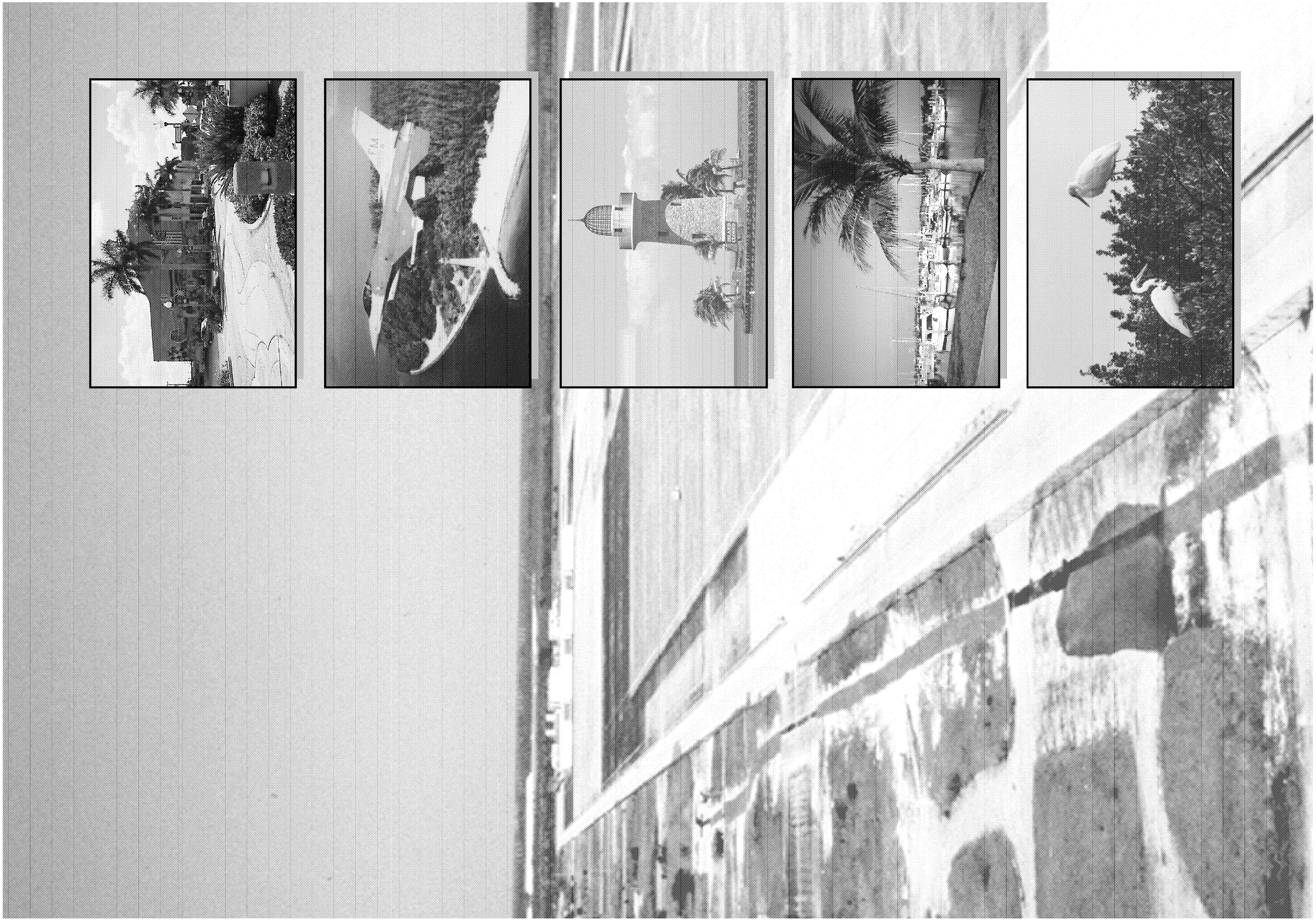
3.0 Affected Environment



IN THIS CHAPTER

This chapter describes the environment around former Homestead AFB that could be affected by reuse of the disposal property. It is divided into 14 resource topics:

- Socioeconomics (**Section 3.1**)
- Transportation (**Section 3.2**)
- Utilities (**Section 3.3**)
- Airspace and Safety (**Section 3.4**)
- Noise (**Section 3.5**)
- Land Use and Aesthetics (**Section 3.6**)
- Hazardous Materials, Hazardous Waste, and Petroleum Products (**Section 3.7**)
- Air Quality (**Section 3.8**)
- Earth Resources (**Section 3.9**)
- Water Resources (**Section 3.10**)
- Biological Resources (**Section 3.11**)
- Cultural Resources (**Section 3.12**)
- Minority and Low-Income Populations (**Section 3.13**)
- Department of Transportation Act Section 4(f) Lands (**Section 3.14**)

Key terms used in this chapter are:

- "Region of influence (ROI)" is the geographic area where the great majority of environmental impacts from the Proposed Action and alternatives are expected to occur. The ROI can vary from resource to resource.

- "Existing environment" refers to conditions as they are now, or as close to now as feasible based on the available information.

- "Projected baseline" refers to the conditions that are expected to exist in the future if the disposal property at former Homestead AFB is not developed for reuse. It incorporates estimates of how environmental conditions might change in the future without reuse of the disposal property. Because the former base would be developed over many years, baseline conditions have also been projected into the future to allow more accurate comparison with the Proposed Action and alternatives. The projected baseline is what impacts from the Proposed Action and alternatives will be compared to in Chapter 4.

- "Moderate growth" refers to the level of population growth that was assumed in developing the projected baseline. It is based on federal and state population forecasts for south Florida.

3.0 AFFECTED ENVIRONMENT

This chapter describes the natural and human environment that would be affected by the proposed disposal and subsequent reuse of portions of former Homestead AFB. It provides a baseline for assessing the environmental effects of the Proposed Action and alternatives described in Chapter 2. Those effects are presented in Chapter 4. The affected environment is described for 14 resource topics: socioeconomics, transportation, utilities, airspace and safety, noise, land use and aesthetics, hazardous materials/hazardous waste/petroleum products, air quality, earth resources, water resources, biological resources, cultural resources, minority and low-income populations, and Department of Transportation Act Section 4(f) lands.

Region of Influence

The sections for each resource topic begin with an introduction that defines the resources addressed in the section, summarizes applicable laws and regulations, and describes the region of influence (ROI) within which the great majority of effects from the Proposed Action and alternatives are anticipated to occur. The ROI varies from resource to resource, but in general, effects from the transfer and reuse of former Homestead AFB are expected to be concentrated in Miami-Dade County and the adjacent national parks, with most occurring south of Eureka Drive (SW 184th Street). There are three main reasons that the ROI can differ among resources:

1. The resource itself has a geographical definition. For example, the ROI for biological resources may be defined by the location and distribution of a certain type of habitat. As another example, the ROI for air quality impacts is defined by the distance that pollutants from the proposed project may have effects on the ground, and by the extent of the airshed affected.
2. The nature of potential impacts from the reuse of former Homestead AFB property can vary from resource to resource. For example, impacts on water resources may be defined by drainage patterns from the location of proposed development to Biscayne Bay, while impacts from aircraft noise may be defined by proposed flight paths from the Homestead airfield.
3. In some cases, data about the resource are only available for certain defined areas (e.g., county level), and as a result, the analysis can only be performed at that level.

The information provided about different geographic areas in the ROI reflects the nature of potential impacts from reuse of former Homestead AFB property. For example, resources that may be affected by ground disturbance and construction activities are only described in areas where such effects could occur, generally in relatively close proximity to the former base. Descriptions of more distant areas, such as Monroe County, are generally limited to resources that might be affected by aircraft overflights.

Existing Environment and Projected Baseline Environment

Following the introduction for each resource topic, information is presented about existing environmental or socioeconomic conditions in the ROI. This information provides a frame of reference about conditions that prevail currently and existed in the recent past. In some cases, this information includes conditions that existed prior to Hurricane Andrew and the realignment of Homestead AFB, when the base was fully active.

However, to understand how the Proposed Action and alternatives could change the environment in the ROI, it was necessary to depict conditions as they are estimated to be in the future, without the reuse of former base property. This provides a basis for comparison of conditions with reuse (presented in

Chapter 4). Therefore, each section of Chapter 3 presents a projected baseline environment that describes conditions as they could be expected to be without reuse of the former base. This projected baseline is presented for three time frames: 2000, 2005, and 2015 (closely approximating the time frames of the 1994 Final EIS). These are also the time frames for which information about the Proposed Action and alternatives was presented in Chapter 2. The sections in Chapter 4, which mirror the resource topics presented in this chapter, depict estimated conditions with each of the reuse alternatives for the same time frames. This enables the environmental effects of each alternative to be clearly distinguished from effects of other, independent actions, as well as from unrelated population growth in the region.

The descriptions of the projected baseline presented in the following sections reflect environmental conditions as they are assumed to evolve in response to the moderate growth in population forecast by the Bureau of Economic Analysis and the State of Florida (see Section 2.1.3). The potential development associated with this level of growth is reflected in the projected baselines presented for each resource topic.

3.1 SOCIOECONOMICS

3.1.1 Introduction

Socioeconomic resources addressed in this SEIS include economic activity, population, housing, public services, and public finance.

3.1.1.1 Resource Definition

Economic activity is defined, for the purposes of this analysis, as employment and earnings. The role of the military, agriculture, and tourism in the regional economy is specifically highlighted.

The population analysis addresses the change in magnitude and geographical distribution of population, the geographical distribution of homeless persons, and county and sub-county level population projections.

Housing addresses existing housing stock, additions to the housing stock as reflected in building permits issued for new construction, the geographical distribution of affordable housing, and distribution of new home construction.

Public services include government structure, public education, fire protection, police protection, and health care services. Special attention is paid in the public education section to changes that have occurred in the characteristics of the students in the school district, region, and individual schools. The characteristics addressed for fire and police protection relate to personnel levels, service area, and facilities and equipment. The discussion of public health services examines the number and size of general and surgical hospitals as well as medical services designed for the exclusive benefit of active duty military personnel.

Public finance addresses the sources of revenues and categories of expenditures for governments in the region of influence.

3.1.1.2 Applicable Laws and Regulations

There are no laws and regulations at the federal, state, or local levels that pertain directly to the resource areas addressed under socioeconomics. Indirect environmental effects associated with population change, such as stormwater runoff, demands for potable water and the effects this might have on water table levels, quantities of wastewater generated, and the capacity of existing and planned wastewater treatment facilities to accommodate these flows, are regulated. Those applicable laws and regulations are addressed in the sections of the SEIS specifically addressing the affected resource (e.g., Utilities, Water Resources).

3.1.1.3 Region of Influence

The ROI varies by resource and the level at which analysis is conducted. In the case of employment and earnings, the primary ROI (**Figure 3.1-1**) is defined as Miami-Dade County and relies on standard data published by BEA for every county in the nation. Employment is also considered at the sub-county level for the portion of the county south of SW 184th Street, also referred to as Eureka Drive. In addition, consideration is given to employment and earnings in Monroe County, portions of which may be affected by reuse of former Homestead AFB.

For population, the ROI is comprised of Miami-Dade County (including Florida City and the City of Homestead) and Monroe County. Sub-county analysis is also accomplished for south Miami-Dade County and Key Largo.

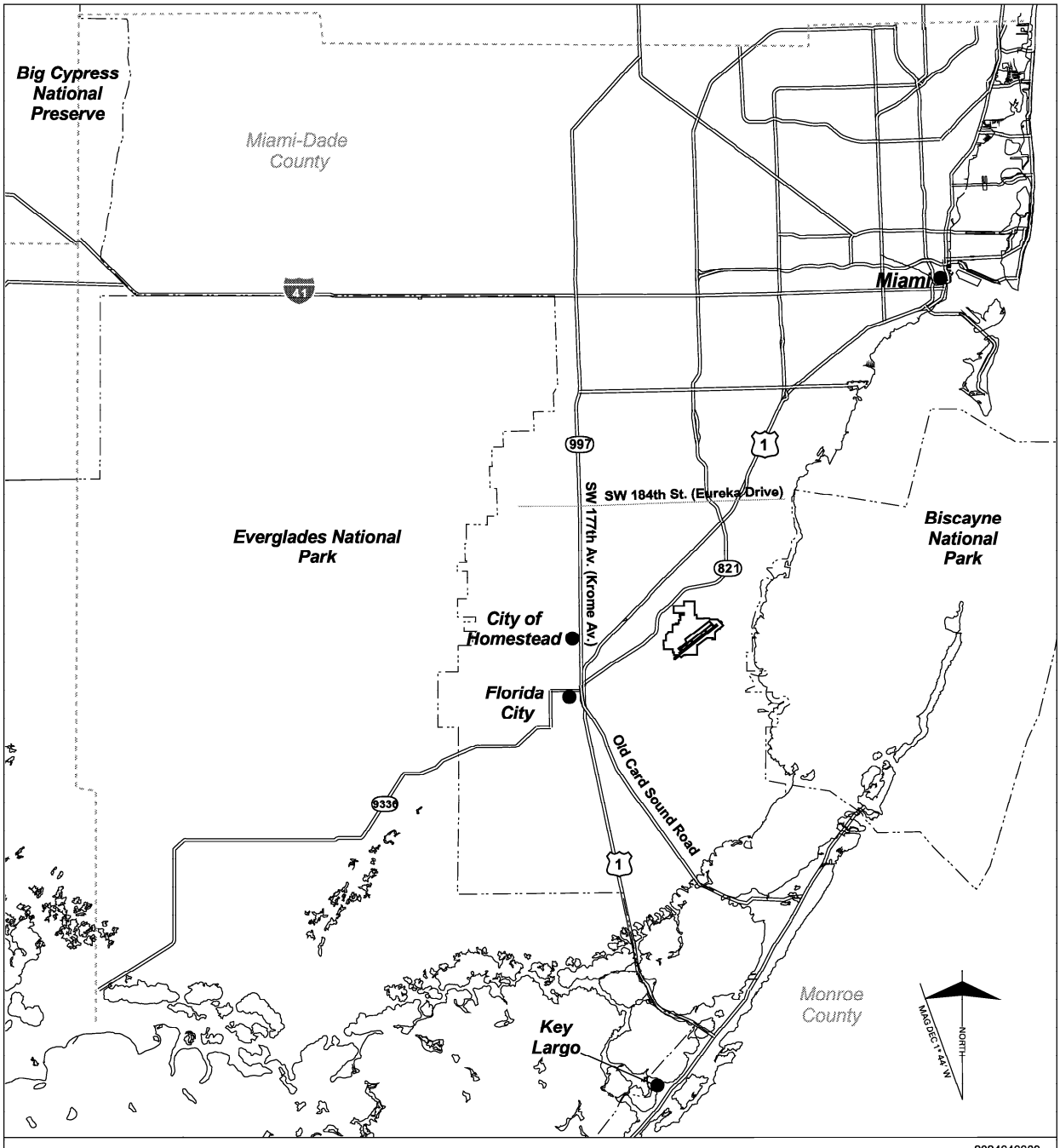


Figure 3.1-1
Socioeconomics Region of Influence

The ROIs for public services are related to the associated public jurisdiction and include the following:

- Government structure—Miami-Dade County, Florida City, City of Homestead.
- Public education—School Board of Miami-Dade County, with special emphasis on Region VI.
- Fire protection—service district of the Miami-Dade County Fire Protection Department.
- Police protection—service areas of the Miami-Dade County Police Department, Florida City Police Department, and Homestead Police Department.
- Health care services—Miami-Dade County.

For public finance, the ROI is made up of Miami-Dade County (including Florida City, the City of Homestead, and the School Board of Miami-Dade County).

3.1.2 Economic Activity

The following sections summarize employment, earnings, and commercial bank deposits as components of economic activity in the ROI. The discussion of earnings highlights the contribution of military payroll and procurements, agriculture, and tourism to economic activity in the ROI.

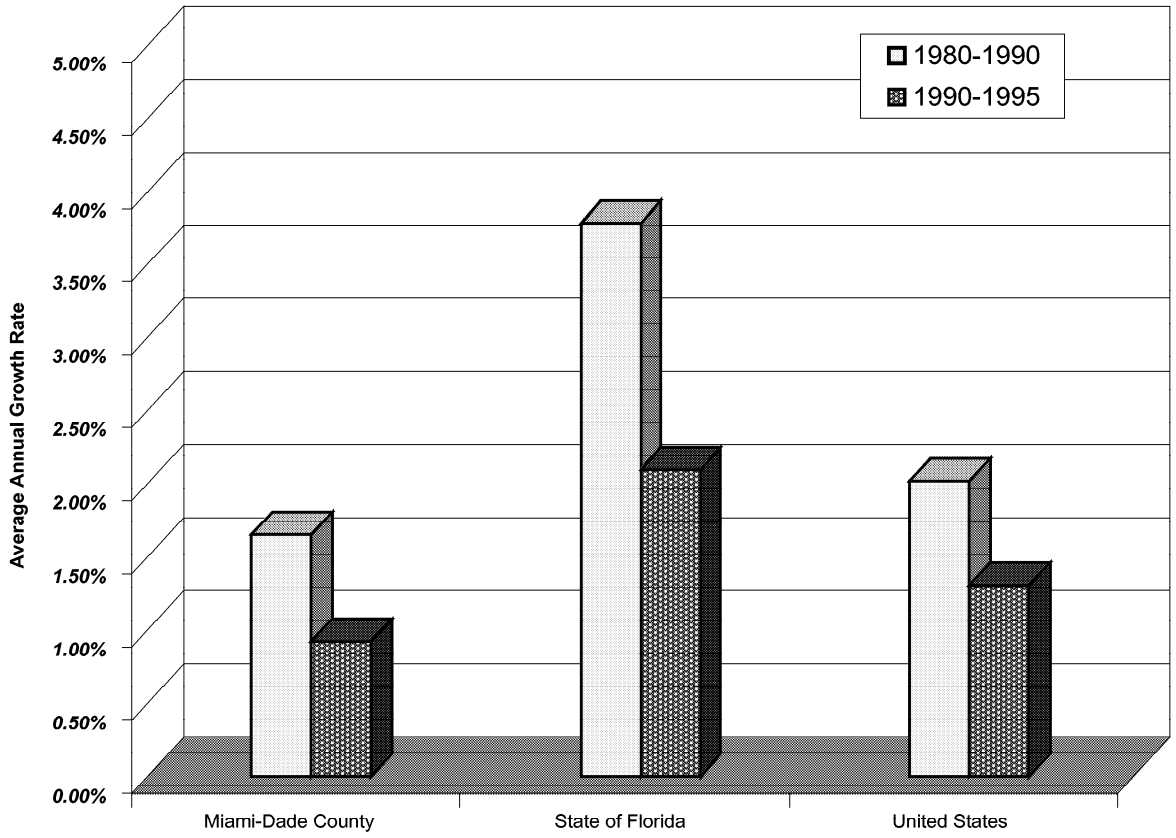
3.1.2.1 Existing Environment

Employment

Information sources on employment include BEA for countywide data and the Miami-Dade County Planning Department for sub-county geographical areas. Historically, the economy of Miami-Dade County has been strongly influenced by tourism and in-migration. Over time, the regional economy has become more service oriented, with an increasing share of employment in the service-producing industries and a decreasing share of employment in goods-producing industries. The economy of south Miami-Dade County has historically relied on three main basic economic activities: military, agriculture, and tourism.

