimated to be between 1.0 and 1.2 percent of the high-growth stormwater flows from Military, Mowry, and Princeton Canals. This equates to between 0.6 and 0.7 percent of total surface water discharges to southern Biscayne Bay.

The impacts of the L-31E Flowway Redistribution Project and STDA would be the same as described for the Proposed Action.

### **Mitigation Measures**

It was assumed for this alternative that there might be no site-wide stormwater management system. As demonstrated for both the Proposed Action and Commercial Spaceport alternative, such a system would be effective in reducing pollutant loadings to Biscayne Bay. Absent a party that had responsibility for site-wide stormwater management, it would be up to the new land owners to maximize pollutant removal on their property by developing a stormwater management system on the former base. Miami-Dade County could require controls on small properties, but only by modifying existing ordinances which currently only require plans for developments of 100 acres or more. Additional potential mitigations that could be implemented by the new property owners and users include designing and implementing an aggressive pollution prevention program and reducing the use of fertilizers on landscaped areas.

#### ***4.10.2.4 No Action Alternative***

Under the No Action alternative, surface water runoff and discharge would not change from the projected baseline, as shown in Table 4.10-4. The estimated runoff of 4,591 acre-feet represents the total annual runoff from all areas of the site. The discharge of 5,051 acre-feet represents the total volume of water that is discharged to Military Canal annually. Total discharge exceeds total runoff because of the water that is assumed to already be present in the canal. The runoff and discharge estimates are the same for all years because there would be little or no change to the drainage system or to impervious area under the No

Action alternative. The chemical loadings for the No Action alternative would also be the same as the projected baseline loadings.

The consequences of the No Action alternative (projected baseline) in conjunction with the high-growth forecasts for south Miami-Dade County are included in Table 4.10-6. There would be no increase in the contribution from the disposal property to total stormwater flow in southern Miami-Dade County in any year.

#### **4.10.2.5    *Independent Land Use Concepts***

Each independent land use concept implies different construction requirements, and the impervious surface associated with each has not been determined. To the extent that a given land use concept would replace a lower-density land use, there would be increased runoff, increased discharges from Military Canal, increased inputs of pollutants to Biscayne Bay, and reduced inputs of groundwater to Biscayne Bay. To the extent that a given land use concept would replace a higher-density land use, all of the changes would be in the opposite direction. Changes associated with the implementation of most of the independent land use concepts are expected to be small, however, because they would occupy a relatively small portion of the disposal property. Uses such as agriculture, a cemetery, or a theme park have the potential to have smaller adverse water quantity and water quality impacts than the uses included as part of the Proposed Action and alternatives.

### **4.10.3        Groundwater**

The hydrologic effects of each alternative on the groundwater system were qualitatively evaluated based on surface water modeling results. The amount of rainfall that reaches groundwater after overland flow, evapotranspiration, and soil moisture retention is the recharge that influences groundwater movement.

**Table 4.10-10** presents estimated changes in groundwater inputs to Biscayne Bay from the Proposed Action and alternatives. **Table 4.10-11** presents estimated changes in nitrogen inputs through groundwater. Table 4.10-10 shows that, by 2015, all alternatives would result in a net reduction in groundwater inputs. Nitrogen loads would also decrease under the Proposed Action and Market-Driven scenario, but are estimated to increase under the Commercial Spaceport alternative and Collier-Hoover scenario (see Table 4.10-11). In the case of the Commercial Spaceport alternative, this is due to the increase in direct groundwater flows caused by on-site stormwater retention and the relatively smaller amount of secondary development associated with this alternative. In the case of the Collier-Hoover scenario, it is attributable to the proposed use of retained stormwater (and possibly wastewater) for irrigation, which further increases direct groundwater inputs.

Ammonia in groundwater is a documented problem in some areas of southeastern Florida, and particularly in the area of the Miami-Dade County landfill ("Mount Trashmore"). However, there are very few data that allow a technically defensible evaluation of the concentration of ammonia in groundwater in the vicinity of former Homestead AFB.

The Florida state freshwater standard for un-ionized ammonia in surface water is 0.02 milligrams per liter. There is no standard for groundwater, but groundwater can interact with surface water, and in those circumstances the surface water standards would be applicable. The few data available indicate that existing ammonia concentrations in nearshore groundwater beneath Biscayne Bay are on the order of 0.7 milligrams per liter (**Meeder et al. 1997**). Assuming un-ionized ammonia comprises 5 percent or more of total ammonia in common conditions, this level would already exceed Florida freshwater surface water standards.

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**Table 4.10-10. Estimated Changes in Groundwater Inputs to Biscayne Bay**

<b>Alternative</b>	<b>2000 (acre-feet/year)</b>	<b>2005 (acre-feet/year)</b>	<b>2015 (acre-feet/year)</b>
Proposed Action			
Direct	0	941	918
Secondary	0	(552)	(4,582)
Total	0	389	(3,664)
Commercial Spaceport			
Direct	0	941	948
Secondary	0	(495)	(1,284)
Total	0	446	(336)
Market-Driven			
Direct	0	(215)	(323)
Secondary	0	(552)	(1,384)
Total	0	(767)	(1,707)
Collier-Hoover			
Direct	0	941	1,428
Secondary	0	(2,135)	(3,055)
Total	0	(1,194)	(1,627)

**Table 4.10-11. Estimated Changes in Groundwater Nitrogen Inputs to Biscayne Bay**

<b>Alternative</b>	<b>2000 (pounds/year)</b>	<b>2005 (pounds/year)</b>	<b>2015 (pounds/year)</b>
Proposed Action			
Direct	0	9,431	24,421
Secondary	0	(4,123)	(34,213)
Total	0	5,308	(9,792)
Commercial Spaceport			
Direct	0	9,691	18,423
Secondary	0	(3,700)	(9,589)
Total	0	5,991	8,834
Market-Driven			
Direct	0	519	784
Secondary	0	(4,123)	(10,332)
Total	0	(3,604)	(9,548)
Collier-Hoover			
Direct	0	9,691	24,681
Secondary	0	(15,940)	(22,811)
Total	0	(6,249)	1,870



These data, although the only available, are not a precise measurement of groundwater ammonia concentrations in the vicinity of former Homestead AFB. More precise calculations can only be obtained through groundwater sampling closer to the former base. There might be a potential for the Florida standard for un-ionized ammonia to be exceeded if groundwater becomes surface water prior to entering the bay and if the following are true: (1) groundwater nitrogen concentrations are the same as those for surface water on the former base, (2) all groundwater nitrogen concentrations are converted to ammonia by the time they are discharged to Biscayne Bay, and (3) there is no dilution of groundwater nitrogen concentrations from rainfall east of the former base. There is insufficient information to determine whether these conditions exist. Obtaining the information needed to make a more precise determination would require groundwater monitoring to assess both current and future concentrations of un-ionized ammonia.

However, monitoring in the vicinity of the former base without providing additional contextual data would be inconclusive. To ascertain the impact of redevelopment of the former base on concentrations of un-ionized ammonia in groundwater, monitoring data would need to be available for the region as a whole, as well as for the immediate vicinity of Homestead. It is suspected that if ammonia in groundwater were found to exceed the Florida freshwater quality standard in areas other than the immediate vicinity of the county landfill, exceedances would likely occur along most of the coast. A monitoring program throughout southeastern Florida would be necessary to obtain the information needed to determine the extent to which un-ionized ammonia is a regional problem. Such a program could be undertaken by the state or another agency responsible for water management in south Florida. Monitoring east of Homestead could be a part of that program. Engineering calculations were used to determine if a new water supply production well installed approximately one mile west of the base would influence the water table configuration and require an update of the groundwater flow model. Based on derived parameters and the Cooper Jacobs equation, the radial extent of a cone of depression of less than 0.25 feet in depth would extend approximately 2,652 feet from the production well. This change was deemed insufficient to affect the conclusions reached through the groundwater flow model.

#### ***4.10.3.1 Proposed Action***

Although The Proposed Action could result in an increase in surface runoff at former Homestead AFB of up to 43 percent by 2015, the total discharge from Military Canal is estimated to decrease by about 28 percent from baseline levels because of the retention of stormwater in the modified canal system and in French drains. Stormwater retention would increase groundwater recharge, and the additional recharge would compensate for any deficit in groundwater recharge associated with increased runoff. The retention of runoff would also reduce the depth to the water table beneath the site and increase the frequency, duration, and/or area of standing water on the site. The system has been designed, however, to prevent any increased standing water from interfering with ongoing military or proposed commercial operation of the airfield by draining water from operations areas and holding it in surface and subsurface structures away from the operational areas.

Retained stormwater would be subject to evapotranspiration and soil moisture retention in the vadose zone above the water table, but soil moisture retention would be small because the water table is very close to the ground surface. Evapotranspiration accounts for the loss of about 36.5 percent of annual precipitation in south Florida, and it was assumed that 36.5 percent of the stored water on the former base would be lost through evapotranspiration. The remaining water would become groundwater recharge that would eventually flow into Biscayne Bay. Using these assumptions, the on-site retention of stormwater at the former base is estimated to increase annual groundwater flow into Biscayne Bay between Princeton and Mowry Canals to 8,115 acre-feet by 2005 and 8,092 acre-feet by 2015, an increase of 13 percent over

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the 1995 groundwater discharge of 7,174 acre-feet per year. Overall changes in groundwater flows are shown in Table 4.10-10.

The increase in the amount of infiltration could potentially increase the concentrations of some pollutants (i.e., water soluble toxic chemicals) in the Biscayne Aquifer, a sole source aquifer, but there are essentially no data that can be used to assess their present occurrence in groundwater or how they are likely to change with airport development. Most toxic pollutants (most metals, PAHs, most pesticides) would probably sorb to soils and would likely not increase groundwater concentrations. In addition, the wells used for public drinking water supplies are west and north of the former base, and groundwater flow is to the east, so no impacts are expected on public drinking water supplies.

The decrease in surface water discharges and increases in groundwater discharges from the former base could change the form of the loadings to Biscayne Bay. The quantities of nitrogen entering the bay through direct surface water discharges would be reduced. At the same time, there is a potential for an increase in ammonia loadings through direct groundwater inputs. Nitrogen compounds tend to be converted to ammonia in groundwater, and more ammonia would be discharged to Biscayne Bay because of the increase in groundwater flow from the former base. Direct nitrogen loads in groundwater are estimated to increase by 9,431 pounds per year in 2005 and 24,421 pounds per year in 2015. Most of the nitrogen is likely to be ammonia, and un-ionized ammonia is estimated to be about 5–10 percent of the total.

Secondary development associated with the Proposed Action would result in an increase in impervious area in areas around former Homestead AFB. Surface runoff in the immediate vicinity of former Homestead AFB is estimated to increase, resulting in a reduction in groundwater recharge and a reduction in groundwater flow into Biscayne Bay. The reduction could be partially offset by landscape watering and other activities associated with increased population and development, but evapotranspiration and overland flow, not groundwater recharge, would account for the majority of the runoff associated with secondary development. It is estimated that secondary development in the vicinity of former Homestead AFB could reduce groundwater flow into Biscayne Bay in the area of the former base by approximately 4,582 acre-feet per year and reduce nitrogen loads by 34,213 pounds per year by 2015.

The net change in groundwater flows and nitrogen loads as a result of the Proposed Action (direct and secondary) would be a net reduction of 3,664 acre-feet of groundwater and 9,792 pounds of nitrogen per year by 2015.

The City of Homestead currently operates a local drinking water supply system that takes its water from the Biscayne Aquifer west of former Homestead AFB (see Section 3.3). Water withdrawals from the Biscayne Aquifer by the City of Homestead for increased population associated with the Proposed Action are estimated to cause a steady state (equilibrium) drop in the water table of no more than 0.5 feet for a radius of no more than 0.5 mile.

Fuel and other spills at HST would be more likely to occur in the impervious areas (pavements) than in pervious areas, so groundwater would generally not be affected by these spills. Should a spill occur on pervious ground, it could contaminate the near-surface groundwater. Although total groundwater flow is significant in the area, its movement is on the order of 100 feet per year, so there would be ample opportunity to clean up contaminated groundwater before it could reach Biscayne Bay. Cleanup procedures would be addressed in a Spill Prevention, Control, and Countermeasures Plan that the airport operator would be required by regulation to prepare.

## Cumulative Impacts

If Miami-Dade County's high-growth population forecasts were realized, approximately 42,000 acre-feet per year of additional runoff could be generated by associated development south of Eureka Drive by 2015. Only part of this runoff (on the order of 30 percent) would be expected to become groundwater recharge; the remainder would evaporate or be transported to Biscayne Bay. This could mean a net loss to the groundwater system south of Eureka Drive of up to 29,434 acre-feet per year by 2015 (**Table 4.10-12**). The reduction in groundwater flow associated with high growth and the net reduction in groundwater as a result of the Proposed Action could cause a total reduction in groundwater flow into southern Biscayne Bay of approximately 33,098 acre-feet per year from the projected baseline in 2015. Similarly, there could be a reduction in total nitrogen discharged in groundwater to southern Biscayne Bay of about 229,583 pounds per year compared to the projected baseline in 2015.

**Table 4.10-12. Cumulative Changes in Groundwater Inputs and Nitrogen Loads to Biscayne Bay by 2015**

<b>Alternative</b>	<b>Flow (acre-feet/year)</b>	<b>Nitrogen (pounds/year)</b>
High-Growth Change	(29,434)	(219,791)
Proposed Action	(3,664)	(9,792)
Commercial Spaceport	(336)	8,834
Market-Driven	(1,707)	(9,458)
Collier-Hoover	(1,627)	1,870

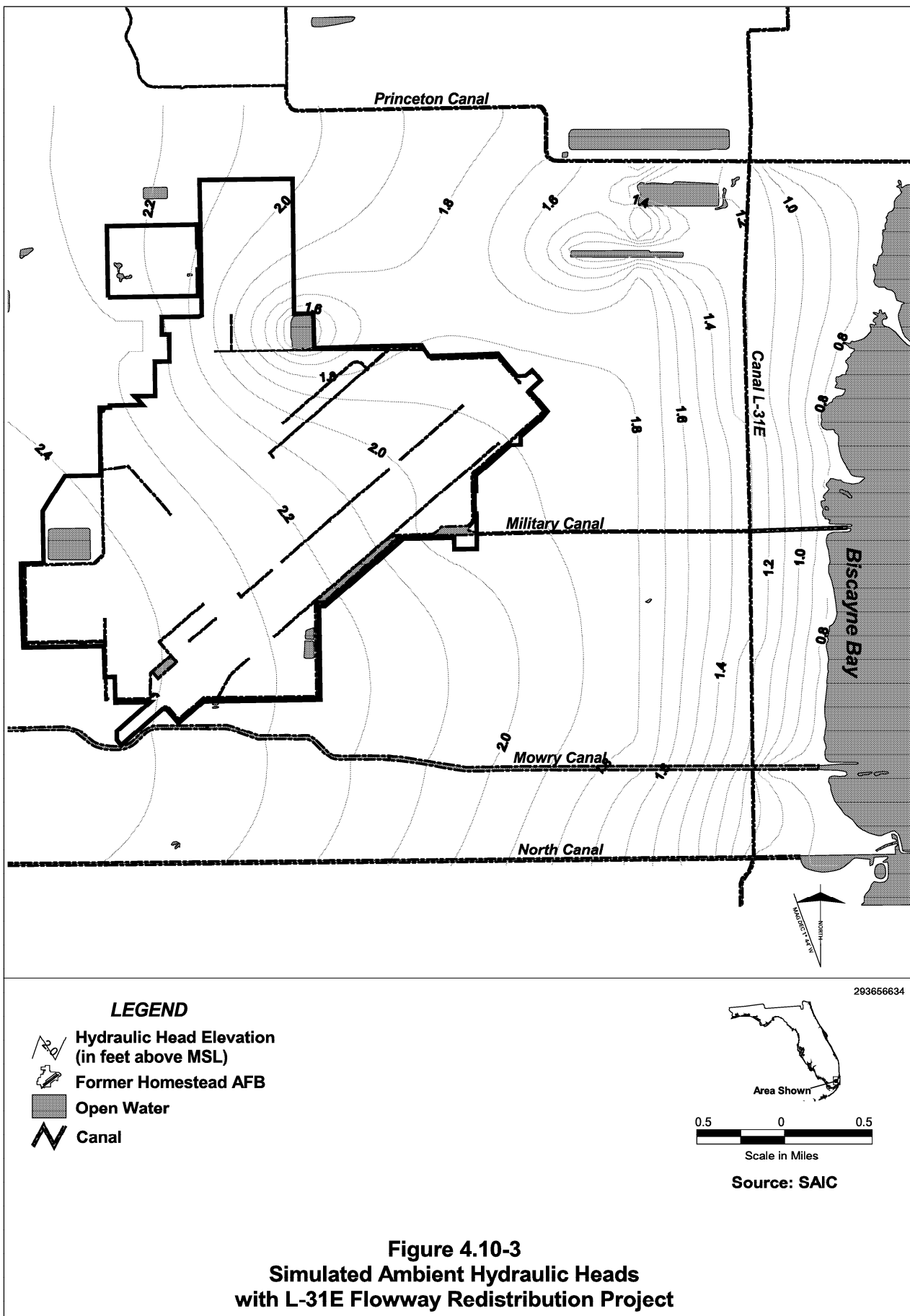
The L-31E Flowway Redistribution Project and STDA could result in a higher hydraulic head east of the proposed canal, but possible reductions in the total amount of water that would be delivered to southern Biscayne Bay could eventually cause the hydraulic head to decrease. Although groundwater flow is generally toward Biscayne Bay (**Figure 4.10-3**) and an increased hydraulic head would increase groundwater flows, it is not now known whether implementation of Restudy projects would increase or decrease groundwater flows in this area.

## Mitigation Measures

The major concern with the increased direct groundwater discharge to Biscayne Bay estimated for the Proposed Action is the potential for increasing pollutant inputs to the nearshore sediments. While many pollutants of concern (such as most metals, most pesticides, and many organics) sorb to sediments and soils and thus move only very slowly in groundwater (at rates a small fraction of the groundwater flow rate), nitrogen compounds, particularly ammonia, are very soluble and are transported at the same rate as the groundwater. One way to minimize potential groundwater contaminant impacts on Biscayne Bay is to reduce groundwater flow by routing runoff through an STDA located either on site or off site. An off-site STDA would apparently require a change in policy by the SFWMD, which has to date required maximum on-site retention of runoff.

A program that limited the use of fertilizer on landscaped areas would reduce potential runoff of nutrients. In addition, aggressive pollution prevention, spill management and control, and integrated pest management programs would help minimize soil and water contamination. Reductions in the use of conventionally fueled vehicles on site would also help to minimize the potential for groundwater contamination.

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### **Possible Future Expansion**

The addition of a second runway at HST would increase the amount of impervious area immediately east and southeast of the site. The runoff from the second runway would be discharged to a revised Boundary Canal system and ultimately would be discharged to Military Canal. Although some of the runoff would recharge groundwater, evapotranspiration and overland flow would be expected to account for the majority of the runoff associated with a second runway. As a result, groundwater recharge east of the former base could be reduced by up to 2,700 acre-feet per year with the construction of a second runway. More precise estimates would need to be determined in future environmental analysis that will be required if a second runway is proposed.

#### **4.10.3.2    *Commercial Spaceport Alternative***

Although surface runoff is estimated to increase by up to 30 percent over baseline by 2015 under this alternative, the total discharge from Military Canal would be expected to decrease from baseline by about 29 percent with retention of stormwater on site. Stormwater retention would increase groundwater recharge, and the additional recharge would compensate for any deficit associated with increased runoff. Using the same assumptions that were described for the Proposed Action, it is estimated that annual direct groundwater flow into Biscayne Bay due to on-site retention of stormwater would increase 941 acre-feet by 2005 and 948 acre-feet by 2015. Changes in groundwater flows are presented in Table 4.10-10. The retention of stormwater on site would increase the height of the local water table and increase the frequency, duration, and/or area of standing water on the former base. It is assumed, however, that the design of the stormwater management system would include considerations of military and spaceport requirements in order to prevent adverse effects on their operations.

The resulting increase in the amount of infiltration on and near the site could potentially increase the concentrations of some pollutants in the Biscayne Aquifer, a sole source aquifer. As with the Proposed Action, however, no impacts are expected on public drinking water supplies. There is also the potential for increased input of ammonia to Biscayne Bay through groundwater. Using the same methodology applied to the Proposed Action, the increase in direct nitrogen loads is estimated to be about 18,423 pounds per year in 2015 (see Table 4.10-11).

Secondary development associated with the Commercial Spaceport alternative could increase surface runoff, resulting in a reduction in groundwater recharge and groundwater flow into Biscayne Bay. The reduction could be partially offset by landscape watering and other activities associated with increased population and development, but evapotranspiration and overland flow, not groundwater recharge, would account for the majority of the runoff. It is estimated that secondary development in the vicinity of former Homestead AFB could reduce groundwater flow into Biscayne Bay by up to 1,284 acre-feet per year by 2015 under this alternative. The decrease in groundwater inputs would reduce the amount of nitrogen being discharged to the bay by an estimated 9,589 pounds per year in 2015.

Considering both direct and secondary changes, there would be an estimated net decrease in groundwater inputs of 336 acre-feet per year and a net increase in nitrogen discharge through groundwater of 8,834 pounds per year in 2015. The increase in nitrogen loads compares to a net decrease estimated for the Proposed Action and is due to the relatively smaller secondary development projected for the Commercial Spaceport alternative. Most of the nitrogen is likely to be ammonia, with un-ionized ammonia comprising about 5–10 percent of the total.

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Increased water withdrawals from the Biscayne Aquifer by the City of Homestead for increased population generated by the Commercial Spaceport alternative could cause a steady state (continuing) drop in the water table of no more than 0.5 feet for a radius of no more than 0.5 mile.

### **Combined Commercial Spaceport/Airport**

The increased impervious surface associated with a combined Commercial Spaceport/Airport is estimated to increase direct runoff by 3,100 acre-feet per year by 2015. This increased runoff would reduce groundwater recharge. The majority of the additional runoff would be retained in the stormwater management system and would either evaporate or become groundwater recharge.

Secondary development associated with this alternative would also generate additional runoff. Some of the runoff would become groundwater recharge, but it is estimated that about 1,600 additional acre-feet per year of groundwater flow to Biscayne Bay could be lost by 2015. Ammonia loads to nearshore Biscayne Bay would probably decrease (compared to the Commercial Spaceport alone) in the same proportion as decreased groundwater flows.

The impacts of fuel and other spills on HST would be the same as described for the Proposed Action.

### **Cumulative Impacts**

Development associated with Miami-Dade County's high-growth population forecasts would have the effect of reducing groundwater recharge to the area south of Eureka Drive by over 29,000 acre-feet per year by 2015. Combined with the increase in groundwater recharge at the spaceport and loss of recharge associated with secondary development, there could be a net reduction in groundwater recharge south of Eureka Drive of approximately 29,770 acre-feet per year, and a similar reduction in groundwater flow to Biscayne Bay. Nitrogen inputs to Biscayne Bay from groundwater are estimated to decrease by approximately 210,957 pounds per year by 2015 compared to the projected baseline (see Table 4.10-12).

The effects of the L-31E Flowway Redistribution Project and STDA would be the same as described under the Proposed Action.

### **Mitigation Measures**

The mitigation measures described for the Proposed Action would also be appropriate for the Commercial Spaceport alternative.

#### ***4.10.3.3 Mixed Use Alternative***

Under the Market-Driven scenario, it is assumed that the disposal land could be conveyed to a number of individual entities, and no single entity would necessarily have responsibility for a consolidated stormwater management program. In that case, runoff and discharges to Military Canal from the base would be estimated to increase 9 percent by 2015. This runoff would decrease direct groundwater inputs to Biscayne Bay by approximately 323 acre-feet per year by 2015 (see Table 4.10-10). Implementation of a stormwater management system on the site could result in an increase in groundwater flows similar to the Proposed Action and Commercial Spaceport alternative. Direct nitrogen loads in groundwater could increase by 784 pounds per year by 2015 (see Table 4.10-11).

Secondary development associated with Market-Driven development is also estimated to increase surface runoff, resulting in a reduction in groundwater recharge and a reduction in groundwater flow into

Biscayne Bay. The reduction could be partially offset by landscape watering and other activities associated with increased population and development, but evapotranspiration and overland flow would be expected to account for the majority of the runoff. Secondary development in the vicinity of former Homestead AFB could reduce groundwater flow into Biscayne Bay in the area of the former base by approximately 1,384 acre-feet per year by 2015. Secondary development is estimated to result in a decrease in nitrogen inputs in groundwater by 10,332 pounds per year by 2015.

The net effect of both direct and secondary development would be an estimated reduction in groundwater inputs of 1,707 acre-feet per year and a reduction in nitrogen loads of 9,548 pounds per year by 2015.

The Collier-Hoover proposal would entail the construction of a number of lakes, wetlands, and canals on the former base which would increase the storage of rainfall and reduce surface water discharges to Biscayne Bay through Military Canal. The result would be an increase in direct groundwater flow from the former base to the bay. In addition, about 510 acre-feet per year of treated sewage is proposed to be used to irrigate golf courses on the former base. For analysis purposes, it was estimated that all of the irrigation water would go to groundwater, although much of it would evaporate. The amount of water that would be retained by the canals and lakes has not yet been designed, and performance of the system is not known. It would likely perform at least as well as the stormwater management system for the Proposed Action and Commercial Spaceport, and it could retain substantially more water than estimated for those alternatives. Nevertheless, without a better developed design, it is not possible to model how such a system would operate, so on-site runoff and discharges from the Proposed Action have been assumed. This alternative is estimated to increase direct groundwater flows by 1,428 acre-feet per year by 2015 (see Table 4.10-10). Direct nitrogen inputs are estimated to increase by 24,681 pounds per year by 2015 (see Table 4.10-11). However, it is probably a considerable overestimation because it does not account for plant uptake, which is likely to be substantial under this proposal.