As of 1997, the largest employers in south Miami-Dade County include the School Board of Miami-Dade County (3,198 employees), FPL/Turkey Point Nuclear Power Plant (875 employees), Florida Keys Factory Shops (700 employees), Homestead ARS (623 employees), Homestead Hospital (580 employees), City of Homestead (370 employees), Everglades and Biscayne NPs (350 employees), Sunrise Communities (278 employees), Community Bank (163 employees), Adelphia Cable (163 employees), Bell South (150 employees), City of Florida City (110 employees), Contender Boats (104 employees), Miami-Dade Community College–Homestead Campus (100 employees), and Keys Gate/Florida Design Communities (75 employees) (**Sovia 1997**).

Employment in Miami-Dade County grew at an average annual rate of 1.4 percent over the period 1980 through 1995 (**Figure 3.1-2**), with the number of full- and part-time jobs increasing from 911,591 in 1980 to 1,125,612 in 1995 (**BEA 1997**). The pace of job growth fell to 0.9 percent per year, on average, between 1990 and 1995. Over the period 1990 through 1995, the highest growth rates were experienced in services (2.5 percent), state and local government (2.1 percent), and transportation and public utilities (2.0 percent). Employment in Miami-Dade County grew less rapidly than in the state of Florida, which posted an average annual rate of change of 3.2 percent over the period 1980 through 1995 and 2.1 percent between 1990 and 1995 (see Figure 3.1-2) (**BEA 1997**). The industrial sectors in the state showing the most robust growth rates over the period 1990 through 1995 were services (4.7 percent), agricultural services (4.6 percent), and transportation and public utilities (2.6 percent). The state of Florida



Source:
BEA 1997

Figure 3.1-2
Full- and Part-Time
Employment Growth

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experienced more rapid growth over the period 1980 through 1995 than the nation, which saw jobs increase at an average annual rate of 1.8 percent. Miami-Dade County employment growth over the same time period lagged that of the nation (**BEA 1997**).

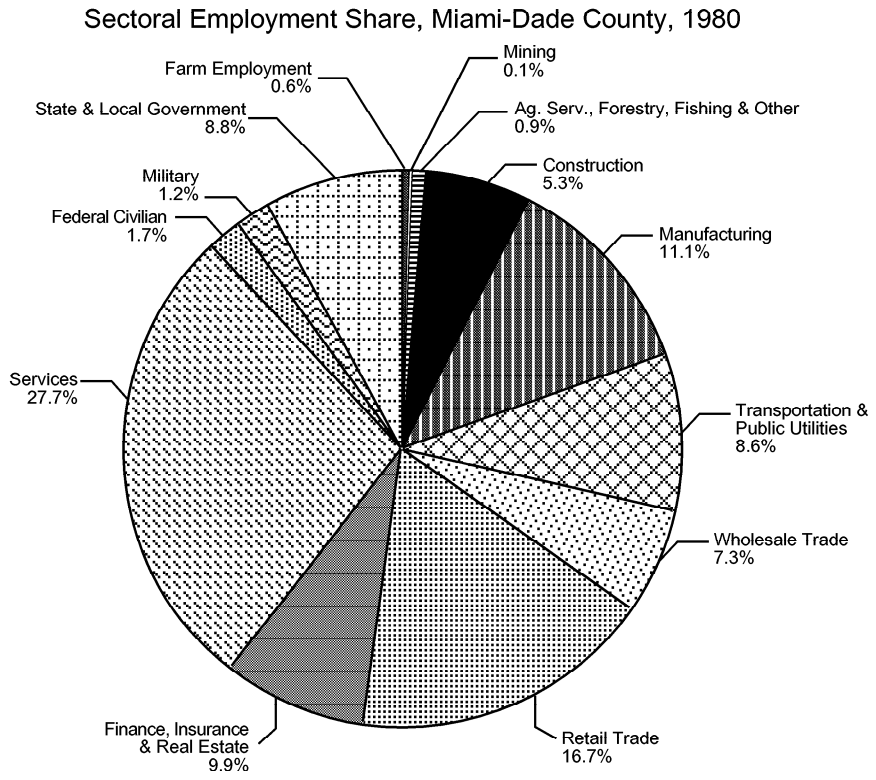
In 1980, the following industrial sectors contributed the greatest shares to total full- and part-time employment in Miami-Dade County: services (27.7 percent); retail trade (16.7 percent); manufacturing (11.1 percent); finance, insurance, and real estate (FIRE) (9.9 percent); and state and local government (8.8 percent) (**Figure 3.1-3**) (**BEA 1997**). This compares to 24.5 percent in services, 18.1 percent in retail trade, 9.9 percent in manufacturing, 10.4 percent in FIRE, and 11.1 percent in state and local government for the state of Florida (**Figure 3.1-4**). By 1995, in Miami-Dade County, the share for services had grown to 34.2 percent, retail trade had dropped to 16.2 percent, manufacturing had dropped to 7.1 percent, FIRE had dropped to 8.8 percent, and state and local government had increased to 10.1 percent. By 1995, in the state of Florida, the share in services increased to 34.6 percent, retail trade increased to 18.7 percent, manufacturing fell to 6.7 percent, FIRE dropped to 8.2 percent, and state and local government fell to 10.5 percent. For the nation as a whole, the most significant changes between 1980 and 1995 in the industrial sectors were the increased contribution made by services from 21.8 percent to 30.0 percent, the increase in retail trade from 15.6 percent to 16.9 percent, and the decreased share of manufacturing from 18.2 percent to 12.9 percent. (**Figure 3.1-5**).

The Miami-Dade County Planning Department has prepared employment estimates and projections for sub-county geographical areas. Based on this information, approximately 88.5 percent of the 1.126 million jobs in the county in 1995 were located in the northern portion of the county, with the remaining 11.5 percent in the southern portion (defined by the county as the area south of Kendall Drive or SW 88th Street) (**Miami-Dade County 1998e**).

Military employment in Miami-Dade County declined from just over 10,820 in 1980 to approximately 6,400 in 1995, and its share of total employment fell from 1.2 percent to 0.6 percent over the same time period (**BEA 1997**). The contribution made by the military sector to employment at the state level fell from 2.6 percent in 1980 to 1.4 percent in 1995, and from 2.2 percent to 1.5 percent for the nation (**BEA 1997**).

Full- and part-time employment in Monroe County has increased at an average annual rate of 2.5 percent over the period 1980 through 1995, from 33,159 jobs to 48,178 (**BEA 1997**). The greatest job gains have occurred in the services and retail sectors over this time period. The contribution to total employment made by the services sector has increased from 25 percent in 1980 to almost 34 percent in 1995, while that of retail trade has risen from 20 percent to over 24 percent. The share contributed by military employment has fallen from 8 percent to 4 percent.

In fiscal year (FY) 1990, Homestead AFB had 8,721 personnel comprised of 6,534 appropriated fund military personnel (including 1,566 Reservists), 1,075 appropriated fund civilian personnel, and 1,112 non-appropriated fund civilian personnel (**Table 3.1-1**) (**USAF 1990b**). Following Hurricane Andrew, the base was realigned as Homestead ARS. By FY 1997, Homestead ARS had 1,961 personnel comprised of 1,175 appropriated fund military personnel (including 1,133 Reservists), 575 appropriated fund civilian personnel, and 211 non-appropriated fund civilian personnel (**HARB 1998**). In addition to direct employment at the base, it is estimated by the Air Force that base payroll expenditure and procurement activity supported 2,884 civilian jobs in the local economy in FY 1990 for a total local employment effect of 10,039 jobs (**USAF 1990b**). For FY 1997, activities associated with the installation are estimated to have 754 civilian jobs in the local economy, for a total local employment effect of 1,582 jobs (**HARB 1998**).



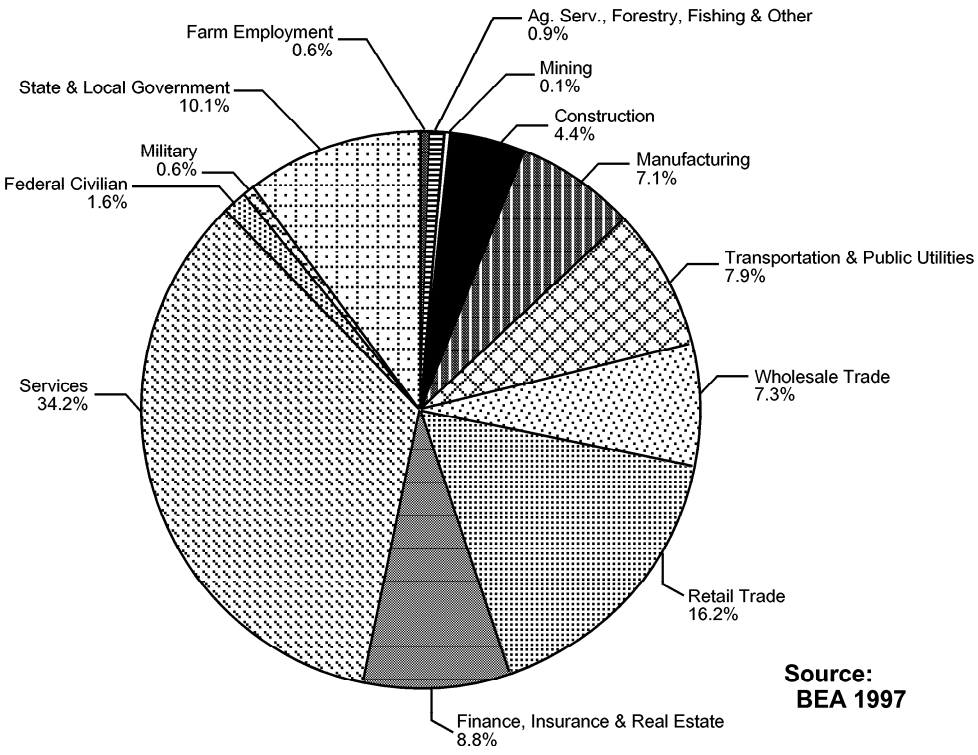


Figure 3.1-3
Sectoral Employment Share,
Miami-Dade County, 1980 and 1995

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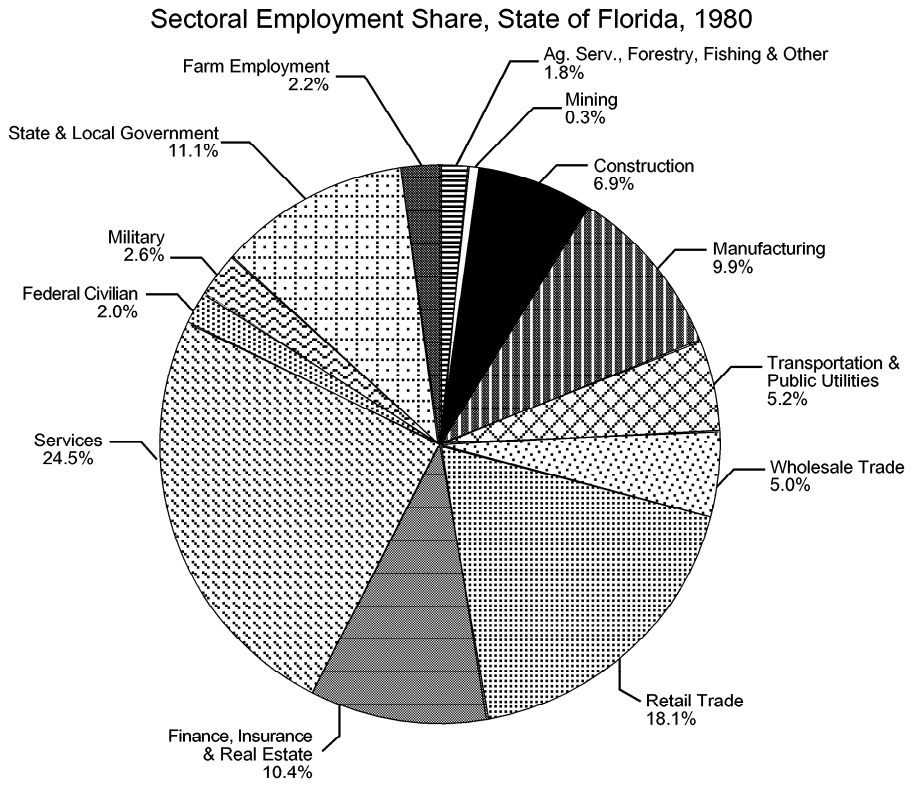

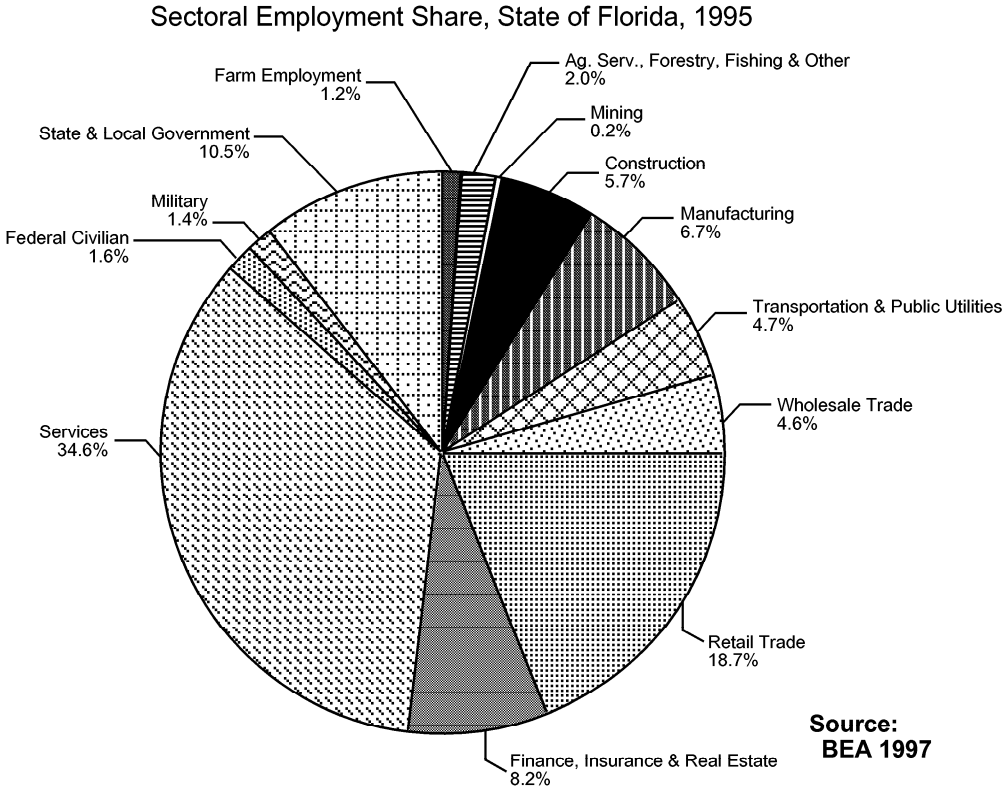

Figure 3.1-4
Sectoral Employment Share, State of Florida, 1980 and 1995

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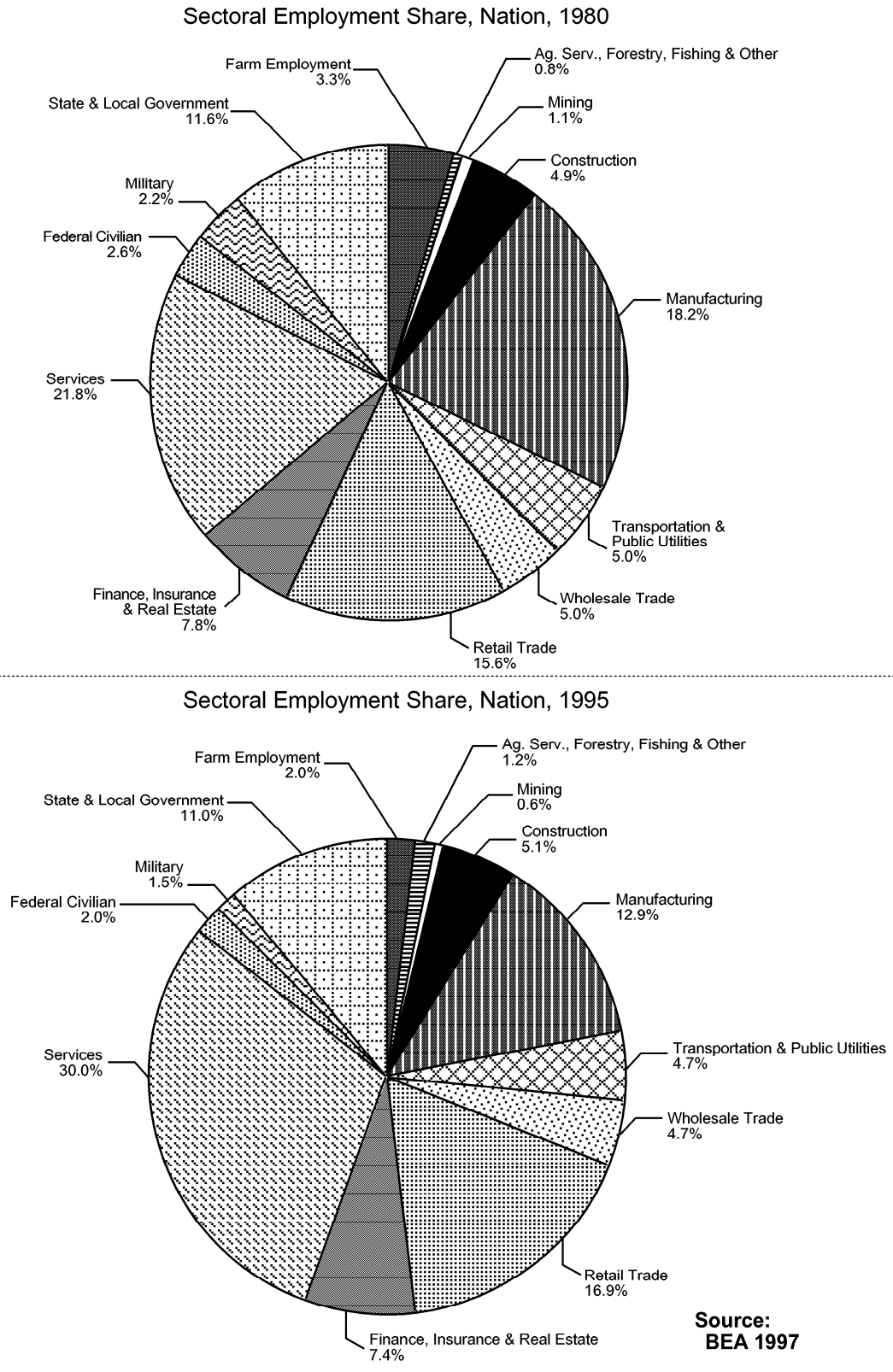

Figure 3.1-5
Sectoral Employment Share, Nation, 1980 and 1995

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Table 3.1-1. Homestead AFB/ARS Site-Related Employment

	FY 1990	FY 1991	FY 1996	FY 1997
Appropriated Fund Military	6,534[1]	6,599	1,423	1,175[1]
Appropriated Fund Civilian	1,075	1,024	605	575
Non-Appropriated Fund and Other Civilian	1,112	1,091	175	211
Total	**8,721**	**8,714**	**2,203**	**1,961**

Source: **USAF 1990b, USAF 1991, HARB 1996, HARB 1998**.
Notes: Data for FY1990 and 1991 reflect Homestead AFB when it was active. Data for FY1996 and 1997 are for Homestead ARS following realignment in 1994.
[1] Includes part-time Reservist jobs.

Earnings

Total wage and salary earnings (expressed in the appropriate current year dollars) associated with full- and part-time employment in Miami-Dade County increased from $10,909 million in 1980 to $22,030 million in 1990 and $26,853 million in 1995 (then-year dollars) (**BEA 1997**). When adjusted for the effects of inflation and expressed in 1995 dollars, these values translate to $20,029 million for 1980, $25,627 million for 1990, and $26,853 million in 1995. The contribution made to non-farm earnings by government and government enterprises has increased from 12.3 percent in 1980 to 15.0 percent in 1995.

Per capita income in Miami-Dade County has risen from $10,325 in 1980 to $17,841 in 1990 and $21,058 in 1995 (**BEA 1997**). When adjusted for the effects of inflation and expressed in 1995 dollars, the rise is more modest, from $18,957 in 1980 to $20,754 in 1990 and $21,058 in 1995. Prior to 1990, per capita income (adjusted for inflation) in Miami-Dade County was above that for the state of Florida (5 percent higher) and the nation (2 percent higher). In 1990 and later, however, the level had fallen below that of the state and the nation. In 1990, per capita income in Miami-Dade County was 7 percent below the level for the state of Florida and the nation, and by 1995 the level had fallen to 9 percent below the state and the nation.

In 1980, the largest contributions to earnings were made by services (25.8 percent), transportation and public utilities (14.3 percent), retail trade (12.1 percent), manufacturing (11.0 percent), and state and local government (8.8 percent) (**BEA 1997**). By 1995, services increased to 33.5 percent, transportation and public utilities decreased to 10.2 percent, retail trade decreased to 10.4 percent, manufacturing decreased to 7.4 percent, and state and local government increased to 12.0 percent.

Of the non-farm earnings paid to full- and part-time workers in Monroe County in 1995, the large majority (35.6 percent) went to workers in the service sector (**BEA 1997**). This share increased from 32.7 percent in 1990. The second largest contribution to earnings was to workers in the retail trade sector (18.8 percent), up from 18.1 percent in 1990.

One measure of the reliance that an area has on tourism is the proportion of non-farm wages and salaries paid to workers in activities that reflect tourism and recreation, specifically eating and drinking places, hotels and other lodging places, and amusement and recreation services. As of 1995, these three economic activities contributed 6.3 percent to total non-farm earnings in the state of Florida, 5.3 percent in Miami-Dade County, and 19.6 percent in Monroe County (**BEA 1997**). Since 1990 these shares have remained virtually unchanged for the state and Miami-Dade County and increased to 20.7 percent in the case of Monroe County.

Military Payroll and Procurements. In FY 1990, Homestead AFB had 8,721 personnel (including 1,566 Reservists) who collectively contributed to a payroll of $144.1 million, including $106.7 million associated with appropriated fund military personnel, $34.4 million for appropriated fund civilian personnel, and $11.8 million for non-appropriated fund civilian personnel (**USAF 1990b**). In FY 1997, Homestead ARS payroll was just under $40 million, which represented 26 percent of the FY 1990 level (**HARB 1998**). It included $10.0 million associated with appropriated fund military personnel, $27.8 million for appropriated fund civilian personnel, and $2.2 million for non-appropriated fund civilian personnel.

Annual expenditures by Homestead AFB/ARS for construction, contracts and materials, equipment, and supplies totaled over $86 million in FY 1990 and over $23 million in FY 1997 (**USAF 1990b**).

Agriculture. Studies of the agricultural sector of the economy in Miami-Dade County conducted by the University of Florida Institute of Food and Agricultural Sciences provide information for 1985 to 1996 (**University of Florida 1990, 1997**). The studies focused on row crops, including traditional and tropical vegetables; tree crops, including tropical fruit production; and commercial ornamental horticulture. Gross sales of agricultural products outside Miami-Dade County (termed "exports") were used to calculate the economic impact of agriculture on the county. These sales bring dollars into the county, thereby stimulating local economic activity. The effect of this economic activity is measured in terms of output and earnings.

The impact that agriculture had on Miami-Dade County earnings totaled $195 million during 1995–96 (**University of Florida 1990**). Of this, $25.7 million (13.2 percent) was generated by the fruit subsector, $82.3 million (42.1 percent) by the vegetable industry, and $87.4 million (44.7 percent) by nursery production. There had been a 34 percent reduction in total earnings impact in the county since the 1988–89 time period (**University of Florida 1997**).

Changes have also occurred between the three agricultural subsectors. In the 1988–89 time period, vegetables provided 56 percent of output and 61 percent of earnings (**University of Florida 1997**). By 1995–96, output of vegetables had declined to 41 percent and earnings to 42 percent (**University of Florida 1990**). The greatest change was in the nursery subsector, which increased its share of output from 30 percent to 47 percent and its share of earnings from 26 percent to 45 percent over the same time period.

In 1996, there were at least 18 traditional vegetables commercially grown in Miami-Dade County with an estimated value of $174 million (**University of Florida 1990**). Of this production, 98 percent was shipped outside the county. The top four traditional vegetable commodities, in value, were tomatoes, green beans (bush and pole), potatoes, and squash. The value of traditional vegetables declined by about 35 percent between 1988 and 1996, reflecting a lower number of acres in production and, possibly, lower prices attributable to increased competition from Mexico and other off-shore sources of winter vegetables.

More than a dozen tropical and specialty vegetables, as well as a variety of herbs and spices, were grown in 1995–96 with a value of about $25 million, down slightly from the 1988–89 season sales (**University of Florida 1990, 1997**). About 90 percent of the sales took place outside the county. The most important crops, based on value of sales, were malanga, boniato, and calabaza, in addition to significant quantities of Asian vegetables and spices.

Of the many tropical fruit crops grown, the highest value crops are carambola, avocados, and limes (**University of Florida 1990**). Sales revenues from tropical fruits in 1995–96 were estimated at $56 million, down from $74 million in 1988–89 (**University of Florida 1997**). Most of the decline is attributable to reduced yields from groves damaged by Hurricane Andrew and low yields from immature

groves planted after the hurricane. Approximately 90 percent of all tropical fruits are shipped out of the county.

The acreage devoted to nurseries grew dramatically from about 6,100 acres in 1988–89 to 8,668 acres in 1995–96 (42 percent increase) (**University of Florida 1990, 1997**). Sale of nursery products totaled almost $266 million in 1995–96, up from $171 million in 1998–89. About 74 percent of the sales are made outside Miami-Dade County.

Tourism. Based on survey information provided by the Greater Miami Convention and Visitors Bureau, 13.62 million people visited Greater Miami in 1996, with the large majority (87 percent) arriving at MIA (**Table 3.1-2**) (**Strategy Research Corporation 1997**). An additional 3 percent of visitors arrived at other airports, and the remaining 10 percent arrived by other transportation modes. Between 1992 and 1996, the number of visitors arriving in Greater Miami increased at an average annual rate of 5 percent (**Strategy Research Corporation 1997**). Of the 13.62 million visitors in 1996, 9.58 million (70 percent) were overnight visitors, with 53 percent originated outside the United States. The major origins of international overnight visitors were Latin America (61 percent), Europe (25 percent), and Canada (12 percent). Among domestic overnight visitors, 45 percent originated in the northeast portion of the nation, 26 percent from the south, and 22 percent from the north-central region of the country.

Table 3.1-2. Total Visitors to Greater Miami

Visitor Arrivals	1992 (000)	1993 (000)	1994 (000)	1995 (000)	1996 (000)
Miami International Airport	9,238.3	10,007.0	10,366.5	11,354.3	11,824.0
Other Airports	487.8	490.3	476.9	533.2	467.1
Non-Airport[1]	1,460.8	1,165.2	1,095.1	1,330.4	1,328.9
Total	**11,186.9**	**11,662.5**	**11,938.5**	**13,217.9**	**13,620.0**

Source: **Strategy Research Corporation 1997**.
Note: [1] Non-airport are visitors who come into the area by transportation mode other than air.

The main purpose of overnight visitors varied between domestic and international visitors. For domestic visitors, the main purpose of their visit was business (34 percent), followed by vacation/pleasure (30 percent), cruises/special events (18 percent), and visits with friends and relatives (17 percent). For international visitors, the main purposes were vacation/pleasure (49 percent), business (25 percent), visits with friends and relatives (14 percent), and cruises/ special events (11 percent).

Among overnight visitors who stayed in hotels and motels, the largest share (33 percent) stayed in Miami Beach, while south Miami-Dade County attracted almost 11 percent. The average length of stay for overnight visitors was 2.7 days.

Overnight visitors to Greater Miami are estimated to annually contribute $10,964 million directly to the regional economy through expenditures on lodging (25.9 percent), meals (26.7 percent), local transportation (9.7 percent), entertainment (15.5 percent), and shopping (22.2 percent).

Direct expenditures by tourists stimulate the regional economy and generate both direct and secondary employment. Using the Regional Input-Output Modeling System (RIMS) developed by BEA to estimate the multiplier effect of these expenditures, tourism in Miami-Dade County generates $4.9 billion in secondary output which, combined with the direct expenditures, results in a total output of $15.9 billion. Tourism expenditures were responsible for 352,520 jobs in 1996, with the majority concentrated in the

lodging (31 percent) and eating and drinking (29 percent) sectors of the economy. In 1997, 372,050 jobs were attributable to tourism (**Strategy Research Corporation 1997**).

As noted in the discussion on earnings, a substantial proportion of Monroe County's economic activity (almost 20 percent of non-farm wages and salaries) is derived from the primary tourism-related activities (**BEA 1997**). This is nearly four times the corresponding proportion for Miami-Dade County.

Commercial Bank Deposits

One indicator of the relative health of an economy is the level of deposits held by commercial banks. Over the past decade, bank deposits in Miami-Dade County declined from a peak of $40.7 billion in 1989 to a low of $32.9 billion in 1994 (**Table 3.1-3**) (**Bond 1998**). Funds on deposit in 1997 ($35.8 billion, unadjusted for the effects of inflation) were almost identical to the level in 1987 ($35.4 billion).

Table 3.1-3. Bank Deposits in Miami-Dade County and South Miami-Dade County

Year	Miami-Dade County			South Miami-Dade County		
	Value of Deposits ($000)	Percent Change Over Previous Year	As Percent of 1987 Level	Value of Deposits ($000)	Percent Change Over Previous Year	As Percent of 1987 Level
1987	35,401,716			899,510		
1988	39,014,630	10.21%	110.2%	987,477	9.78%	109.8%
1989	40,701,079	4.32%	115.0%	1,030,332	4.34%	114.5%
1990	36,642,953	–9.97%	103.5%	1,070,479	3.90%	119.0%
1991	34,513,702	–5.81%	97.5%	1,081,460	1.03%	120.2%
1992	36,613,836	6.08%	103.4%	1,923,172	77.83%	213.8%
1993	33,864,096	–7.51%	95.7%	1,240,936	–35.47%	138.0%
1994	32,928,706	–2.76%	93.0%	979,023	–21.11%	18.8%
1995	34,207,500	3.88%	96.6%	994,758	1.61%	110.6%
1996	34,789,532	1.70%	98.3%	917,218	–7.79%	101.2%
1997	35,846,465	3.04%	101.3%	869,356	–5.22%	96.6%

Sources: **Johnson 1998**, **Bond 1998**.
Note: Data are for December of each year except for 1997, which is for September. All deposit values are depicted in current year dollars.

In the southern portion of the county, deposits held by commercial banks rose gradually from $0.9 billion in 1987 to $1.1 billion in 1991 (**Bond 1998**). Immediately following Hurricane Andrew, there was a sharp increase in deposits to $1.9 billion attributable primarily to insurance claim payments. The level of deposits declined steadily after the peak in 1992 and currently (unadjusted for the effects of inflation) is slightly below the level reported for 1987.

3.1.2.2 Projected Baseline Environment

This section presents employment and earnings levels projected to occur in the ROI between 2000 and 2015, independent of the reuse of the disposal property at former Homestead AFB.

Employment

Employment forecasts have been prepared by the Miami-Dade County Planning Department for 2005 and 2020. As described in Section 2.1.3, these forecasts were adjusted to a more moderate rate of growth for the projected baseline, and employment levels for intervening years were interpolated. With moderate growth, employment in Miami-Dade County is projected to rise from an estimated 1.126 million in 1995 to 1.165 million in 2000, 1.204 million by 2005, and 1.282 million in 2015 (**Metro-Dade County 1994a**). This represents an average annual rate of growth of 0.7 percent between 1995 and 2015. It compares to an average annual rate of change in the county between 1980 and 1995 of 1.4 percent. Between 1995 and 2015, over 156,000 jobs are projected to be added in the county. The majority (83 percent) of these jobs will be in the northern portion of the county (north of Eureka Drive). Although the absolute increase in jobs will be smaller in the southern portion of the county (south of Eureka Drive), the rate of job growth there is expected to be higher. The average annual county growth rate in the south county is projected to be 3.2 percent between 1995 and 2000, 2.8 percent between 2000 and 2005, and 2.4 percent between 2005 and 2015, compared to about 0.6 percent for the northern part of the county. Baseline employment in the south county is projected to increase from 41,683 in 1995 to 48,378 in 2000, 55,074 in 2005, and 68,464 in 2015.

Earnings

No wage or salary projections were available for the employment projections prepared by the Miami-Dade County Planning Department. Therefore, projections were developed for analysis purposes for the SEIS. In developing those projections, it was assumed that average wage and salary earnings per job would increase at the rate experienced between 1990 and 1995. In addition, the relationship between wage and salary employment and total full- and part-time employment was held constant (87.5 percent). Based on these assumptions, the average annual wage and salary earnings per worker can be expected to rise from $27,255 in 1995 to $28,560 in 2000, $29,926 in 2005, and $32,859 in 2015. Total wage and salary earnings in Miami-Dade County can be expected to rise from $26,853 million in 1995 to $33,706 million in 2000, $34,836 million in 2005, and $37,097 million in 2015.

3.1.3 Population

Population information is provided below for Miami-Dade County as a whole, and for sub-county areas south of Eureka Drive. Sub-county data were derived from a database developed by Miami-Dade County Planning Department. This database contains population estimates for 1995 and projections for 2005 and 2020 for Traffic Analysis Zones and Traffic Analysis Districts. For transportation planning purposes, Miami-Dade County is divided into 1,166 TAZs, which are further aggregated into 96 TADs. The county's population forecasts, which assume high growth, were adjusted to a moderate growth level and further interpolated for 2000, 2005, and 2015 for the projected baseline. Recent population data are also provided for Monroe County.

3.1.3.1 Existing Environment

Between 1960 and 1990, the population of Miami-Dade County increased from 935,047 to 1,937,094 residents at an average annual rate of 2.5 percent (**State of Florida 1998**). The average annual rate of population growth has slowed over that time from 3.1 percent between 1960 and 1970, to 2.5 percent between 1970 and 1980, and 1.8 percent between 1980 and 1990. The population increase experienced by Miami-Dade County was generated more by net migration than by local births. For example, net migration accounted for 66 percent of the population increase between 1980 and 1990. For the state of Florida, net migration contributed 87 percent of the population gain over the same time period. However, between 1990 and 1995, net migration contributed only 3 percent to the population increase. This was in

stark contrast to the experience in neighboring Broward County, immediately to the north, where net migration contributed 82 percent of the population increase between 1990 and 1995. The population of Miami-Dade County is estimated at 2,070,573 in 1997, having increased at an average annual rate of 1 percent since 1990.

There are two incorporated municipalities in south Miami-Dade County: Florida City and the City of Homestead. Between 1960 and 1990, the population of Florida City increased from 4,114 to 5,806, an average annual rate of 1.2 percent (**South Florida Regional Planning Council 1998**). The population of the City of Homestead increased at an average annual rate of 3.7 percent from 9,152 to 26,866 over the same time period. The growth rates in Florida City changed from 2.2 percent between 1960 and 1970, to 1.9 percent between 1970 and 1980, and -0.6 percent between 1980 and 1990. The respective growth rates for Homestead were 4.1 percent between 1960 and 1970, 4.2 percent between 1970 and 1980, and 2.7 percent between 1980 and 1990. Between 1990 and 1997, the population of Homestead decreased from 26,866 to 25,865, at an annual rate of –0.5 percent. For the same period, Florida City population increased from 5,806 to 5,978, at an annual rate of 0.4 percent.

Hurricane Andrew had an effect on population distribution within Miami-Dade County. Most of the damage occurred south of Kendall Drive (SW 88th Street). The Miami-Dade County Planning Department estimates that county population stood at 2,000,555 in 1992, prior to Hurricane Andrew, with 20.7 percent of the population residing in the southern portion of the county and 79.3 percent in the northern portion (**Metro-Dade County 1992a**). By 1993, the split had changed to 16.1 percent in the southern portion and 83.9 percent in the northern portion of the county. By 1995, the residential dislocations and redistribution associated with the hurricane had subsided, and 18.5 percent of the county population resided in the southern portion.

Population in south Miami-Dade County, south of Eureka Drive, declined by over 100,000 between 1992 and 1993 (**Metro-Dade County 1993**). In the same time frame, there was an estimated population gain of nearly 44,000 in northern Miami-Dade County. Countywide, population declined by more than 57,000 residents. Most of the population increase in the northern part of the county is attributed to relocation by residents from the southern part. Population forecasts prepared by the Miami-Dade County Planning Department were revised downward following Hurricane Andrew to show almost 43,000 fewer persons in 1995 than previously expected.

The military-related population in Miami-Dade County at the time of Hurricane Andrew included 11,839 permanent party military personnel and their dependents, 1,024 appropriated fund personnel, 416 non-appropriated fund civilian personnel, and approximately 21,000 military retirees and their dependents (**USAF 1991**). Nearly 85 percent of this population resided in the southern portion of Miami-Dade County.

The population of Monroe County increased from 63,188 in 1980 to 78,024 in 1990 (at an average annual rate of 2.1 percent) and 85,646 in 1998 (at an average annual rate of 1.2 percent) (**State of Florida 1998**). The population of Key Largo stood at 11,336 in 1990.

Homeless Population

In April 1997, a “Homeless Count” in Miami-Dade County identified 2,345 homeless persons, 2,254 of whom could be assigned to specific geographical areas (selected municipalities and unincorporated portions of the county) (**Florida Department of Children and Families 1997**). The largest percentage of the homeless population was in Miami (50 percent), followed by unincorporated parts of Miami-Dade County (26 percent), Homestead (12 percent), and Miami Beach (8 percent). As a percentage of total population, homeless persons represent 0.1 percent of the county. The highest concentration of homeless

population can be found in Homestead, where homeless persons represent 1 percent of the population, ten times the county average.