Secondary development associated with the Collier-Hoover proposal is estimated to increase surface water runoff and decrease groundwater flows to Biscayne Bay by approximately 3,055 acre-feet per year by 2015. This would result in a decrease in nitrogen inputs through groundwater by an estimated 22,811 pounds per year.

The net effect, considering both direct and secondary changes, would be estimated reductions in groundwater flow of 1,627 acre-feet per year and an increase of 1,870 pounds per year of nitrogen inputs through groundwater by 2015. Most of the nitrogen is likely to be ammonia, and un-ionized ammonia is estimated to be about 5–10 percent of the total.

### **Cumulative Impacts**

Development associated with Miami-Dade County's high-growth population forecasts could result in a reduction in groundwater infiltration to the area south of Eureka Drive by over 29,000 acre-feet per year by 2015. There could, therefore, be a cumulative reduction in groundwater recharge south of Eureka Drive of approximately 31,141 acre-feet per year for the Market-Driven scenario and 31,061 acre-feet per year for the Collier-Hoover proposal compared to the projected baseline in 2015 (see Table 4.10-12). Nitrogen loads in groundwater could decrease by 229,249 pounds per year under the Market-Driven scenario and 217,921 pounds per year under the Collier-Hoover proposal.

The effects of the L-31E Flowway Redistribution Project and STDA would be the same as those described under the Proposed Action.

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### **Mitigation Measures**

Mitigation measures described for the Proposed Action would be appropriate for the Mixed Use alternative.

#### ***4.10.3.4 No Action Alternative***

Under the No Action alternative, there would be no impacts to the groundwater system caused by on-site or reuse-related secondary development. The cumulative impacts if the high population growth forecasts were realized would still be essentially the same as described for the Proposed Action. Groundwater infiltration to the area south of Eureka Drive could be reduced by approximately 29,434 acre-feet per year by 2015, and there could be a net reduction in groundwater recharge south of Eureka Drive by approximately the same amount, with a similar reduction in groundwater flow to Biscayne Bay.

#### ***4.10.3.5 Independent Land Use Concepts***

Each independent land use concept implies different construction requirements, and the impervious surface associated with each has not been determined. To the extent that a given land use concept would replace a lower-density land use, there would be a decrease in groundwater recharge and a consequent reduction in groundwater discharge to Biscayne Bay. If a given land use concept were to replace a higher-density land use, however, groundwater recharge would increase, and groundwater discharge to Biscayne Bay would also increase. Changes associated with the implementation of most of the independent land use concepts are expected to be small because they would occupy a relatively small portion of the disposal property. Agriculture, a cemetery, and a theme park would all be likely to increase infiltration to groundwater and increase groundwater flow to Biscayne Bay. Agriculture would also probably increase the amount of nitrogen in groundwater, differentially increasing the discharge of ammonia to nearshore Biscayne Bay sediments.



**4.11 BIOLOGICAL RESOURCES****4.11.1 Introduction**

A variety of methods were used to determine impacts to biological resources, depending on the resource. In general, if construction could occur on land occupied by a particular biological community or in part of the range occupied by a sensitive species, the extent of the potential loss of the community or range was determined. Greater importance was placed on more pristine communities and breeding ranges than on degraded or fragmented communities and foraging ranges.

While physical alteration of communities or ranges would be the most direct cause of permanent impacts, changes in the water balance of an area also would have an impact on wetland and aquatic communities. Water relationships in south Florida are determined primarily by flood control and stormwater management practices. Estimated changes in patterns of water flows caused by proposed changes in stormwater management practices were used to conduct a qualitative assessment of possible impacts to biological communities in given geographic areas. The location of water is also important in determining the suitability of foraging habitat for some sensitive species such as water birds. Pollutants in water, particularly in stormwater, affect the biota of aquatic communities and are a particular concern in Biscayne Bay. Although data on the biota of the bay and their relationship to pollutants are extremely limited, potential trends in those communities were surmised based on the estimated trend in pollutant discharges to the bay under different stormwater management options.

Although the risk of an aircraft mishap is very small (see Section 4.4), this section addresses the types and potential severity of impacts on biota from an accident, should one occur, and subsequent recovery operations. This analysis is of necessity qualitative because the actual consequences associated with any given mishap would depend on site-specific conditions and response actions.

The impacts of noise were determined by evaluating what species or communities would be exposed to different noise levels and comparing those noise levels with information on noise-related impacts published in the scientific literature for similar species or communities.

**4.11.2 Biological Communities**

This section addresses the anticipated impacts from the Proposed Action and alternatives on three types of biological communities: (1) estuarine and marine, (2) wetlands and freshwater, and (3) upland and disturbed. The discussions of noise impacts, which could affect wildlife in each of these communities, is consolidated in Section 4.11.3.1.

**4.11.2.1 Proposed Action**

***Estuarine and Marine Communities.*** Although the nearshore area of Biscayne Bay was once substantially estuarine (lower salinity than seawater) in nature, the existing estuarine areas are limited to areas near the outfalls of canals and have salinities that vary widely on a daily basis because of the opening and closing of flow control structures at canal mouths. Estuarine species, such as oysters, do not thrive in this salinity regime, and the bay is essentially marine in character. While there would be no direct impacts to the bay from construction either on or off the former base, changes in stormwater management practices might influence the nearshore salinity regime.

The nearshore area is exposed to inputs of nutrients and toxic chemicals from both canal discharges and groundwater. Surface water contributes significant amounts of the nutrients nitrogen and phosphorus, but

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groundwater is disproportionately rich in nitrogen compounds, primarily ammonia, compared to phosphorus. The ammonia in groundwater from the county landfill (“Mount Trashmore”) is thought to be responsible for the greatest extent of sediment toxicity in the bay, but inputs of other toxic chemicals in both surface water and groundwater contribute to localized areas of sediment toxicity, particularly near canal mouths. Nutrient inputs have also led to the growth of epiphytes on the leaves of nearshore seagrasses, reducing the amount of light available to them for photosynthesis, their nearshore abundance, and the availability of this habitat for other biota. Because Biscayne Bay is shallow and plankton (open water) biota contribute a relatively small amount to overall bay productivity, the reduced density of seagrasses may have led to changes in the fauna of the bay as well. Few data exist to confirm this suspicion, however.

The majority of toxic chemicals other than ammonia are derived from surface water inputs, primarily from stormwater, but groundwater probably also contributes small amounts of soluble toxic chemicals. The effect of toxic chemicals depends on the levels at which biota would be exposed. At high concentrations, adverse biological effects, including death, could occur, but at low concentrations, there would likely be no effects. Florida water quality standards to protect aquatic life (Class III freshwater) are set at levels that ensure no adverse biological effects, so if chemical concentrations comply with water quality standards, no effects would be expected.

The effects of the Proposed Action on estuarine and marine environments would occur primarily through changes in water, nutrient, and toxic chemical loads to Biscayne Bay. On the whole, changes in these parameters caused by the Proposed Action are expected to be small, on the order of 1–3 percent of existing surface water discharges through Military, Mowry, and Princeton Canals, which contribute about 60 percent of the surface water flows to southern Biscayne Bay. As explained in Section 4.10, net changes in water inputs to southern Biscayne Bay by 2015 are expected to be about 0.6 percent of projected baseline surface water discharges from Military, Mowry, and Princeton Canals. This reflects an increase in surface water discharges of 5,108 acre-feet per year and a decrease in groundwater discharges of about 3,664 acre-feet per year. For comparison, year-to-year variations in surface water and groundwater flows are many times higher than the estimated reuse-related changes.

Nitrogen loads from the Proposed Action are projected to increase as a result of increases in water-borne and atmospheric inputs, despite a reduction in groundwater inputs. The increase by 2015 is estimated to be about 3.6 percent of the projected baseline inputs from Military, Mowry, and Princeton Canals, which is about 2.2 percent of total surface water inputs to southern Biscayne Bay. This would represent a 3.9 percent increase over estimated 1995 inputs from the three canals (estimated 2.3 percent increase over 1995 canal inputs). Phosphorous inputs are estimated to increase by less than 2 percent. The increased loads of nitrogen and phosphorus could encourage the growth of epiphytes on seagrasses, limiting their productivity. With sufficiently lowered productivity, the abundance of seagrasses in nearshore waters could decline, reducing the habitat that would be available for a variety of marine species that currently use the bay. Any effects are expected to be localized to the areas immediately around the canals. Once these inputs have been mixed with Biscayne Bay water, the potential stimulatory effects of phosphorus would be considerably reduced. The anticipated small change in discharge volumes indicate that discernible changes in nearshore Biscayne Bay would be unlikely.

Most nitrogen in groundwater becomes ammonia, and ammonia in its un-ionized form is toxic. Un-ionized ammonia varies from about 2 to 20 percent of total ammonia, depending on temperature and pH. Under conditions thought to exist near the former base, un-ionized ammonia is between 5 and 10 percent of total ammonia. Under the Proposed Action, net nitrogen (and ammonia) inputs to Biscayne Bay through groundwater are projected to increase about 5,308 pounds per year by 2005. By 2015, the

increase in secondary development is anticipated to result in a net decrease in nitrogen (and ammonia) inputs through groundwater of about 9,792 pounds per year.

The concentration of metals in surface water discharges is anticipated to comply with water quality standards designed to protect aquatic life. There are insufficient data to estimate concentrations of other toxic chemicals. Petroleum and other constituents typically associated with parking lots and roads (e.g., metals, oils, and PAHs) would increase the contaminant loading in surface water discharged through the canals. Therefore, the Proposed Action can be expected to slightly exacerbate the effects of discharge of contaminated fresh water to the bay. These inputs would continue to contribute to the sediment toxicity of nearshore areas and stress the marine species near the outfalls of Princeton and Mowry canals

Reductions in nearshore salinity, as well as pollutant inputs, might affect the nearshore area of the bay, especially between Princeton and Mowry Canals. Areas farther from shore than about one-half mile could be affected, but are unlikely to be appreciably impacted by reuse-related construction or changes in stormwater management practices on or off the former base. Thus, the coral reefs that border the keys near the outer boundary of Biscayne NP; the shallower, intertidal areas near the keys; and the major area of open water between the keys and the shore are unlikely to be affected by reuse-related activities on or off the former base.

The National Marine Fisheries Service (NMFS) has indicated that Biscayne Bay contains essential fish habitat comprising seagrasses, estuarine mangroves, intertidal flats, estuarine water column, live/hard bottoms, and coral reefs. As discussed above, impacts to these habitats are expected to be so small as to be indiscernible. An Essential Fish Habitat Assessment was prepared discussing the species that rely on these habitats in Biscayne Bay. This assessment appears in **Appendix J**. NMFS had no specific Essential Fish Habitat Conservation Recommendations (NMFS 2000).

Although low, the Proposed Action carries a statistical risk of aircraft accidents. If an accident occurred in the estuarine and marine environment east of former Homestead AFB, the impacts on the estuarine and marine communities would depend, at least in part, on the size of the aircraft. Larger aircraft, such as commercial passenger-carrying jets, have the potential to damage a greater area both through physical damage at impact and through release of fuels, oils, and hydraulic fluids.

In the immediate vicinity of impact, all biota would be immediately killed. Physical alteration of the environment would generally not inhibit recolonization of the area following removal of the wreckage, except if the crash occurred on a coral reef. On reefs, depending on the extent of the damage, recolonization could take as long as decades. If the impact area were contaminated by fuels, oils, or hydraulic fluids, recolonization could be delayed until these materials were substantially degraded and dispersed.

In general, fuels, oils, and hydraulic fluids are immiscible with water and float. Jet fuel, having both low viscosity and high volatility, would tend to disperse rapidly on the water surface and evaporate. A very small portion of the fuel (heavier petroleum fractions that were not refined out of the fuel) might sink. Oils and hydraulic fluids would be released in substantially lesser amounts than fuels, but would evaporate more slowly and have a higher proportion of fractions that might sink.

Fuels, oils, and hydraulic fluids are generally toxic to marine organisms and would kill most organisms with which they came in substantial contact. In general, however, contact would occur only along shorelines in intertidal areas. Coral reefs below the water surface would generally not be affected, but under meteorological conditions that caused spilled fuels or oils to remain over coral reefs for several days, light penetration could be reduced sufficiently to affect the viability of underlying corals by

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reducing the productivity of the symbiotic algae that inhabit coral polyps. Emergent vegetation, such as mangroves, could be severely damaged with substantial exposure (contact with high concentrations over several hours). Unlike oil spills from ships, there is much lower likelihood of oil-damaged birds or marine mammals with aircraft accidents because most of the spilled fluids would be rapidly dispersed and because of the relatively small amounts of heavier oils and hydraulic fluids. Some birds and marine mammals could be killed by spilled fluids if contacted in very high concentrations over extended periods of time.

Investigation and recovery activities following a crash into estuarine or marine environments would probably be based from vessels, and additional impacts associated with these activities are expected to be minor. If the crash occurred in shallow areas, however, seagrass areas could be damaged by the scouring action of vessel props and prop wash and the placement of anchors.

Fuel spills at the airport itself would generally be localized because the bulk fuel storage areas would be surrounded by berms that could contain the fuel in an above-ground tank, and fuels spilled during fueling operations would be handled in accordance with a spill response plan that would contain the fuel to the extent feasible. Should fuels enter the Boundary Canal, they would be contained within the stormwater management system because water is pumped from mid-depth of the collection reservoir to Military Canal, and the fuel would float on the water. Should a spill occur during (or because of) a hurricane, however, Biscayne Bay water levels could rise to cover at least part of the former base, and fuels could be widely distributed to the east and southeast. It would be expected that the strong winds associated with hurricanes would rapidly disperse fuels so their impact on marine and estuarine biota would likely be small and of short duration.

***Wetland and Freshwater Communities.*** The vast majority of southern Florida is wetland. Large expanses of wetlands occur in the Everglades west of the City of Homestead, to the south, and, to a lesser extent, east of former Homestead AFB. These wetlands could be affected by the reuse of Homestead AFB if the direct and/or secondary development changed the land use of these areas or altered their water balance. In general, little development would be expected to occur on wetlands because they are now protected (by Everglades and Biscayne NPs and the Environmentally Endangered Lands program), are slated for protection, or occur where development would be limited by zoning. The Miami-Dade County Comprehensive Development Master Plan limits most development to areas within the Urban Development Boundary. This boundary could, however, be changed by future amendments to the CDMP.

Given the general easterly/southeasterly surface water and groundwater flows from the Homestead area, water balances of areas west and south of the City of Homestead are unlikely to be affected by changes in stormwater management activities on the former base. Therefore, the Everglades would essentially not be affected by changes in land use and water balances associated with reuse of the former base. Impacts from these changes would be limited to areas east and southeast of the former base, and to a lesser extent, to the northeast.

Construction activities associated with the Proposed Action are not expected to alter the wetland and freshwater communities on former Homestead AFB because no construction is planned on existing wetlands, but the hydrologic relationships of wetlands and surface waters on the former base could be altered. The retention of stormwater by French drains and raising the height of canals and Mystic Lake would generally reduce the depth to the water table and potentially increase the area, frequency, or duration of standing water on the former base. The magnitude of these changes is expected to be small to prevent standing water from interfering with aircraft operation by flooding the runway or taxiways. Wetlands east of the former base could also have slightly increased areas, frequency, and durations of

standing water, but the percentage change at off-site wetlands would be considerably less than at on-site wetlands. An increase in the area of wetlands on the former base would provide additional habitat for wading birds, potentially increasing bird-airstrike hazard.

Freshwater communities on former Homestead AFB would be directly affected by proposed changes to Mystic Lake and the canal system. Raising the surface elevation of Mystic Lake to accommodate additional stormwater storage would likely result in the temporary loss of fringe freshwater emergent wetlands around the lake, although this habitat would be expected to reestablish through natural succession. No change in the area of freshwater habitat is expected from implementation of the Surface Water Management Master Plan, although the lakes and canals would be deeper than at present. Increases in depth are not expected to alter the freshwater communities in these water bodies, but emergent vegetation and vegetation growing on the sides of the canals may be temporarily disturbed. The drainage patterns that affect existing wetlands on the former base would not change, although flood levels might increase slightly. The raising of flood levels implies a raising of the water table, possibly increasing the suitability of wetland habitat on the former base for native wetland flora and fauna.

Spectacled caiman now residing in the canals and lakes on the former base may be forced to migrate to other areas as development proceeds. The number of caiman likely to migrate off the site may be fairly small, given that a large population existed when Homestead AFB was in full operation. If caiman did migrate off site, they would likely move to areas they currently occupy west of Canal L-31E. Procedures that could be established under Executive Order 13112 might involve programs for control or eradication of caiman on the former base if federal funds are used to assist development of the airport. Should such programs be implemented, the potential for off-site migration of caiman would probably be substantially reduced.

The caiman is essentially a freshwater species and would not be expected to move into American crocodile (mangrove) habitat east of Canal L-31E. Salinity in the mangroves can range from 14 to 45 parts per thousand, and the disappearance of brackish water species that require salinities of 5 to 25 parts per thousand (**USACE 1998**) indicate conditions are not favorable for caiman. In Venezuela, the caiman has established populations in most areas where crocodiles were over harvested, except in a brackish water habitat. Caiman failed to colonize the brackish area possibly because they do not have physiological adaptations to survive in such environments (**Seijas 1988**).

Construction associated with secondary development would probably have few impacts on wetlands or other aquatic habitats as these habitats are less likely to be developed because of government restrictions on development in wetlands. Increased runoff from land converted to residential, commercial, and industrial land uses could increase surface water flow and reduce groundwater flow, but the change caused by secondary development associated with the Proposed Action would be relatively small (estimated at less than 3 percent above 1995 surface water flow by 2015). Near the Biscayne Bay shoreline, the change could result in a small percentage reduction in the area, duration, or frequency of inundation of wetlands.

If an aircraft accident occurred in a wetland or freshwater community, biota in the impact area would be killed, and released fuels, oils, and hydraulic fluids, if not burned, would have the potential for coming in contact with a much greater percentage of nearby biota than in the marine environment. Biota that came in extensive contact with fuels would likely be killed or severely impaired. The evaporative loss of fuels would be slower than in a marine environment because the fuel would generally not be dispersed over as large an area, and some of the fuel could permeate through soils and substantially reduce the rate of recolonization in the impact area. If the fuel remained on the water surface of a lake or pond for several hours, aquatic organisms could be smothered. However, the impact would be limited to the immediate

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vicinity of the crash. Investigation and recovery activities might require construction of temporary roads and placement of fill near the crash site. If circumstances made avoidance impossible, temporary roads and fill sites could end up eliminating existing wetlands.

Any fuel that might be spilled at the airport and that entered the Boundary Canal system would kill emergent vegetation and potentially smother aquatic biota in the canal by preventing oxygen diffusion through the water's surface. In addition, fuel that percolated through soils along the edge of the canal system could delay or prevent recolonization of the edges of the canals by emergent vegetation. No off-site impacts would be expected under most circumstances, however, because the fuel would be retained on site and not be pumped into Military Canal. Should a spill occur during (or because of) a hurricane, fuel could be transported by Biscayne Bay water over broad areas to the south and southeast of the former base. High winds would tend to disperse the fuel, limiting long-term impacts on wetlands and other freshwater environments.

***Upland and Disturbed Communities.*** Upland and disturbed communities generally occur inland of wetland areas. Most of these communities occur on higher, drier ground, and some, such as hardwood hammocks, are limited to isolated patches of limestone outcrops. While isolated outcrops that occur in the Everglades and south of the City of Homestead have essentially native vegetation, the majority of the upland communities on land where development could occur have been highly degraded by invasion of exotic species and fragmentation. Most of the area within the UDB is now occupied by disturbed communities, largely comprising grasslands and agriculture. East of former Homestead AFB, areas once occupied by hardwood hammocks are now essentially occupied by the exotic Australian pine and Brazilian pepper. The loss of the native vegetation and invasion of these exotic species in this area are probably related to hurricane damage and lowering of the water table.

As with wetlands, the major areas off the former base that now contain native upland communities are not expected to be appreciably affected by construction related to reuse of the disposal property because they occur in areas where development would be limited or in areas slated for protection. No impacts would be associated with changes in stormwater management practices. The biological communities that occur in the Everglades and south of the City of Homestead would not be altered.

Upland areas on former Homestead AFB are essentially all disturbed communities composed of grasslands and agriculture, shrub and brushland, exotic plant, and urban community types. Eleven areas of remnant pine rocklands occur on the surplus property. Impacts in those areas are discussed in Section 4.11.3.1.

Under the Proposed Action, it is estimated that pavement and buildings could occupy up to 785 acres of the disposal property by full buildout, a substantial increase over the 469 acres of impervious area there now. Buildings and infrastructure would replace disturbed communities and some remnant pine rocklands. Construction and demolition could remove an estimated 710 acres of disturbed communities at full buildout, but the disturbed areas not ultimately covered by buildings or pavement would generally be landscaped (classified as a disturbed community). Areas disturbed by construction but not landscaped would be subject to invasion by exotic species. Procedures that could be established under Executive Order 13112 might involve actions such as revegetation with native species to prevent invasion by exotic species if federal funds are used to assist development of the airport.

Secondary development outside the former base could result in the disturbance of approximately 2,000 additional acres of land by 2015 and almost 3,000 acres by full buildout. This would be about 2–3 percent of unprotected vacant and agricultural land in Miami-Dade County south of Eureka Drive. Much of the land most likely to be developed contains disturbed communities (i.e., grasslands and

agriculture, exotics, or urban). Because of their location to the north, west, and southwest of former Homestead AFB, these habitats would generally be more affected by secondary development than the natural dry prairie and tropical hardwood hammock upland communities that occur south and southeast of the former base. In general, development can be expected to result in between 40 and 80 percent of any given land parcel becoming paved or occupied by buildings, with the remainder left as is or landscaped. Thus, secondary development could result in elimination of the habitat value of up to 3 percent of the upland and disturbed communities in south Miami-Dade County. Most of the upland communities within the Urban Development Boundary have been developed into small, isolated patches that fragment previously continuous upland habitat. Species that rely on larger areas of continuous habitat for their home range almost certainly have reduced population sizes because of this fragmentation. Further fragmentation could occur as the areas surrounding the former base become developed as a consequence of the Proposed Action.

An aircraft accident on upland and disturbed communities would kill all biota in the area of impact. Spilled fuels, oils, and hydraulic fluids that did not burn would permeate local soils, substantially extending the time required for recolonization by vegetation. The distribution of spilled fuels, oils, and hydraulic fluids would likely be much more localized than spills in marine or freshwater environments. The effects could be more severe, but the area affected would be less extensive than for other community types. Investigation and recovery activities could require clearing of vegetation near the site, and vegetation could also be destroyed if temporary roads were constructed to the crash site.

Spilled fuels on the airport itself would be unlikely to affect the upland and disturbed communities on site because fueling operations would not occur in the vicinity of these communities. Few off-site impacts on upland and disturbed communities would be expected because the spilled fuel would generally be retained in the stormwater management system. Should spilled fuel be carried off the site during very high water (i.e., during a hurricane), it would be dispersed over a wide area, and the impacts on upland and disturbed communities would probably be small in comparison to the effects from inundation by seawater.

### **Cumulative Impacts**

***Estuarine and Marine Communities.*** Were Miami-Dade County's high-growth forecasts to occur, population growth and associated development could result in an increase in the combined discharges from Military, Mowry, and Princeton Canals of about 26 percent above 1995 surface water flows by 2015. Combined with the Proposed Action, the total increase would be about 28 percent. The increased surface water input and reduced groundwater input would potentially increase nutrient and toxic loadings to Biscayne Bay and continue the historical trend of greater surficial freshwater inputs and higher contaminant loadings. Under high growth, nitrogen inputs in surface water could increase by about 26 percent (29 percent with the Proposed Action) by 2015 compared to 1995 levels. Nearshore biota would continue to be stressed by the increased nutrient and toxic loadings. The relatively large magnitude of the change indicates that there would probably be seagrass loss because of nutrient (phosphorus) stimulation of epiphyte growth, changing the nearshore habitat to be less productive. Biota that rely on seagrass habitat such as juvenile shrimp and fish would likely have reduced population sizes, although the magnitude of the changes cannot be quantified. It is estimated the Proposed Action's contribution to the change in surface water flow to southern Biscayne Bay by 2015 would be about 8 percent.

The L-31E Flowway Redistribution Project would reroute some of the surface water flow from Princeton and Mowry Canals and all of the flow from Military Canal to an STDA between Biscayne Bay and the former base. Water being discharged from the STDA to Biscayne Bay is expected to have lower

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concentrations of toxic chemicals and nutrients, so the rerouted inputs to the bay could contribute to a more diverse, nearshore estuarine community. Given the uncertainties about the quantity and quality of water that would be delivered to the south bay under the Restudy, however, no firm statements can be made as to the combined effects of the flowway, population growth, and the Proposed Action.

***Wetland and Freshwater Communities.*** Miami-Dade County's high-growth population forecasts could lead to reduction in groundwater flows and increases in channelized surface water discharges to Biscayne Bay. This could, in turn, lower the water table, reduce the area of wetland and aquatic habitats along the Biscayne Bay shoreline, and remove some of the filtering action of existing wetlands by bypassing them. The importance of these changes cannot be quantified, however, without more specific information about the locations of likely development and the stormwater management practices that might be associated with development. At this time, this information is not available. In any case, the Proposed Action's contribution to these effects would be small because the Proposed Action is anticipated to add about 8 percent to the increase in surface water flows by 2015.

The L-31E flowway project and STDA, if implemented, could restore degraded wetlands and create new wetlands and natural stream channels from just west of Canal L-31E to the mangrove fringe along Biscayne Bay. These projects could raise the water table and might encourage the development of more native vegetation, helping to restore the ecosystems that once occurred there. As groundwater levels and surface water sheet flows increased, however, the productivity of some agricultural lands could be reduced.