3.1.3.2 Projected Baseline Environment

As discussed in Section 2.1.3, a number of population forecasts for Miami-Dade County have been developed by various organizations. Interpolating from these forecasts for 2015, they range from a low of 1.9 million (BEBR low-growth forecast), which would represent a net decline in population from 1990, to about 2.5 million for the BEBR medium-growth forecast (also reflected in the BEA and State of Florida forecasts), to a high of over 3 million (BEBR high-growth forecast). The various forecasts, as interpolated, are presented for 2000, 2005, and 2015 in **Table 3.1-4**. Forecasts by the Miami-Dade County Planning Department are similar to the BEBR high-growth forecasts for 2005 and 2015. The county is in the process of revising these forecasts. A medium-growth condition based on these forecasts has been selected as the most reasonable basis for the projected baseline.

Table 3.1-4. Population Projection Series for Miami-Dade County

Year	Low-Growth Forecast	Medium-Growth Forecasts			High-Growth Forecasts	
	BEBR	BEA	State of Florida	BEBR	Miami-Dade County Planning Department	BEBR
2000	2,012,700	2,171,400	2,155,859	2,134,700	2,293,697	2,269,600
2005	1,990,300	2,271,100	2,270,164	2,246,100	2,530,604	2,533,100
2015[1]	1,901,200	2,475,600	2,476,442	2,461,900	3,030,495	3,102,000

Source: **South Florida Regional Planning Council 1998**, **Metro-Dade County 1994a**, **University of Florida 1998**.
Note: [1] Forecasts for 2015 have been interpolated from 2020.
BEA Bureau of Economic Analysis
BEBR Bureau of Economic and Business Research

The only organization that has prepared forecasts for subareas of the county is the Miami-Dade County Planning Department, and only for the high-growth projections (**Metro-Dade County 1994a**). These subarea forecasts have been prepared for 2005 and 2020 (the levels shown for 2015 in Table 3.1-4 have been interpolated from 2020). As Table 3.1-4 shows, the county has projected a population of approximately 2.5 million for 2005, which is similar to the medium-growth forecasts for 2015. Therefore, for the projected baseline, a moderate population growth level has been developed, interpolating from the county's high-growth forecasts for 2005, which are assumed to be more likely to be realized in 2015.

In the high-growth projections for 2005, the Miami-Dade County Planning Department anticipated that 21.6 percent of the county population will reside south of Kendall Drive (SW 88th Street) (**Metro-Dade County 1994a**). Implicit in this population redistribution is a population growth rate in the southern portion of the county that exceeds that in the northern portion. Over the period 1995 through 2015, the population of the county as a whole is projected to grow at an average annual rate of about 1 percent under the moderate growth forecast. The growth rate in the southern portion of the county over the same time period is projected to be over 2 percent, while that of the northern portion is forecast to be less than 1 percent.

The geographic area of primary interest for this SEIS is the portion of Miami-Dade County that lies south of Eureka Drive. **Table 3.1-5** depicts population forecasts developed by the Miami-Dade County Planning Department for the county as a whole and for the area south of Eureka Drive. In Table 3.1-5, these population forecasts have also been adjusted to reflect the moderate growth projections. This results in a growth rate for the county of 1.1 percent annually over the time periods 1995 to 2000 and 2000 to 2005 and 1.0 percent over the period 2005 to 2015. The corresponding rates for the area south of Eureka Drive would be 2.2 percent over the period 1995 to 2000; 2.0 percent between 2000 and 2005, and 1.8 percent between 2005 and 2015.

Population in the City of Homestead is projected to increase from 25,865 in 1997 to 36,303 in 2000, 43,480 in 2005, and 63,532 in 2015. These increases represent average annual growth rates of 12 percent between 1997 and 2000 and 3.8 percent between 2000 and 2015. Population in Florida City is projected to increase from 5,978 in 1997 to 7,373 in 2000, 8,970 in 2005, and 13,278 in 2015. This represents an average annual increase of more than 7 percent between 1997 and 2000, leveling off to 4 percent between 2000 and 2015.

3.1.4 Housing

This section discusses the housing stock in Miami-Dade County, Monroe County, City of Homestead, and Florida City. It also describes additions to the housing stock in terms of building permits issued in Miami-Dade County for new construction, the distribution of new home construction, and the geographical distribution of affordable housing.

3.1.4.1 Existing Environment

From 1980 through 1990, the number of housing units in Miami-Dade County grew from 665,382 to 771,288, an average annual rate of 1.5 percent (**Bureau of the Census 1996a, 1996b**). The proportion of owner-occupied units compared to renter-occupied units remained constant at about 54 percent. The vacancy rate rose from 8.4 percent in 1980 to 10.2 percent in 1990 (**Bureau of the Census 1996a, 1996b**). The Miami-Dade County Planning Department estimates that there were a total of 812,767 housing units in the county in 1995 (**Metro-Dade County 1994a**). Of this total, 141,637 (17.4 percent) were located south of Kendall Drive.

Monroe County had a total of 46,215 housing units in 1990; 27.3 percent were vacant and 27.5 percent were renter occupied (**Bureau of the Census 1996b**). Of the 12,632 vacant housing units, almost 63 percent were for seasonal, recreational and occasional use. Key Largo had a total of 7,594 housing units in 1990; 23.4 percent were vacant and 11.5 percent were renter occupied. Of the 2,649 vacant housing units in Key Largo, almost 75 percent were for seasonal, recreational and occasional use.

From 1980 to 1990, the number of housing units in Homestead rose from 8,812 to 10,775, an average annual rate of 2.0 percent (**City of Homestead 1995**). In May 1993, following Hurricane Andrew, City of Homestead Community Development staff surveyed the stock of duplexes and multi-family housing units in the city. This survey showed a total of 4,480 housing units (**City of Homestead 1995**). Based on this information, and assuming that single-family homes existing before the storm either survived or were rebuilt, it is estimated that there were approximately 6,295 single-family homes in the city. Thus, the total number of housing units in 1993 was estimated at 10,775 units.

Table 3.1-5. Population Projections for South Miami-Dade County (South of Eureka Drive)

	Planning Department Projections (high growth)				Absolute Population Increase				Average Annual Percent Change			
	1995	2000	2005	2015	1995–2000	2000–2005	2005–2015	1995–2015	1995–2000	2000–2005	2005–2015	1995–2015
County Total	2,056,789	2,293,697	2,530,604	3,030,495	236,908	236,907	499,891	973,706	2.20%	1.99%	1.82%	1.96%
South of Eureka Dr.	163,235	201,414	239,592	407,017	38,179	38,178	167,425	243,782	4.29%	3.53%	5.44%	4.67%
Percent of County Total	7.94%	8.78%	9.47%	13.43%	16.12%	16.12%	33.49%	25.04%				
	Adjusted Projections (moderate growth)				**Absolute Population Increase**				**Average Annual Percent Change**			
	1995	**2000**	**2005**	**2015**	**1995–2000**	**2000–2005**	**2005–2015**	**1995–2015**	**1995–2000**	**2000–2005**	**2005–2015**	**1995–2015**
County Total	2,056,789	2,175,243	2,293,697	2,530,604	118,454	118,454	236,907	473,815	1.13%	1.07%	0.99%	1.04%
South of Eureka Dr.	163,235	182,324	201,414	239,592	19,089	19,090	38,178	76,357	2.24%	2.01%	1.75%	1.94%
Percent of County Total	7.94%	8.38%	8.78%	9.47%	16.12%	16.12%	16.12%	16.12%				

Source: SAIC; **Metro-Dade County 1994a**.

Note: Population estimates and projections were developed by the Miami-Dade County Planning Department for the years 1995, 2005, and 2020. Intermediate values were interpolated. Adjusted projections for 2015 were based on Miami-Dade County Planning Department forecasts by Transportation Analysis Zone for 2005 and interpolated for intervening years.

Between 1980 and 1990, the number of housing units in Florida City decreased from 2,180 to 2,045 (**James Duncan & Associates 1996a**). The owner-occupancy rate fell from 50 percent in 1980 to 45 percent in 1990, while the vacancy rate rose from 9.7 percent to 12.9 percent. The Comprehensive Plan for Florida City estimates there were 1,227 housing units in Florida City in 1993 following Hurricane Andrew. Based on residential rebuilding activity, it is estimated that the city contained 1,539 housing units in 1995.

An average of 13,635 annual permits for new residential units was issued in Miami-Dade County between 1980 and 1994. Building activity was above average between 1984 and 1989, declining sharply between 1990 and 1994. Between 1994 and 1997, a total of 16,551 single-family units were constructed in Miami-Dade County. The share of this construction activity in the southern portion of the county (made up of the Homestead, Redland/Goulds and Perrine/Cutler Ridge areas) fell from 9.7 percent in 1994 to 5.8 percent in 1997 (**Hofford 1998**). By far, the largest share of new construction has taken place in the Kendall West area, which has consistently attracted over 40 percent of all new construction in the county.

Affordable Housing

For this SEIS, affordable housing includes units under any type of project-based rental and single-family acquisition home ownership program that receives any kind of government assistance, directly or through subsidies provided to developers. Also included are Department of Housing and Urban Development (HUD) Section 8 tenant-based rental housing assistance (both certificate and voucher) programs.

A study completed by the Miami-Dade Housing Agency in 1998 identified a total of 57,548 affordable housing units in the county (**Miami-Dade Housing Agency 1998**). The majority of units (69 percent) is in tenant-based rental programs, with an additional 19 percent comprised of HUD Section 8 units. Much of the affordable housing, as defined here, is concentrated in a few communities. While 7.5 percent of the housing stock in Miami-Dade County is affordable housing, the proportion is 47.7 percent for Florida City and 30.1 percent for Homestead.

3.1.4.2 Projected Baseline Environment

Miami-Dade County Planning Department has projected that the number of housing units in the county will increase from 812,767 in 1995 to 896,470 by 2000, 980,172 in 2005, and 1,145,515 in 2015 (**Metro-Dade County 1994a**). These were adjusted for the moderate-growth projected baseline to 854,618 units in 2000, 896,470 units in 2005, and 980,172 units in 2015. The Planning Department has estimated that 7.0 percent of the total countywide housing units in 1995 were located south of Eureka Drive. With moderate growth, it is expected that this share will increase to 8.7 percent by 2015. Over the period 1995 through 2015, the number of housing units in the county is projected to increase at an average annual rate of 0.9 percent. The growth rate for the area south of Eureka Drive over the same time period is projected to be 2.1 percent. This area is expected to receive 17 percent of the increase in housing units over this period.

3.1.5 Public Service

Public service includes the following resources: government structure, public education, fire protection, police protection, and health care services.

3.1.5.1 Existing Environment

Government Structure

Miami-Dade County. The county government consists of a mayor and board of commissioners. The county provides all public services to the residents of unincorporated areas and to selected municipalities that do not provide their own services. The county also operates police and fire rescue departments and some utility systems, including potable water and sanitary sewers.

City of Homestead. The City of Homestead is located approximately 20 miles south of Miami. The city has a mayor/city council form of government. It operates a utility department which supplies potable water, sanitary sewers, and electricity service to city residents and residents of the immediately surrounding area. There is a city police department, but fire protection is provided by Miami-Dade County Fire Rescue Department.

City of Florida City. Florida City is located immediately adjacent to and south of the City of Homestead. It has a mayor/city council form of government and provides potable water and sanitary sewer services to its residents. The city has its own police department, while fire protection is provided by Miami-Dade County Fire Rescue Department.

Public Education

Elementary and secondary school education in Miami-Dade County is provided by the School Board of Miami-Dade County. For the school year 1996–97, the district operated 300 schools, had a student enrollment of 340,899 pupils, employed 17,410 teachers, and had an average of 19.6 students per teacher (**Aguiar 1997**).

The school district, up until the school year 1996–97, was organized into six regions. Region VI corresponds approximately with the southern portion of Miami-Dade County. Between 1990 and 1997, enrollment in the school district increased from 296,321 to 340,899 students at an average annual rate of 2.4 percent.

Enrollment increased each year except 1992–93 (**Table 3.1-6**). The number of teachers over the same time period increased from 14,081 to 17,410 at an average annual rate of 2.4 percent, and the number of schools rose from 259 to 300. The average number of students per teacher increased from 18.1 to 19.6.

Enrollment in Region VI increased at an average annual rate of 1.7 percent between 1990 and 1997. The effect of the dislocation associated with Hurricane Andrew is reflected in a decline in enrollment of almost 23 percent in Region VI between school years 1991–92 and 1992–93, with a loss of over 10,000 pupils. In 1990–91, Region VI comprised 16.0 percent of the total district enrollment, while in 1992–93, Region VI comprised 11.9 percent of the district enrollment. Since that time, enrollment in Region VI has increased at a rate more than double that experienced in the district as a whole, reaching and exceeding 1990–91 levels in school year 1995–96. That year, Region VI comprised 14.8 percent of total district enrollment.

Region VI contains a total of 43 schools: 5 high schools, 8 middle schools, and 30 elementary schools. Over the period 1990–91 through 1996–97, enrollment increased at 20 schools and decreased at 19 schools. The largest change in enrollment occurred at Airbase Elementary School, which was converted after Hurricane Andrew from a conventional elementary school to a magnet school with a significantly smaller enrollment.

Table 3.1-6. School Board of Miami-Dade County—Ethnic Composition of Students in the District and Region VI

Year	Number					Percent				
	White, Non-Hispanic	Black, Non-Hispanic	Hispanic	Other	Total	Percentage Change From Prior Year	White, Non-Hispanic	Black, Non-Hispanic	Hispanic	Other
District										
1990–91	55,518	99,008	138,182	3,613	296,321		18.74%	33.41%	46.63%	1.22%
1991–92	56,222	102,218	142,145	3,843	304,428	2.74%	18.47%	33.58%	46.69%	1.26%
1992–93	50,551	102,794	144,936	3,822	302,103	–0.76%	16.73%	34.03%	47.98%	1.27%
1993–94	50,226	106,352	151,761	4,075	312,414	3.41%	16.08%	34.04%	48.58%	1.30%
1994–95	48,528	109,968	159,125	4,214	321,835	3.02%	15.08%	34.17%	49.44%	1.31%
1995–96	47,325	112,812	168,696	4,611	333,444	3.61%	14.19%	33.83%	50.59%	1.38%
1996–97	45,977	114,624	175,139	5,159	340,899	2.24%	13.49%	33.62%	51.38%	1.51%
Average Annual Percent Change 1991–1997	–3.09%	2.47%	4.03%	6.12%	2.36%					
Region VI										
1990–91	15,297	12,165	18,902	913	47,277		32.36%	25.73%	39.98%	1.93%
1991–92	15,389	12,665	17,573	1,006	46,633	–1.36%	33.00%	27.16%	37.68%	2.16%
1992–93	10,669	9,887	14,761	774	36,091	–22.61%	29.56%	27.39%	40.90%	2.14%
1993–94	11,895	11,295	18,010	855	42,055	16.52%	28.28%	26.86%	42.82%	2.03%
1994–95	11,927	12,611	20,453	835	45,826	8.97%	26.03%	27.52%	44.63%	1.82%
1995–96	11,831	13,505	22,988	1,018	49,342	7.67%	23.98%	27.37%	46.59%	2.06%
1996–97	11,559	14,019	25,561	1,191	52,330	6.06%	22.09%	26.79%	48.85%	2.28%
Average Annual Percent Change 1991–1997	–4.56%	2.39%	5.16%	4.53%	1.71%					

Source: **Aguiar 1997**.

Between school year 1990–91 and school year 1996–97, the white, non-Hispanic segment of the student body at the district level decreased from 18.7 percent to 13.5 percent. In Region VI it also decreased, from 32.4 percent to 22.1 percent. The proportion of the student body comprised of Hispanic pupils increased over the same time period from 46.6 percent to 51.4 percent at the district level and from 40.0 percent to 48.9 percent in Region VI (see Table 3.1-6).

The proportion of the student body comprised of pupils of white, non-Hispanic ethnic origin decreased at 36 of the 39 schools over the period 1990–91 through 1996–97 for which comparable data are available. The average decrease was 12.2 percent. In 20 of the 39 schools having comparable data, the proportion of the student body comprised of black, non-Hispanic pupils rose (on average by 2.2 percent), while for pupils of Hispanic origin the proportion rose in 33 of the 39 schools (on average by 9.3 percent). The proportion of the student body receiving lunch at reduced cost increased at 38 of 39 schools for which comparable data are available (on average by 14.1 percent).

For the school year 1996–97, only a small portion (1.6 percent) of the average daily attendance in the school district was comprised of federally connected students for which the school district was eligible for funds from the federal government. There were approximately 23 students enrolled in the school district who were the children of military personnel located on federal installations. There were an additional 145 off-base federally connected students enrolled in the district. Federal impact aid funds comprised less than 0.1 percent of the school district operating budget.

Fire Protection

The fire protection capabilities of Miami-Dade County and Homestead ARS are described in terms of their personnel, facilities, and equipment. The Fire Rescue Department of Miami-Dade County provides services to the two incorporated communities of Homestead and Florida City.

Miami-Dade County. The Miami-Dade County Fire Rescue Department provides services to an area of approximately 1,924 square miles that encompasses the entire county, including 26 municipalities, with a combined resident population of over 1.9 million. The department operates out of 43 fire rescue stations and several administrative facilities (**Moore 1998**). The territory covered by the department is divided into four divisions that are broken down to 11 battalions. Along with fire suppression and emergency medical services, the department has the ability to transport patients to area trauma hospitals via Air Rescue's two trauma helicopters. The department also has a Hazardous Materials Bureau and Marine Services Bureau. It maintains Crash Fire Rescue units at two local airports, including an entire division at MIA. Nine of the 43 facilities are located in the portion of Miami-Dade County south of Eureka Drive (**Table 3.1-7**).

The Fire Rescue Department has 1,553 personnel, of which 1,327 are firefighters. There are 161 civilian administrative personnel and 65 support personnel. All firefighters are qualified Emergency Medical Technicians (EMTs) and 500 are qualified paramedics.

The Miami-Dade Hazardous Materials Bureau staffs a two-person truck 24 hours a day. This is supplemented by a task force consisting of one battalion chief, a four-person aerial ladder truck, and a three-person haz-tox rescue crew. All members of the task force are hazardous material (HAZMAT)-certified technicians or higher.

The Miami-Dade County Fire Rescue Department has formal written mutual aid agreements with the Air Force and U.S. Navy. It has informal agreements with numerous municipalities (Miami, Miami Beach, Coral Gables, Hialeah, and the Village of Key Biscayne); Broward, Monroe, and Collier counties; Everglades NP; and Biscayne NP.

Table 3.1-7. Fire Rescue Department Facilities in South Miami-Dade County

Station No.	Address	Community	Units
4	9201 SW 152nd Street	Coral Reef	Rescue, engine, battalion
5	13150 SW 238th Street	Redland	Rescue, engine
6	15890 SW 288th Street	Modello	Rescue, tanker, battalion
9	7777 SW 117th Street	Kendall	Rescue, engine
14	5860 SW 70th Street	South Miami	Rescue, engine, battalion
16	325 NW 2nd Street	Homestead and Florida City	Rescue, engine, 50 foot Squrt
34	10850 SW 211th Street	Cutler Ridge	Rescue, 100 foot platform, peak load rescue
36	1001 Hammocks Boulevard	Hammocks	Rescue, 50 foot Squrt, battalion
43	13390 SW 152nd Street	Richmond	Tanker

Source: **Moore 1998**.

Homestead Air Reserve Station. The Homestead ARS fire department provides fire protection to the cantonment area (885 acres) only. There is a single station located in Building 706 adjacent to the flightline. As of 1998, there are 53 full-time personnel comprised of 35 firefighters, 10 EMTs, 5 administrative personnel, and 3 support personnel (**Grier 1998**). Available equipment includes three crash vehicles, two pumpers, two command/control vehicles, one quick-response vehicle, one hazardous materials vehicle, and three trailers (one for hazardous materials, one for foam, and one for confined spaces). The department is responsible only for first responder duties at hazardous materials incidents. Mutual aid agreements exist between the department and Miami-Dade County Fire Rescue Department, Turkey Point Nuclear Power Plant, and Advance Life Support Service to provide assistance on an as-needed basis. The Homestead ARS fire station is currently undergoing renovation. Dispatch services are provided through a proprietary alarm dispatching system with a fully operational alarm room at the fire station.

Police Protection

Police protection in the ROI is provided by the Miami-Dade County Police Department, City of Homestead Police Department, and Florida City Police Department. Each provider is described in terms of personnel, facilities, and equipment.

Miami-Dade County. The Miami-Dade County Police Department serves the entire unincorporated area of Miami-Dade County. The area south of Eureka Drive is served by three stations that together have a service area of 1,800 square miles. The area that is routinely patrolled covers 505 square miles. The three stations in south Miami-Dade County are Station 4 at 10800 SW 211th Street, Station 5 at 7707 SW 117th Street, and Station 8 at 10000 SW 142nd Street. In 1998, there were a total of 4,672 personnel comprised of 2,999 sworn officers, 26 auxiliary/reserve officers, and 1,647 administrative/support personnel. The department has a large array of equipment, including 1,714 patrol sedans, 75 vans, and 29 utility vehicles. There are also 698 unmarked sedans, 103 other unmarked vehicles, and 49 motorcycles. A number of mutual aid agreements are maintained by the department with the following agencies: statewide mutual aid agreement through the State of Florida Department of Community Affairs, Opa-Locka, Sweetwater, North Miami Beach, Miami-Dade County, South Miami, and the School Board of Miami-Dade County (**Alvarez 1998**).

City of Homestead. The City of Homestead Police Department serves an area of 16 square miles from a single office located at 4 South Krome Avenue. In 1998, there were a total of 101 personnel comprised of

70 sworn officers, 11 reserve officers, 1 auxiliary officer, 9 administrative personnel, 8 dispatchers, and 2 corrections officers (**Bowe 1998**). The department has 54 marked cars, 14 unmarked cars, 2 vans, 1 motorcycle, 1 command center, and 6 additional vehicles. It maintains mutual aid agreements with each municipality in Miami-Dade County with the exception of Pinecrest. It is part of a centralized dispatching system including police, sheriff, fire, and ambulance.

Florida City. The Florida City Police Department serves an area of approximately 5 square miles from a single office located at 404 West Palm Drive in Florida City. In 1998, there were a total of 52 personnel comprised of 28 sworn officers, 10 auxiliary officers, 8 administrative personnel, and 6 support personnel (**Washington 1998**). The department has 14 marked cars, 9 unmarked cars, and 2 vans. Mutual aid agreements are maintained with Opa-Locka, Sweetwater, Homestead, Miami-Dade County, Miami-Dade Corrections, and the School Board of Miami-Dade County. The department operates an independent dispatch system.

Health Care Services

Health care services in the ROI are provided by doctors, dentists, nurses, and general and surgical hospitals located in Miami-Dade County and facilities specifically operated for the benefit of military members, their dependents, military retirees, and dependents of retirees.

There are 6,031 doctors, 1,351 dentists, 13,526 registered nurses, and 3,842 practical nurses in Miami-Dade County (**Agency for Health Care Administration 1998**). There are 25 general and surgical hospitals (over 8,600 beds) in the county. Of these facilities, 13 are operated on a for-profit basis, 9 are not-for-profit, 1 is operated by Miami-Dade County, and 1 is operated by the Department of Veterans Affairs. The larger hospitals in the county include:

- Jackson Memorial Hospital, located in the City of Miami, is the largest hospital in the county and is operated by the county. It has 1,422 beds, 1,009 of which, on average, were in use through the year, giving a bed utilization rate of 71 percent (**American Hospital Association 1998**). It has 8,450 employees and an annual payroll of $278 million. The hospital accommodated over 467,000 out-patient visits in 1996.
- Veterans Affairs Medical Center, located in the City of Miami, is operated by the Department of Veterans Affairs. It has 803 beds, 628 of which, on average, were in use through the year, giving a bed utilization rate of 78 percent. It has 2,333 employees and an annual payroll of $98 million (**American Hospital Association 1998**). The hospital accommodated over 342,000 out-patient visits in 1996.
- Mount Sinai Medical Center, located in the City of Miami Beach, is a non-government, not-for-profit facility. It has 707 beds, 416 of which, on average, were in use through the year, giving a bed utilization rate of 59 percent (**American Hospital Association 1998**). It has 3,076 employees and an annual payroll of $105 million. The hospital accommodated over 181,000 out-patient visits in 1996.
- Mercy Hospital, located in the City of Miami, is a church-operated, not-for-profit facility. It has 365 beds, 274 of which, on average, were in use through the year, giving a bed utilization rate of 75 percent (**American Hospital Association 1998**). It has 1,686 employees and an annual payroll of $59 million. The hospital accommodated over 152,000 out-patient visits in 1996.
- Baptist Hospital of Miami, located in the City of Miami, is a church-operated, not-for-profit facility. It has 392 beds, 318 of which, on average, were in use through the year, giving a bed utilization rate of 81 percent (**American Hospital Association 1998**). It has 3,127 employees and an annual payroll of $90 million. The hospital accommodated over 134,000 out-patient visits in 1996.

3.1.5.2 Projected Baseline Environment

Public services in the ROI are expected to remain relatively constant into the future, with the exception of some facilities improvements planned for schools, fire protection, and police protection.

A number of facility improvements were programmed in Region VI of the Miami-Dade County School District for FY 1998–99 (**Aguiar 1997**). They include a $20 million conversion of the Robert Morgan Technical Vocation School (located at 181 SW 112th Street) to a high school with a capacity for between 2,600 and 2,700 students. Middle school additions will also be made to Miami Heights, Pine Lake, and Pesko elementary schools. A new middle school and middle school additions at Claude Pepper and Oliver Hoover elementary schools are planned for FY 1999–2000. For the entire county, plans exist to add 22 middle schools and 6 high schools between 1999 and 2004.

Nine new fire stations are planned for the southern portion of Miami-Dade County, as listed in **Table 3.1-8** (**Moore 1998**). Plans exist to open a store-front police office at 9827 Hibiscus Street in Perrine (**Alvarez 1998**). The facility will be staffed by approximately 70 personnel.

Table 3.1-8. New Fire Stations Planned for South Miami-Dade County

Station	Address	Planned Completion Date
Redland	248th Street and SW 177th Avenue	October 1999
Village of Homestead	152nd Avenue and SW 320th Street	February 2002
Sky Vista	312th Street and SW 162nd Avenue	February 1999
Coconut Palm	248th Street and 112th Avenue	July 2002
Perrine	Hibiscus and SW 98th Road	March 1999
South Miami Heights	186th Street and SW 177th Avenue	January 1999
Turnpike	120th Street and SW 177th Avenue	December 1998
Saga Bay	87th Avenue and SW 216th Street	February 1999
East Kendall	88th Street and 97th Avenue	February 2000

Source: **Moore 1998**.

No information is available regarding specific plans for additional health care capital facilities and/or personnel. However, it is assumed that health care services and facilities will continue to reflect population levels in the region and effective demand.

3.1.6 Public Finance

Public finance addresses the sources of revenues and categories of expenditures for Miami-Dade County, the City of Homestead, Florida City, and the School Board of Miami-Dade County.

3.1.6.1 Existing Environment

Miami-Dade County

In addition to operation of the General Fund (which accounted for nearly 54 percent of revenues in FY 1996), the county has a number of enterprise funds (**Metro-Dade County 1997b**). Enterprise funds are established to finance and account for the operation and maintenance of facilities and services that are intended to be entirely or predominantly self-supporting through the collection of charges from users. The following are the main enterprise funds maintained by the county: Transit Agency, Department of Solid

Waste Management, Seaport Department, Aviation Department, Water and Sewer Department, and Public Health Trust. **Table 3.1-9** presents combined revenues and expenditures associated with all government fund types and expendable trust funds. In FY 1996, county revenues totaled over $2 billion. The principal sources of these revenues were taxes (51.7 percent) and intergovernmental transfers (26.1 percent). Expenditures in FY 1996 totaled just over $1.9 billion with major expenditures in personal and property protection (35.7 percent), socioeconomic environment (19.6 percent), and general government (13.4 percent).

Table 3.1-9. Miami-Dade County Revenues and Expenditures

	FY 1996	
	Amount (000)	**Percent**
Revenues		
Taxes	$1,104,905	51.71
Special Tax Assessments	$43,117	2.02
Licenses and Permits	$56,705	2.65
Intergovernmental Revenues	$556,917	26.07
Charges for Services	$160,179	7.50
Fines and Forfeitures	$31,475	1.47
Interest Income	$44,213	2.07
Collections in Trust	$32,046	1.50
Other	$107,075	5.01
Total Revenues	**$2,136,632**	**100.00**
Expenditures		
Current		
General Government	$256,849	13.40
Personal and Property Protection	$684,316	35.71
Physical Environment	$52,156	2.72
Transportation	$35,740	1.86
Health	$102,021	5.32
Socioeconomic Environment	$376,279	19.63
Culture and Recreation	$122,514	6.39
Trust Agreement Expenditure	$42,832	2.24
Capital Outlay	$106,843	5.58
Debt Service		
Principal Retirement	$74,263	3.88
Interest	$61,883	3.23
Other	$680	0.04
Total Expenditures	**$1,916,376**	**100.00**

Source: **Metro-Dade County 1997b**.

City of Homestead

In addition to operation of the General Fund (which accounted for just over 51 percent of revenues in FY 1996), the City of Homestead also has a number of enterprise funds (**City of Homestead 1997**). The

main enterprise funds maintained by the city are for electric, water, sewer, stormwater, and sports complex activities. **Table 3.1-10** shows combined revenues and expenditures associated with all government fund types and expendable trust funds.

Table 3.1-10. City of Homestead Revenues and Expenditures

	FY 1996	
	Amount (000)	**Percent**
Revenues		
Taxes	$5,223	18.22
Licenses and Permits	$649	2.26
Intergovernmental Revenues	$14,822	51.70
Charges for Services	$3,557	12.41
Fines and Forfeitures	$1,624	5.66
Interest Income	$619	2.16
Payments in Lieu of Taxes	$1,464	5.11
Insurance Proceeds	$37	0.13
Other	$676	2.36
Total Revenues	**$28,671**	**100.00**
Expenditures		
Current		
General Government	$8,679	29.91
Public Safety	$9,210	31.74
Sanitation	$2,385	8.22
Public Works	$943	3.25
Parks and Recreation	$1,531	5.28
Capital Outlay	$5,408	18.64
Debt Service		
Principal Retirement	$105	0.36
Interest	$747	2.57
Fiscal Charges	$12	0.04
Total Expenditures	**$29,020**	**100.00**

Source: **City of Homestead 1997**.

In FY 1996, city revenues totaled $28.7 million. The principal sources of these revenues were intergovernmental revenues (51.7 percent of total revenues), taxes (18.2 percent), and charges for services (12.4 percent). Expenditures in FY 1996 totaled $29.0 million, with the major categories comprised of public safety (31.7 percent of total annual expenditures), general government (29.9 percent), and capital outlay (18.6 percent).

Florida City

In addition to operation of the General Fund (which accounted for 26 percent of revenues in FY 1996), Florida City receives revenues from a special revenue fund (65 percent of total revenues in FY 1996) and water and sewer enterprise fund (7 percent of total revenues in FY 1996) (**City of Florida City 1997**).

The special revenue fund was comprised of federal and state grants related to damage associated with Hurricane Andrew. As this source of revenue declines, it is being replaced by standard grants (mostly from the state of Florida) for infrastructure construction and maintenance. **Table 3.1-11** presents combined revenues and expenditures associated with all government fund types and expendable trust funds. In FY 1996, city revenues from government fund types totaled over $14 million, and the principal sources of these revenues were taxes (11.0 percent) and intergovernmental revenues (68.8 percent). Expenditures in FY 1996 totaled almost $14 million with major expenditures in general government (80.9 percent), public safety (8.9 percent), and public works (8.7 percent).

Table 3.1-11. Florida City Revenues and Expenditures

	FY 1996	
	Amount (000)	**Percent**
Revenues		
Taxes	$1,539	10.97
Intergovernmental	$9,655	68.82
Charges for Services	$778	5.55
Program Income	$1,113	7.94
Interest	$130	0.92
Licenses and Permits	$253	1.80
Other	$416	2.96
Donations	$92	0.66
Confiscated Property	$26	0.19
Public Safety	$26	0.19
Total Revenues	**$14,029**	**100.00**
Expenditures		
Current		
General Government	$11,302	80.86
Public Safety	$1,240	8.87
Public Works	$1,221	8.74
Parks and Recreation	$191	1.37
Capital Outlay	$23	0.16
Total Expenditures	**$13,976**	**100.00**

Source: **City of Florida City 1997**.

School Board of Miami-Dade County

The majority (over 65 percent) of revenues received by the school district are from the General Fund (**Dade County School Board 1997**). An additional 20 percent is from the Capital Projects Fund. The largest share of revenues is derived from state sources (53 percent), followed by local (39 percent) and federal (8 percent) sources. Almost 48 percent of expenditures is for instructional services. **Table 3.1-12** presents combined revenues and expenditures associated with all fund types and expendable trust funds.

Table 3.1-12. School Board of Miami-Dade County Revenues and Expenditures

	FY 1996	
	Amount (000)	Percent
Revenues		
Local Sources		
Ad Valorem Taxes	$756,374	34.40
Food Service Sales	$20,639	0.94
Interest Income	$38,962	1.77
Local Grants and Other Sources	$36,665	1.67
Total Local Sources	***$852,640***	***38.78***
State Sources		
Florida Education Finance Program	$924,515	42.05
Public Education Capital Outlay	$46,370	2.11
Food Services	$3,212	0.15
State Grants and Other Sources	$195,205	8.88
Total State Sources	***$1,169,302***	***53.18***
Federal Sources		
Federal Grants	$109,930	5.00
Food Services	$66,733	3.04
Total Federal Sources	***$176,663***	***8.04***
Total Revenues	**$2,198,605**	**100.00**
Expenditures		
Current		
Instructional Services		
Basic Programs	$907,395	36.22
Exceptional Child Program	$179,370	7.16
Adult And Vocational-Technical Programs		
Total Instructional Services	***$1,200,102***	***47.90***
Instructional Support Services	$174,122	6.95
Pupil Transportational Services	$68,329	2.73
Operation and Maintenance Of Plant	$240,067	9.58
School Administration	$128,593	5.13
General Administration	$74,541	2.98
Food Services	$94,513	3.77
Other	$23,584	0.94
Capital Outlay	$409,178	16.33
Debt Service		
Principal Retirement	$40,354	1.61
Interest and Fiscal Charges	$52,000	2.08
Total Expenditures	**$2,505,383**	**100.00**

Source: **Dade County School Board 1997**.

3.1.6.2 Projected Baseline Environment

No information is available concerning future public finance. It is assumed that revenue streams and expenditure patterns will continue much as shown by historic trends.

3.2 TRANSPORTATION

3.2.1 Introduction

This section addresses the availability, capacity, and use of surface transportation infrastructure, including regional, local, and on-site roads; mass transit; and emergency evacuation capabilities.

3.2.1.1 Resource Definition

Roadway conditions are defined by capacity, which reflects the ability of the network to serve the traffic demand and volume. The capacity of a roadway depends mainly on the street width, number of lanes, intersection control (traffic signals), and other physical factors. Traffic volumes are reported as the daily number of vehicular movements (e.g., passenger vehicles and trucks) in both directions on a segment of a roadway, averaged over a full calendar year (average annual daily traffic [AADT]) or averaged over a period less than a year (average daily traffic [ADT]), or the number of vehicular movements on a road segment during the peak hour.

The performance of a roadway segment is generally expressed in terms of level of service (LOS). The LOS scale ranges form A to F. General descriptions of operating conditions for each LOS as defined by the *Highway Capacity Manual* (**National Research Council 1994**) are as follows:

1. LOS A describes completely free-flow operations. The operations of vehicles are virtually unaffected by the presence of other vehicles, and operations are constrained only by the geometric features of the highway and driver preferences. Maneuverability within the traffic stream is good. Minor disruptions to flow are easily absorbed at this level without a change in travel speed.
2. LOS B is also indicative of free flow, although the presence of other vehicles begins to be noticeable. Average travel speeds are the same as in LOS A, but drivers have slightly less freedom to maneuver. Minor disruptions are still easily absorbed at this level, although localized deterioration in level of service will be more obvious.
3. LOS C represents a range of conditions in which the traffic density has a noticeable effect. The ability to maneuver within the traffic stream is clearly affected by the presence of other vehicles. Average travel speeds begin to slow along multilane highways with speed limits over 50 miles per hour (mph). Minor disruptions may be expected to cause serious local deterioration in service, and lines of vehicles may form behind any significant traffic disruption.
4. LOS D represents a range in which the ability to maneuver is severely restricted because of traffic congestion. Travel speed begins to be reduced by increasing volumes. Only minor disruptions can be absorbed without extensive lines and major slowdowns.
5. LOS E is operating at or near capacity and is quite unstable. At LOS E, vehicles are operating with minimum spacing between vehicles than can still maintain uniform flow. As the limits for the level of service are approached, disruptions cannot be dampened or readily dissipated, and most disruptions will cause lines to form and service to deteriorate to stop-and-go conditions. For the majority of multilane highways with speed limits between 45 and 60 mph, passenger car speeds at capacity range from 40 to 55 mph but are highly variable and unpredictable within that range.
6. LOS F reflects a breakdown in flow. It occurs either when vehicles arrive faster than they leave or where demand exceeds capacity. Although operations will appear to be at capacity, lines will form behind the crunch points. The lines will move at stop-and-go rates. Average travel speeds are generally less than 30 mph.

Minimum acceptable LOS is the lowest acceptable operating conditions provided under local or state regulation or policy.

LOS analysis for the SEIS has been conducted using *Florida Level of Service Standards and Guidelines Manual for Planning* (**FDOT 1995**) prepared by the Florida Department of Transportation (FDOT).