The widening of U.S. Highway 1 between the City of Homestead and Key Largo would fill wetlands along the corridor. The loss of these wetlands has already been offset by the construction of replacement wetlands in other, nearby locations.

***Upland and Disturbed Communities.*** Under the Miami-Dade County high-growth population forecasts, about 20,000 acres of undeveloped land south of Eureka Drive could be converted to residential, commercial, and industrial use by 2015. This would represent about 20 percent of unprotected vacant and agricultural land in the south county. It is expected that most of the development would occur in disturbed biotic communities, although small areas of pine rockland and hardwood hammock communities may be interspersed throughout the area. Between 40 and 80 percent of the developed land could be expected to become pavement or buildings, depending on whether it is developed for residential or industrial use, and the remaining area would probably be landscaped. Therefore, between 8 and 16 percent of available land south of Eureka Drive could become covered over by 2015, predominantly in biological communities that have already been disturbed by human activity or invaded by exotic species. The Proposed Action's contribution to the increase in development would be about 10 percent.

The L-31E flowway project and the STDA, if built, would probably reduce the area of upland and disturbed communities east of the former base by encouraging their replacement with wetlands. A higher water table and more permanent freshwater inputs east of the former base could encourage the development of more water tolerant native species. The affected land would likely include all of the area east of the new canal proposed to be constructed as part of the flowway project.

The widening of U.S. Highway 1 would also eliminate or degrade upland and disturbed communities in the highway corridor between Florida City and Key Largo.



## **Mitigation Measures**

***Estuarine and Marine Communities.*** A number of entities have recommended that a buffer area be established between former Homestead AFB and Biscayne NP where development would be restricted or eliminated. Most of this area is already protected from intensive development, and, although further restricting development would prevent surface runoff from increasing and groundwater inputs to the Biscayne Bay from declining, these changes are likely to be very small. The buffer area is likely to generate little change in the existing estuarine and marine communities. The buffer would help preserve the present situation and prevent future degradation.

Appropriate mitigation measures to reduce impacts on estuarine and marine communities include practices, programs, and procedures that would minimize stormwater flows and minimize the possible contamination of stormwater. These would need to be implemented by property owners and users. Aggressive pollution prevention, spill prevention and control, integrated pest management, and fertilizer minimization programs would all reduce the probability (and total amount) of contaminants reaching Biscayne Bay. The impact of these programs if implemented only on the former base, however, would be small given the relative magnitude of inputs from the site in relation to other inputs to Biscayne Bay. Implementation of such programs outside of the former base would probably not be effective without changes in current Miami-Dade County and FDEP environmental regulations.

Additional stormwater treatment (an STDA) for Military, Mowry, and Princeton Canals would help reduce contaminants in runoff both from the former base and from the surrounding area.

***Wetlands and Freshwater Communities.*** Creation of a buffer area would preclude development on wetlands in the area between the former base and Biscayne NP. Existing ordinances and regulations already discourage development on large wetlands, however, so the benefits to wetland communities would be in preserving the small, isolated wetlands which are widely distributed in this area. A buffer would substantially reduce the potential loss of these small wetlands.

The most direct mitigation for potential loss of wetlands in the area east of the former base would be the construction of an STDA to treat stormwater from the former base and the surrounding area. Construction of an STDA would increase the area of wetlands east of the former base. There is some concern that increasing wetlands near the former base could increase bird-airstrike hazards.

Aggressive pollution prevention, spill prevention and control, integrated pest management, and fertilizer minimization programs on the former base would all reduce the probability (and total amount) of contaminants reaching wetlands or an STDA. Overall impacts of pollution prevention and other programs would probably be small unless they were implemented over most of south Miami-Dade County.

The implementation of a program to control or eradicate caiman on the former base would minimize the potential for off-site migration as suitable habitat on site for caiman is eliminated by development.

***Upland and Disturbed Communities.*** Although it would eliminate development east of the former base, the creation of a buffer area would be expected to have little impact on upland and disturbed communities. The great majority of the land east of the former base is occupied by agriculture, exotic vegetation, and wetlands. There may be small areas of native upland vegetation that could be preserved.

Some mitigation measures for upland and disturbed communities are included in the Wildlife/Habitat Management and Mitigation Plan as part of the Proposed Action. Implementation of this plan would protect at least four remnant pine rocklands on the former base, but would not protect other on-site and

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off-site upland and disturbed communities. Preserving the other pine rocklands on the site would have some added benefit. The potential for adverse impact to off-site upland and disturbed communities is minimal, but identification, location, and regulatory protection of isolated, natural upland communities could help to reduce overall impacts in the region.

Requirements to revegetate disturbed areas with native vegetation following demolition or construction would minimize the potential for invasion of denuded areas by exotic species.

### **Possible Future Expansion**

***Estuarine and Marine Communities.*** The construction of a second runway at former Homestead AFB would create additional impervious surface on presently agricultural land east of the former base, resulting in up to an additional 2,700 acre-feet per year runoff. Most of the approximately 1,060 acres needed for the expansion would become runway, reducing groundwater recharge in this area. This additional surface water discharge and reduction of groundwater recharge would offset the potential benefits of the almost 30 percent reduction in Military Canal discharge estimated to be attained by the Proposed Action's Surface Water Management Master Plan. The net effect would be essentially no discernible change to the nearshore marine communities of Biscayne Bay from current conditions. More precise estimates would need to be determined in future environmental analysis that will be required if a second runway is proposed.

***Wetland and Freshwater Communities.*** The addition of a second runway at HST would result in filling of several acres of wetlands along the southeastern boundary of the former base, filling of part of Boundary Canal, creation of a new Boundary Canal, and rerouting of both Mowry and Military canals. Filling wetlands would most likely require a Clean Water Act Section 404 permit. The resulting reduction in groundwater recharge would increase the depth to the water table, potentially decreasing the area of wetlands east of the former base or decreasing the duration or frequency of standing water in these wetlands. The change to wetlands as a result of decreases in groundwater flow would likely be small. More precise estimates would need to be determined in future environmental analysis that will be required if a second runway is proposed.

***Upland and Disturbed Communities.*** The majority of the area that would be occupied by an airport expansion is currently agricultural land (disturbed community), and more than half of this land would be expected to be covered by pavement and buildings. The remainder would probably be maintained as grassland. Five pine rocklands along the southern and eastern part of the runway (about 17 acres) would probably be lost during construction unless specific conservation measures were taken to preserve them.

### **4.11.2.2 Commercial Spaceport Alternative**

***Estuarine and Marine Communities.*** It is assumed the Commercial Spaceport alternative would include stormwater management practices similar to and as stringent as those in the Surface Water Management Master Plan developed for the Proposed Action. Most or all of the disposal land would be controlled by a single developer, and because of this, the stormwater regulator (either SFWMD or Miami-Dade County) would probably require the same performance from the stormwater management system for the Commercial Spaceport as for the Proposed Action.

Because secondary development is projected to be less under the Commercial Spaceport alternative than the Proposed Action, net water flows are estimated to remain about the same as they are currently, and most chemical loadings are estimated to change by less than 1 percent. Net nitrogen inputs in 2015 are estimated to increase by about 1.3 percent over projected baseline inputs (1.4 percent over 1995 inputs)

from Military, Mowry, and Princeton Canals. Unlike the Proposed Action, the Commercial Spaceport alternative is projected to result in a net increase in nitrogen inputs (and therefore ammonia) through groundwater. The effects of this change on biota are anticipated to be minor.

Petroleum and other constituents typically associated with parking lots and roads would increase the contaminants in surface water discharged through the canals. This could be expected to slightly exacerbate the effects of surface water discharges to the bay. Toxic chemical inputs would continue to contribute to the sediment toxicity of nearshore areas, stress the marine species near the outfalls of Princeton and Mowry canals, and contribute nutrients that would probably maintain the reduced density of seagrasses in the nearshore environment. Discernible changes in nearshore Biscayne Bay biota are unlikely.

Accidents associated with spacecraft would have similar physical impacts to aircraft crashes, but the toxic impacts of fuel releases would be reduced or avoided. Some spacecraft fuels are highly explosive, and any accident (or intentional airborne destruct) would result in an immediate and intense fireball. In a fireball, all fuels would be completely consumed. If the explosion occurred in the air, pieces of the spacecraft could be distributed over a wide area, depending on the altitude of the explosion, but the size of the pieces would generally be smaller than a small jet aircraft. Nevertheless, biota hit by falling debris would probably be killed. If an intact spacecraft crashed into the earth, even just to the ocean surface, the fireball would consume essentially all of the fuel. Biota in the impact area would be killed, but debris would not be distributed over as wide an area as with an airborne destruction. Because toxic fuels would not be dispersed as in an aircraft crash, there would generally be little impediment to recolonization of the impacted area<sup>1</sup>. The impacts of investigation and recovery operations would be the same as described for the Proposed Action.

The impacts associated with spilled jet fuels at the spaceport itself would be the same as reported for the Proposed Action, but the probability of occurrence would be reduced because of the lower volumes of fuels being handled. Spilled rocket fuels (liquid oxygen and liquid hydrogen) would freeze (and probably kill) biota with which they came in contact, but the spilled fuels would quickly evaporate. In the long term, the area of the spill would be repopulated by natural succession.

***Wetland and Freshwater Communities.*** Qualitatively, the impacts to wetland and freshwater communities from the Commercial Spaceport alternative would be the same as those described for the Proposed Action. Assuming that stormwater controls as stringent as those in the Proposed Action would be required, groundwater levels would likely increase slightly over current levels. The quantity of surface water discharged to Military Canal would be expected to decrease by as much as 30 percent as a result of stormwater controls. Wetland areas near the runway and east of the former base may have somewhat increased areas, frequencies, and durations of inundation. Changes in on-site wetlands are expected to be small, and changes would be even smaller in off-site wetlands.

If existing caiman on the former base were displaced by on-site development, they would probably migrate to areas they currently occupy off base, west of Canal L-31E. They would not be expected to migrate to brackish areas east of the canal. Procedures that could be established under Executive Order 13112 might involve programs for control or eradication of caiman on the former base if federal funds are used to assist development of the spaceport. Should such programs be implemented, the potential for off-site migration of caiman would probably be substantially reduced.

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<sup>1</sup> The combustion products of solid rocket fuels generally include hydrogen chloride gas. Although hydrogen chloride is highly acidic (and therefore toxic), the high buffering capacity of marine water would likely rapidly neutralize any adverse impact. Reductions in pH would be small and of short duration.

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Secondary development associated with this alternative would probably not result in conversion of wetlands to residential, commercial, or industrial land. Increased runoff from secondary development could increase surface water flow and reduce groundwater flow, but by 2015, the change would be less than 1 percent of current surface water flow. Near the Biscayne Bay shoreline, the change could result in a very small percentage reduction in the area, duration, and frequency of inundation of wetlands.

If one occurred, a spacecraft accident, either airborne or on land, would kill biota impacted by the debris. In an on-earth accident, nearby biota would also be burned by the ensuing fire, and aquatic biota could be killed by the heat generated by the fireball. There would be no fuel remaining after the fireball, so recolonization of the affected area would likely be relatively rapid. The impacts of investigation and recovery operations would be the same as described for the Proposed Action.

The impacts associated with spilled aircraft fuels on the airport itself would be the same as described for the Proposed Action, but the probability of occurrence would be reduced because of the lower volumes of fuels being handled. If spacecraft fuels were spilled in wetlands or surface waters on the former base, localized freezing could occur, and some biota could be killed. With the rapid evaporation of the fuel, freezing effects would be likely to be short lived.

***Upland and Disturbed Communities.*** By 2015, there could be an estimated 555 acres of impervious surface (buildings and pavement) on the disposal property under this alternative, which is 86 acres more than at present. At full buildout, impervious surface could occupy up to about 591 acres. The majority of new buildings and pavement would be built on land occupied by disturbed communities. During construction, up to about 289 acres of disturbed communities could be damaged or denuded by 2015 (estimated 370 acres by full buildout), but the disturbed area not ultimately covered by buildings or pavement would probably be landscaped. Those areas not landscaped following construction would be subject to invasion by exotic species. Procedures that could be established under Executive Order 13112 might involve actions such as revegetation with native species to prevent the invasion of exotic species if federal funds are used to assist development of the spaceport.

This alternative may not include plans for protecting the 16.7 acres of pine rocklands on the disposal property. Three of these remnant pine rocklands (15.9 acres) might be preserved through a deed covenant requested by U.S. Fish and Wildlife Service. Impacts on the remnant pine rocklands are discussed in Section 4.11.3.2.

Reuse-related secondary development could result in the disturbance of an additional 498 acres of disturbed communities by 2015, much less than 1 percent of the available vacant and agricultural land south of Eureka Drive. The qualitative impacts of this development would be the same as described for the Proposed Action, but the overall change would be quantitatively negligible.

An accident involving a spacecraft would kill biota impacted by the debris or burned in the ensuing fire, but recolonization would likely occur relatively rapidly. The impacts of investigation and recovery operations would be the same as described for the Proposed Action.

The impacts associated with on-site aircraft fuel spills would be the same as described for the Proposed Action, but the probability of occurrence would be less because of the lower volumes of fuels being handled. Spilled spacecraft fuels would kill biota with which they came in contact, but they would rapidly evaporate, and recolonization would occur through natural succession.

**Combined Commercial Spaceport/Airport**

The stormwater discharge to Military Canal from a combined Commercial Spaceport/Airport would be slightly higher than the Commercial Spaceport without a civil aviation component. Toxic chemical and nutrient discharges would also be slightly higher. Changes in the nearshore Biscayne Bay biota would be similar to those described for the Proposed Action. No construction is expected to occur on wetlands on the former base, and increases in surface water discharges from the former base would be small. Impacts on pine rocklands on the disposal property would also be the same as described above.

Secondary development associated with a combined Commercial Spaceport/Airport would be expected to increase surface water discharges from Princeton and Mowry Canals by less than 2 percent by 2015. Although increases in discharges would slightly increase the loads of nutrients and toxic chemicals to Biscayne Bay, the effects on nearshore biota are unlikely to be discernible. A less than 2 percent increase in surface water discharges from Mowry and Princeton Canals would result in a very small percentage reduction in the area, duration, or frequency of inundation of wetlands east of former Homestead AFB. In addition, about 1,100 acres of upland community could be converted to residential, commercial, or industrial land off of the former base.

The effects of aircraft accidents or fuel spills would be the same as described for the Proposed Action. The effects of spacecraft crashes would be the same as described above.

**Cumulative Impacts**

The increased canal discharges south of Eureka Drive caused by population growth and development should Miami-Dade County's high-growth forecast be realized would potentially increase nutrient and toxic loadings to Biscayne Bay and continue the historical trend of greater surficial freshwater inputs and higher contaminant loadings. Nearshore biota would continue to be stressed by the increased nutrient and toxic loadings. Increases in canal discharges would also lower the water table, reduce the area of wetland and aquatic habitats along the Biscayne Bay shoreline, and remove some of the filtering action of existing wetlands by bypassing them. The Commercial Spaceport alternative's contribution to cumulative surface water flow in southern Biscayne Bay is estimated to be less than 0.1 percent in 2015.

Development of vacant and agricultural lands under Miami-Dade County's high-growth population forecasts is estimated to affect about 20 percent of vacant and agricultural land in the south county. It is expected that most of the development would occur in disturbed biotic communities. It is estimated the Commercial Spaceport alternative would contribute about 2 percent of the increase in development by 2015. Under the combined Commercial Spaceport/Airport, the contribution would be about 5 percent.

The L-31E Flowway Redistribution Project, the STDA, and the widening of U.S. Highway 1 between the City of Homestead and Key Largo would have the same impacts as described for the Proposed Action.

**Mitigation Measures**

The effects of creating a buffer zone between the former base and Biscayne NP would be the same as described for the Proposed Action. USFWS has requested that a deed covenant requiring preservation of the pine rocklands on the former base that contain Small's milkpea be included in the property transfer. This would protect three of the areas (areas 1–3 on Figure 3.11-6) on the former base. Further measures could be implemented to protect the other pine rocklands on the former base.

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The implementation of a program to control or eradicate caiman on the former base would minimize the potential for off-site migration as on-site habitat suitable for caiman is eliminated by development. Requirements to revegetate disturbed areas with native vegetation following demolition or construction would minimize the potential for invasion of denuded areas by exotic species.

### **4.11.2.3    *Mixed Use Alternative***

***Estuarine and Marine Communities.*** The Market-Driven scenario of the Mixed Use alternative may not necessarily include implementation of a site-wide stormwater management system, so the increased runoff associated with increased impervious surface could become surface water discharge under that scenario. Without a stormwater management system, there could be an increase in surface water discharge to Biscayne Bay through Military Canal and a decrease in groundwater inputs to the bay. By 2015, net water flows are projected to increase by 0.3 percent over projected baseline discharges from Military, Mowry, and Princeton Canals. Qualitatively, these discharges would contribute to a continued trend of generally higher salinities, higher concentrations of toxic chemicals and nutrients in nearshore waters and sediments of Biscayne Bay, and reduced density of seagrasses through epiphytic growth. Because seagrasses are the dominant primary producers in the bay, overall bay productivity would be expected to suffer. Net nitrogen inputs are estimated to increase less than 1 percent of projected baseline inputs from the three canals.

Under the Collier-Hoover proposal, a stormwater management system would be implemented, and the impact of the increased surface water discharges and reduced groundwater discharges would be similar to those described for the Proposed Action. Overall, nitrogen inputs associated with the Collier-Hoover scenario are estimated to increase 1.7 percent above projected baseline inputs from Military, Mowry, and Princeton Canals by 2015 (1.8 percent above 1995 levels). This could slightly exacerbate the effects of discharges of stormwater to Biscayne Bay and could continue to contribute to the sediment toxicity of nearshore areas, stress the marine species near the outfalls of Princeton and Mowry Canals, and contribute nutrients that would help aggravate the reduced seagrass density of the nearshore environment.

Like the Commercial Spaceport alternative, this scenario is projected to result in an increase in nitrogen inputs through groundwater. While there is a potential for larger increases in ammonia inputs with the Collier-Hoover proposal, the proposed treatment of stormwater in on-site wetlands would be expected to reduce the ammonia levels. The impacts of increased ammonia discharges under this scenario are expected to be minor.

***Wetland and Freshwater Communities.*** The Market-Driven scenario would not be expected to adversely affect existing wetlands and other aquatic habitat on the disposal property. All of the plans developed by Collier and Hoover involve development of ponds, which are estimated to increase on-site surface water. The Collier-Hoover proposal includes about 90 acres of lakes, canals, and wetlands.

In the absence of a stormwater management system under the Market-Driven scenario, the reduction in groundwater inputs to the area east of the former base could decrease the area, duration, and frequency of inundation of wetlands in this area, although changes would be expected to be small. The concentrations of nutrients and toxic chemicals in the Boundary Canal system of former Homestead AFB could increase under the Market-Driven scenario. The increased flow would not be expected to have appreciable impacts on biota, but the higher nutrient loads could lead to more rapid growth of aquatic vegetation on the sides and bottoms of canals and ponds and increase the possibility of algal blooms in the canal system. The higher levels of toxic chemicals could potentially reduce the diversity and abundance of freshwater animals, but the magnitude of the impacts are not quantifiable.

Under the Collier-Hoover proposal, the concentrations of nutrients and toxic chemicals in Boundary Canal are expected to decline because of the proposed use of Integrated Pest Management protocols and controlled fertilizer applications. With this approach, no adverse impacts on biota in on-site canals are expected.

Caiman might be displaced if the canals on the disposal property were altered or eliminated. This might result in small numbers migrating off base to areas they currently occupy west of canal L-31E. They would not be expected to inhabit brackish areas east of the canal. The Collier-Hoover proposal, like the original Collier and Hoover plans, would increase on-site surface waters and/or wetlands that would likely be inhabited by caiman. These proposals have the potential to result in an increase in the caiman population on the disposal property.

***Upland and Disturbed Communities.*** The Mixed Use alternative is estimated to result in up to 536 acres of disposal property being covered with impervious surface by 2015, which would be 67 acres more than at present. By full buildout, impervious surface could cover up to 661 acres on the disposal property. In the first 15 years of development, the amount of impervious surface under the Collier-Hoover proposal (as well as the original Hoover plan) would be less than current conditions because of plans to use pervious pavements. The areas affected by development would be predominantly disturbed biological community types. Between 223 and 1,115 acres could be disturbed by construction by 2015 (633 to 1,215 acres by full buildout), and disturbed acres not ultimately covered by impervious surface would likely be landscaped or vulnerable to invasion by exotic species. The amount of land disturbed under any of the Collier and Hoover proposals is expected to be greater than for the Market-Driven scenario because those proposals would involve removal of existing pavement in the apron areas.

None of the scenarios of the Mixed Use alternative includes specific plans for protecting the 16.7 acres of pine rocklands that could be harmed by development on the disposal property, although USFWS has requested that three of the remnant pine rocklands (15.9 acres) be preserved through a deed covenant. Given protection by a deed covenant, less than 1 acre of pine rocklands on the former base would likely be lost through development. The original Hoover plan specified preservation of all the remnant pine rocklands on the disposal property, and the Collier-Hoover proposal includes a general commitment to incorporate those areas into the landscaping plan and preserve them. About 17 acres of pine rocklands located near the southern and southeastern boundary of the former base would be within the area retained by the Air Force and are unlikely to be disturbed.

### **Cumulative Impacts**

The potential cumulative impacts of the Mixed Use alternative in combination with other projects and developments in the ROI would be qualitatively the same as described for the Proposed Action and Commercial Spaceport alternative. The reuse of former base property would be expected to contribute less than 5 percent to the increase in development south of Eureka Drive by 2015 and about 3.9 percent to the increase in surface water flows to Biscayne Bay under the high-growth population forecasts for Miami-Dade County.

### **Mitigation Measures**

The establishment of a buffer between former Homestead AFB and Biscayne NP would have the same effects under this alternative as described under the Proposed Action. Other mitigation measures described for the Proposed Action would also be appropriate for the Mixed Use alternative. In addition, protecting some or all of the remnant pine rockland habitats through deed covenant, as requested by USFWS, would mitigate the potential loss of those areas.

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The implementation of a program to control or eradicate caiman on the former base would minimize the potential for off-site migration as habitat suitable for caiman is eliminated by development. Similarly, requirements to revegetate disturbed areas with native vegetation following demolition or construction would minimize the potential for invasion of denuded areas by exotic species. These mitigation measures would be difficult to implement under the Market-Driven scenario, however, because no single entity would have responsibility of site-wide development.

### **4.11.2.4    *No Action Alternative***

Under the No Action alternative, there would be no effect on estuarine and marine, wetland and freshwater, and upland and disturbed communities from development on the disposal property at former Homestead AFB. The small amount of ongoing and projected development on retained and previously conveyed property at the former base would result in a minor increase in ground disturbance and impervious surface. The Surface Water Management Master Plan developed for the Proposed Action would not be implemented.

The realization of Miami-Dade County's high-growth forecasts would have the effect of increasing surface water flow to Biscayne Bay by up to 10 percent by 2015. About 20,000 acres of land, most of it already disturbed, would likely be converted to residential, commercial, or industrial use by 2015. The L-31E Flowway Redistribution Project and STDA would still have the same impacts as discussed under the Proposed Action.

### **4.11.2.5    *Independent Land Use Concepts***

Development of any of the independent land use concepts would not be expected to have appreciably different effects from those described for the Proposed Action and other reuse alternatives. Any effects would primarily be related to increased impervious surface. Ground disturbance and increases in impervious surface would have similar direct and indirect effects as described for the Proposed Action and other reuse alternatives.

## **4.11.3        Threatened, Endangered, and Other Special-Status Species**

This section describes potential impacts on threatened, endangered, and other special-status species from construction activities associated with the reuse alternatives and from subsequent operations, including aircraft noise. The noise impact discussion is not confined to special-status species but has been consolidated in this section.

### **4.11.3.1    *Proposed Action***

#### **Construction**

On-site construction associated with the Proposed Action has the potential to disturb an estimated 144 acres by 2005 and 710 acres by full buildout. A total of 51 sensitive species occur or have the potential to occur on the disposal property at former Homestead AFB, including 5 federally listed species and 46 state-listed or sensitive species. The remaining sensitive species listed in Tables 3.11-3, 3.11-4, and 3.11-6 occur in the area of former Homestead AFB but not on the former base itself. Secondary development could disturb another 2,000-3,000 acres, expected to be primarily north, west, and southwest of the former base. This could affect sensitive plants and animals in the area.



**Plants.** Sensitive plant species have been observed in twelve areas on disposal property at former Homestead AFB (see Figure 3.11-6). Of the twelve areas, the federally endangered Small's milkpea occurs in three areas (areas 1–3 on Figure 3.11-6). Eleven areas are remnant pine rocklands identified as the most significant ecological communities of the former base (**PBS&J 1998b**). The twelfth area is the former golf course and housing area, which is heavily overgrown with exotic plants and weeds, but contains a few isolated sensitive plants. This area, area 8 on Figure 3.11-6, will not be protected under the Proposed Action (**PBS&J 1998b**).

Four remnant pine rocklands (areas 1–4) were identified in the Wildlife/Habitat Management and Mitigation Plan for preservation under the Proposed Action. These areas contain not only the largest numbers of sensitive plant species, but all areas where Small's milkpea is known to occur. Implementation of the plan would maintain and/or enhance the integrity of these areas by, at a minimum, controlling exotic plants and restricting human access.

Areas 11 and 12 have already been designated as preservation areas and are included in the Miami-Dade County Future Land Use Plan as Environmental Protection Areas (**PBS&J 1998b**). Although not addressed in the Wildlife/Habitat Management and Mitigation Plan, no development is planned to occur in these areas, and human interference is not expected. Thus, these areas are likely to remain unchanged.

Areas 9 and 10 would not be affected by construction activities but may attract wildlife (**PBS&J 1998b**). The potential bird-aircraft strike hazard of these sites is likely low, and it is assumed there is a low probability they will be altered. If, however, it is determined that they would pose a significant bird-aircraft strike hazard, they would be filled and graded, eliminating these habitats.

The remaining sites would not be protected under the Proposed Action and would likely be eliminated. The three remnant pine rocklands that would be destroyed are collectively very small (0.6 acre) and located very near existing buildings.

In summary, the Proposed Action would result in the preservation and management of at least 16.1 acres (areas 1–4) of remnant pine rocklands with their associated federally listed and state sensitive species, the probable preservation of two sites of unknown acreage (areas 11 and 12), the possible but unlikely loss of 14.1 acres (areas 9 and 10), and the destruction of 0.6 acre (areas 5–7). Area 8, the former golf course and housing area, would be developed and landscaped, although some isolated sensitive plants might be retained as part of the landscaping.

USFWS has indicated that the transfer of lands containing federally protected plants to a non-federal agency could result in adverse effects to those species and recommended that the Air Force include a preservation covenant in the transfer document for the protection and preservation of listed plant species. The Air Force has agreed to this recommendation. USFWS has concurred that this permits the Air Force to avoid any adverse effects on threatened or endangered species.

Sensitive plant surveys have not been conducted on land that may be subject to secondary development. Much of the undeveloped land in south Miami-Dade County has been disturbed for agriculture or other purposes, and the occurrence of intact remnant pine rocklands is unlikely. A few small remnant pine rocklands might occur on vacant land and could be affected by secondary development.

**Reptiles.** The federally threatened eastern indigo snake and state threatened rim rock crowned snake have the potential to occur on disposal property. However, these species were not observed on former Homestead AFB during biological surveys beginning in 1992, including surveys for these species in 1998 (**Hilsenbeck 1993, Denton and Godley 1999, Mazzotti 1999b**). Given that the eastern indigo snake and

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rim rock crowned snake have not been observed on former Homestead AFB and the marginal habitat for these snakes on the disposal property and surrounding areas, it is unlikely that on-site development would affect these species.

The American crocodile is not known to occur on former Homestead AFB (**Mazzotti 1999b**), so on-site construction activities would not directly affect this species. Changes in stormwater runoff from the former base would have little potential to alter the aquatic habitat used by this species, so such small changes probably would not affect the distribution or abundance of the crocodile.

Agricultural and vacant land outside the former base could be converted to residential, commercial, or industrial land by secondary development under the Proposed Action. These lands may provide habitat for the eastern indigo snake. Agricultural lands are considered marginal habitat for this species (**Steiner et al. 1983**), while vacant land may be better habitat. Reuse-related, secondary development has the potential to result in the elimination and fragmentation of eastern indigo snake habitat, especially on vacant land and agricultural land that is near vacant land or canals. Fragmentation of habitat can result in apparently suitable habitat becoming unusable by making the habitat blocks too small to support species that have a large home range and/or by reducing the population of prey species. For example, the indigo snake, with a home range on the order of a few hundred acres, might require up to 10,000 acres of contiguous unaltered habitat to support a viable population (**USFWS 1998a**). The continued fragmentation of large areas by development associated with population growth in south Florida will eventually result in the reduction and then possible elimination of the indigo snake from the area, even though small pockets of suitable habitat remain. The former base property is marginal snake habitat, so its development is unlikely to contribute to habitat loss. Secondary development could contribute to habitat reduction, although some of the existing habitat in the area, such as agricultural land, is already marginal for the indigo snake. Agricultural fields are not considered rim rock crowned snake habitat (**Moler 1992**), but secondary development on vacant lands could affect this species. Secondary development could result in mortality of some individuals of both snake species.

**Birds.** The disposal property and other areas on the former base provide marginal foraging habitat for the federally listed wood stork and bald eagle. This marginal habitat would be eliminated by construction, and there would be a large increase in human activity that could further reduce the attractiveness of the land to these two species. The effect of eliminating this habitat would be negligible given infrequent use of the former base by these species and the large amount of good habitat to the east.

The impacts of development on state-listed bird species and species of special concern are likely to be small. The Antillean nighthawk nests in a variety of habitats, including flat-roofed buildings (**Rodgers et al. 1996**), and it is anticipated that on-site construction would have little impact on this species. The American redstart and Cooper's hawk are rare migrants on the former base, and the redstart is also a rare winter resident. Proposed Action construction would reduce the amount of available habitat, but it would have a negligible impact on these species given that they currently use the area infrequently. The osprey would be expected to continue its occasional use of the lakes on the former base, including Mystic Lake. This use would probably decrease under the Proposed Action. This impact is considered negligible because good osprey habitat is common east of the former base.

Various species of state sensitive wading birds forage in the shallow wetlands along the runway on former Homestead AFB, but on-site construction would not be expected to affect these areas. It has been recommended that these wetlands be studied to determine whether they should be eliminated or altered to lower potential bird-aircraft strike hazard (**PBS&J 1998b**). Their removal is considered to be unlikely and is not incorporated into the Proposed Action. If they are removed, a Clean Water Act Section 404 permit would be required. The removal of these wetlands could eliminate some foraging habitat on the

former base which, in turn, would result in reduced wading bird use of the area. This would represent a loss of foraging habitat that has been used consistently over the years by a small number of wading birds.

Surveys in 1998 documented the existence of three family groups of Florida burrowing owls along the runway on the former base (**Denton and Godley 1999**). The increase in air traffic that would occur under the Proposed Action is not expected to affect the burrowing owl. However, construction projects along the runway could disturb nest sites. Measures such as avoiding nest sites during construction or relocating the nest sites could be taken to protect the burrowing owl. The Southeastern American kestrel was not observed during surveys in 1998 (**Denton and Godley 1999**), and this species is not expected to occur on former Homestead AFB. Breeding bird surveys for the mangrove cuckoo, black-whiskered vireo, Florida prairie warbler, and Cuban yellow warbler were conducted on the former base and none were recorded. Their occurrence in the future is unlikely because of the lack of appropriate habitat.

Agricultural and vacant lands that may be impacted by secondary development associated with the Proposed Action do not provide suitable habitat for the bald eagle. There are approximately 1,270 acres of freshwater bodies within the UDB, including 639 acres of canals and rivers and 629 acres of other surface water bodies such as lakes, ponds, and borrow pits that are potential foraging habitat for the wood stork and state sensitive wading bird species. Secondary development could eliminate a small portion of these aquatic habitats, and other areas, such as roadside ditches, may be rendered unusable because of the increase in human activity. Migratory and wintering species, such as the Cooper's hawk and American redstart, are expected to make only minimal use of agricultural fields, and loss of agricultural land would not affect these species. The Florida burrowing owl may occur in the agricultural and vacant land that would be disturbed by secondary development and could be affected by potential loss of nesting sites.

**Mammals.** No federally or state-listed mammals are known to occur or have the potential to occur on former Homestead AFB. Potential habitat modifications caused by altered stormwater runoff are not expected to affect the distribution or abundance of the manatees that use Biscayne Bay. No federal or state sensitive mammal species are known to occur on the agricultural or vacant lands that may be affected by secondary development associated with the Proposed Action north and west of the former base. There is evidence that a Florida panther used the area south of the former base in the late 1980s (**Ferro 1999a**), and there have been recent unconfirmed reports of a panther near Palm Drive (**Wasilewski 1999a**). This species may still occur in this area, and secondary development could, but is unlikely to, affect its habitat.

### **Noise From Aircraft Operations**

This section discusses the impacts of modeled changes in aircraft noise levels projected for the Proposed Action on resident biota, primarily sensitive species. The discussion begins with a general description of the changes in noise exposures over south Florida projected to occur under the Proposed Action, followed by a review of the literature on noise effects on various species. The findings of the literature review are then used to assess the potential impacts associated with changes in noise exposures due to the Proposed Action. Few existing studies involved the same species that could be affected by the Proposed Action and alternatives, so the analogies drawn in this discussion contain an element of uncertainty. Judgements on impacts were based on the available literature addressing similar species and on observations during surveys conducted on and near the former base.

**Projected Changes in Noise Levels.** Near Homestead ARS, military aircraft generate relatively high levels of single-event noise, so even with the addition of commercial aircraft, L<sub>Amax</sub> is not projected to appreciably change in the immediate vicinity of the proposed airport. The largest changes in L<sub>Amax</sub>

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would occur to the south, west, and northwest of the former base at distances more than 10 miles from the airport (see Figure 4.5-12) where L<sub>Amax</sub> levels would be lower. The highest L<sub>Amax</sub> levels would be caused by continuing military aircraft operations within a few miles of the airport in areas already experiencing high noise levels from military aircraft (see Figure 4.5-13).

The frequency of occurrence of noise events is estimated by the TA<sub>amb</sub> metric, which could increase substantially by maximum use of the single runway at HST in some areas under the proposed flight tracks near the airport. Southwest of the airport, increases of more than two hours could occur in some places. Increases between one and two hours are estimated within a few miles east and south of the runway and in a broad area west-northwest of the runway (see Figure 4.5-16). Increases of 30 minutes or less are estimated over the western part of Biscayne Bay, over a broad area of Crocodile Lake NWR, and in a wide band extending to the Gulf of Mexico directly west of the former base.

A number of supplemental noise points along the Biscayne Bay shoreline were analyzed for various noise metrics (see Figure 3.5-13). These points were selected to cover the diverse habitats (aquatic, mangrove, and freshwater wetlands) that occur along the shoreline and that would lie beneath one or more flight tracks proposed to be used under the Proposed Action.

Noise data for these points are presented in **Table 4.11-1**. They include the maximum SEL value for military and commercial aircraft, L<sub>Amax</sub>, TA<sub>amb</sub>, and Leq(h) (for definitions of these terms, see Section 3.5). As can be seen from the table, military aircraft would have the highest noise levels at all the points, with commercial aircraft generating an average of 15 dB lower ground-level noise. Thus, the biota along the western shoreline of Biscayne Bay would not be exposed to any louder noise events than they are exposed to now, but, as indicated by TA<sub>amb</sub>, the frequency of noise events would increase. Noise levels are projected to be above traditional ambient levels more than two hours a day at three of the locations and more than one hour per day at the other two points analyzed. Leq(h) is projected to increase by less than 3.5 dB at three of the sites, by between 0.5 and 0.9 dB at five sites, and by 0.4 dB at two sites.

In general, peak noise levels (SEL, L<sub>Amax</sub>) are expected to be highest near the runway, but maximum noise levels over 80 dB have been predicted to occur over points as far south as the southern end of Biscayne Bay (SX10). These noise levels are also expected to occur fairly infrequently, generally less than once per day. On the other hand, noise levels approaching these values could be generated several times a day at all locations, with the highest frequencies of occurrence at locations nearest the airfield.

TA<sub>amb</sub> was modeled for only five of the ten points, but substantial increases in TA<sub>amb</sub> would be expected at all locations, because a large number of the proposed flight tracks that could be used by commercial aircraft would be directly over these sites. Locations like SX10, where a large number of flight tracks converge prior to arrival or prior to dispersal after departure, show a higher increase in TA<sub>amb</sub> than locations nearer the airport. TA<sub>amb</sub> values at all SX locations would be dominated by the changes that would occur with the addition of commercial traffic. Of the five points modeled, TA<sub>amb</sub> was calculated to increase by over 50 minutes at all of the supplemental points.

***Existing Studies of Noise Effects on Wildlife.*** Studies and incidental observations have been made of the response of animals to noise and aircraft. Most studies focused on responses to exposures to loud noise events and the frequency of those events. In general, the long-term effects of aircraft overflights on wildlife are unclear. Reported animal responses vary greatly among species, as well as within species at different stages of their lives, and the ability of species to adapt to overflights also varies (**NPS 1995**). Many reported responses by wildlife to aircraft overflights appear to be temporary and do not affect

**Table 4.11-1. Predicted Noise Exposures at Supplemental Locations Along the Biscayne Bay Shoreline (2015)**

Location <sup>1</sup>	Military Aircraft			Commercial Aircraft			L <sub>A</sub> max (dB)	TA <sub>amb</sub> (minutes) <sup>4</sup>		Leq(h) (dB)	
	Aircraft	Altitude <sup>2</sup> (feet)	Max SEL <sup>3</sup> (dB)	Aircraft	Altitude <sup>2</sup> (feet)	Max SEL <sup>3</sup> (dB)		Proposed Action	Change from Projected Baseline	Proposed Action	Change from Projected Baseline
SX1	F-16	2,797	106.8	MD83	3,119	87.4	100.3	88	60	60.6	1.9
SX2	F-16	3,137	105.4	MD83	2,694	89.0	93.2	130	89	65.7	0.5
SX3	F-15	1,229	92.5	P3A	1,064	90.0	98.4	74	50	52.8	0.8
SX4	F-16	3,148	104.9	P3A	3,294	80.1	87.9	NA	NA	56.7	0.4
SX5	F-16	2,396	108.4	MD83	2,655	90.4	102.8	NA	NA	63.2	0.8
SX6	F-16	4,000	102.6	S65	1,073	89.9	85.2	120	77	56.9	0.4
SX7	F-16	2,687	106.8	MD83	2,083	90.7	101.3	NA	NA	67.2	0.5
SX8	F-15	1,123	93.4	MD83	3,083	87.4	100.1	NA	NA	52.7	0.7
SX9	F-16	2,987	105.3	MD83	4,798	82.3	88.3	NA	NA	55.5	0.0
SX10	F-16	4,000	100.4	S65	1,091	88.3	83.9	149	105	58.1	0.6

Source: **Landrum & Brown 1999b.**

Notes: <sup>1</sup> See Figure 3.5-13.

<sup>2</sup> Slant distances not presented because most aircraft would be directly overhead.

<sup>3</sup> For days with at least one overflight. Differs from Peak Daily SELs in Landrum & Brown 1999b, which average lower in locations that would have less than one overflight per day.

<sup>4</sup> Increases over both baseline and traditional ambient levels.

dB      decibels

L<sub>A</sub>max      Maximum Sound Level

Leq(h)      Peak Hour Equivalent Sound Level

NA      Not available

SEL      Sound Exposure Level

TA<sub>amb</sub>      Time Above ambient

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animal populations or long-term habitat use. The potential consequences from noise are thought to be greatest on breeding animals, although impacts also occur during the non-breeding season at some waterfowl concentration areas (NPS 1995, Bélanger and Bédard 1989, Ward et al. 1999).

Physiological and/or behavioral animal responses to noise have been reported in the literature (Knight and Gutzwiller 1995, Mancini et al. 1988). Physiological effects include temporary or permanent hearing threshold shifts, masking of auditory signals, increased respiration and heart rate, and increased corticosteroid levels. Reported hearing threshold shifts were related to noise sources that were of much greater duration and intensity than would occur from aircraft overflights. Behavioral responses may include animals becoming alert and turning toward the sound source, running from the sound source, changing activity patterns (e.g., stop feeding), abandoning nests, or changing habitat use. If changes are sufficiently severe, the health and survival of an individual animal could be reduced. If a large number of animals were affected, then population declines could result.

The following sections summarize information on noise effects available in the literature for several groups of species and describe anticipated noise exposure changes associated with the Proposed Action. As each section indicates, the information is limited, and in many instances data are not available on the specific species that occur in the ROI. In those cases, available information on similar species is reported. The focus of the analysis is on species that reside outside the former base itself because sensitive species that use the former base, such as wading birds, have apparently acclimated to existing aircraft noise, and the Proposed Action would not result in an increase in maximum noise levels in the vicinity of the airfield.

The main area potentially affected by aircraft noise and overflights would be between the former base and the western shoreline of Biscayne NP. Other areas that contain sensitive wildlife species, including Everglades NP, the Everglades Water Conservation Areas outside the park, Crocodile Lake NWR, and Big Cypress National Preserve, were also examined.

**Invertebrates.** The Schaus swallowtail butterfly is the only sensitive invertebrate species that occurs in the Homestead area. Little information is available regarding possible noise impacts on invertebrates. The main population of this species occurs on Elliott Key and two nearby keys. An analysis of noise grid points covering these keys shows there would be a slight increase in maximum noise levels. The time noise levels would be above ambient levels would increase from an estimated 3.4 minutes per day under current conditions to 7.3 minutes under the Proposed Action. These slight increases in noise levels would not be expected to affect the Schaus swallowtail butterfly.

**Reptiles.** Limited information is available on the effects of short-duration noise events on reptiles. Dufour (1980) and Mancini et al. (1988) summarized a few studies of reptile responses to noise. Some reptile species tested under laboratory conditions experienced at least temporary threshold shifts or hearing loss after exposure to 95 dB for several minutes. Crocodilians in general have the most highly developed hearing of all reptiles. Crocodile ears have lids that can be closed when the animal goes under water. These lids can reduce the noise intensity by 10 to 12 dB (Wever and Vernon 1957). No information was found on the American crocodile's response to noise. The American crocodile is repopulating the western shoreline of Biscayne Bay, and two related crocodilians (American alligator and spectacled caiman) now reside on former Homestead AFB.

The American crocodile occurs along the western shoreline of Biscayne Bay between Turkey Point and Matheson Hammock County Park, at Crocodile Lake NWR on Key Largo, and in the Little Madeira/Joe Bay areas in Florida Bay in Everglades NP. Maximum noise levels from military jets along the western shoreline of Biscayne Bay currently reach 95 to 103 dB from Black Point to south of Military Canal.

Maximum estimated noise levels at these points from commercial aircraft would be 76 to 91 dB, so the Proposed Action would not result in increased maximum noise levels in American crocodile habitat along the western shoreline of Biscayne Bay.

The average traditional ambient noise level at 11 points along the western shoreline of Biscayne Bay is estimated to be 49 dB, and noise levels are currently above ambient levels for an average of about 32 minutes per day. The time above traditional ambient would increase by an average of about 92 minutes under the Proposed Action at maximum use of one runway. This increase in time above traditional ambient would be greatest in the Finder Point and Military Canal area (102 to 154 minutes per day) and at Mangrove Point at the south end of the western shoreline of Biscayne Bay (144 minutes per day). The maximum noise levels at Mangrove Point (84 dB) would be less than in the Military Canal area.

An analysis of 53 noise grid locations at Crocodile Lake NWR indicates that there would be no increase in L<sub>Amax</sub> at any location as a result of the Proposed Action, and that the average L<sub>Amax</sub> would be 72.6 dB. The average traditional ambient noise level for 29 of these locations is 41 dB, and noise levels are above traditional ambient levels for an average of 6 minutes per day under current conditions. Under the Proposed Action at maximum use, the time above traditional ambient is estimated to increase by 27 minutes, with the greatest increase (approximately 40 to 60 minutes) in the northern half of Crocodile Lake NWR.

A total of 24 grid points were analyzed in eastern Florida Bay, including the American crocodile habitat. L<sub>Amax</sub> was estimated to increase by an average of 3.6 dB at 10 points to a maximum of 61.4 dB. The traditional ambient noise levels for 23 points in eastern Florida Bay is 46 dB, and the time above traditional ambient noise levels under current conditions averages 0.7 minutes per day. The time above traditional ambient would increase to 2.2 minutes per day under the Proposed Action with maximum use of one runway.

These results indicate that maximum noise levels would not substantially increase at these three locations. The highest noise levels are currently and would continue to be along the western shoreline of Biscayne Bay. Similarly, time above traditional ambient is currently highest in that area, which would also experience the largest increase under the Proposed Action. The next largest increase would occur at Crocodile Lake NWR, followed by Florida Bay. The western shoreline of Biscayne Bay is currently the noisiest part of the American crocodile range in southeastern Florida and would likely remain so under the Proposed Action.

The effects of noise on crocodilians is poorly understood. Circumstantial evidence from Homestead AFB and from along the western shoreline of Biscayne Bay indicated that the crocodilians inhabiting this area would probably be able to coexist with the increased noise that would result from the Proposed Action. Two crocodilians (the American alligator and spectacled caiman) currently reside in the wetlands and canals along the base runway. Further, these species have resided at the base for decades. The caiman first arrived in the mid-1970s (**Ellis 1980**) and an eradication program in the early 1980s resulted in the removal of 20 to 30 individuals from the base (**Mazzotti 1999c**). This indicates that these two crocodilians coexist with the current noise levels and resided on the base when it was under full operation in a much noisier environment.

The American crocodile established a breeding population at the Turkey Point Nuclear Power Plant cooling water canals shortly after they were constructed in the mid-1970s (**Brandt et al. 1995**). The population increased through the 1980s when Homestead AFB was in full operation. The DNL 85 dB noise contour was very close to this population during that period. Thus, the crocodile expanded its range

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along the western shoreline of Biscayne Bay under past and current noise levels generated by aircraft from Homestead AFB. If it is as unaffected by aircraft noise as the American alligator and spectacled caiman appear to be, noise from the Proposed Action would likely not have a detrimental effect on this population. The same would hold true for the American crocodile populations at Crocodile Lake NWR and Florida Bay, where potential noise levels from the Proposed Action would be much less than along the western shoreline of Biscayne Bay.

**Birds.** Birds comprise the majority of special-status wildlife species that have the potential to be affected by aircraft noise from the Proposed Action. Most of these species can be found in the aquatic environments on the former base and between the former base and Biscayne Bay. There are limited data on the specific species that occur in south Florida, and information about similar species, particularly water birds, is used to assess potential impacts.

The available information on effects of aircraft noise on wading birds and other aquatic birds is based primarily on studies involving military jets, helicopters, and small fixed-wing propeller aircraft. The noise from military jets is generally louder than from commercial aircraft, but the frequency of military flights in some studies was less than the projected number of flights at Homestead ARS. Louder, less frequent (or less regular) noise events are considered more likely to elicit behavioral responses in animals than regular, less loud events. The results of noise studies involving other aquatic birds such as waterfowl are also discussed. Although wading birds and other aquatic birds may respond differently to noise than waterfowl, it is believed that the findings of waterfowl studies may apply to other groups of aquatic birds, particularly because waterfowl may be more responsive to noise and aircraft than other birds (**Knight and Gutzwiller 1995**).

The effects of aircraft activity on wading bird rookeries have been assessed for military aircraft and single-engine airplanes and helicopters (**Black et al. 1984, Kushlan 1979**). Based on indirect evidence, Black et al. (1984) found that low-flying military aircraft (at altitudes of 500 feet or less) had no effect on wading bird colony establishment or size in Florida. Colonies were found to be distributed randomly with respect to military routes and were more related to wetland types. These results indicated that wading birds were using wetland habitat for colonies as it became available, and this choice was not affected by low-level military overflights.

A detailed study to determine the effects of military overflights on nesting wading birds such as the great egret, snowy egret, tricolored heron, and little blue heron was conducted in central Florida (**Black et al. 1984**). The study examined a rookery subjected to overflights and a control site. Military jets flew over the colony at about 500 feet above the ground, and sound levels ranged from 55 to 100 dBA. The flight frequency was one to two flights per day, and each flight consisted of two to four aircraft. The behavior of breeding wading birds in the study colony included no response (48 percent of the time), looking up (34 percent of the time), or changing position (18 percent of the time). In the control rookery, birds looked up 1 percent of the time and changed position 3 percent of the time. While responses were significantly higher in the colony overflown, it was believed that the responses were not severe. More severe behavior, such as walking around on the nest or flushing, was not observed. Birds began looking up as noise levels reached 60 to 65 dBA and changed position at the 70 to 75 dBA range. Birds exhibited all three responses at the 75 to 100 dBA range. Birds typically resumed their pre-overflight behavior 1 to 2 minutes after the overflight, and there was no evidence of an increase in aggressive encounters after the overflight. Further, there was no evidence of the birds habituating to the overflights. Reproductive activity, such as nest success, nesting survival and mortality, and nesting chronology were not affected by the military jet overflights. It was noted that wading birds showed much more extreme behavior, such as flushing and panic, if humans entered the colony or if airboats went through or near the colony. The



responses observed in this study were similar to the responses of nesting great egrets and black-crowned under similar noise levels (61 to 110 dBA).

In a study designed to assess the impacts of wading bird colony census flights, the reaction of 220 wading birds to fixed-wing, single-engine airplane and helicopter overflights were measured (**Kushlan 1979**). The overflights consisted of the airplane and helicopter circling colonies at 120 and 60 meters above the ground. Seventy-one percent of the birds showed no reaction, 19 percent looked up, 6 percent stood up, 3 percent walked from the nest, and 2 percent flushed and returned within 5 minutes. The birds that flew were without active nests. It was concluded that the disturbances from the aircraft were minor and of short duration.

Studies regarding the effects of aircraft flights and noise on diurnal and nocturnal roost sites are limited. As indicated above, non-nesting wading birds at a rookery had a slightly higher chance of reacting to overflights than nesting birds (**Kushlan 1979**), and gulls roosting near a colony remained at the roost when subsonic aircraft flew overhead (**Burger 1981**). As indicated in Appendix G and shown on Figure G-15, there is a wading bird nocturnal roost site on the former base about 1,000 feet from the runway in an area where maximum noise levels commonly exceed 110 dB. This roost site was occupied in 1998 and 1999 (**Denton and Godley 1999, Peterla 1999c**) by 50 to 70 birds, mostly white ibis and cattle egrets, as well as a few other unidentified herons and egret species. Currently, most air operations at the former base take place during daylight hours, although some occur at dusk and shortly after when wading birds would be arriving at their roost sites. This indicates that, under current conditions, wading birds successfully roost near the runway and most likely at other roosts between the former base and Biscayne Bay. Under the Proposed Action, 6 to 10 percent of the commercial flights could occur at night, and it is not known if this increase in the number of night flights would affect this roost.