3.2.1.2 Applicable Laws and Regulations

Comprehensive Development Master Plan (CDMP) for Miami-Dade County (**Metro-Dade County 1997a**). This document identifies the standards for LOS in the former Homestead AFB area. As of 1997, the minimum acceptable LOS for Miami-Dade County between the Urban Infill Area (UIA) and the Urban Development Boundary (UDB) (**Metro-Dade County 1997c**, **Dade County 1995**), which includes the majority of former Homestead AFB and surrounding area, is LOS D (90 percent of capacity), with the following exceptions:

- State urban minor arterials, where the minimum acceptable LOS is E.
- Mass transit routes with headways less than 20 minutes, where the minimum acceptable LOS for parallel roadways within 0.5 mile of the transit service is E.
- Routes with extraordinary transit service, such as commuter rail or express bus service, where parallel roads within 0.5 mile may operate at no greater than 120 percent of their capacity.
- Outside of the UDB, where the minimum acceptable LOS for Miami-Dade County is D for state minor arterials and C for county roads and state principal arterials.
- Florida City, where the minimum acceptable LOS is C on all roads.
- The City of Homestead, where the minimum acceptable LOS is D for state freeways and principal arterials and E for other state and local roads.

3.2.1.3 Region of Influence

The ROI for the transportation analysis **(Figure 3.2-1)** includes the existing principal road network in southern Miami-Dade County, with emphasis on the immediate area surrounding former Homestead AFB. The analysis focuses on the segments of the transportation network that serve as direct or key indirect linkages to the former base and are described at three levels: (1) regional, representing the major links within Miami-Dade County; (2) local, representing key community roads; and (3) on-base roads. These links are most likely to be affected by reuse of former Homestead AFB. Also included are principal roadways, such as U.S. Highway 1 and the Florida Turnpike Extension, Krome Avenue (SW 177th Avenue), the 18-mile stretch of U.S. Highway 1 to Key Largo, and Card Sound Road to the Ocean Reef Community.

3.2.2 Existing Environment

Roadways

Regional Roads. Former Homestead AFB area is served by a number of regional roads (**Figure 3.2-2**). The Florida Turnpike Extension (State Road [SR] 821) lies about 1 mile northwest of the former base. This four-lane expressway terminates in Florida City to the south and connects the former base with

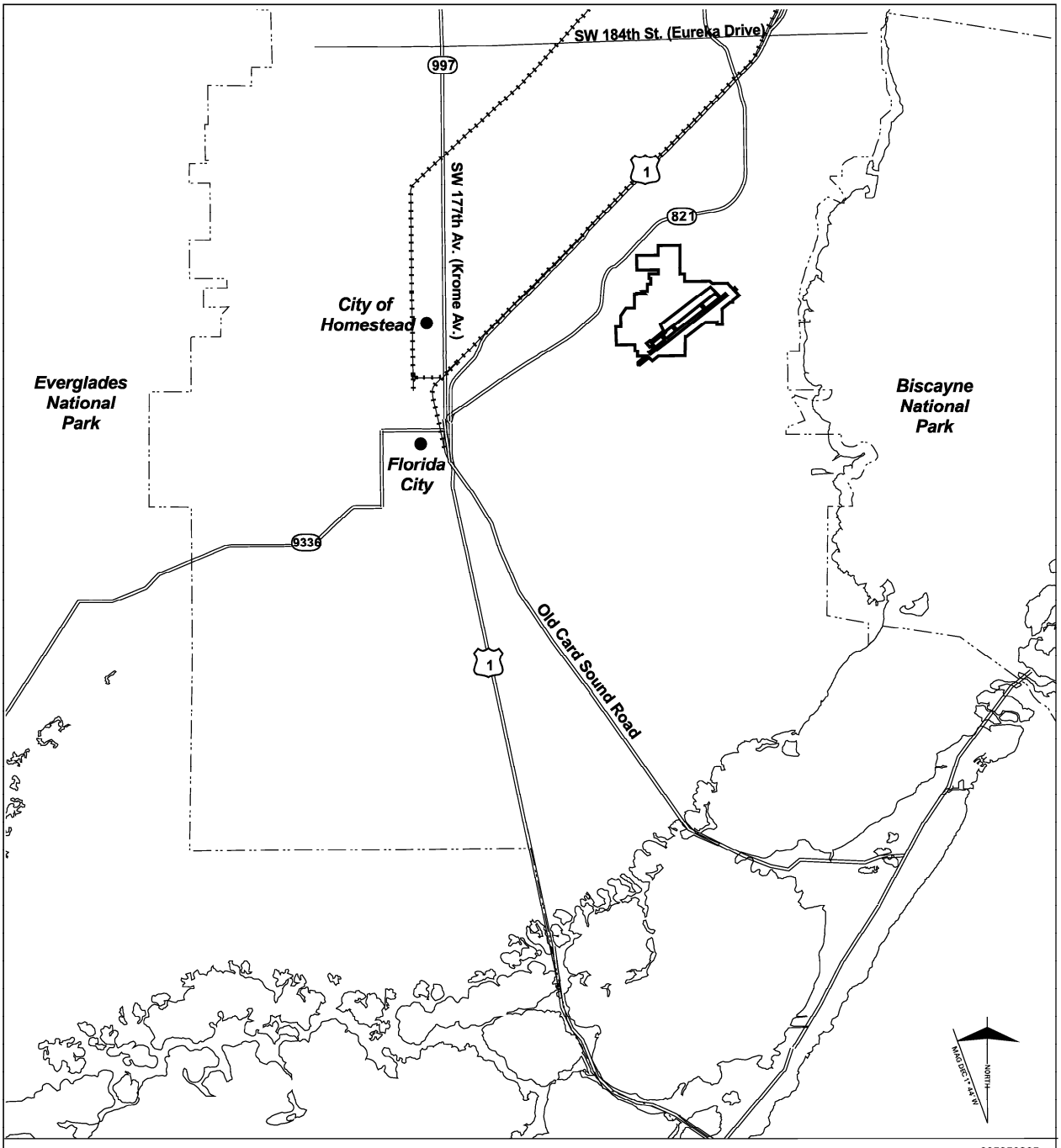

Figure 3.2-1
Region of Influence
for Transportation

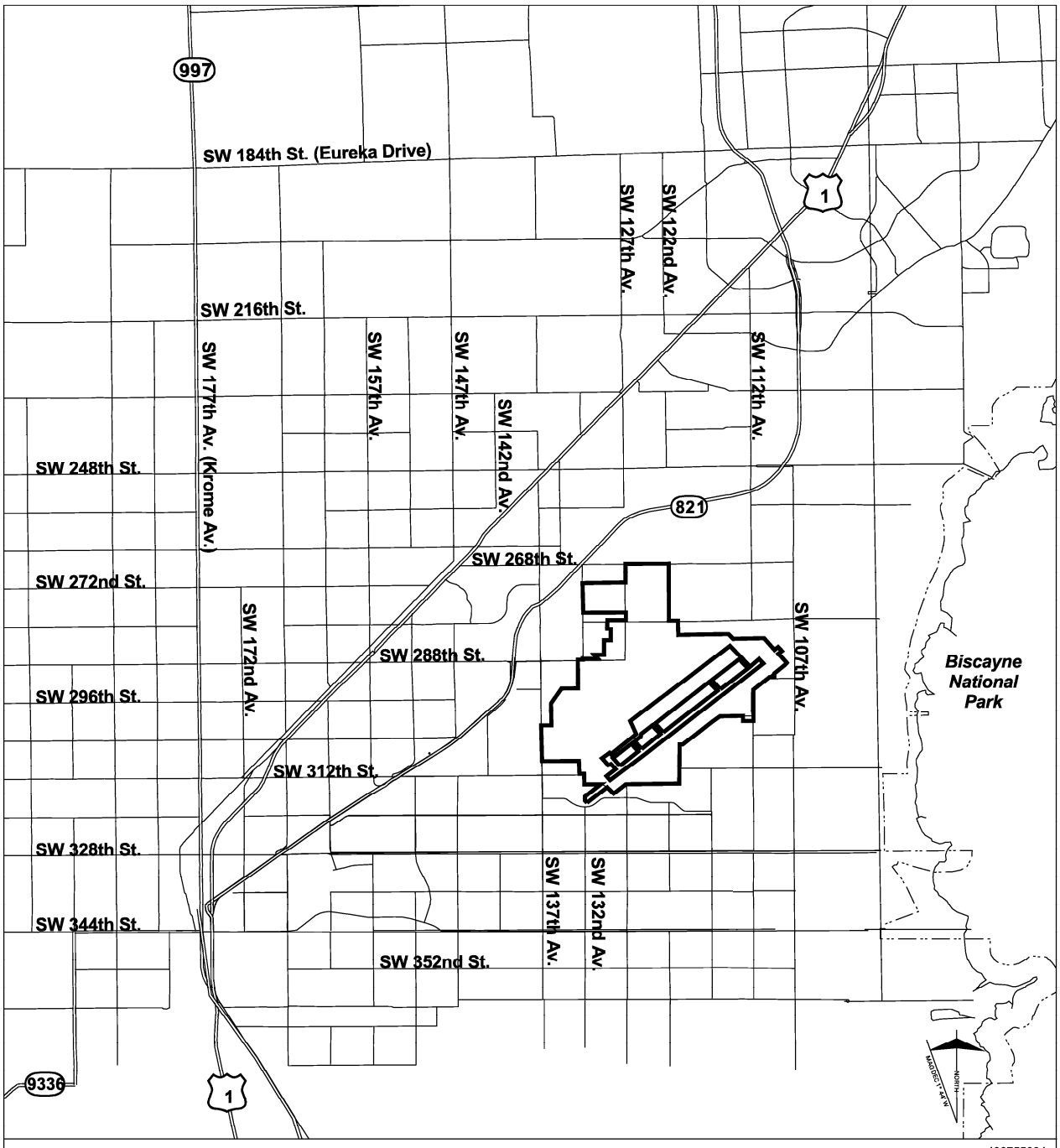

Figure 3.2-2
Roadways in the Vicinity of Former Homestead AFB

Miami and Fort Lauderdale to the north. The nearest interchanges are on SW 112th Avenue, SW 137th Avenue, SW 288th Street, and SW 312th Street. AADT volumes in the ROI ranged from 13,200 to 36,900 vehicles per day in 1997, and LOS is A.

South Dixie Highway (U.S. Highway 1) lies about 2 miles northwest of the former base. The four-lane principal arterial terminates in Key West to the south and connects the former base with Miami and Fort Lauderdale to the north. This roadway follows the east coast of Florida through the state. AADT volumes in the vicinity of the former base ranged from 16,600 to 39,500 vehicles per day in 1997, and LOS ranged from B to D.

SW 177th Avenue (SR 997), also called Krome Avenue, lies about 4.5 miles west of the former base. This two-lane principal arterial terminates in Florida City to the south and intersects U.S. Highway 27 near the Broward County line to the north. This roadway extends through primarily suburban and rural areas of Miami-Dade County. AADT volumes in the vicinity of the former base ranged from 2,100 to 12,400 vehicles per day in 1997, and LOS ranged from B to C.

SW 137th Avenue (Tallahassee Road) lies adjacent to the west side of the former base. This two-lane principal arterial provides an important interchange to the Florida Turnpike Extension and also connects with U.S. Highway 1. Traffic volumes on SW 137th Avenue in the vicinity of former Homestead AFB ranged from 2,300 to 14,200 vehicles per day in 1997, and LOS was B. This roadway provides several important access points, including: an important interchange to the Florida Turnpike Extension and U.S. Highway 1, direct access to the Motorsports Complex and Sports Complex, easy access to the Homestead Park of Commerce and Key Gate Residence, as well as direct access to the west gate (now closed) at former Homestead AFB. Nearly completed, a significant portion of SW 137th Avenue adjacent to former Homestead AFB, between SW 288th Street and SW 344th Street, is being expanded to a four-lane divided roadway.

Local Roads. Several roadways provide important access to the former base, primarily serving local traffic. Local traffic is defined as mainly former Homestead AFB area traffic. SW 112th Avenue, about 1.5 miles northeast of the former base, is a four-lane minor arterial that provides an important interchange with the turnpike for traffic oriented to Miami and also connects with U.S. Highway 1 near Cutler Ridge. South of the turnpike, SW 112th is classified as a collector. Traffic volumes in 1997 ranged from 11,800 to 24,000 vehicles per day, and LOS ranged from B to D.

SW 268th Street (Moody Drive) lies at the north side of the former base. This four-lane minor arterial connects the north base gate (now closed) with SW 112th Avenue to the east and U.S. Highway 1 to the west. The traffic volume in 1997 was approximately 11,700 vehicles per day, and LOS ranged from B to C.

SW 288th Street (Biscayne Drive) provides access to the former west gate of Homestead AFB. This four-lane minor arterial provides an interchange to both the north and southbound lane of the turnpike and also connects with U.S. Highway 1. Traffic volumes in 1997 ranged from 10,150 to 13,700, and LOS ranged from B to D.

SW 312th Street between 137th Avenue and Florida's Turnpike is two lanes and generally operates at LOS C. Between Florida's Turnpike and U.S. Highway 1, this roadway operates at LOS A during peak hours.

SW 328th Street connects to Keys Gate, the sports complexes, Park of Commerce, and Biscayne NP. This two-lane roadway operates at LOS A and LOS B during peak hours.

On-Base Roads. Former Homestead AFB contains a network of internal roads (**Figure 3.2-3**). Prior to realignment, Bougainville Boulevard led to the west gate (now abandoned) and off base to SW 288th Street. In 1988, the last date traffic counts were taken at the gates, the west gate had 11,800 vehicles per day pass through it in both directions. Coral Sea Boulevard led to the old north gate (removed to build the Homeless Assistance Center) and off base to 268th Street. The 1988 volume passing through the north gate was 13,800 vehicles per day. A minor gate at the north side of the former base on Florida Avenue provided access to 268th Street. The 1988 volume for this gate was 850 vehicles per day. All roadways on the former base are two lanes, except Bougainville Boulevard between the west gate and Westover Avenue (four lanes), and Coral Sea Boulevard between the former north gate and Bougainville Boulevard (three and four lanes). Bougainville Boulevard carried approximately 11,000 vehicles per day in 1988 and Coral Sea Boulevard carried about 14,000 vehicles per day. A traffic study prepared by the Air Force in 1988 indicated that these roads were congested at certain times of the day (**USAF 1994a**). Present-day traffic on the base is very low in comparison with prerealignment patterns.

Existing Traffic Conditions. **Table 3.2-1** identifies the maximum peak hour service volumes for key roads in the vicinity of former Homestead AFB as defined in the Miami-Dade County CDMP for 1992 and 1997. **Table 3.2-2** presents peak hour volumes for those roads in 1992 and 1997. The volumes in 1992 were reported in the *Final Environmental Impact Statement, Disposal and Reuse of Homestead Air Force Base* (**USAF 1994a**), which also indicated that peak hour volumes were approximately 7.7 percent of daily traffic counts. This factor was applied to AADT counts and average weekday daily traffic (AWDT) counts obtained for roads in the ROI. For state roads, 1997 AADT counts were available from FDOT (**FDOT 1998**). These are shown in bold on Table 3.2-2. AWDT counts were available for 1996 from Miami-Dade County count stations for some non-state roads (**Metro-Dade County 1996**). For purposes of comparison, these were increased by 1.5 percent to derive comparable 1997 volumes in Table 3.2-2, and are shown in italics. For some roads, the latest data available were for 1994, which were increased by an annual growth rate of 1.5 percent to derive comparable 1997 volumes for comparison purposes. The 1.5 percent annual growth rate is based on the Miami-Dade Metropolitan Planning Organization long-range transportation plan, which projected a 35 percent increase in daily trips between 1995 and 2015 (**Miami-Dade County 1998f**).

Mass Transit

The Miami-Dade County area has a comprehensive mass transit system. The Miami-Dade Transit Agency has 71 bus routes that crisscross the county. Most of the bus routes connect with the Metrorail, a 21 mile elevated rail line. Metrorail connects with Metromover in the downtown Government Center Station, which makes a 1.9 mile loop around downtown Miami. Metrorail also connects with the 67 mile Tri-Rail system serving Miami-Dade, Broward, and Palm Beach counties. Over a quarter-million people ride Miami-Dade Transit each day.

Miami-Dade Transit provides bus service to the Homestead area. Route 70 provides service between Florida City and Cutler Ridge. The route circulates through the City of Homestead and serves Coral Sea Boulevard on the north side of the former base. Route 35 provides service between Florida City and western Kendall, in the area of the south campus of Miami-Dade Community College. This route also circulates around the City of Homestead and serves Coral Sea Boulevard on weekends. Route 38 is a limited-stop express-bus route that operates all day, 7 days a week. Expanded in February 1997, this route connects the Homestead-Florida City area with the Dadeland South Metrorail station. Buses operate on 15 minute headways during peak periods and 30 minute headways during the off-peak periods and weekends (**Peersol 1998**). This express bus route runs along U.S. Highway 1 and connects to the busway, qualifying U.S. Highway 1 to operate at 120 percent of its capacity.