**Burger (1986)** studied the response of migrating shorebirds to human disturbance and found that shorebirds did not fly in response to aircraft overflights, but did flush in response to humans and their dogs on the beach. **Burger (1981)** studied the effects of noise from JFK airport in New York on herring gulls (*Larus argentatus*) that nested less than 1 kilometer from the airport. Noise levels over the nesting colony were 85 to 100 dBA on approach and 94 to 105 dBA on takeoff. No effects of subsonic aircraft on nesting were noted, although some birds flushed when supersonic aircraft flew overhead and, when they returned, they engaged in aggressive behavior. Groups of gulls tended to loaf in the area of the nesting colony, and these birds remained at the roost when subsonic aircraft flew overhead. Up to 208 of the loafing gulls flew when supersonic aircraft flew overhead. These birds would circle around and immediately land in the loafing flock.

The effects of military aircraft on wintering waterfowl were studied near Piney Island, North Carolina. The behavior of wintering ducks in relation to low-altitude (about 152 meters) flights was assessed, and sound levels were measured (**Conomy et al. 1998a**). Fifty-five hours of sound data were collected in 1991 and 1992, and noise levels equaled or exceeded 80 dBA was 1 to 44 times per hour. Sound levels averaged 85.1 dBA and ranged from 80 to 109 dBA. The 24 hour equivalent sound level averaged 63.2 dB. There was no relationship between the number of disturbance events and the response of four species of wintering waterfowl. Of the 672 observations, waterfowl spent 1.4 percent of their time or less responding to aircraft by flying, swimming, or alert behavior. These behavioral responses lasted only an average of 10 to 40 seconds for the four species. The number of behavioral reactions to aircraft disturbance was not related to the number (up to 44 flights per hour) and duration of sound levels equal to or greater than 80 dBA. The low reaction rate of wintering waterfowl to aircraft flights and noise indicates that these species can tolerate some level of noise on their wintering grounds and that they may have habituated to aircraft noise.

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Habituation to aircraft noise of one of the species in this study, black duck (*Anus rubripes*), has been demonstrated (Conomy et al. 1998b). Previously unexposed ducks were exposed to 71 noise events per day that equaled or exceeded 80 dBA for a 24 hour equivalent sound level that averaged 63.2 dB. It was determined that the proportion of time black ducks reacted to aircraft activity and noise decreased from 38 percent to 6 percent in 17 days and remained stable at 5.8 percent thereafter. In the same study, the wood duck did not appear to habituate to aircraft disturbance. This suggests a species-specific reaction to aircraft disturbance.

Species-specific responses were observed for the Pacific brant (*Branta bernicla nigricans*) and Canada geese (*B. canadensis*) (Ward et al. 1999). Overall, brant flocks flushed 75 percent of the time and Canada geese 9 percent of the time in response to aircraft overflights. It was observed that the noise, rather than the sight, of the aircraft may have been more important because brant reacted more to high-noise aircraft (greater than 76 dBA). While there was some indication that brant may habituate to aircraft noise, the results were inconclusive. The study area, in southwestern Alaska, was subject to infrequent disturbance, and the geese may not have acclimated to the aircraft noise because it was sporadic and unpredictable.

Greater snow geese (*Chen caerulescens atlantica*) are apparently slow to habituate to human disturbance. In one study (Bélanger and Bédard 1989), low-level aircraft flights were the most common disturbance and generally resulted in the longest flights by the geese (66 to 110 seconds) and the longest time to resume feeding (8 to 22 minutes). It was recommended that low-level aircraft flights at altitudes below 500 meters be prohibited in snow goose staging areas.

The effects of aircraft activity on wading and other special-status bird species on and near former Homestead AFB have not been studied. There are also no historic data regarding aquatic bird use on and near the former base when it was in full operation. The wading birds and other special-status species on the former base and between the former base and Biscayne Bay forage under current noise levels from military aircraft operations. Noise produced by military aircraft is generally louder than commercial jets, so the maximum sound levels that occur under current conditions would generally not be exceeded under the Proposed Action in most places on and around the bay.

There would, however, be an increase in the frequency of aircraft operations over Biscayne National Park. The proposed departure flight paths under east flow include routes headed east, southeast, and northeast over Biscayne NP. The number of departing aircraft flying directly east over the park is projected to increase from about 4 per day in 2005 to about 50 per day at full buildout. The number of operations headed southeast over Biscayne Bay is estimated to increase from less than 3 per day in 2005 to 26 per day under maximum use. There would be an estimated increase of between 11 and 23 operations per day at maximum use along the flight path headed northeast over the bay. It is estimated that the east flow departures from former Homestead AFB would be at an altitude of approximately 1,500 to 5,000 feet as they entered the airspace over Biscayne NP and would exit the airspace at much higher altitudes.

Aircraft operations could affect sensitive species between the former base and the western shoreline of Biscayne Bay, particularly in areas where aircraft would be below an altitude of 2,000 feet. However, many of the bird species, including special-status species, that occur in this area may have acclimated to noise from aircraft, as evidenced by their present use of the area. Studies of wintering waterfowl in North Carolina support this conclusion (Conomy et al. 1998a). Waterfowl in the Conomy study were exposed to a maximum of 44 low-level flights per hour, yet they spent very little time responding to these flights. Wildlife are more likely to habituate to noise if it is produced on a regular and consistent basis rather than at irregular intervals (NPS 1995, Dufour 1980, Ward et al. 1999).

Wildlife in Biscayne NP currently live in an environment that contains regular aircraft traffic and, in some areas, high levels of human activity, especially on weekends. However, the western shoreline of Biscayne NP is a “Protected Natural Area Subzone” and human use is concentrated at Convoy Point and at the mouths of canals (NPS 1983). The remainder of the shoreline is used occasionally by visitors in shallow draft boats such as canoes. Many of the sensitive species at Biscayne NP occur along this shoreline, and while daily aircraft flights from Homestead ARS fly over this area, there is much less human recreational activity than in other sections of the park. Given the current levels of human activity even in the Protected Natural Area Subzone, it is believed that the reaction of special-status bird species to noise on and near the former base would be consistent with results of studies in other areas with high levels of human activity (Conomy et al. 1998a; Burger 1981, 1986) rather than in areas where human activity is limited (Ward et al. 1999, Bélanger and Bédard 1989).

The wading bird rookeries and bald eagle nest sites nearest the former base are about 8 miles southeast, and the nearest osprey nests are about 10 miles east. The maximum noise levels at the bald eagle nest site and wading bird rookery would be about 84 dB and at the osprey nests, 66–77 dB. These are current L<sub>Amax</sub> levels that would not increase as a result of the Proposed Action. There would be an increase in flights over these locations, but commercial aircraft would be at altitudes of 3,000 to 5,000 feet. These altitudes are higher than have been recommended to minimize noise effects of fixed-wing aircraft on staging snow geese (500 meters, or 1,640 feet) or to have greatly-reduced effects on flocks of brant and Canada geese (600 to 915 meters, or 1,968 to 3,001 feet) not habituated to this disturbance (Ward et al. 1999, Bélanger and Bédard 1989). Therefore, aircraft operations associated with the Proposed Action would apparently not be expected to adversely affect nesting sites of special-status species.

Wading bird rookeries and bald eagles’ nests occur in eastern Florida Bay. There would be a slight increase in maximum noise levels and an increase in time above traditional ambient of 2.2 minutes per day at maximum use of the Proposed Action. These small increases in noise levels in Florida Bay are not expected to affect nesting wading birds or bald eagles in this area.

The current breeding distribution of the Cape Sable seaside sparrow includes three populations. The eastern population is closest at about 12 miles west of former Homestead AFB, along the eastern boundary of Everglades NP and Southern Glades Wildlife and Environmental Area next to the park.

As indicated in Section 3.8.2, Regional Air Quality, the wind is predominantly out of the northwest from December through February, which is when the airport would most commonly operate in west flow. The Cape Sable seaside sparrow nesting season extends from March into August with the peak from mid-April through May. During the Cape Sable seaside sparrow breeding season, the wind is predominantly from the southeast, indicating that most air traffic would operate in east flow. Occasional west flow air traffic would be expected during the breeding season, and the west flow air traffic would fly over the southern portion of the eastern Cape Sable seaside sparrow population, including areas in the Southern Glades Wildlife and Environmental Area.

In general, departing aircraft produce more noise than arriving aircraft. However, the resulting noise level at the ground also depends on altitude. The noise levels from departing west flow aircraft would be relatively low over Cape Sable seaside sparrow habitat because the aircraft would be at altitudes between 7,500 and 17,000 feet. In general, east flow inbound traffic would be about 4,000 feet above Everglades NP at its eastern boundary. Therefore, given the relatively infrequent number of west flow departures during the Cape Sable seaside sparrow breeding season and the altitude of west flow departing aircraft, it is believed that west flow departing aircraft would not result in appreciably greater noise levels over the Cape Sable seaside sparrow habitat than the east flow arriving aircraft. The noise modeling

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performed for this SEIS incorporated both the east flow and the west flow operations projected for the Proposed Action.

It is expected that the increases in L<sub>Amax</sub> in those areas would not result in the Cape Sable seaside sparrow abandoning its habitat or in other overt behavior. However, there is a concern that some of the noise levels generated from the Proposed Action could inhibit birds in these population from receiving sounds from their environment that are important for their survival (masking) such as, for example, territorial vocal displays. In addition, it is possible that increased noise could inhibit Cape Sable seaside sparrow researchers from hearing bird calls during breeding bird surveys and these surveys are an important part of the monitoring program for this species.

There is little information regarding the effects of masking on bird populations including inhibiting territorial males from hearing each other. Studies have shown that birds are less sensitive than humans to sounds in the higher and lower ranges, but in the intermediate range their sensitivity is equal to humans and mammals in general (**Farner et al. 1973**). The discrimination of sound frequencies within the range for birds seems to be about equal to humans (**Sturkie 1965**). This being the case, it may be assumed that the noise levels that begin to inhibit human communications may be the same levels that began to inhibit bird communication. As indicated in Section 3.5.1.1, disruption of communication between people standing three feet apart begins at about 65 dB. Birds, as well as researchers conducting breeding bird surveys, usually need to be able to communicate over larger distances. Therefore, in this analysis, it is assumed that 60 dB is a reasonable threshold for masking to begin, and the analysis focuses on areas where L<sub>Amax</sub> is projected to increase from below to above 60 dB.

**Table 4.11-2** presents various noise metrics in grids overlapping Cape Sable seaside sparrow populations. Within the western population of the Cape Sable seaside sparrow, where data are available, L<sub>Amax</sub> and TA<sub>amb</sub> are calculated to increase in 50 and 92 percent of the grid cells, respectively, under the Proposed Action, and there is an average estimated increase of 64 flights per day at maximum use. The average increase in L<sub>Amax</sub> for all grid cells in the western population is estimated to be 4.7 dB. L<sub>Amax</sub> would be over 60 dB in six grid cells. Of those, five would experience no change from current L<sub>Amax</sub> levels. The only cell projected to experience an increase in L<sub>Amax</sub> and also be over 60 dB is A196. This area is already exposed to L<sub>Amax</sub> 71.3 dB under current conditions, and the Proposed Action would increase this by 1.8 dB, to 73.1 dB. TA<sub>amb</sub> was calculated to increase by an average of 10.8 minutes per day for 12 of 18 cells where data are available. This increase is estimated to range from none to 37.3 minutes per day. The maximum total TA<sub>amb</sub> under the Proposed Action is estimated to be 38 minutes in grid cell A196.

L<sub>Amax</sub> is projected to increase at one (A193) of eight cells in the Ingraham Population (40.5 to 41.7 dB). Three of the eight cells are estimated to have L<sub>Amax</sub> levels over 60 dB, but they would have no change from current L<sub>Amax</sub> levels. TA<sub>amb</sub> is projected to increase between zero and 2.2 minutes per day under the Proposed Action at maximum use. Therefore, it is assumed that the Proposed Action at maximum use would not have masking effects on the Cape Sable seaside sparrow and would not appreciably inhibit monitoring surveys in the western and Ingraham populations.

At maximum use of the Proposed Action, L<sub>Amax</sub> in the eastern population at Everglades NP may increase from below to above 60 dB in seven grid cells and at a Cape Sable seaside sparrow study plot. The average level in those cells is projected to be 62 dB, and no case exceeds 63 dB. L<sub>Amax</sub> is already above 60 dB in 19 cells, where it could increase up to 2.5 dB. TA<sub>amb</sub> at 25 grid cells is projected to increase by an average of 77.8 minutes per day from the current average of 31.2 minutes per day. The increases range from 4.2 to 193.0 minutes per day, resulting in total TA<sub>amb</sub> of between 4.5 and 225.1 minutes per day. These noise levels may result in masking effects on the Cape Sable seaside

**Table 4.11-2. Projected Noise Levels at Grid Cells Overlapping Cape Sable Seaside Sparrow Populations for Proposed Action at Maximum Use**

Grid Point <sup>1</sup>	Traditional Ambient Level (dB)	LAm <sub>ax</sub> (dB)		TA <sub>amb</sub> (min)	
		Increase	Total	Increase	Total
Western Population					
A129	45	6.3	58.1	1.6	1.6
A130	45	21.5	58.5	14.6	14.6
A150	42	0.0	75.6	15.3	15.7
A151	45	0.0	76.0	23.5	24.0
A152	45	8.2	58.0	0.0	0.0
A153	NA	22.4	58.4	NA	NA
A173	45	0.0	73.3	24.1	24.5
A174	45	0.0	77.0	4.6	4.9
A175	NA	0.0	47.8	NA	NA
A176	NA	6.4	41.5	NA	NA
A196	40	1.8	73.1	37.3	38.0
A197	39	0.0	70.4	4.4	4.8
A198	NA	0.0	45.9	NA	NA
A199	NA	7.6	44.2	NA	NA
A200	NA	0.0	48.8	NA	NA
A221	40	3.9	48.2	0.7	0.7
A222	31	6.3	47.7	2.0	7.4
A223	41	0.0	53.4	1.0	4.7
Ingraham Population					
A192	47	0.0	52.1	0.0	0.0
A193	45	1.2	41.7	0.0	0.0
A215	45	0.0	64.3	0.0	0.5
A216	42	0.0	48.8	0.1	0.1
A217	40	0.0	49.9	0.6	0.7
A238	45	0.0	66.0	0.1	2.9
A239	40	0.0	61.4	0.7	1.9
A240	40	0.0	52.3	2.2	2.5
Eastern Population					
B7	40	0.0	51.7	4.2	4.5
B8	47	8.3	62.0	18.9	19.2
B9	40	8.7	62.5	40.3	41.0
B10	40	2.1	75.6	15.7	17.6
B26	40	0.7	52.9	10.5	10.8
B27	47	8.2	62.3	23.7	23.9
B28	31	7.0	61.8	109.3	122.5
B29	31	2.2	76.3	78.1	114.1
B30	31	2.1	76.1	47.7	86.9
B46	47	7.1	62.2	121.6	126.3

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Grid Point <sup>1</sup>	Traditional Ambient Level (dB)	LAmox (dB)		TAamb (min)	
		Increase	Total	Increase	Total
B47	31	5.0	62.3	141.9	194.2
B48	31	2.1	76.6	97.6	161.0
B49	31	0.0	78.4	70.6	133.9
B50	31	8.4	62.8	76.2	135.0
B62	31	0.0	75.0	34.2	54.1
B63	31	0.0	77.6	75.3	101.6
B64	31	0.0	68.8	166.3	191.5
B65	31	0.0	72.8	193.0	225.1
B66	31	0.0	67.3	126.0	181.7
B67	31	2.5	76.8	95.4	166.2
B68	31	0.0	79.6	92.7	167.9
B69	31	2.1	63.3	112.0	207.6
B81	31	0.0	64.9	11.5	22.5
B82	31	0.0	80.9	NA	NA
B83	31	0.0	82.6	NA	NA
B84	31	0.0	72.1	NA	NA
B100	31	0.0	60.5	144.0	175.0
B101	NA	0.0	69.7	NA	NA
B102	NA	0.0	86.9	NA	NA
B119	45	0.0	74.2	39.5	43.2

Source: **Landrum & Brown 1999b.**

Notes: <sup>1</sup> See Figures 3.5-9 and 3.5-10 and Appendix E.

<sup>2</sup> Grids outside Everglades NP and over SFWMD lands.

NA Not available

sparrow and minor disruptions in breeding bird surveys. Thirteen grid cells are projected to have both LAmox levels above 60 dB and TAamb of more than two hours. Of those, nine are already exposed to LAmox levels above 60 dB. The remaining four cells (B28, B46, B47, and B50) are the areas where the Proposed Action is anticipated to have the greatest effects. TAamb is also projected to increase to more than two hours at B64, B65, B66, B67, B68, and B100, but LAmox at those locations would not change. TAamb at B69 is projected to increase to 207.6 minutes, and LAmox to increase from 61.2 to 63.3 dB. Potential masking effects in the other cells where LAmox would exceed 60 dB would be less because of lower TAamb values.

Eight noise grid points overlap the Southern Glades Wildlife and Environmental Area Cape Sable seaside sparrow population (points B81, B82, B83, B84, B100, B101, B102, and B119). None show an increase in LAmox as a result of the Proposed Action at maximum use. TAamb is available for only three of these points, where it is projected to increase by 11.5 (grid point B81), 39.5 (B119), and 144.0 (B100) minutes per day under the Proposed Action at maximum use. While the increase in TAamb is substantial at B100, this increase would probably not result in masking effects because the maximum noise levels at this point would be 60.5 dB.

In summary, individuals conducting breeding bird surveys may not be able to hear all the birds calling while aircraft are overhead. The projected increase in the average number of flights has the potential to

disrupt breeding bird census work. The largest number of flights would likely occur in grid cells with the highest change in TAamb. Therefore, there is the potential for the Proposed Action at maximum use to result in slight masking effects on the Cape Sable seaside sparrow and slight disruption of breeding bird surveys in certain locations, especially in the three grid cells where LAmax is currently below 60 dB, is projected to increase to 60 dB or more, and TAamb would be two hours or more.

**Mammals.** In a summary of the effects of noise on marine mammals (NPS 1995), it was determined that species such as the gray whale and harbor porpoise showed no obvious behavioral response to aircraft noise or overflights. Bottlenose dolphins showed no obvious reaction in a study involving helicopter overflights at 1,200 to 1,800 feet above the water. Nor did they show any reaction to survey aircraft unless the shadow of the aircraft passed over them, at which point they may dive (Richardson et al. 1995). Human-made noises in the marine environment from ships, pleasure craft, and other sources may have more of an effect on marine mammals than aircraft noise. It is believed that increased overflights by commercial aircraft would have little impact on the bottlenose dolphin population in Biscayne Bay.

Little is known about the importance of acoustic communication for manatees, although they are known to produce at least ten different types of sounds and are thought to have sensitive hearing. There is also little information regarding the effects of aircraft and aircraft noise on manatees (Richardson et al. 1995). The continued occupation of canals near Miami International Airport suggests that manatees in urban areas have become habituated to human disturbance and noise.

The area of Biscayne Bay that would be affected by the Proposed Action is non-urban, so an increase in the number of flights could result in disturbance of the manatee. However, several factors may indicate that this would not result in an adverse impact. First, the manatee that occur along the western shoreline of Biscayne Bay between Black Point and Turkey Point are currently exposed to jet aircraft flights and noise and, although the number of flights associated with the Proposed Action would increase substantially, the maximum noise levels would not. Second, commercial aircraft are projected to be 2,000 to 5,000 feet above sea level as they enter the airspace over Biscayne Bay. This is likely much higher than aircraft used to census manatees. In addition, some manatee surveys take place from helicopters, which have been shown in some cases to have a greater negative effect on wildlife than fixed-wing aircraft (NPS 1995, Ward et al. 1999, Gladwin et al. 1988, Grubb and Bowerman 1997). Third, it is expected that the manatee would habituate to the increased air traffic. This species is known to become tame after being exposed to boat traffic and tourists over a period of time (Richardson et al. 1995). In addition, the manatee regularly travels up the Miami River to areas near Miami International Airport, including such areas as Blue Lagoon Lake and canals on the airport property (Metro-Dade County 1995b). Apparently these animals have become habituated to noise from that airport as well as various other human noise sources. This information indicates that the manatee may have a minor short-term reaction to increased air traffic as a result of the Proposed Action but should habituate to this activity over time.

Studies of terrestrial mammals have shown that noise levels of 120 dBA can damage mammals' ears, and levels at 95 dBA can cause temporary loss of hearing acuity (Dufour 1980). No studies of the effects of noise on the Florida panther or any other large cat were found. Noise from aircraft has affected other large carnivores by causing changes in home ranges, foraging patterns, and breeding behavior. One study recommended that aircraft not be allowed to fly at altitudes below 2,000 feet over important grizzly and polar bear habitat (Dufour 1980). Wolves have been frightened by low-level flights that were 25 to 1,000 feet off the ground. However, wolves have been found to be able to adapt to aircraft overflights and noise as long as they are not being hunted from aircraft (Dufour 1980, Mech 1970).

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The Florida panther has been observed about three-quarters of a mile south of the former base in the past. The Proposed Action would not result in an increase in the maximum noise levels in this area. There would, however, be a substantial increase in the number of flights, estimated to increase from an average of less than 4 per day in 2005 to 46 per day over potential Florida panther habitat at maximum use. Aircraft would be at altitudes of approximately 5,000 feet as they crossed Palm Drive and about 8,000 feet as they passed over the center of potential panther habitat in the Model Lands Basin. These altitudes are higher than the minimum 2,000 feet recommended for sensitive bear habitat (**Dufour 1980**). It is believed that the increased number of flights over potential Florida panther habitat would not affect any panthers that may reside in the area.

The Key Largo cotton mouse and Key Largo woodrat occur in tropical hardwood hammocks in north Key Largo, including Crocodile Lake NWR. The Proposed Action would not result in an increase in maximum noise levels in the habitat of these two species. The increase in time above traditional ambient at Crocodile Lake NWR would average about 22 minutes more per day than under current conditions. Commercial aircraft would be above 5,000 feet when they pass over Key Largo. Behaviorally, these two species would be in burrows of large stick nests resting during the day when most commercial flights would take place and active at night when fewer flights occur. Based on these factors, it is believed that the noise levels projected for north Key Largo would not have an effect on the Key Largo cotton mouse and Key Largo woodrat.

### **Cumulative Impacts**

Realization of Miami-Dade County's high-growth population forecasts would result in the development of vacant and agricultural land south of Eureka Drive and could result in the loss of pine rocklands. The total area of pine rocklands in southern Miami-Dade County is unknown, so the potential loss cannot be quantified. The Proposed Action's potential contribution to loss of pine rocklands is believed to be minor because most of the pine rocklands on the disposal property would be preserved, and secondary development associated with the Proposed Action is estimated to contribute about 10 percent to cumulative development outside the former base.

Sensitive species could be affected by the increased development associated with high growth. The land most likely to be developed may be eastern indigo and rim rock crowned snake habitat. There are approximately 1,270 acres of freshwater bodies within the UDB in south Miami-Dade County, and some could be developed or be subject to increased human activity and rendered unusable by wood storks and state-listed wading birds. Development could also affect potential Florida panther habitat south of the former base.

The L-31E Flowway Redistribution Project and the county's proposed STDA, if implemented, could improve habitat for the American crocodile, wood stork, state-listed wading birds, bald eagle, and manatee by increasing the area of wetlands east of the former base and improving nearshore water quality in Biscayne Bay.

Miami-Dade County's Environmentally Endangered Lands program to purchase environmentally sensitive land includes five pine rocklands near the former base. Thirty acres of the pine rocklands have been acquired, and an additional 172 acres are on the acquisition list. The EEL program would also benefit the Florida panther because it could include purchase of over 40,600 acres of freshwater wetlands that could include panther habitat in the Model Lands Basin.

Widening of U.S. Highway 1 to a four-lane road from Florida City to Key Largo would result in the elimination and disturbance of wetlands and could reduce the area of appropriate habitat for sensitive



species. It would remove potential snake and wading bird habitat in the corridor between Florida City and Key Largo. However, these effects have been mitigated through the establishment of replacement wetlands.

### **Mitigation Measures**

The establishment of a buffer between former Homestead AFB and Biscayne NP would prevent or reduce development within the protected area, which would reduce the potential loss of remnant pine rocklands in the region. It would also reduce the potential destruction and fragmentation of eastern indigo snake and rim rock crowned snake habitat. In addition, it would preserve foraging habitat for the wood stork and other wading birds.

The Air Force has determined that a preservation covenant would be included in the transfer of disposal property to Miami-Dade County to avoid adverse effects on the federally listed Small's milkpea.

If the wetlands near the runway were eliminated to reduce bird-aircraft strike hazards, wetlands replacement or enhancement would likely be required.

It is suggested that the eastern indigo and rim rock crowned snake habitat on the disposal property be resurveyed by the developer just prior to construction. If snakes are found, the USFWS and the Florida Game and Fresh Water Fish Commission should be consulted regarding potential measures to avoid negative impacts, if any, to these species. These measures might include relocating the snakes.

### **Possible Future Expansion**

Most of the area that could be disturbed by development of a second runway at HST is currently used for agriculture, but there are wetlands on the land southeast of the former base which are dominated by exotic plants (NPS 1997). Biological surveys have not been performed on this land, so information on special-status species use is limited. There may be small remnant pine rocklands that could be affected by construction. Airport expansion could also result in destruction of more than 16 acres of remnant pine rocklands that apparently do not contain federally listed species at the southern end of the existing runway (groups B and E on Figure 3.11-6).

The area of the possible expansion includes marginal (agricultural lands) and good (exotic plant dominated wetlands and uplands) habitat for the eastern indigo snake. Much of the agricultural land in the area is adjacent to good habitat. It is probable that the eastern indigo snake occurs throughout the area. The likelihood of indigo snakes occurring on this land would increase near the outer boundaries of the expansion area, closer to good habitat. The rim rock crowned snake also has the potential to occur in this area, particularly on overgrown vacant land. Therefore, construction of a second runway has the potential to result in the elimination of eastern indigo and rim rock crowned snake habitat and in direct mortality of some individuals of these species.

Airport expansion could result in the elimination of wetlands adjacent to the existing runway, an existing roost site, and other aquatic habitats such as roadside drainage ditches and exotic plant dominated wetlands. Wood storks forage in roadside ditches and other aquatic habitats in this area during the winter. State sensitive wading bird species also forage in the aquatic habitats that could be affected, and roost sites may occur in the wetlands. Some species, such as the white ibis, forage in agricultural lands as well. With the loss of this habitat, wading birds, including the wood stork, would have to forage elsewhere.

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The Florida burrowing owl may currently reside in the area of a possible second runway, with the potential for loss of nest sites. However, this species may also expand into areas developed for a new runway. Breeding birds associated with mangroves (such as the mangrove cuckoo, black-whiskered vireo, Florida prairie warbler, and Cuban yellow warbler) probably do not nest in this area because of the lack of appropriate habitat.

Tracking data in the late 1980s indicated the Florida panther occurred south of former Homestead AFB, with a home range that extended almost up to the area that would be affected by possible airport expansion (**Ferro 1999a**). There have been recent unconfirmed sightings of the panther near Palm Drive (**Wasilewski 1999a**). The potential impacts to this species would need to be assessed at the time of any future construction.

Operations at a second runway would result in increased aircraft flights and noise. The northeast end of the second runway may be about 0.7 mile closer to the western shoreline of Biscayne NP than the existing runway. New flight tracks might also be necessary to handle the increased number of flights safely. This could result in a broader area of increased noise exposure along this shoreline from both commercial and military aircraft than under current conditions or under the single-runway Proposed Action. In addition, the increase in the number of commercial flights would result in noise levels being above traditional ambient levels for greater periods of time. The increase in noise levels and time above ambient associated with a second runway are not known. The magnitude of potential noise effects on sensitive species and habitats cannot be determined at this time and would have to be assessed in a separate NEPA process if a second runway is proposed in the future.

### **4.11.3.2    *Commercial Spaceport Alternative***

#### **Construction**

**Plants.** Construction activities associated with this alternative would have the potential to impact the same sensitive plant species locations that could be affected by the Proposed Action. Although it is not known whether a plan similar to the Proposed Action's Wildlife/Habitat Management and Mitigation Plan would be implemented under this alternative, USFWS has requested that the Air Force include a preservation covenant in any deeds that transfer the three remnant pine rocklands containing the federally listed Small's milkpea to non-federal entities (areas 1–3 on Figure 3.11-6). This covenant would require the new land owner to protect and manage these remnant pine rocklands. A fourth pine rockland, which would be protected under the Proposed Action, may not be protected under the Commercial Spaceport alternative (area 4 on Figure 3.11-6).

Secondary development would have the same kinds of impacts that are described for the Proposed Action, but the magnitude of the impacts under this alternative would be less than under the Proposed Action because a smaller area would be affected.

**Reptiles.** Construction of the Commercial Spaceport alternative would not be expected to affect the American crocodile, eastern indigo snake, or the rim rock crowned snake for the reasons given under the Proposed Action.

Secondary development would have the same kinds of impacts that are described for the Proposed Action, but the magnitude of the impacts under this alternative would be less than under the Proposed Action because a smaller area would be affected.

**Birds.** The impacts of this alternative on birds would be similar to the Proposed Action. There would be essentially no impacts from on-site development on the bald eagle and the wood stork, because these species occur only sporadically on disposal property. The use of the wetlands near the runway by wading birds could be eliminated or reduced to avoid potential hazards from collisions between birds and aircraft or spacecraft. Use of the disposal property by other sensitive bird species such as the Cooper's hawk, osprey, and American redstart would be reduced because of development and increased human activity.

Secondary development would have the same kinds of impacts that are described for the Proposed Action, but the magnitude of the impacts under this alternative would be less than under the Proposed Action because a smaller area would be affected.

**Mammals.** Development associated with the Commercial Spaceport alternative would not be expected to have an impact on sensitive species of mammals for the reasons stated under the Proposed Action.

Secondary development would have the same kinds of impacts that are described for the Proposed Action, but the magnitude of the impacts under this alternative would be less than under the Proposed Action because a smaller area would be affected.

### **Noise From Spacecraft Operations**

It is assumed that noise from commercial space vehicles would be concentrated principally northeast of former Homestead AFB. Spacecraft are expected to enter the airspace over Biscayne Bay in the Black Point area. These operations are projected to result in noise levels higher than current levels along the western shoreline of the bay directly under the flight path (location SX3 on Figure 3.5-13), where maximum sound levels are projected to increase from 98.4 dB to 102.2 dB. Sound levels over 100 dB currently occur elsewhere along and near the shoreline, including points SX1, SX5, and SX7. The largest increase in LAmax over baseline levels would occur at the northern boundary of Biscayne NP where an increase of 16.8 dB over a current level of 69.5 dB is projected. TAamb would be expected to increase slightly because of the low number of space-related operations projected for this alternative.

The assumed flight corridor for space vehicles is well north of special-status species habitat at Sands, Elliott, and West Arsenicker Keys and the special-status species on the keys are not anticipated to be affected. It is believed that operations associated with the Commercial Spaceport alternative would have a negligible impact on special-status species at Biscayne NP.

### **Combined Commercial Spaceport/Airport**

A combined Commercial Spaceport/Airport would have the same direct effects as described above. Wildlife would be exposed to increased aircraft noise similar to the Proposed Action, but the maximum number of operations would be much less. The effects of reuse-related secondary development would be slightly greater in magnitude than with the spaceport alone, but the impacts would be small or negligible.

### **Cumulative Impacts**

Cumulative impacts with this alternative would be slightly less than with the Proposed Action because of lower intensity development on the disposal property.

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### Mitigation Measures

As under the Proposed Action, the establishment of a buffer between the former base and Biscayne NP would be expected to have a positive effect on sensitive species.

A deed covenant as requested by USFWS to protect three remnant pine rocklands containing federally listed plant species would ensure the long-term preservation and management of at least three pine rockland sites on the former base. Developing a habitat management and mitigation plan similar to that for the Proposed Action would further offset potential impacts from development of a Commercial Spaceport. Surveys for the eastern indigo and rim rock crowned snakes are suggested before project-related construction proceeds. If snakes are found, appropriate mitigation measures would need to be developed in consultation with USFWS and the Florida Game and Fresh Water Fish Commission.

#### 4.11.3.3 *Mixed Use Alternative*

##### Construction

**Plants.** The development of industrial, commercial, recreational, and residential land uses under this alternative could impact the remnant pine rocklands on the former base. USFWS has requested that the Air Force include a preservation covenant in any deeds transferring the three remnant pine rocklands containing the federally listed Small's milkpea (areas 1–3 on Figure 3.11-6) to a non-federal entity. Even with deed covenants, four small pine rocklands (areas 4–7) could be lost unless the property recipients undertook to preserve them. The original Hoover plan provided for preservation of these areas, and the Collier-Hoover proposal includes a general commitment to preserve these areas, but no specific plan was provided. The pine rocklands south and east of the runway (areas 9–12 on Figure 3.11-6) would be retained by the Air Force and would not be disturbed.

Secondary development would have the same kinds of impacts that are described for the Proposed Action, but the magnitude of the impacts under this alternative would be less than under the Proposed Action because a smaller area would be affected.

**Reptiles.** On-site development associated with the Mixed Use alternative would not be expected to affect the eastern indigo snake or the rim rock crowned snake for the same reasons given for the Proposed Action.

Secondary development would have the same kinds of impacts that are described for the Proposed Action, but the magnitude of the impacts under this alternative would be less than under the Proposed Action because a smaller area would be affected.

**Birds.** The Mixed Use alternative would be expected to have negligible impacts on foraging wood storks and bald eagles because the foraging habitat on former Homestead AFB for these species is marginal and there is a large amount of good habitat east of the former base. This alternative is not expected to affect state-listed wading bird foraging habitat in wetlands in the area of the runway. Construction activities would have little impact on state-listed wading birds because of the lack of foraging habitat on the land that would be developed. The Collier-Hoover proposal could involve creation of 90 additional acres of waterways, while the development of two golf courses would result in the establishment of an estimated 338 acres of grasslands. These additional habitat areas would attract foraging wading birds, including state-listed species recorded in the wetlands in the area of the runway. The number of wading birds would vary according to the type of wetlands that would be developed and the degree of human activity. For example, water bodies in areas frequently used by humans would be expected to attract fewer wading

birds than wetlands or grasslands away from human activity. Another consideration is the potential for increased bird-aircraft strike hazard, which could require measures to discourage birds from congregating in the new wetlands.

Development under this alternative could affect the burrowing owl because of construction and/or demolition activities near their nest sites. The occurrence of the osprey would be expected to remain the same on Homestead ARS but would likely be reduced on the disposal land because of increased human activity. The Collier-Hoover proposal would create increased aquatic habitat, but the level of human activity around these bodies of water would likely preclude osprey use.

Secondary development would have the same kinds of impacts that are described for the Proposed Action, but the magnitude of the impacts under this alternative would be less than under the Proposed Action because a smaller area would be affected.

**Mammals.** Development associated with the Mixed Use alternative would not be expected to affect sensitive species of mammals.

Secondary development would have the same kinds of impacts that are described for the Proposed Action, but the magnitude of the impacts under this alternative would be less than under the Proposed Action because a smaller area would be affected.

### **Cumulative Impacts**

Cumulative impacts under this alternative would be similar to those described for the Proposed Action, although overall development and resulting habitat loss would be slightly less.

### **Mitigation Measures**

The effects of establishing a buffer between former Homestead AFB and Biscayne NP with the Mixed Use alternative would be the same as described under the Proposed Action.

USFWS has requested that three remnant pine rocklands on the former base be preserved and managed through deed covenants. If adopted, deed covenants would prescribe preservation of at least a portion of this habitat.

#### **4.11.3.4 No Action Alternative**

Under the No Action alternative, seven remnant pine rocklands on the disposal property and the former golf course would not be physically disturbed, but without a wildlife/habitat management plan, exotic plants would continue to grow in these areas and elsewhere on the property. The growth of exotic plants in pine rocklands would threaten the continued existence of the sensitive plants in these areas if actions are not taken to discourage the spread of exotic species and provide for the preservation of these habitats (Argonne National Laboratory 1997).

The marginal habitat that exists on the former base for eastern indigo snake, rim rock crowned snake, wood stork, and bald eagle foraging would remain intact and be available for occasional use by these species. Other sensitive species, such as the Cooper's hawk, osprey, Antillean nighthawk, and American redstart, would continue to use the land from time to time, as they have in the past. The Florida burrowing owl would continue to nest near the runway. The wetlands near the runway would persist in their current form, and wading bird use of these wetlands would be expected to continue. The impacts

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from other projects and developments in the ROI would be essentially the same as under the reuse alternatives.

### ***4.11.3.5 Independent Land Use Concepts***

The impacts of the independent land use concepts would be similar to those described for the Proposed Action and other reuse alternatives.

## **4.12 CULTURAL RESOURCES**

### **4.12.1 Introduction**

Impacts on cultural resources from the Proposed Action and alternatives were assessed by (1) identifying the nature and location of elements of the alternatives; (2) comparing those locations with identified cultural resource locations, areas considered sensitive, and surveyed locales; (3) determining the known or potential significance of cultural resources that could be affected; and (4) determining the extent, intensity, and context of the effects. The impact analysis process for cultural resources centers on the concept of cultural resource significance. Federal law protects cultural resources only if they are significant and usually only applies to undertakings that are federally funded or permitted.

The impact analysis for archaeological, architectural, and landscape resources employed the guidelines and standards set forth in Section 106 of the National Historic Preservation Act. This process has five steps. First, resources are identified and evaluated for eligibility to the National Register of Historic Places. Second, the effects of the Proposed Action and alternatives on eligible resources are assessed. Third, a determination is made, in consultation with the SHPO, as to whether the effects would be adverse, and, where appropriate, measures are identified to avoid, reduce, or otherwise mitigate those effects. In the fourth step, the Advisory Council on Historic Preservation (ACHP) comments on the determinations of effect. The fifth step consists of proceeding with the undertaking. This section focuses on an assessment of the potential effects of the Proposed Action and alternatives on resources listed, eligible, or potentially eligible for listing on the National Register.

An action results in adverse effects, or impacts, to a significant cultural resource when it alters the resource's characteristics, including relevant features of its environment or use, in a manner that affects its eligibility for inclusion on the National Register (36 CFR 800.9[b]). Potential impacts could include physical destruction, damage, or alteration; alteration of the character of the property's setting when the setting contributes to the property's National Register qualifications; introduction of visual, audible, or atmospheric elements that affect the property's National Register qualifications; neglect of a property so that it deteriorates or is destroyed; and transfer, lease, or sale of the property without provisions or covenants to protect it.

### **4.12.2 Archaeological, Architectural, and Landscape Resources**

The potential for impacts on prehistoric and historic archaeological resources would not vary appreciably among the alternatives. Sites could be affected by actions associated with construction, maintenance, and operations. Such actions could inadvertently damage an undiscovered archaeological site. If the site is eligible for listing on the National Register, this would be an adverse impact.

Setting is rarely considered a contributing factor to an archaeological site's National Register eligibility status. Thus, archaeological sites are rarely considered to be adversely affected by noise or visual intrusions.

Architectural resources could be affected by construction, noise or vibration, or visual intrusion. Architectural resources generally must be at least 50 years old to be eligible for the National Register, but buildings that are not now eligible may become eligible by 2015.

In a letter dated March 6, 2000, the Florida State Historic Preservation Officer (Division of Historical Resources) stated that a review of the Draft SEIS, the Florida Site file, and the division's records indicated no significant archaeological or historical sites have been recorded or are likely to be present

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within the project's area of potential effects. The letter further indicates that, because of the project location and/or nature, it is unlikely historic properties will be affected.

### **4.12.2.1 Proposed Action**

**Archaeological Resources.** The disposal property has been previously surveyed, and no archaeological resources have been identified on former Homestead AFB. Existing facilities may sit on undisturbed sediments that could contain archaeological deposits. While the presence of such deposits is unlikely, it is possible that facility demolition and construction might disturb unanticipated archaeological resources. Once full buildout has occurred, the likelihood of finding additional archaeological resources would diminish from very low to almost non-existent. Given the low likelihood of archaeological resources on the disposal property, it is unlikely that the Proposed Action would affect significant archaeological resources.

Impacts on archaeological resources from secondary development associated with the Proposed Action could arise from off-site ground-disturbing activities such as construction. There are few known archaeological sites in the area around Homestead that could be affected by secondary development, but there are some eligible for listing on the National Register. Because secondary development would be expected to occur near the former base, and most of these archaeological sites are relatively far from the former base, the likelihood that a site would be affected is considered low.

**Architectural Resources.** A single architectural resource located on former Homestead AFB is potentially eligible for the National Register because of its association with the Cold War (**Patterson et al. 1997**). It was conveyed to the U.S. Department of Labor and is being rehabilitated for use as an Administrative Center. This building was an Air Force conference center and its location near an operational airport was important to its historic function. Airport operations, with the attendant noise, vibration, and visual intrusion from overflights, have always been part of its setting. Thus, its National Register eligibility would not be adversely impacted by continued use of the airport by either military, government, or civil aircraft. No other architectural resources have been identified as potentially significant on former Homestead AFB.

Because of the damage to former Homestead AFB caused by Hurricane Andrew, as well as the destructive hurricane that occurred in 1945, there is little likelihood that any additional buildings will be identified as eligible for the National Register. Thus, the Proposed Action is expected to have no impact on architectural resources on the former base.

Numerous National Register and National Register-eligible architectural resources have been identified in southern Miami-Dade County where most secondary development is anticipated to occur. These resources could be adversely affected if setting is an integral part of the resource's National Register eligibility and development altered the setting to such an extent that the structure were no longer eligible for the National Register. Adverse effects could also occur if development destroyed or degraded a National Register-eligible property. Eighty-nine historic architectural resources have been identified in the area around the former base. These include 28 National Register or National Register-eligible properties and 62 properties that have local historic importance. No specific locations for reuse-related secondary development have been identified. There is no reason to believe that any such development would adversely affect National Register or Register-eligible properties. However, it cannot be guaranteed that no impacts might occur.

Resources located within the area governed by the Miami-Dade County Historic Preservation Ordinance (**Metro-Dade County 1981**) would receive some protection from adverse impacts, as the ordinance is



intended for the “protection, enhancement and perpetuation of properties of historical, cultural, archaeological, aesthetic and architectural merit” (**Metro-Dade County 1981**). The City of Homestead also has historic preservation codes that enhance protection of architectural resources (**Research Atlantica 1994**). Most of the reuse-related off-site development would likely be funded by private or local government rather than federal sources. Any secondary development involving federal funding would be subject to the requirements of Section 106 of the National Historic Preservation Act. These and other regulations would reduce the potential for adverse impacts to architectural resources from secondary development.

Within Biscayne NP, one architectural site and two districts are on or eligible for listing on the National Register. Biscayne NP has expressed concern that vibrations and emissions from aircraft could adversely affect the buildings in the Boca Chita Key Historic District (Boca Chita Key is just north of Sands Key) (**NPS 1998b, 1999a**). Aircraft flying over Boca Chita Key are not likely to generate levels of noise or vibrations that could physically affect the structures within the historic district. Noise data (discussed in Section 4.5) indicate that L<sub>Amax</sub>, the measurement of the loudest single, instantaneous noise event, would not change over current conditions at Boca Chita Key, which is exposed to L<sub>Amax</sub> between 65 and 85 dB (refer to Figures 3.5-14, 4.5-12, and 4.5-13). Another noise measure is the time noise levels are above traditional ambient noise, or TA<sub>amb</sub>. Current TA<sub>amb</sub> at Boca Chita is estimated at 1 to 10 minutes per day (see Figure 3.5-16). Under the Proposed Action, this could change to up to 30 minutes per day (see Figures 4.5-16 and 4.5-17).

**Historic Landscape.** Identification and documentation of historic landscapes within Biscayne NP have not been completed, but the potential for such a resource has been described (**NPS 1998b, 1999a; Cordell 1997**). Increased aircraft operations over the park may have the potential to affect the integrity of a historic landscape’s setting, depending on how that landscape is ultimately defined.

### **Cumulative Impacts**

**Archaeological Resources.** Other future actions that could affect archaeological resources include widening of U.S. Highway 1, development of the STDA, and other development associated with population growth. Neither the SHPO nor Miami-Dade County has identified areas within the ROI that are sensitive for the presence of significant archaeological resources and would be affected by the widening of Highway 1 or construction of the STDA. Other development in the area does have the potential to disturb archaeological resources.

Activities planned by the South Florida Ecosystem Restoration Project and the Restudy also have the potential to impact archaeological sites by changing the hydrology in the area or by damaging resources while constructing project facilities. Although one of the objectives of the Restudy is to protect cultural and archaeological resources and values, this would not preclude the possibility of impacts to those resources. While these activities could affect archaeological resources, it is not anticipated that the Proposed Action would contribute to any effects.

**Architectural Resources.** Most future projects that could occur in the region would be expected to have little or no impact on architectural resources. It is possible that accelerated population growth, as reflected in Miami-Dade County’s high-growth forecasts, could impact architectural resources by leading to the demolition or alteration of National Register-eligible properties. It is not anticipated that the Proposed Action would contribute to any adverse effects.

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**Historic Landscape.** The STDA could benefit a historic landscape by enhancing the natural setting of the landscape. This could be offset by an increased use of the park due to population growth, which could result in damage to the sites.

### **Mitigation Measures**

Impacts on cultural resources that are directly caused by federal undertakings can be mitigated by following Section 106 of the NHPA. Archaeological and architectural resources affected by activities not subject to federal regulations (e.g., most secondary development) would be protected to some degree by requirements of the Miami-Dade County and City of Homestead preservation ordinances.

During construction on the former base, procedures could be imposed to suspend construction if previously undiscovered archaeological resources are uncovered to allow the resource to be evaluated or recovered. No other mitigation measures are suggested.

### **Possible Future Expansion**

The area south of the existing runway has not been surveyed for the presence of archaeological resources. Surveys in the vicinity of former Homestead AFB found no cultural resources. Although it is unlikely archaeological sites are present because of the terrain and what is known of the settlement patterns of both American Indians and early Euroamerican settlers, there remains a small potential for the presence of archaeological sites. Construction of a second runway at HST would likely involve federal funds and would therefore be considered a federal undertaking. Before construction could occur, the area of potential effect would need to be surveyed for cultural resources, as required by Section 106 of NHPA. Any site found during survey would need to be evaluated for National Register eligibility, and the Section 106 steps would be taken. There are no architectural resources in the area of the potential second runway and airport expansion. If construction of a second runway is proposed in the future, additional environmental analysis will be required to assess potential impacts on archaeological, architectural, and landscape resources.

#### **4.12.2.2    *Commercial Spaceport Alternative***

The potential impacts of the Commercial Spaceport alternative on archaeological, architectural, and landscape resources would be essentially the same as described for the Proposed Action. With less secondary development, the potential for off-site impacts could be less. Noise effects at Boca Chita Key would be less than reported for the Proposed Action because the space launch vehicles are anticipated to depart farther north.

#### **4.12.2.3    *Mixed Use Alternative***

The potential impacts of the Mixed Use alternative on archaeological and architectural resources would be essentially the same as described for the Proposed Action. With less secondary development, the potential for off-site impacts could be less. No potential impacts on Biscayne NP landscape or other cultural resources have been identified in connection with this alternative.

#### **4.12.2.4    *No Action Alternative***

Since no archaeological or architectural resources are known to be present on the disposal property at former Homestead AFB, it is unlikely that reuse of this property would adversely affect those resources. There is a small chance that there are previously unknown buried archaeological resources that would

remain undisturbed under the No Action alternative. National Register-eligible properties outside of former Homestead AFB could still be affected by ongoing growth and development in the region.

#### **4.12.2.5    *Independent Land Use Concepts***

The independent land use concepts would have the same potential for affecting previously undiscovered archaeological resources on former Homestead AFB as the Proposed Action and other reuse alternatives. There are no significant architectural resources on the property that could be affected.

### **4.12.3        *Traditional Cultural Resources***

#### **4.12.3.1    *Proposed Action***

No traditional cultural resources have been identified on former Homestead AFB that could be affected by development of the disposal property or reuse-related secondary development. The potential historic landscape being documented by Biscayne NP could have a traditional cultural element (**NPS 1999a**). Such a historic landscape could have the potential to be affected by noise or visual impacts from aircraft overflights, depending on how it is ultimately defined.

The area south of the existing runway has not been surveyed for traditional cultural resources, but it is unlikely that any are there and could be affected by possible expansion of HST and construction of a second runway.

No traditional cultural resources have been identified within the region that could be affected by cumulative impacts, although it remains possible that some could exist. If any such resources do exist within the ROI, they would probably be related to plants, animals, and their habitats. If this is the case, then the habitat enhancements proposed by the South Florida Ecosystem Restoration Project and the Restudy could provide beneficial impacts to cultural resources by restoring habitats. The STDA could also enhance habitats within the ROI. In addition, the Restudy has preservation of cultural resources as one of its objectives.

#### **4.12.3.2    *Commercial Spaceport Alternative***

The potential for impacts from the Commercial Spaceport alternative on traditional cultural resources would be essentially the same as with the Proposed Action.

#### **4.12.3.3    *Mixed Use Alternative***

No potential impacts on traditional cultural resources from the Mixed Use alternative have been identified. Potential cumulative impacts would be the same as with the Proposed Action.

#### **4.12.3.4    *No Action Alternative***

The No Action alternative would not differ from the reuse alternatives because, to date, no traditional cultural resources have been identified on former Homestead AFB or in the ROI that could be affected by reuse of the disposal property. The potential for impacts from other activities in the ROI would be the same as with the Proposed Action.

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### ***4.12.3.5 Independent Land Use Concepts***

The potential for impacts on traditional cultural resources from the independent land use concepts would be essentially the same as from the Proposed Action and other reuse alternatives.

## **4.13 MINORITY AND LOW-INCOME POPULATIONS**

### **4.13.1 Introduction**

This section addresses the potential for the Proposed Action and alternatives to have disproportionately high and adverse environmental, safety, and health impacts on minority and low-income populations.

Several tasks were completed in performing this analysis. First, resource impacts described in other portions of the SEIS were reviewed to determine the location and level of reported impacts, as well as their potential for adverse environmental, safety, or health effects on nearby populations. That review identified areas in the vicinity of former Homestead AFB where sound levels are anticipated to exceed DNL 65 and 60 dB.

Second, results from a field survey of the areas surrounding the former base were used to update information on residential populations. Residential and demographic patterns in south Miami-Dade County have changed dramatically since Hurricane Andrew, and 1990 census data were not considered adequate for the analysis. The survey results are shown in Figure 3.6-4, which depicts dwelling units near Homestead ARS. The survey identified a number of residences that provide housing for farmworkers (South Dade Center). In addition, the Homeless Trust Center located on previously conveyed property at former Homestead AFB was considered. The analysis then examined whether minority and low-income populations would be exposed to increases in noise levels of DNL 1.5 dB or greater within the 65 dB contour and 3 dB or greater within the 60–65 dB contour, changes that have been recognized by FAA as warranting further consideration.

During preparation of the SEIS, contacts were made with non-profit providers of housing for the homeless and with the Homestead Housing Authority, which operates the farmworker housing, as well as with the Coalition of Florida Farmworker Organizations. Other public outreach activities were conducted, including bilingual public scoping meetings and public hearings, to describe the SEIS process and obtain public comments. In addition, public notices and outreach materials were distributed in both English and Spanish.