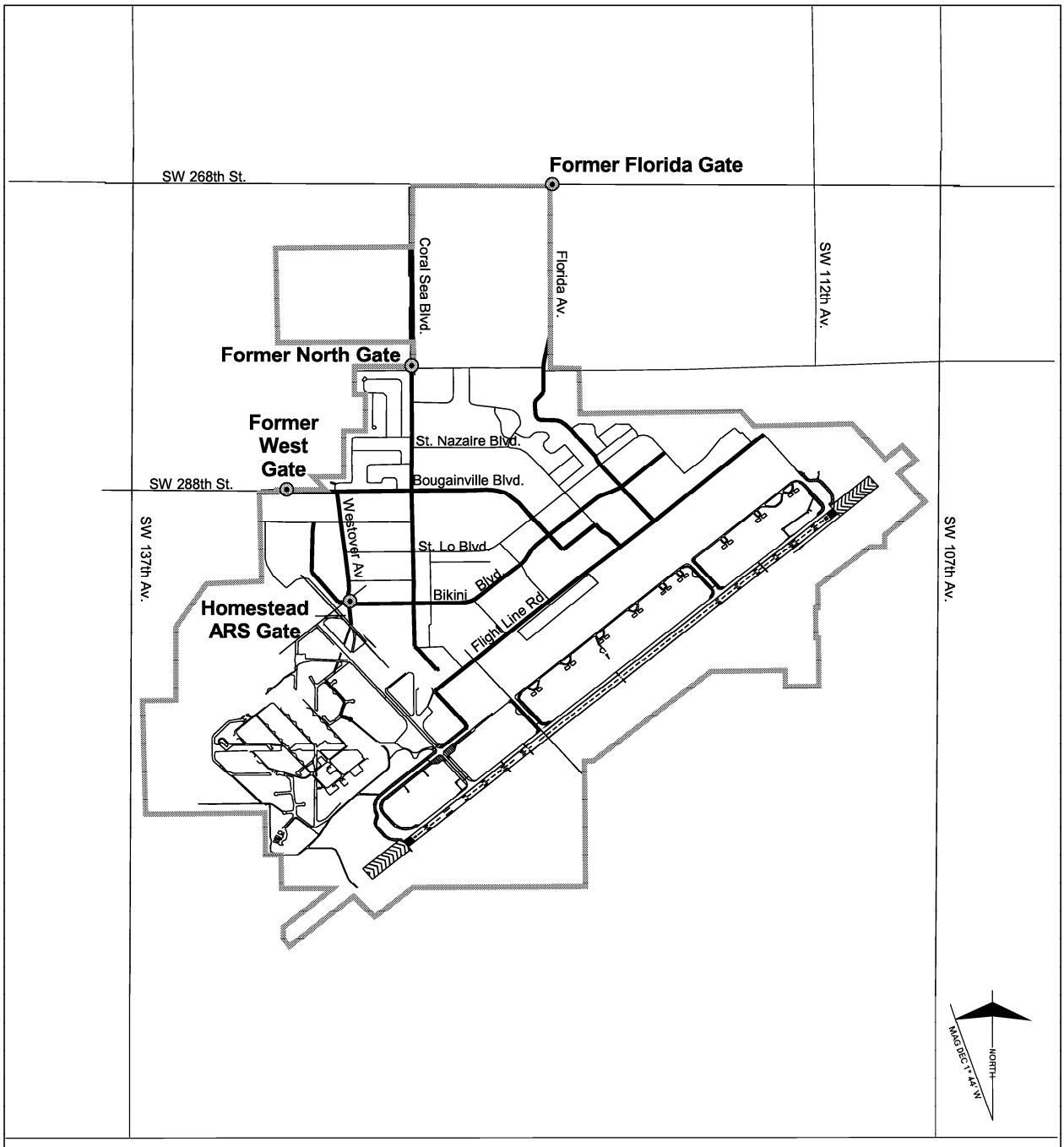

Figure 3.2-3
Key On-Base Roads

Table 3.2-1. Current Maximum Comprehensive Plan Service Volumes on Key Roads

Roadway	Link	Location	Number of Lanes	Peak-Hour Two-Direction Maximum Comprehensive Plan Service Volume	
				1992 [1]	1997 [2]
FL Turnpike Extension	from Old Cutler Road to SW 112th Avenue	MDC	4LX	6360	5700
FL Turnpike Extension	from SW 112th Avenue to SW 137th Avenue	MDC	4LX	6360	5700
FL Turnpike Extension	from SW 137th Avenue to SW 288th Street	MDC	4LX	6360	5700
FL Turnpike Extension	from SW 288th Street to SW 308th Street	MDC	4LX	6360	5700
FL Turnpike Extension	from SW 308th Street to SW 172nd Avenue	H	4LX	5910	5700
FL Turnpike Extension	from SW 172nd Avenue to U.S. Highway 1	FC	4LX	4890	4500
U.S. Highway 1	from SW 112th Avenue to SW 137th Avenue	MDC	4LD	3110	3996
U.S. Highway 1	from SW 137th Avenue to SW 147th Avenue	MDC	4LD	3110	3996
U.S. Highway 1	from SW 147th Avenue to SW 157th Avenue	MDC	4LD	2930	3792
U.S. Highway 1	from SW 157th Avenue to SW 308th Street	MDC	4LD	2930	3792
U.S. Highway 1	from SW 308th Street to SW 328th Street	H	4LD	3110	3320
U.S. Highway 1	from SW 328th Street to SW 336th Street	FC	4LD	2900	3100
U.S. Highway 1	from SW 336th Street to SW 352nd Street	FC	4LD	2900	3100
Krome Avenue	from SW 248th Street to SW 272nd Street	MDC	2L	1480	1420
Krome Avenue	from SW 272nd Street to Homestead City Limits	MDC	2L	1480	1422
Krome Avenue	from Homestead City Limits to SW 328th Street	H	2L	1220	1330
Krome Avenue	from SW 328th Street to SW 352nd Street	FC	2L	1340	1550
SW 107th Avenue	from SW 268th Street to SW 328th Street	MDC	2L	2250	1720
SW 112th Avenue	from U.S. Highway 1 to Old Cutler Road	MDC	4LD	2820	2440
SW 112th Avenue	from Old Cutler Road to FL Turnpike	MDC	4LD	3110	2997
SW 112th Avenue	from FL Turnpike to SW 268th Street	MDC	4LD	3110	3320
SW 127th Avenue	from SW 268th Street to Homestead AFB	MDC	2L	2250	2260
SW 137th Avenue	from U.S. Highway 1 to SW 268th Street	MDC	2L	1480	1422
SW 137th Avenue	from SW 268th Street to SW 288th Street	MDC	2L	1480	1422
SW 137th Avenue	from SW 288th Street to SW 328th Street	MDC	2L	2250	1422

Roadway	Link	Location	Number of Lanes	Peak-Hour Two-Direction Maximum Comprehensive Plan Service Volume	
				1992 [1]	1997 [2]
SW 268th Street	from SW 112th Avenue to SW 122nd Avenue	MDC	4LD	3110	3100
SW 268th Street	from SW 122nd Avenue to SW 137th Avenue	MDC	4LD	3110	2997
SW 268th Street	from SW 137th Avenue to U.S. Highway 1	MDC	4LD	2930	2844
SW 288th Street	from SW 132nd Avenue to SW 137th Avenue	MDC	4LD	3110	2997
SW 288th Street	from SW 137th Avenue to FL Turnpike	MDC	4LD	2820	2440
SW 288th Street	from FL Turnpike to U.S. Highway 1	MDC	4LD	2930	2844
SW 312th Street	from SW 137th Avenue to 3-Mile Road	MDC	2L	2250	1422
SW 312th Street	from 3-Mile Road to FL Turnpike	H	2L	2250	1580
SW 312th Street	from FL Turnpike to U.S. Highway 1	H	4LD	2930	3160
SW 328th Street	from SW 112th Avenue to SW 142nd Avenue	MDC	2L	2250	1720
SW 328th Street	from SW 142nd Avenue to Homestead City Limits	MDC	2L	2250	2260
SW 344th Street	from SW 112th Avenue to SW 132nd Avenue	MDC	2L	2250	1720
SW 344th Street	from SW 132nd Avenue to SW 147th Avenue	H	2L	2250	3010

Source: **USAF 1994a**; **FDOT 1995**, **1998**; **Metro-Dade County 1996**; **Miami-Dade County 1998f**.

Notes: [1] Service volumes are from the 1992 Update to the Florida Level of Service Standards and Guidelines Manual for Planning for the minimum acceptable LOS of the governmental jurisdiction where the roadway segment is located. The minimum acceptable LOS for Miami-Dade County in the Urban Infill Area of the ROI was 15 percent below LOS E until January 1, 1995.

[2] Service volumes are from the 1995 Florida Level of Service Standards and Guidelines Manual for Planning for the minimum acceptable LOS of the governmental jurisdiction where the roadway segment is located. As of 1997, the minimum acceptable LOS for Miami-Dade County between the Urban Infill Area and the Urban Development Boundary is LOS D (90 percent of capacity) with the following exceptions: on state urban minor arterials the minimum acceptable LOS is E; where mass transit is provided with headways less that 20 minutes, parallel roadways within 0.5 mile of the transit service shall operate at LOS E; where extraordinary transit service exists, such as commuter rail or express bus service, parallel roads within 0.5 mile shall operate at no greater than 120 percent of their capacity.

FC Florida City H City of Homestead MDC Miami-Dade County
2L two-lane undivided 4LD four-lane divided 4LX four-lane expressway

Table 3.2-2. Peak Hour Conditions on Key Roads

Roadway	Link	Peak-Hour Two-Direction Traffic Volumes			
		1992	LOS	1997 [1]	LOS
FL Turnpike Extension	from Old Cutler Road to SW 112th Avenue	1954	A	**2094**	B
FL Turnpike Extension	from SW 112th Avenue to SW 137th Avenue	1954	A	**2094**	B
FL Turnpike Extension	from SW 137th Avenue to S. W. 288th Street	2498	B	**2148**	B
FL Turnpike Extension	from SW 288th Street to SW 308th Street	2087	A	**1887**	A
FL Turnpike Extension	from SW 308th Street to SW 172nd Avenue	1111	A	**1016**	A
FL Turnpike Extension	from SW 172nd Avenue to U.S. Highway 1	465	A	**1016**	A
U.S. Highway 1	from SW 112th Avenue to SW 137th Avenue	2526	C	**3042**	C
U.S. Highway 1	from SW 137th Avenue to SW 147th Avenue	2526	C	2541	B
U.S. Highway 1	from SW 147th Avenue to SW 157th Avenue	2526	D	*2486*	D
U.S. Highway 1	from SW 157th Avenue to SW 308th Street	2145	D	**2349**	D
U.S. Highway 1	from SW 308th Street to SW 328th Street	1383	B	**1663**	B
U.S. Highway 1	from SW 328th Street to SW 336th Street	1383	B	**1278**	B
U.S. Highway 1	from SW 336th Street to SW 352nd Street	1383	B	**1371**	B
Krome Avenue	from SW 248th Street to SW 272nd Street	968	B	*1025*	B
Krome Avenue	from SW 272nd Street to Homestead City Limits	968	B	**878**	B
Krome Avenue	from Homestead City Limits to SW 328th Street	659	C	**162**	C
Krome Avenue	from SW 328th Street to SW 352nd Street	195	B	**955**	B
SW 107th Avenue	from SW 268th Street to SW 328th Street	NA	NA	63	A
SW 112th Avenue	from U.S. Highway 1 to Old Cutler Road	1950	D	**1679**	D
SW 112th Avenue	from Old Cutler Road to FL Turnpike	1413	B	*1851*	B
SW 112th Avenue	from FL Turnpike to SW 268th Street	1481	B	*906*	B
SW 127th Avenue	from SW 268th Street to Homestead AFB	1828	E	162	A
SW 137th Avenue	from U.S. Highway 1 to SW 268th Street	255	B	*225*	B
SW 137th Avenue	from SW 268th Street to SW 288th Street	1122	C	*1097*	B
SW 137th Avenue	from SW 288th Street to SW 328th Street	392	B	178	B

Roadway	Link	Peak-Hour Two-Direction Traffic Volumes			
		1992	LOS	1997 [1]	LOS
SW 268th Street	from SW 112th Avenue to SW 122nd Avenue	1420	B	*902*	B
SW 268th Street	from SW 122nd Avenue to SW 137th Avenue	966	B	*902*	B
SW 268th Street	from SW 137th Avenue to U.S. Highway 1	971	C	*899*	C
SW 288th Street	from SW 132nd Avenue to SW 137th Avenue	1318	B	*1055*	B
SW 288th Street	from SW 137th Avenue to FL Turnpike	1435	C	*1055*	D
SW 288th Street	from FL Turnpike to U.S. Highway 1	1736	C	*782*	C
SW 312th Street	from SW 137th Avenue to 3-Mile Road	396	A	68	B
SW 312th Street	from 3-Mile Road to FL Turnpike	1778	C	*1612*	C
SW 312th Street	from FL Turnpike to U.S. Highway 1	432	B	*153*	A
SW 328th Street	from SW 142nd Avenue to Homestead City Limits	432	B	*153*	A
SW 328th Street	from SW 112th Avenue to SW 142nd Avenue	396	A	115	B
SW 344th Street	from SW 112th Avenue to SW 132nd Avenue	675	B	10	A
SW 344th Street	from SW 132nd Avenue to SW 147th Avenue	297	A	*164*	A

Source: **FDOT 1998, Metro-Dade County 1996, Miami-Dade County 1998f.**

Note: [1] The peak hour volumes given in **bold** were calculated from AADT counts for state facilities collected by FDOT for 1997. The peak hour volumes given in *italics* were calculated from 1996 AWDT counts, increased by 1.5 percent from Miami-Dade County maintained count stations. The peak hour volumes are 7.7 percent of these 1997 AADT and AWDT counts. Where counts were not available, an annual growth rate of 1.5 percent was applied to 1994 peak hour volumes developed by Miami Urban Area Transportation Planning model to arrive at the 1997 values.

AADT Annual Average Daily Traffic (vehicles/day)

AWDT Average Weekday Daily Traffic (vehicles/day)

LOS Level of Service

An 8.2 mile exclusive busway (Route 31) connects the Cutler Ridge Mall area to the Dadeland South Metrorail station. Both full-size buses and minibuses operate on the busway and in adjacent neighborhoods, entering the exclusive lanes at major intersections. Local and limited-stop service is offered between Florida City and Dadeland South Metrorail station. The busway runs parallel to U.S. Highway 1 in an old railroad right-of-way.

Emergency Evacuation

Evacuation procedures are in place in south Florida to respond to the threat of a hurricane or an accident at the Turkey Point Nuclear Power Plant. In the event of a hurricane, mandatory evacuation of residents in south Florida, the Florida Keys, Anglers Club, and Ocean Reef Community will follow two designated evacuation routes: U.S. Highway 1 and Florida's Turnpike (**Metro-Dade County 1995c**). In case of an emergency at Turkey Point, the following links in the ROI are designated for evacuation (**NRC 1997**):

- Florida Turnpike Extension
- U.S. Highway 1 north of SW 137th Avenue and south of SW 344th Street
- Krome Avenue north of SW 360th Street
- SW 107th Avenue north of SW 328th Street
- SW 137th Avenue north of SW 328th Street
- SW 328th Street east of SW 137th Avenue
- SW 344th Street east of U.S. Highway 1

Certain segments of U.S. Highway 1 and Krome Avenue are expected to operate near or above capacity. This could have implications for emergency evacuations depending on the effectiveness of emergency traffic control procedures.

In the event of an emergency, the American Red Cross has selected approximately 75 sites, mostly schools, to be used as evacuation centers. Seven special-needs evacuation centers are also available to people needing extra assistance due to a disability. These evacuation centers are only used as a last resort. All the evacuation centers are outside the ROI. A listing of these shelters can be found on the Miami-Dade Office of Emergency Management home page at www.co.miami-dade.fl.us/oem/arcevaccent.htm. However, every site is not open for every evacuation.

3.2.3 Projected Baseline Environment

Projected Roadway Improvements

Several roadway improvement projects that will have a direct impact on capacity, access, and LOS are planned in the ROI by the year 2015. These projects are listed in the Miami-Dade Long Range Transportation Plan (LRTP) (**Metro-Dade County 1995c**) and the 1999 Miami-Dade Transportation Improvement Program (**Metro-Dade County 1995c**). The projects in the ROI are as follows:

- Widening of SW 137th Avenue from two to four lanes from SW 336th Street to north of SW 312th Street.
- Widening of SW 137th Avenue from two to four lanes will be continued from north of SW 312th Street to Florida's Turnpike.

- Widening of the Florida Turnpike Extension from four to six lanes from Quail Roost Drive to SW 288th Street.
- Widening of SW 112th Avenue to six lanes from former Homestead AFB to the Florida Turnpike Extension.
- Widening of SW 112th Avenue from four to six lanes from U.S. Highway 1 to the Florida Turnpike Extension

An extension of the U.S. Highway 1 Busway to Florida City is also being considered. All of the projects are subject to the availability of funding and other considerations. The schedules may therefore be delayed or accelerated accordingly.

Projected Traffic Volumes

The planned and expected roadway improvements (i.e., additional lanes) in the vicinity of Homestead AFB are included in the projected baseline LOS. The changes in the number of lanes and the corresponding maximum comprehensive plan service volumes are presented in **Table 3.2-3**. Peak hour traffic volumes, as presented in **Table 3.2-4**, were computed by applying a 1.5 percent annual growth rate to the 1997 peak hour traffic volumes presented in Table 3.2-2. Additional trips associated with retained and conveyed property at former Homestead AFB were also added. Based on these peak hour traffic volumes, no roadway links are expected to exceed the minimum acceptable LOS, based on local government criteria, during the projected baseline years.

Although not surpassing the minimum acceptable LOS, the following segments of U.S. Highway 1 will be near or over capacity for the years indicated:

- SW 112th Avenue to SW 137th Avenue (LOS F in 2005 and 2015).
- SW 137th Avenue to SW 147th Avenue (LOS F in 2015).
- SW 147th Avenue to SW 157th Avenue (LOS E in 2005 and LOS F in 2015).
- SW 157th Avenue to SW 308th Street (LOS E in 2005 and LOS F in 2015).

Many of these problematic links will operate at LOS F, indicating that there will be lines and stop-and-go driving at these locations. However, none will exceed the maximum comprehensive plan service volume due to the fact that there is extraordinary transit service such as commuter rail or express buses in these locations.

Table 3.2-3. Projected Maximum Comprehensive Plan Service Volumes on Key Roads

Roadway	Link	Location	Number of Lanes[1]			Peak Hour Two-Direction Maximum Comprehensive Plan Service Volume[2]		
			2000	2005	2015	2000	2005	2015
FL Turnpike Extension	from Old Cutler Road to SW 112th Avenue	MDC	4LX	6LX	6LX	5700	8200	8200
FL Turnpike Extension	from SW 112th Avenue to SW 137th Avenue	MDC	4LX	6LX	6LX	5700	8200	8200
FL Turnpike Extension	from SW 137th Avenue to SW 288th Street	MDC	4LX	6LX	6LX	5700	8200	8200
FL Turnpike Extension	from SW 288th Street to SW 308th Street	MDC	4LX	4LX	4LX	5700	5700	5700
FL Turnpike Extension	from SW 308th Street to SW 172nd Avenue	H	4LX	4LX	4LX	5700	5700	5700
FL Turnpike Extension	from SW 172nd Avenue to U.S. Highway 1	FC	4LX	4LX	4LX	4500	4500	4500
U.S. Highway 1	from SW 112th Avenue to SW 137th Avenue	MDC	4LD	4LD	4LD	3996	3996	3996
U.S. Highway 1	from SW 137th Avenue to SW 147th Avenue	MDC	4LD	4LD	4LD	3996	3996	3996
U.S. Highway 1	from SW 147th Avenue to SW 157th Avenue	MDC	4LD	4LD	4LD	3792	3792	3792
U.S. Highway 1	from SW 157th Avenue to SW 308th Street	MDC	4LD	4LD	4LD	3792	3792	3792
U.S. Highway 1	from SW 308th Street to SW 328th Street	H	4LD	4LD	4LD	3320	3320	3320
U.S. Highway 1	from SW 328th Street to SW 336th Street	FC	4LD	4LD	4LD	3100	3100	3100
U.S. Highway 1	from SW 336th Street to SW 352nd Street	FC	4LD	4LD	4LD	3100	3100	3100
Krome Avenue	from SW 248th Street to SW 272nd Street	MDC	2L	2L	2L	1420	1420	1420
Krome Avenue	from SW 272nd Street to Homestead City Limits	MDC	2L	2L	2L	1422	1422	1422
Krome Avenue	from Homestead City Limits to SW 328th Street	H	2L	2L	2L	1330	1330	1330
Krome Avenue	from SW 328th Street to SW 352nd Street	FC	2L	2L	2L	1550	1550	1550
SW 107th Avenue	from SW 268th Street to SW 328th Street	MDC	2L	2L	2L	1720	1720	1720
SW 112th Avenue	from U.S. Highway 1 to Old Cutler Road	MDC	4LD	4LD	6LD	2440	2440	3750
SW 112th Avenue	from Old Cutler Road to FL Turnpike	MDC	4LD	4LD	6LD	2997	2997	4500
SW 112th Avenue	from FL Turnpike to SW 268th Street	MDC	4LD	4LD	6LD	3320	3320	5000
SW 127th Avenue	from SW 268th Street to Homestead AFB	MDC	2L	2L	2L	2260	2260	2260
SW 137th Avenue	from U.S. Highway 1 to SW 268th Street	MDC	2L	2L	4LD	1422	1422	2997
SW 137th Avenue	from SW 268th Street to SW 288th Street	MDC	2L	2L	4LD	1422	1422	2997
SW 137th Avenue	from SW 288th Street to SW 328th Street	MDC	4LD	4LD	4LD	2997	2997	2997

Roadway	Link	Location	Number of Lanes[1]			Peak Hour Two-Direction Maximum Comprehensive Plan Service Volume[2]		
			2000	2005	2015	2000	2005	2015
SW 268th Street	from SW 112th Avenue to SW 122nd Avenue	MDC	4LD	4LD	4LD	3100	3100	3100
SW 268th Street	from SW 122nd Avenue to SW 137th Avenue	MDC	4LD	4LD	4LD	2997	2997	2997
SW 268th Street	from SW 137th Avenue to U.S. Highway 1	MDC	4LD	4LD	4LD	2844	2844	2844
SW 288th Street	from SW 132nd Avenue to SW 137th Avenue	MDC	4LD	4LD	4LD	2997	2997	2997
SW 288th Street	from SW 137th Avenue to FL Turnpike	MDC	4LD	4LD	4LD	2440	2440	2440
SW 288th Street	from FL Turnpike to U.S. Highway 1	MDC	4LD	4LD	4LD	2844	2844	2844
SW 312th Street	from SW 137th Avenue to 3-Mile Road	MDC	2L	2L	2L	1422	1422	1422
SW 312th Street	from 3-Mile Road to FL Turnpike	H	2L	2L	2L	1580	1580	1580
SW 312th Street	from FL Turnpike to U.S. Highway 1	H	4LD	4LD	4LD	3160	3160	3160
SW 328th Street	from SW 112th Avenue to SW 142nd Avenue	MDC	2L	2L	2L	1720	1720	1720
SW 328th Street	from SW 142nd Avenue to Homestead City Limits	MDC	2L	2L	2L	2260	2260	2260
SW 344th Street	from SW 112th Avenue to SW 132nd Avenue	MDC	2L	2L	2L	1720	1720	1720
SW 344th Street	from SW 132nd Avenue to SW 147th Avenue	H	4LD	4LD	4LD	6510	6510	6510

Source: **Metro-Dade County 1995c, FDOT 1995**; SAIC.