### **4.13.2 Proposed Action**

Under the Proposed Action, an estimated 8,026 acres of land area would be located within the DNL 60 dB noise contour at maximum use of the one runway. This compares to 6,458 acres currently, for a total increase of about 1,568 acres (see Table 4.5-2).

Portions of both the Homeless Trust Center housing and the South Dade Center migrant farmworker housing are projected to be within the DNL 60 dB contour, and a portion of the South Dade Center housing is projected to be within the DNL 65 dB contour. As noted in Section 3.13, some of the South Dade Center housing is exposed to DNLs above 60 and 65 dB under current conditions. An estimated 297 units are currently within the DNL 60 dB contour, 95 of which are exposed to DNL 65–70 dB (see Table 4.5-3). This is projected to increase to an estimated 440 units within the DNL 60 dB contour under the Proposed Action at maximum use of the one runway at HST. Of that number, 124 units are estimated to be exposed to noise levels of DNL 65–70 dB, 53 to DNL 70–75 dB, and 1 to levels above 75 dB. An estimated 645 additional residents could be affected by DNL 60 dB and above.

Although more residents would be exposed to higher noise levels, in most areas, the change over current and projected baseline conditions would be less than 1.5 dB of DNL. As is shown in Figure 4.5-6, areas within the DNL 65 dB contour that would be expected to experience 1.5 dB and greater changes, a

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significant noise increase according to FAA environmental guidance, are confined to the southwest end of the runway. This includes a portion of the South Dade Center housing. No residences have been identified in the area that would experience more than 3 dB increase within the DNL 60 dB contour.

Maximum use is not likely to occur for 30 years or more, and it is difficult to predict what the status of the existing housing will be at that time. Looking at a more immediate time frame, the analysis indicates that the changes in DNL contours from the Proposed Action in 2005 would be virtually undetectable. By that time, no residents within the 65 dB contour are anticipated to experience increases greater than 1.5 dB. By 2015, a small portion of South Dade Center could begin to experience changes of more than 1.5 dB.

Considering the information available, there appears to be a potential for minority and low-income populations to be disproportionately affected by noise from the Proposed Action because they appear to be the only residents that would be exposed to potentially incompatible noise levels. The South Dade Center farmworker housing is located in an area could experience increases in noise levels in future years which are considered incompatible for residential uses that are not sound insulated.

Secondary development associated with the Proposed Action could occur in the vicinity of the proposed airport. Any new residential developments would need to consider compatibility with aircraft operations and the associated noise. No disproportionately high and adverse impacts on minority or low-income populations have been identified in connection with reuse-related secondary development.

### **Cumulative Impacts**

Accelerated population growth in the vicinity of HST could increase residential densities and the potential for encroachment into areas exposed to elevated noise levels. This would not necessarily affect minority and low-income populations disproportionately.

### **Mitigation Measures**

The timing and selection of appropriate mitigation measures for the potential increase in noise exposure at the South Dade Center would depend in part on how quickly a commercial airport at HST grew and the rate at which aircraft operations increased. Based on current expectations used in the analysis, aircraft noise at HST would not be expected to increase significantly until some time between 2005 and 2015. The aircraft operations forecast for 2015 are considered optimistic, so it is more likely to be toward the end of the time period. Periodic noise evaluation could be done to identify the appropriate timing for mitigation actions.

Typical mitigation measures include structural sound attenuation or acquisition and relocation. Structural sound attenuation can be used to reduce indoor noise levels when outdoor levels are elevated. Noise measurements are taken inside and outside the house, and the existing level of noise reduction is determined. Depending on the effectiveness of the existing structure in attenuating noise, additional insulation and weather-stripping can increase the amount of attenuation. If sound attenuation is not found to be an effective mitigation, consideration can be given to acquiring the property and relocating residents to areas with lower noise exposure.

### **Possible Future Expansion**

The possible future expansion of HST could incrementally increase noise exposure on residents but is not expected to markedly change the effects described above. The location of the second runway does not

currently contain any residences. The implementation of this possible expansion is so far in the future that the location and distribution of minority and low-income populations cannot be predicted.

#### **4.13.3 Commercial Spaceport Alternative**

Under the Commercial Spaceport alternative, an estimated 7,405 acres could be exposed to noise levels above DNL 60 dB in 2015, which is not expected to change at full buildout. This could be an increase of 947 acres over the current condition. It appears the area within the South Dade Center farmworker housing site that would be exposed to noise levels above DNL 60 dB and 65 dB would not change from current conditions. Therefore, it does not appear that the Commercial Spaceport alternative would create a disproportionately high and adverse impact on minority or low-income populations.

Secondary development associated with the Commercial Spaceport alternative could occur in the vicinity of the spaceport. Any new residential developments would need to consider compatibility with spaceport operations and associated noise. No disproportionately high or adverse impacts on minority or low-income populations have been identified in connection with reuse-related secondary development.

#### **Combined Commercial Spaceport/Airport**

The addition of commercial aviation at the spaceport would marginally increase DNL levels in the surrounding area, but no disproportionately adverse effects on minority or low-income populations have been identified. Any new residential developments in the vicinity of the spaceport/airport would need to consider compatibility with operations and associated noise.

#### **Cumulative Impacts**

Potential cumulative impacts would be similar to those described for the Proposed Action.

#### **Mitigation Measures**

Although reuse of former Homestead AFB under the Commercial Spaceport alternative would not increase the number of residents exposed to noise levels above DNL 65 dB, the City of Homestead, Miami-Dade County, or the spaceport developer/operator could consider structural sound attenuation or relocation of existing residences exposed to DNL 65 dB or higher due to ongoing military and government operations.

#### **4.13.4 Mixed Use Alternative**

Under this alternative, aircraft noise levels in the vicinity of Homestead ARS would be the same as under baseline conditions. No disproportionately high or adverse effects on minority or low-income populations have been identified.

#### **Cumulative Impacts**

No cumulative impacts on minority or low-income populations have been identified in connection with the Mixed Use alternative.

#### **Mitigation Measures**

Potential mitigation measures described for the Commercial Spaceport alternative could also be considered for the Mixed Use alternative.

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### **4.13.5 No Action Alternative**

Under the No Action alternative, approximately 6,458 acres of land area would continue to be exposed to noise levels exceeding DNL 60 dB through 2005, including portions of the South Dade Center residential area. A portion of this area would continue to be exposed to levels of 65 to 70 dB. The Homeless Trust Center on the former base would be exposed to DNLs between 60 and 65 dB. The area within the DNL 60 dB contour is projected to decline slightly to 6,445 acres by 2015.

### **4.13.6 Independent Land Use Concepts**

The independent land use concepts would not be expected to create disproportionately high and adverse impacts on minority and low-income populations.



#### **4.14 DEPARTMENT OF TRANSPORTATION ACT SECTION 4(F) LANDS**

This section addresses the requirement under Section 4(f) of the Department of Transportation Act (now codified at 49 U.S.C. Section 303) to determine whether development of former Homestead AFB property for transportation purposes would require the use of publicly owned land of a public park, recreation area, wildlife or waterfowl refuge, or land of an historic site of national, state, or local significance. A transportation project that involves such a use can be approved by the Department of Transportation and its agencies (including the Federal Aviation Administration) only if (1) there is no prudent and feasible alternative to using that land, and (2) the project includes all possible planning to minimize harm to the affected land from the proposed use.

##### **4.14.1 Section 4(f) Review**

Section 4(f) applies exclusively to approvals of transportation projects by the U.S. Department of Transportation (DOT), including the modal administrations within DOT such as the FAA. Section 4(f) does not apply to approvals by other federal agencies, such as the Air Force, nor to state or local approvals. The FAA consults with the Department of the Interior concerning a finding that there is no feasible and prudent alternative to the use of Section 4(f) lands, but FAA is ultimately solely responsible for determining whether an airport project would constitute a use and thereby invoke Section 4(f). The evaluations and determinations in this Section 4(f) review are those of the FAA.

The two proposals for the reuse of Homestead to which a Section 4(f) review applies are the Proposed Action for a commercial airport and the Commercial Spaceport alternative, both of which would be “transportation projects” requiring specific approvals by FAA. Section 4(f) does not apply to projects that are not transportation projects, such as the Mixed Use alternative for Homestead, for which DOT/FAA approval is not required. Neither does Section 4(f) apply to the No Action alternative.

Section 4(f) requires the FAA to determine whether the Proposed Action and the Commercial Spaceport would “use” publicly owned land of a public park, recreation area, or wildlife or waterfowl refuge of national, state, or local significance; or land (either publicly owned or privately owned) of an historic site of national, state, or local significance. A transportation “use” can occur in two ways: (1) an actual direct physical taking of property for a transportation project, such as to construct an airport on the property; or (2) a “constructive” use, where a transportation project does not directly use the property, but does impact it so adversely that it effectively uses it by substantially diminishing its activities, features, or attributes. Constructive use would result when the environmental impacts caused by the transportation project are so severe that the utility of the Section 4(f) resource in terms of its prior significance is substantially diminished or destroyed.

The resources in the Homestead region of influence that are subject to Section 4(f) protection are identified in Section 3.14 of this SEIS. Section 3.14 summarizes all Section 4(f) resources and includes references to other portions of the SEIS for greater detail on specific resources, e.g., national parks and refuges, state and local parks, historic sites. The potential environmental effects of the Proposed Action and of the Commercial Spaceport alternative are assessed under applicable resource categories in Chapter 4 of the SEIS. The FAA is relying on the data and analyses in the SEIS for its Section 4(f) determination. Data and analyses relevant to this determination have not substantially changed between the Draft and Final SEIS.

##### **4.14.2 Proposed Action**

The Proposed Action would not directly take any Section 4(f) resources. The development of a commercial airport would not require the actual physical use of property of any publicly owned land of a

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public park, recreation area, wildlife or waterfowl refuge, or land of an historic site of national, state, or local significance.

The question of whether the Proposed Action would constructively use any Section 4(f) resources has been extensively reviewed by the FAA. In fact, this review is the most extensive ever performed for a proposed airport development project because of the environmental sensitivity and concerns related to the national parks and refuge. All potential impacts of the Proposed Action are analyzed and described in other sections of Chapter 4 of the SEIS. This Section 4(f) determination relies on the results of those analyses.

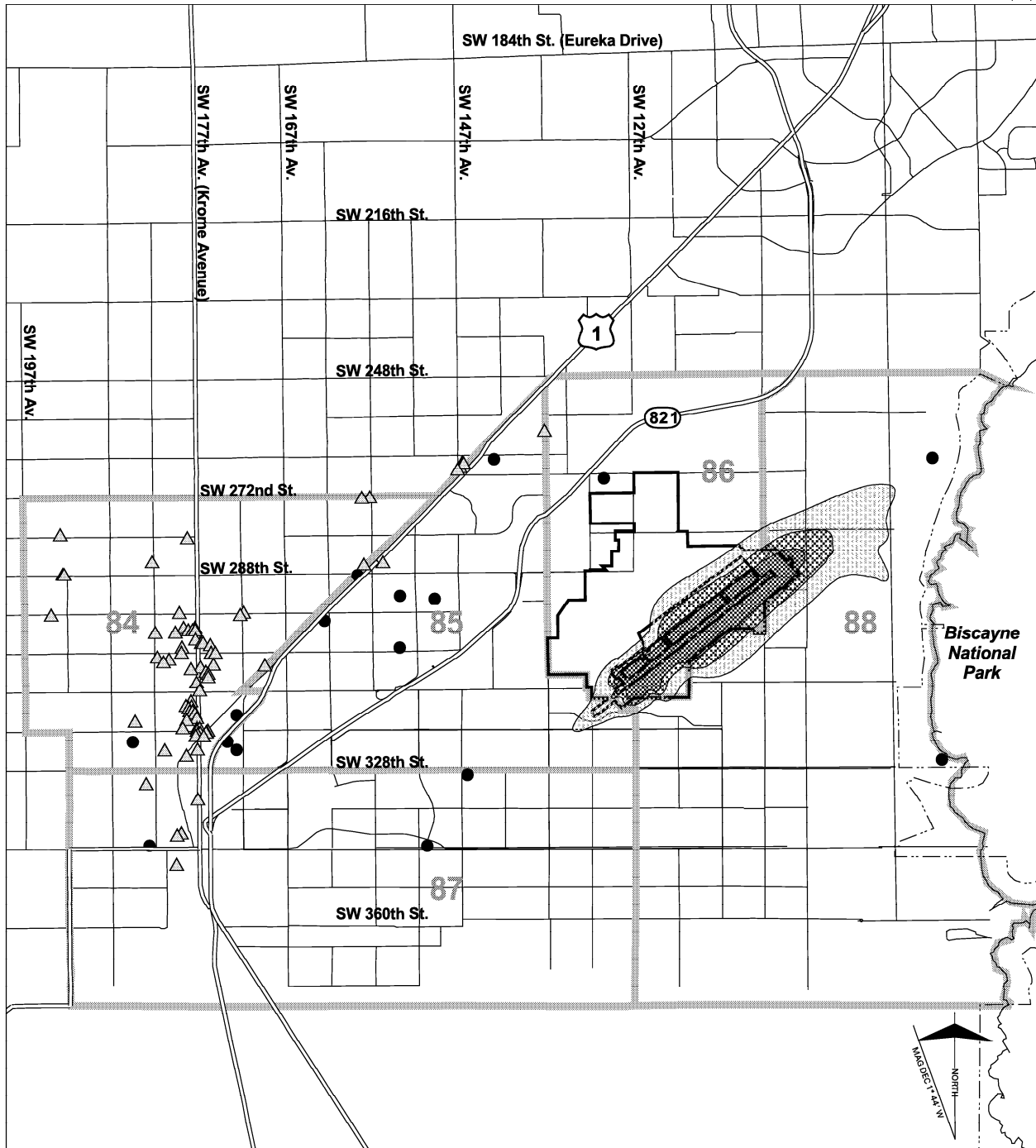
#### **Aircraft Noise in Local Parks**

Aircraft noise has been raised as the primary concern for Section 4(f) properties in the vicinity of Homestead. For most park and recreation areas, the FAA relies on the compatible land use guidelines in Federal Aviation Regulation Part 150 (see Table 4.5-4 in Section 4.5). These guidelines have been in existence and use for a number of years to determine noise impacts by relating land use type to certain airport noise levels. These guidelines are appropriate for use here to determine the compatibility of lands in the vicinity of Homestead that are devoted to traditional recreational uses, as categorized in Part 150. A constructive use due to aircraft noise over DOT Act Section 4(f) lands is considered not to occur when noise exposure levels due to the proposed project will not exceed these FAA compatible land use guidelines. There are a number of local parks serving traditional recreational uses in the general area of Homestead, as shown in Figure 3.14-2 in Section 3.14. All are located outside of the Proposed Action's DNL 65 dB noise contour at maximum airport use and are classified as compatible with aircraft noise levels, according to FAA's Part 150 guidelines (**Figure 4.14-1**). Accordingly, FAA has determined that the Proposed Action would not constructively use local parks based on aircraft noise.

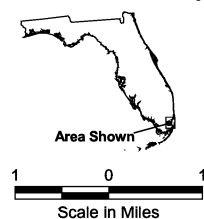
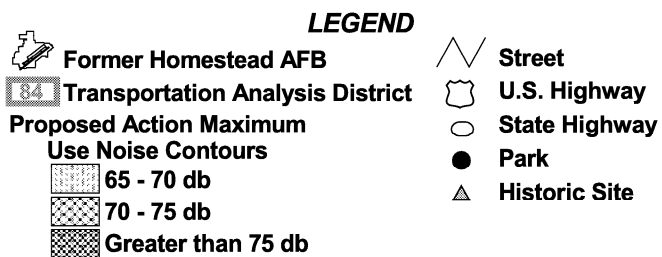
#### **Aircraft Noise in National Parks, Refuge, and Preserve**

There are Section 4(f) properties of national importance and unique value in south Florida. These include Biscayne NP, Everglades NP, Crocodile Lake National Wildlife Refuge, and Big Cypress National Preserve. All are outside of the DNL 65 dB noise contour at maximum airport use and would be considered compatible with aircraft noise levels under FAA's Part 150 land use guidelines if their uses generally comported with the common recreational uses found in most parks. A number of common recreational uses do occur (e.g., boating, swimming, fishing, water skiing, hiking) that would be regarded by the FAA as within the scope of the Part 150 guidelines. However, these properties have unique value as special ecosystems and are important for the preservation of special species of plants and animals, whether officially designated as wildlife refuges or not, and for providing people an opportunity to visit and experience nationally designated special natural environments. More detailed descriptions of these properties are in Section 3.6. Because of the unique nature of these properties, FAA is supplementing its usual reliance on DNL and Part 150 compatible land use guidelines as the basis for its constructive use determination.

FAA has conducted supplemental, extensive grid point noise analyses using a variety of metrics to evaluate the Proposed Action's potential noise effects. Three noise metrics were primarily used for these properties. The Maximum Sound Level, L<sub>max</sub>, is a single-event metric that assesses the loudest aircraft noise. The Peak Hour Equivalent Sound Level, Leq(h), is a cumulative noise metric that assesses the total amount of aircraft noise (including loudness, duration of noise, and frequency of noise events) for the busiest hour of aircraft operations during an average day. Time Above Ambient, TA<sub>amb</sub>, assesses the amount of average daily time that aircraft noise would be above the average level of other non-aircraft sounds in the parks and refuge. TA<sub>amb</sub> was not calculated for the Big Cypress National Preserve because of the distance of this property from Homestead and the low aircraft noise levels at that distance.



801945714



Derived from:  
Florida Bureau of Historical Research n.d.,  
Metro-Dade County 1992b,  
Landrum & Brown 1999b

**Figure 4.14-1**  
**Noise Contours**  
**and 4(f) Properties**

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The results of the grid point analyses are summarized below for each property. These results are reported for the noisiest situation analyzed: maximum capacity commercial use of the runway, no aircraft noise levels lower than current quietest Stage 3 aircraft, and no flight track noise mitigation.

***Biscayne National Park.*** Military aircraft will continue to be the loudest aircraft, from 5 to over 20 dB more than civil aircraft. Cumulative noise levels of the Proposed Action (considering loudness, frequency, and duration of aircraft noise) would be below the average level of other non-aircraft sounds in most of the park. There could be some very small cumulative noise increases in Leq(h) of less than 3 dB above other sounds. (Increases of less than 5 dB are *de minimus* and are mapped as “no change.”) At maximum runway use, the amount of total time, on an average day, that aircraft noise would be above the average level of other non-aircraft sounds could increase by less than 10 minutes in central and eastern areas of the park, by 10–30 minutes along the park’s west shoreline, and by 1–2 hours in two areas closest to the runway. These are not all sequential minutes. TAamb would total up throughout the day as aircraft are heard.

***Everglades National Park.*** Close to Homestead, military aircraft would continue to generate the highest maximum sound levels. Farther away, where military and civil flight tracks would diverge, civil aircraft could increase maximum sound levels by 5 to over 10 dB along corridors in north-central and southeastern park areas. However, aircraft would be at higher altitudes by the time military and civil flight tracks diverged, which means that maximum sound levels heard on the ground would be lower. Cumulative noise levels would be below the average level of other non-aircraft sounds in most of the park. Cumulative increases ranging from less than 5 to over 10 dB could occur under certain flight corridors; however, with a few exceptions at the eastern boundary of the park, cumulative noise levels would not exceed 45 dB, and would be below 30 dB in the bulk of the park. At maximum runway use, the amount of total daily time, on average, that aircraft noise would be above other non-aircraft sounds could increase by 1–30 minutes along a western approach corridor, by 10 minutes to over 2 hours along an eastern corridor, and over 2 hours closest to the runway approach. Other areas within Everglades NP would experience either no increases in the time aircraft noise would be above other sounds, or less than 1 minute a day.

***Crocodile Lake National Wildlife Refuge.*** Military aircraft would continue to be the loudest aircraft. Cumulative noise levels of the Proposed Action would be below the average level of other non-aircraft sounds in most of the park. *De minimus* cumulative noise increases of 2.1 dB and less above other sounds are projected in some areas. Cumulative noise levels of the Proposed Action would be in the 40–43 dB range at the northern end of the refuge, and in the 34–39 dB range in the remainder of the refuge. The average measurements of all non-aircraft sounds range from 39.0 to 41.3 dB. At maximum runway use, the time that aircraft noise would be above other non-aircraft sounds could increase by 30–60 minutes in the northern part of the refuge, 10–30 minutes in the central and southwestern portions, and 1–10 minutes in the southern refuge. One area on the northwestern edge could increase by 1–2 hours. Crocodile Lake NWR is not open to visitors. The primary concern in the refuge is with the effects of noise on wildlife.

***Big Cypress National Preserve.*** Civil and military flight tracks would have diverged at this distance from Homestead. Civil aircraft transiting the preserve along a northwesterly corridor would cause maximum sound levels to increase by more than 10 dB. However, at this distance from Homestead, aircraft would be at a higher altitude, and the highest maximum sound levels would still only be in the mid-40 to upper-50 dB range. Cumulative noise levels of the Proposed Action would be very low—ranging from 10.0 to 33.2 dB, but mostly in the mid-teen to mid-20 dB range. By comparison, average Leq(h) measurements of non-aircraft sounds are higher than predicted aircraft levels. Average measured traditional ambient sound levels in the Big Cypress range from 33.7 to 64.0 dB, with most being in the mid-30 to mid- and upper-40 dB range.

### **FAA Constructive Use Determination On Noise for the Four National Properties**

The Air Force and FAA respect the views of agencies and individuals that regard aircraft noise in general and the Homestead airport proposal in particular as undesirable for the national parks. A commercial airport at Homestead would add aircraft noise to the national parks, refuge, and preserve. Reasonable people will probably continue to disagree on how much aircraft noise is too much based on various expressed or implicit noise tolerances. For DOT Act Section 4(f) purposes, in order to constructively use a property due to aircraft noise, the noise must be at levels high enough not only to be heard by people and animals, but also high enough to have negative consequences of a substantial nature—that is, to impair the attributes of the Section 4(f) resource so severely that it would interfere with the property’s continued ability to serve its purposes.

As discussed in more detail below, under Other Environmental Impacts, the potential effects of aircraft noise on wildlife have been analyzed in Section 4.11, including a review of existing studies on wildlife responses to noise. None of the potential effects identified for the Proposed Action are anticipated to substantially diminish wildlife resources or affect the viability or success of any species or habitat within any of the national properties. The FAA relies on the biological resources analyses and conclusions in Section 4.11 to make the determination that there would not be constructive use of any Section 4(f) properties based on effects on wildlife. This determination includes property specifically designated as a wildlife refuge (i.e., Crocodile Lake NWR), as well as the other Section 4(f) properties where biological resources constitute important attributes.

With respect to people, aircraft noise resulting from the Proposed Action would not substantially change the noise environment experienced in the national properties. The noise environment is comprised of noise from military and other government aircraft operations at Homestead; aircraft noise from other airports in the region; and other human, mechanical, and natural levels of sounds in the national properties. Additional civil aircraft operations projected for the Proposed Action would result in incremental changes in noise at various locations, but would not significantly increase noise over existing conditions or forecast future no action conditions. The following paragraphs explain the basis for the FAA’s conclusion regarding noise in the national properties. This does not mean that FAA has concluded that there would be no noise effects. There would be effects at some locations in the national properties, as assessed in Section 4.5 and Appendix E, and it is understood that a number of people find these effects unacceptable. However, the FAA’s judgment is that, based on worst case maximum use conditions, predicted noise effects of the Proposed Action would not rise to the level of a DOT Act Section 4(f) use as further explained below.

The FAA uses sophisticated computer models to translate aircraft operational numbers, noise and performance characteristics, flight track and altitude information, and other relevant factors into noise contour and grid point analyses using various noise metrics. This information is then used by the FAA to make judgments about the Proposed Action’s noise effects on DOT Act Section 4(f) resources.

When aircraft noise is evaluated from the standpoint of the loudest aircraft, using the LA<sub>max</sub> metric, military aircraft (which will continue to use Homestead regardless of the disposal decision) are the loudest aircraft close to Homestead where aircraft are arriving and departing. It is only at farther distances from Homestead, where civil flight tracks diverge from military flight tracks, that civil aircraft would be the loudest aircraft. However, by the time flight tracks diverged, civil aircraft would be higher in the air and, therefore, the maximum noise level heard on the ground would be lower.

The loudness of aircraft provides an assessment of individual aircraft flyover noise. It does not measure the duration of noise. The Time Above metric specifically targets duration. The SEIS assesses the time that aircraft noise would be above the average level of other noises (both natural and man-made) in the

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national parks and refuge, using TAamb. Agencies and individuals that have strong concerns about noise impacts on the parks have particularly focused on the results of the TAamb metric, and a number of them have concluded that these results indicate a significant noise impact, as well as a constructive use under DOT Act Section 4(f).

The Time Above results look high in certain areas of the parks and refuge (1–2 hours and more daily), although they also look low over large percentages of park and refuge geographic areas (less than 10 minutes a day). It should be kept in mind that Time Above results reflect total time during an average day, by adding non-consecutive durations of time from individual flyovers. It is also important to keep in mind that Time Above is only a time-based noise descriptor. It does not reflect noise energy or loudness of an aircraft—factors that have been shown to correlate closely with human reaction to noise. TAamb is only reporting durations of aircraft sound above other sounds. It is not reporting how loud aircraft sounds are in comparison to the other sounds (i.e., whether aircraft are a lot louder, or only a little louder, than other sounds). TAamb, therefore, does not provide an assessment of the extent to which aircraft noise would be high enough above other sounds to be substantially intrusive, annoying to people, or substantially change the overall noise environment.

The third noise metric primarily used for the noise assessment of the national properties is peak hour Leq—Leq(h). Leq(h) is a cumulative measure of noise, and it includes the number of aircraft, the loudness of aircraft, and the duration of aircraft noise. It is a better indicator than either LAmax or TAamb of overall changes in aircraft sound levels and the noise environment, and of how people respond to noise. The relationship between sound levels and community response to noise is well known and documented (**Report of Federal Interagency Committee on Noise, August 1992**). The nature of this relationship appears to be true in park environments also. In recent FAA research on national park visitor reaction to aircraft noise, the findings indicated that visitors were three times more likely to be annoyed by the level of sound heard than by the amount of time they heard aircraft, and visitors were four times more likely to be annoyed by the level of sound than by the number of aircraft they heard (**Fleming et al. 1998**).

In the SEIS, Leq(h) calculates the peak (i.e., busiest) hour cumulative noise, not the average hour, and indicates the extent to which the Proposed Action would increase Leq levels above the projected baseline/No Action alternative and average traditional ambient Leq levels (see Figure 4.5-14). There is no significant increase in cumulative noise in the national properties. At maximum use of the Proposed Action, only in a few grids in Everglades NP are Leq(h) levels predicted to increase by as much as 5 dB. (Less than a 5 dB increase is considered to be *de minimus* and falls within the “no change” category in Figure 4.5-14.) Biscayne NP, Crocodile Lake NWR, and Big Cypress National Preserve are not predicted to have any Leq(h) increases as much as 5 dB. There are no increases as much as 10 dB in any national property grids.

In addition to the increases in Leq(h) noted in the Everglades NP grids, it is also important to look at the absolute Leq(h) values in these same grids, which range from 36.0 to 43.8 dB. These values are categorized as low-level noise, rather than high or even moderate. (As a reference point, the performance goal for the interior of homes that are sound insulated is 45 dB.) These Proposed Action Leq(h) levels are also within the range of traditional ambient measurements in Everglades NP, which range from average Leqs of 31.2 to 54.9 dB. The grids also occur within the geographic area of Everglades NP that can benefit from noise abatement flight paths, which would somewhat lower Leq(h) increases.

Leq(h) increases, as well as TAamb increases, are in relation to average traditional ambient levels in the parks and refuge, as well as in relation to the noise of the projected baseline. NPS and a number of commentators on the Draft SEIS have recommended using natural ambient levels (sounds of nature only), instead of traditional ambient (all sounds—i.e., nature, people, boats, mechanical noise, etc.—except aircraft). NPS would use a natural ambient baseline as developed using the NPS/Wyle methodology

described in Appendix H. This methodology would produce a lower ambient baseline than used in the SEIS—perhaps as low as 33 dB in Biscayne NP, according to NPS indications. The obvious result of using a lower baseline is that the extent to which aircraft noise would be calculated above the ambient level would increase. Such an increase could be regarded as adding severity to the aircraft noise impact, although it should be noted that absolute L<sub>Amax</sub> and Leq(h) aircraft noise levels would remain the same. Single-event and cumulative aircraft noise would not be at higher levels than assessed in the SEIS. It is the ambient value that would be lowered, which would affect TA<sub>amb</sub> calculations. Any additional minutes per day that may be added to the TA<sub>amb</sub>, if a lower natural ambient threshold were used, would be from aircraft noise that is below the average level of other sounds (the traditional ambient) in the national parks and refuge.

The FAA has reviewed the NPS/Wyle methodology and has addressed in some detail in Appendix H the FAA's concerns with this methodology and reasons for not using it. It is worth summarizing key reasons why the FAA does not use natural ambient in general and the NPS/Wyle calculation of natural ambient in particular as a basis for assessing aircraft noise effects and for this Section 4(f) determination. The FAA has selected traditional ambient, rather than natural ambient, in order to account for all sounds except aircraft that are heard in particular park and refuge locations. In locations where human and mechanical sounds are few and low, the traditional ambient and natural ambient are essentially the same. In other park locations where human and mechanical sounds dominate and are louder than natural sounds, the traditional ambient is higher than the natural ambient.

There have been many studies performed on people's reactions to noise. People are physically capable of hearing noise at levels that do not annoy them, so whether or not people can hear aircraft noise does not provide a reliable threshold for potential adverse effects. Moreover, aircraft noise that is still relatively low in relation to other surrounding environmental sounds is not necessarily segregated out by people as an intrusive noise; it may not even be noticed unless a person is actively listening for it. For these reasons, the FAA regards it as essential to take into account all surrounding sounds when assessing the effects of aircraft noise in lower level noise environments. If some categories of sound that are heard are excluded from the ambient baseline simply because they are human-made, rather than natural sounds, one begins to calculate aircraft noise effects at levels that would not tend to be annoying or intrusive—and may even be below what people would hear to some extent because of the masking effects of other environmental sounds.

The FAA's concern with a natural ambient baseline for aircraft noise assessment is exacerbated by the NPS/Wyle methodology for deriving the natural ambient level. Under this methodology, the natural ambient level is based on the quietest 10 percent of noise data that is statistically derived from noise monitoring. This results in a very low ambient level, referred to as the L<sub>90</sub>. Using the L<sub>90</sub> as the natural ambient baseline, 90 percent of the sounds in the park—whether natural or man-made—are noisier than the natural ambient. Insect activity, bird calls, and waves lapping the hulls of boats at idle, for example, were measured in the national parks at higher noise levels than the L<sub>90</sub>. While the NPS may find the L<sub>90</sub> to be useful as a natural ambient baseline for park management purposes, FAA does not believe that its use is readily transferable to the evaluation of the extent to which aircraft noise affects national parks. Because the L<sub>90</sub> is such a low level, it not only excludes many natural as well as human-made sounds that people actually hear in a park, but also the L<sub>90</sub> could be below the level of hearing audibility of aircraft noise for appreciable periods of time.

The FAA has not found scientific support for the establishment of a threshold level for aircraft noise intrusions that is so low that aircraft sounds would not be heard by attentive listeners at times. The technical capability has been developed to calculate noise to such low levels that it can be meaningless in terms of assessing actual noise impact. (For example, at one location in Everglades NP, FAA's computer calculation indicated that the "loudest aircraft noise" at the location was from an aircraft on the ground at

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Miami International Airport 50 miles away.) Aircraft noise should be at levels high enough not only to be heard, but also high enough to produce adverse annoyance reactions from park visitors or an adverse impact on fauna in order for the FAA to determine that there would be an adverse noise impact on a national park. The FAA does not believe there is reasonable technical support for assumptions that aircraft noise above an  $L_{90}$  level, but below levels detrimental to animals or annoying to visitors, would adversely affect national park resources.

A few studies have been done of people in park and wilderness settings (see Section 4.6). While statistics in these studies cannot be used to predict the percentage of visitors in the national parks near Homestead that would be annoyed by aircraft noise, the studies have not generally found substantial levels of visitor disturbance by aircraft noise. No specific surveys have been done for the SEIS of visitors in Biscayne NP and Everglades NP. (Crocodile Lake NWR is closed to the public.) In numerous comments on the Draft SEIS, people generally remarked favorably on the current quiet environment and natural sounds of the national parks. At the same time, one can see by looking at the noise maps of existing conditions in Section 3.5 that the national parks currently receive aircraft noise from Homestead and other south Florida airports. This is anecdotal evidence, of course, but one might expect more expressions of adverse reactions to existing aircraft noise if there were an extremely low threshold of sensitivity to aircraft noise on the part of park visitors. It is also informative that visitation and use patterns of Biscayne NP and Everglades NP were not markedly different when Homestead was a very active military base, producing higher  $Leq(h)$  and  $TA_{amb}$  levels in park locations closest to Homestead than is the case today. The western portion of Biscayne NP was subjected to higher military aircraft  $Leq(h)$  and  $TA_{amb}$  levels in 1987 than it is predicted to receive at maximum use of the Proposed Action.

The primary factor affecting the evaluation of noise effects of the Proposed Action is not the selection of the ambient baseline in the parks and refuge, but rather the noise of the projected No Action baseline. Section 3.5 includes noise contours and noise grid analyses for future No Action baseline conditions in the national properties, including military and other government aircraft that will continue to operate at Homestead under any future reuse option, as well as aircraft at other airports in the area. Military aircraft are noisier than civil aircraft, particularly since the completion of the transition to the current quietest generation of large civil aircraft, Stage 3 aircraft (which are expected to be replaced in the future by even quieter Stage 4 civil aircraft). Even though military aircraft are fewer in numbers than future predicted numbers of civil aircraft, their loudness makes them continue to dominate the noise environment in the national properties near Homestead. In addition, the national properties collectively occupy such large amounts of territory in south Florida that it is virtually impossible to serve Miami International, Fort Lauderdale International, and other Miami-Dade County airports without flying over some portions of the national properties. The additional civil aircraft noise that could be added at Homestead constitutes an incremental increase in noise rather than a substantial change in the noise environment above the future No Action baseline.

In addition to the potential effects on national park visitors and wildlife, the issue of “impairment” has been raised based on the view that aircraft noise will impair national park resources because it is human-made, rather than natural, and because it is not part of the natural soundscape. The SEIS acknowledges that the Proposed Action would add aircraft noise, which is contrary to NPS soundscape goals. However, the addition of aircraft noise to a national park that also experiences various other human and mechanical sounds is not per se equivalent to a substantial environmental change, a significant noise impact, or a constructive use under DOT Act Section 4(f). FAA does not find a basis for concluding that aircraft noise would impair the national properties in a way that would be independent of factors evaluated in the SEIS and previously addressed in this Section 4(f) review. The FAA does not subscribe to the concept that the presence of aircraft noise, absent predictive negative consequences based on hearing and reactions of people and animals, would constitute an impairment of resources.



Many people who commented on the Draft SEIS have made individual judgments on the Proposed Action's noise impact by counting numbers of aircraft at maximum use—either the total number of annual aircraft operations of 231,000 or the total daily average number of 634. Based on such numbers, many people have concluded that a commercial airport would be both much busier and much noisier than the former military air base and that it would be unacceptable in juxtaposition to the national parks and refuge on that basis. However, aircraft operational numbers alone do not provide a sufficient basis for evaluating aircraft noise and should not be substituted for the extensive SEIS noise contour and grid point analyses.

The Proposed Action would be both busier and noisier than the current and future operational status of Homestead as a military/government airfield. However, to provide some historical and relational context, when Homestead was an active military air base before Hurricane Andrew, it had about 525 military aircraft operations a day, five days a week. There were substantial numbers of high-performance, very noisy military aircraft—including the F-4, B-52, and F-15 aircraft that were noisier than the F-16 military aircraft presently operating at Homestead. High-performance military aircraft currently operating at Homestead remain noisier than large high-performance civil aircraft, whose noise has been reduced by federal law and regulation. Low-performance general aviation propeller aircraft are much less noisy. In 2015, a commercial airport at Homestead is predicted to result in about 125 civil jet aircraft operations and 175 civil propeller aircraft operations a day, seven days a week, allocated on various flight tracks over the national properties as indicated in the SEIS. At maximum use (estimated as a potential airport condition near the year 2038), these numbers are predicted to increase to about 340 civil jet aircraft operations and 220 civil propeller aircraft operations a day. (Additional numbers of military/government aircraft operations that currently occur at Homestead are projected to continue in the future.) At maximum use, the Proposed Action would still not generate as high a level of aircraft noise exposure over the nearby areas of the national properties as the military base generated during its active years prior to Hurricane Andrew.

In conclusion, the FAA does not predict that the reuse of former Homestead AFB for a commercial airport would significantly change the noise environment of the four national properties or constructively use the properties under DOT Act Section 4(f), based on the results of the extensive SEIS analysis done with a variety of metrics to examine different aspects of noise within the national properties and on information accumulated to date on human and animal reactions to noise.

#### **FAA Constructive Use Determination on Noise for Marine Sanctuary and State Parks**

Noise grid point analysis on a smaller scale has also been applied to Florida Keys National Marine Sanctuary, John Pennekamp Coral Reef State Park, Bill Baggs Cape Florida State Park, and Key Largo Hammocks State Botanical Site. All of these properties are well outside of the DNL 65 dB noise contour and are considered compatible under FAA's Part 150 guidelines. None are as close to Homestead as Biscayne NP. Because of their distance from Homestead, they would not normally have been subjected to special grid point analysis for either NEPA or DOT Act Section 4(f) purposes. However, because the geographic area of noise analysis was so extended in this SEIS to address national park and refuge concerns, other parks were included because similar concerns about them have been raised.

Based on noise analysis in the SEIS and summarized below, these properties are less affected by the Proposed Action than the national parks and refuge. Their noise environments would change very little, if at all, because of the Proposed Action. The analysis of biological resources in Section 4.11 has found no substantial adverse noise effects on wildlife. There would be no substantial diminishing of the use or value of these parks for people or wildlife. Based on Part 150 land use compatibility guidelines as supplemented by criteria used to evaluate the four national properties, FAA has determined that the

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Proposed Action would not constructively use the marine sanctuary or any of these other parks based on aircraft noise effects.

***Florida Keys National Marine Sanctuary.*** Florida Keys National Marine Sanctuary (FKNMS) is more distant from Homestead than the national parks. Two grid points were located in FKNMS—one about 8 miles east of Biscayne NP's Old Rhodes Key and the other just south of Everglades NP near Lower Maticumbe Key. Ambient noise measurements were not done in FKNMS, but reasonable estimates of TAamb were able to be made based on traditional ambient data for nearby park sites. At the FKNMS grid point east of Biscayne NP, there would be no change in maximum sound level from the Proposed Action. The peak hour Leq increase from 26.3 to 36.5 dB would be well below the level of other sounds based on an estimated traditional ambient level of 52 dB. The TAamb is not projected to be exceeded more than 3 minutes on an average day for any future condition of the Proposed Action. At the FKNMS site south of Everglades NP, the maximum sound level would increase with the Proposed Action at maximum use from 30 to 52 dB because of civil jet aircraft operations along the MNATE departure route from Homestead. This 52 dB maximum sound level is not regarded as a high single-event aircraft noise level and may occur only occasionally—not necessarily on a daily basis. Cumulative aircraft noise levels, measured in peak hour Leq, would be extremely low—increasing from 8.3 to 18.6 dB at maximum use, which is far below the estimated traditional ambient level of 46 dB. TAamb data in nearby grids indicates that there would be virtually no increases in TAamb on an average day.

***John Pennekamp Coral Reef State Park.*** The maximum sound level would not change as a result of the Proposed Action. Cumulative noise levels are predicted to slightly increase, from 41.3 to 42.2 dB (an increase of slightly less than 1 dB) at maximum use of a commercial airport. Cumulative aircraft noise levels are projected to remain below the estimated traditional ambient level of 50 dB. Nearby sites indicate an expected increase in TAamb of 4 to 7 minutes per day on the average at the Proposed Action's maximum use. The highest TAamb for the Proposed Action calculated at any nearby grid is 13 minutes daily.

***Bill Baggs Cape Florida State Park.*** This park is not far from the residential areas of Key Biscayne. It was primarily analyzed because of noise concern relative to the Commercial Spaceport Alternative, rather than the Proposed Action. The park is exposed to more noise from aircraft operations at Miami International Airport than from current or projected operations at Homestead. The traditional ambient noise level is estimated to be 55 dB based on the measured ambient levels in nearby areas of Biscayne NP. Neither the maximum sound level, cumulative noise, nor TAamb would be increased with the Proposed Action.

***Key Largo Hammocks State Botanical Site.*** This park is adjacent to the northeast corner of Crocodile Lake NWR. Military aircraft using Homestead would continue to be the loudest aircraft. At maximum use of the Proposed Action, cumulative noise levels calculated in Leq(h) are projected to increase from 34.3 to 37.8 dB—remaining below the traditional ambient noise level of 41 dB. TAamb was not calculated for this park. In the nearest grid in Crocodile Lake NWR where TAamb was calculated, TAamb is predicted to increase by 58.1 minutes on an average day with the Proposed Action at maximum use. The TAamb increase at Key Largo Hammocks State Botanical Site would be less than this because both LAmx and Leq(h) levels are lower than in the Crocodile Lake NWR grid.

#### Noise in South Florida Water Management District Lands

It is debatable whether South Florida Water Management District (SFWMD) lands fall within the purview of DOT Act Section 4(f). They are not officially designated as public parks or wildlife refuges and do not specifically function as such. They are not in public ownership in entirety. Information provided by the SFWMD indicates that the Model Lands Basin is not fully in public ownership and is not yet open to the

public. Agricultural uses continue to function. However, the Southern Glades Wildlife and Environmental Area and the Model Lands Basin provide a wildlife corridor between the national parks and refuge, and the Southern Glades and Frog Pond lands allow various public recreational uses to the extent appropriate to the environmental sensitivity of the areas. The Model Lands Basin would provide opportunities for hiking and boating.

The SEIS's assessment of the potential effects of the Proposed Action on biological resources includes resources within the SFWMD lands, including potential effects on the Cape Sable seaside sparrow. The results of that assessment, which included but was not limited to noise effects, supports the determination that the Proposed Action would not constructively use the wildlife refuge aspects of the SFWMD lands.

All of the SFWMD lands are well outside of the DNL 65 dB noise contour. The recreational uses within these lands (e.g., hiking, boating, horseback riding, hunting, fishing) appear to fall within traditional recreational use categories in FAA's Part 150 compatible land use guidelines, and are considered compatible with the Proposed Action's predicted aircraft noise levels on that basis. In addition, a special noise grid analysis was performed at the request of the SFWMD and is in an Addendum to Appendix E of the SEIS. The lack of ambient noise measurement and mapping precludes the calculation of TAamb data. The grid analysis essentially shows, as elaborated on below for each area, that military aircraft using Homestead would continue to be the loudest aircraft in these lands and that cumulative levels of aircraft noise would not significantly change the current noise environment nor be high enough to substantially diminish or interfere with existing or planned public recreational uses of these areas. The FAA has determined that, if the SFWMD lands are subject to DOT Act Section 4(f), there would be no constructive use based on noise of the Proposed Action.

***Southern Glades Wildlife and Environmental Area.*** Maximum sound levels from military aircraft currently using Homestead range from 64.9 to 86.9 dB. In all but one case, these levels would remain the same in the future with the Proposed Action. Only within one grid is the maximum sound level predicted to increase in 2015 because of the MD-80 civil aircraft. This increase only amounts to 2.1 dB. Between 2015 and maximum use of a commercial airport, MD-80 aircraft will have been phased out—again leaving military aircraft as the loudest aircraft throughout the Southern Glades. Cumulative aircraft noise levels calculated in Leq(h) currently range from 31.3 to 42.9 dB. At maximum use, the Proposed Action would increase aircraft Leq(h) values, so that they would range from 34.4 to 49.8 dB. In three grids, the Leq(h) increases are greater than 5 dB (increases of less than 5 dB are considered *de minimus*). The increases above 5 dB are 6.9, 7.6, and 11 dB. The grid showing the 11 dB increase is adjacent to U.S. Highway 1. Although ambient noise measurement was not specifically performed for the Southern Glades, there are select ambient data collected for nearby park areas and special noise assessments. Ambient measurements at three locations adjacent to U.S. Highway 1 resulted in traditional ambient values of 40, 45, and 47 dB. These ambient Leq levels would temper the Leq(h) increase in aircraft noise. Even untempered by ambient data, the Leq(h) values calculated for the Proposed Action at maximum use would not be high enough to interfere with or substantially diminish public use and enjoyment of the recreational opportunities in the Southern Glades.

***Model Lands Basin.*** Military aircraft would continue to produce the highest maximum sound levels. Cumulative aircraft noise levels calculated in Leq(h) currently range from 29.1 to 57.8 dB throughout the Model Lands Basin. These Leq(h) values are only reporting aircraft noise. In the grid with the 29.1 dB of aircraft noise, the traditional ambient level measures much higher at 47 dB. This is a grid adjacent to U.S. Highway 1. With the Proposed Action at maximum use, aircraft noise levels calculated in Leq(h) would range from 36.3 to 57.9 dB. Leq(h) increases of over 5 dB would occur with the Proposed Action at maximum use in three grids within the Model Lands Basin. However, these cumulative increases in aircraft noise still result in relatively low Leq(h) values for aircraft noise that remain within the range of current aircraft Leq(h) levels within the Model Lands Basin. The grid analysis overall shows no

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substantial change in the noise environment of the Model Lands Basin with the Proposed Action. Cumulative aircraft noise levels are considered to be compatible with public recreational uses.

**Frog Pond.** In Frog Pond, military aircraft would continue to produce the highest maximum sound levels. Cumulative aircraft noise levels calculated in  $Leq(h)$  currently range from 39 to 54.5 dB. With the Proposed Action at maximum use, aircraft  $Leq(h)$  values would range from 43.6 to 56 dB. There are no predicted  $Leq(h)$  increases as high as 5 dB. The noise environment in the Frog Pond lands would not substantially change with the Proposed Action, and no adverse effects on public use and enjoyment of recreational uses would occur.

#### Other Environmental Impacts

None of the other potential environmental impacts of the Proposed Action (e.g., air, water, land use and aesthetics) would substantially diminish the activities, features, or attributes of any Section 4(f) property identified in Section 3.14, based on the analysis in the SEIS of each of these impacts. For some impacts, there would be environmental changes in the Homestead vicinity that could either be noticed or measured, or both, at some of the nearby Section 4(f) properties. However, these changes would not approach a level of substantially altering the air quality, water quality, land use, aesthetics, or other activity, feature, or attribute of any Section 4(f) resource.

Visual intrusion of aircraft over the national properties is of concern. Under the Proposed Action more aircraft would be added to the south Florida airspace over the national properties along the proposed flight tracks delineated in the SEIS. These aircraft would be more visible at relatively lower altitudes nearer the runway, than at higher altitudes, and when they would be flying over areas of open vistas, such as open water in Biscayne NP, than over park areas with high vegetation. Aircraft lights at night would be visible. However, unless people's attention is attracted to aircraft because of high noise levels or people are otherwise looking up at the sky, aircraft are not necessarily noticed. Moreover, the visibility of aircraft from a national park location does not equate to a significant impact. It is very rare for the FAA to receive complaints from people about seeing aircraft unless the aircraft are extremely low (generating safety concerns), intrusive because of noise, or perceived by people to be deviating substantially from prescribed flight paths. Visitor survey information compiled by NPS from 39 different units of the National Park System reported that 18.8 percent of visitors reported seeing aircraft and that 3 percent of visitors were annoyed by seeing aircraft. Aircraft overflights from Homestead and other airports in the region currently occur over the national properties and have not generated a record of visual complaints. Aircraft from Homestead would be flying along different flight paths based on their origin/destination and performance characteristics, rather than concentrated over a single area. Visual sightings of aircraft would tend to be short and transitory. The FAA does not believe there is a sound basis for assuming that additional aircraft operations at Homestead would constructively use Section 4(f) resources based on visual effects.

Section 4.11 analyzes the potential effect of the Proposed Action on biological resources, including but not limited to biological resources within Section 4(f) properties. Included within this analysis are potential effects on biological resources of aircraft noise, as well as air quality, water quality and changes in patterns of water flows, land disturbance, secondary development, and other factors. None of the potential impacts on biological resources identified for the Proposed Action are anticipated to substantially diminish those resources or affect the viability or success of any species or habitat within any of the Section 4(f) properties. The FAA relies on the biological resources analyses and conclusions to make the determination that there would not be constructive use of any Section 4(f) properties based on substantial effects on their biological resources. This determination includes property specifically designated as Section 4(f) to protect wildlife, such as the Crocodile Lake Wildlife Refuge, as well as other Section 4(f) property where biological resources constitute important attributes, including national and

state parks, preserves, and sanctuaries, and the biological resources and wildlife corridors in the SFWMD lands.

### **Historic Sites**

The FAA has determined that there would be no constructive use of historic sites based on the evaluation in Section 4.12. The Florida State Historic Preservation Officer has concurred in a no effect finding. In a letter dated March 6, 2000, the Florida SHPO (Division of Historical Resources) stated that a review of the Draft SEIS, the Florida Site file, and the division's records indicated that no significant archeological or historical sites have been recorded or are likely to be present within the Proposed Action's area of potential effects. The letter further indicates that, because of the project location and/or nature, it is unlikely that historic properties would be affected.

### **Section 4(f) Findings**

If a proposed airport project involves the use of DOT Act Section 4(f) land, the FAA must make two findings in order to approve the project: (1) there is no prudent and feasible alternative to using the land, and (2) the project includes all possible planning to minimize harm to the land from the proposed use. The FAA normally relies on information in an EIS to support such findings and then makes the findings themselves in a NEPA Record of Decision. In this case, since the FAA has determined that the Proposed Action will not use Section 4(f) land, these findings do not need to be made. If these findings were required, the FAA believes there is sufficient supporting information in Appendix A regarding commercial airport need and alternatives to support the first finding and environmental mitigation in Chapter 4 to support the second finding.

#### **4.14.3 Commercial Spaceport Alternative**

The Commercial Spaceport Alternative would not directly take any Section 4(f) resources.

The concept of a Commercial Spaceport for reusable launch vehicles is an emerging idea. As of the publication of the Final SEIS, there are no existing commercial launch facilities for horizontally launched reusable launch vehicles. Operational, performance, and noise characteristics of such a commercial spaceport have been evaluated in the SEIS based on the best available information and estimates. However, there remains much environmental uncertainty about a Commercial Spaceport, to the extent that additional environmental review would be required by the FAA for licenses for site and launch operators. Given current uncertainties, the FAA is not in a position to make a definitive DOT Act Section 4(f) determination at this time on a Commercial Spaceport alternative.

#### **4.14.4 Mixed Use Alternative**

This alternative does not include a transportation project. Section 4(f) is not applicable.

#### **4.14.5 No Action Alternative**

The continuation of the status of Homestead as a military-owned airfield does not constitute a transportation project under the meaning of DOT Section 4(f). Section 4(f) is not applicable.

#### **4.14.6 Independent Land Use Concepts**

These uses do not include a transportation project. Section 4(f) is not applicable.

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