Notes: [1] Number of lanes include planned or expected roadway improvements.

[2] Service volumes are from the 1995 *Florida Level of Service Standards and Guidelines Manual for Planning* for the minimum acceptable LOS of the governmental jurisdiction where the roadway segment is located.

FC	Florida City	H	City of Homestead	MDC	Miami-Dade County
2L	two-lane undivided	4LD	four-lane divided	4LX	four-lane expressway
6LD	six-lane divided	6LX	six-lane expressway		

Table 3.2-4. Projected Peak Hour Conditions on Key Roads

Roadway	Link	2000		2005		2015	
		Peak-Hour Two-Direction Traffic Volume [1]	LOS	Peak-Hour Two-Direction Traffic Volumes [1]	LOS	Peak-Hour Two-Direction Traffic Volumes [1]	LOS
FL Turnpike Extension	from Old Cutler Road to SW 112th Avenue	2358	B	2548	A	2982	B
FL Turnpike Extension	from SW 112th Avenue to SW 137th Avenue	2242	B	2418	A	2814	B
FL Turnpike Extension	from SW 137th Avenue to SW 288th Street	2246	B	2420	A	2809	B
FL Turnpike Extension	from SW 288th Street to SW 308th Street	2119	B	2584	B	2678	B
FL Turnpike Extension	from SW 308th Street to SW 172nd Avenue	1191	A	1289	A	1514	A
FL Turnpike Extension	from SW 172nd Avenue to U.S. Highway 1	1154	A	1247	A	1461	B
U.S. Highway 1	from SW 112th Avenue to SW 137th Avenue	3219	D	3470	F	4032	F
U.S. Highway 1	from SW 137th Avenue to SW 147th Avenue	2696	C	2906	C	3378	F
U.S. Highway 1	from SW 147th Avenue to SW 157th Avenue	2693	D	2906	E	3385	F
U.S. Highway 1	from SW 157th Avenue to SW 308th Street	2558	D	2761	E	3218	F
U.S. Highway 1	from SW 308th Street to SW 328th Street	1811	B	1955	B	2278	B
U.S. Highway 1	from SW 328th Street to SW 336th Street	1422	B	1536	B	1795	B
U.S. Highway 1	from SW 336th Street to SW 352nd Street	1486	B	1604	B	1869	B
Krome Avenue	from SW 248th Street to SW 272nd Street	1075	B	1159	B	1346	C
Krome Avenue	from SW 272nd Street to Homestead City Limits	925	B	997	B	1158	B
Krome Avenue	from Homestead City Limits to SW 328th Street	179	C	194	C	226	C
Krome Avenue	from SW 328th Street to SW 352nd Street	1015	B	1096	B	1273	C
SW 107th Avenue	from SW 268th Street to SW 328th Street	87	A	95	A	113	A
SW 112th Avenue	from U.S. Highway 1 to Old Cutler Road	1808	D	1951	D	2272	D
SW 112th Avenue	from Old Cutler Road to FL Turnpike	2018	B	2179	B	2541	B
SW 112th Avenue	from FL Turnpike to SW 268th Street	1142	B	1240	B	1468	B
SW 127th Avenue	from SW 268th Street to Homestead AFB	594	A	662	A	830	B
SW 137th Avenue	from U.S. Highway 1 to SW 268th Street	298	B	325	B	386	B
SW 137th Avenue	from SW 268th Street to SW 288th Street	1317	C	1427	D	1681	B
SW 137th Avenue	from SW 288th Street to SW 328th Street	225	B	244	B	288	B

Roadway	Link	2000		2005		2015	
		Peak-Hour Two-Direction Traffic Volume [1]	LOS	Peak-Hour Two-Direction Traffic Volumes [1]	LOS	Peak-Hour Two-Direction Traffic Volumes [1]	LOS
SW 268th Street	from SW 112th Avenue to SW 122nd Avenue	1163	B	1264	B	1499	B
SW 268th Street	from SW 122nd Avenue to SW 137th Avenue	1159	B	1259	B	1493	B
SW 268th Street	from SW 137th Avenue to U.S. Highway 1	1030	C	1113	C	1306	C
SW 288th Street	from SW 132nd Avenue to SW 137th Avenue	1451	B	1581	B	1885	B
SW 288th Street	from SW 137th Avenue to FL Turnpike	1408	D	1533	D	1823	D
SW 288th Street	from FL Turnpike to U.S. Highway 1	994	C	1079	C	1279	C
SW 312th Street	from SW 137th Avenue to 3-Mile Road	78	B	85	B	99	B
SW 312th Street	from 3-Mile Road to FL Turnpike	127	B	138	B	160	B
SW 312th Street	from FL Turnpike to U.S. Highway 1	1703	C	1836	D	2133	D
SW 328th Street	from SW 112th Avenue to SW 142nd Avenue	163	A	177	A	205	A
SW 328th Street	from SW 142nd Avenue to Homestead City Limits	163	A	177	A	205	A
SW 344th Street	from SW 112th Avenue to SW 132nd Avenue	14	A	16	A	19	A
SW 344th Street	from SW 132nd Avenue to SW 147th Avenue	175	A	189	A	220	A

Source: **Miami-Dade County 1998f**; SAIC.

Note: [1] Peak hour volumes were computed by applying a 1.5 percent annual growth rate to the 1997 peak hour volumes and adding trips for retained and conveyed property at former Homestead AFB.

LOS Level of Service

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3.3 UTILITIES

3.3.1 Introduction

The utility systems described in this section include water, wastewater, solid waste, electricity, and natural gas.

3.3.1.1 Resource Definition

For purposes of this SEIS, utilities include public agencies and private companies that provide treatment, storage, and distribution of potable water; collection, treatment, and disposal of wastewater; collection, recycling, and disposal of solid waste; generation and distribution of electricity; and distribution of natural gas.

3.3.1.2 Applicable Laws and Regulations

Following are summaries of laws and regulations that apply to the operation of utilities in Florida.

Safe Drinking Water Act (Title 42, United States Code [U.S.C.] Chapter 300f et seq.). The primary objectives of the Safe Drinking Water Act are protection of the nation's sources of drinking water and protection of public health to the maximum extent possible using proper water treatment techniques. Facilities that treat drinking water supplies are regulated by the states through permits. Underground sources of drinking water are protected through application of drinking water standards, identification of critical aquifer protection areas, and protection of wellhead areas from contaminants.

Florida Safe Drinking Water Act (Sections 403.850–403.876, Florida Statutes). This statute expresses the state's policy that the citizens of Florida be assured of the availability of safe drinking water. The act provides for safe drinking water at all times throughout the state, with due regard for economic factors and efficiency in government.

Clean Water Act, as amended (33 U.S.C. 1251 et seq.). The Clean Water Act is the primary federal law that protects the nation's waters, including lakes, rivers, and coastal areas. The objective of the act is to restore and maintain the chemical, physical, and biological integrity of the nation's waters.

Water and Wastewater System Regulatory Law (Chapter 367, Florida Statutes). These regulations govern the operation of water and wastewater utilities in the State of Florida for the protection of the public health, safety, and welfare.

County Water and Sewer District Law (Sections 153.50–153.88, Florida Statutes). These laws govern the provision and regulation of sewage disposal and water supply facilities in unincorporated areas of the State of Florida.

Florida Solid Waste Management Act of 1988. This act provides the framework for management of solid waste in the State of Florida.

Florida Energy Efficiency and Conservation Act (Sections 366.80–366.85 and 403.519, Florida Statutes). This act ensures development of the most efficient and cost-effective energy conservation systems in order to protect the health, prosperity, and general welfare of the state and its citizens and to conserve expensive resources, particularly petroleum fuels.

Natural Gas Transmission Pipeline Intrastate Regulatory Act (Sections 368.101–368.112, Florida Statutes). This act regulates natural gas intrastate transmission and sale to protect the public interest.

3.3.1.3 Region of Influence

The ROI for utilities (**Figure 3.3-1**) is typically comprised of either the total service area or a portion of the service area of each utility. These ROIs generally include unincorporated portions of south Miami-Dade County, the City of Homestead, Florida City, and former Homestead AFB.

The ROI for potable water service extends from Flagler Street on the north to the southern extent of the UDB at Lucille Drive (360th Street), which forms the southernmost boundary of Florida City. The ROI includes the service areas of the Alexander Orr Water Treatment Plant, the Rex System treatment plants, the City of Homestead, Florida City, and former Homestead AFB.

The ROI for wastewater service extends from Bird Drive (42nd Street) on the north to the southern extent of the UDB at SW 360th Street. The ROI includes the service areas of the South District Sewage Treatment Plant and the City of Homestead.

The ROI for solid waste service is defined as the portion of Miami-Dade County south of SW 184th Street (Eureka Drive).

The ROI for electric power is south Miami-Dade County. The service area, however, cannot be defined in limited terms because the Florida Power and Light Company (FPL) service area covers a large portion of the state.

The ROI for natural gas is south Miami-Dade County from approximately SW 42nd Street to the southernmost extent of the City Gas service area at approximately Old Cutler Road, just south of the intersection of Florida's Turnpike and U.S. Highway 1.

3.3.2 Potable Water

The Miami-Dade Water and Sewer Department (WASD) and various municipal utilities provide essentially all of the potable water service in Miami-Dade County. Water service is provided for developed areas within the UDB, and extension of water service outside of the UDB is discouraged in accordance with the Miami-Dade County CDMP Water and Sewer Sub-Element Policy 1A (**Metro-Dade County 1997a**).

Water sources (both surface water and groundwater) are managed by the South Florida Water Management District to meet existing and future water demands in Miami-Dade County. SFWMD allocates groundwater to WASD and the municipal utilities by limiting withdrawals from wellfields. Water sources are further discussed in Section 3.10.

3.3.2.1 Existing Environment

Three water agencies provide potable water service in the ROI: the Miami-Dade WASD, the City of Homestead Utilities Department, and the Florida City Water and Sewer Department. The current permitted capacity, average daily flow, maximum daily flow, and available treatment capacity for water treatment plants in the ROI are shown in **Table 3.3-1**. Available treatment capacity is calculated as permitted capacity minus maximum daily flow, which leaves unused or "available" capacity.

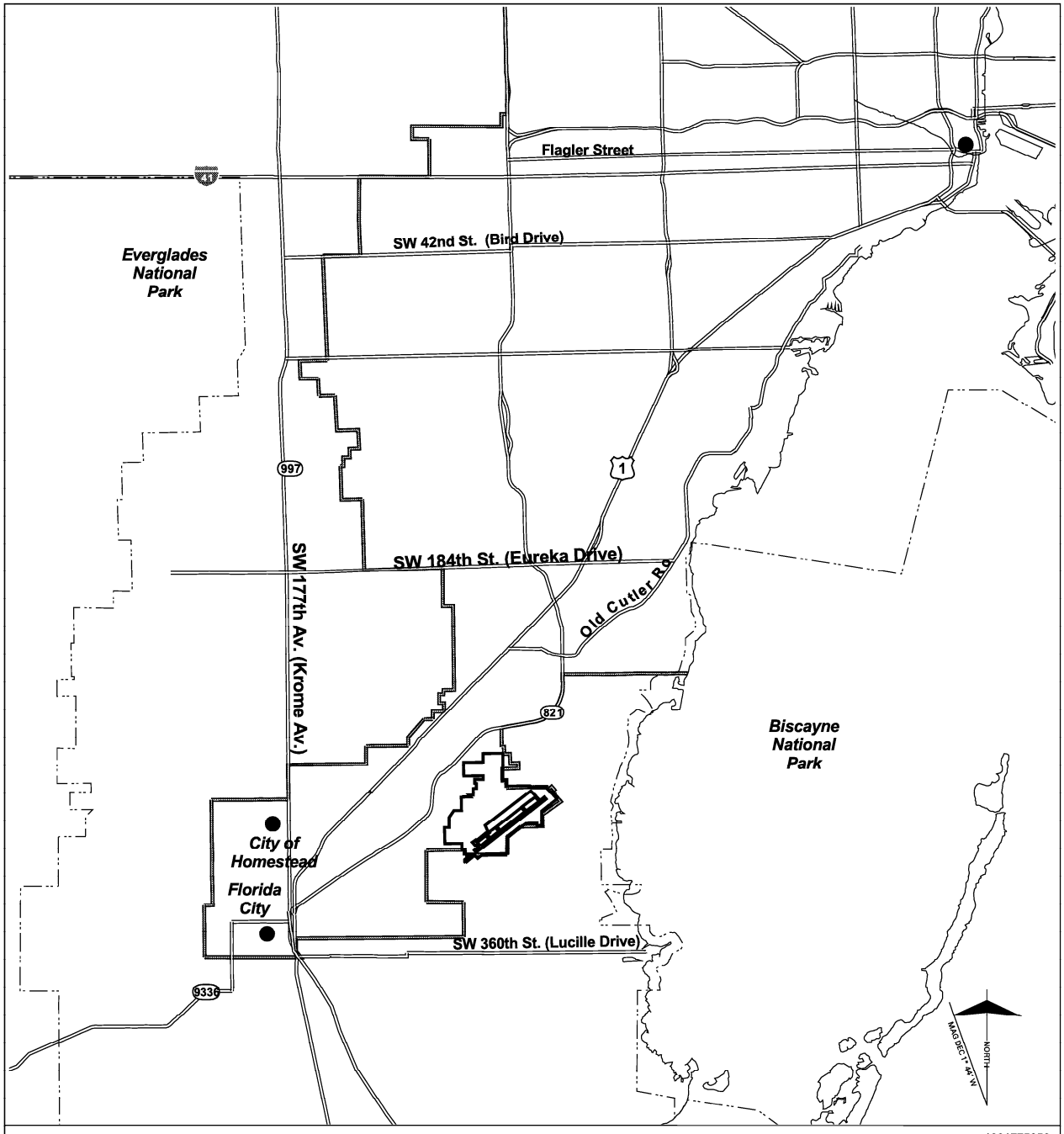


Figure 3.3-1
Region of Influence for Utilities

Table 3.3-1. Water Treatment Plant Capacities and Flows

Water Treatment Plant	Permitted Capacity (mgd)	Average Daily Flow (mgd)	Maximum Daily Flow (mgd)	Available Capacity (mgd)[1]
Alexander Orr (WASD)	196.0	174.6	184.6	11.4
Rex System (WASD)	12.6	6.2	7.6	5.0
City of Homestead	17.0	8.1	9.3	7.7
Florida City	4.1	2.6	3.0	1.1
Former Homestead AFB	3.0	0.8	0.9	2.1
Total	**232.7**	**192.3**	**205.4**	**27.3**

Sources: **Miami-Dade County 1998b**; **James Duncan & Associates 1996a**, **1996b**; **Shannon 1998**.
Note: [1] Available Capacity = Permitted Capacity – Maximum Daily Flow
mgd million gallons per day
WASD Water and Sewer Department (Miami-Dade County)

The following paragraphs describe the water treatment and distribution systems in the ROI. Estimated average daily water consumption in the ROI for 1990, 1997, and the projected baseline years are presented in **Table 3.3-2**.

Table 3.3-2. Average Daily Water Consumption in the ROI

Water Treatment Plant Service Areas	1990 (mgd)	1997 (mgd)	2000 (mgd)[1]	2005 (mgd)[1]	2015 (mgd)[1]
Alexander Orr (WASD)	153.5	174.6	187.0	206.0	245.0
Rex System (WASD)	5.5	6.2	6.6	7.2	8.3
City of Homestead	7.1	8.1	11.4	13.6	19.9
Florida City	2.3	2.6	3.2	3.9	5.8
Former Homestead AFB	2.0	0.8	0.3	0.3	0.3
Total	**170.4**	**192.3**	**208.5**	**231.0**	**279.3**

Sources: **Miami-Dade County 1998b**, **USAF 1994a**, **Shannon 1998**.
Note: [1] Projected water consumption based on projected population (see Section 3.1.3).
mgd million gallons per day
WASD Water and Sewer Department (Miami-Dade County)

Miami-Dade Water and Sewer Department

Treated potable water is supplied to most of the ROI from WASD's Alexander Orr Water Treatment Facility located in the northern portion of the ROI. Alexander Orr has a permitted capacity of 196 million gallons per day (mgd) and an average daily flow of 174.6 mgd. The plant is planned for expansion to a capacity of 220 mgd. It is supplied with raw water from wells located at the plant and at Snapper Creek, Southwest, and West wellfields. These wells have a total annual allocation of 203.1 mgd and a maximum day allocation of 241.7 mgd from SFWMD.

South of SW 264th Street (Bauer Drive), several small plants formerly operated by Rex Utilities are now owned and operated by WASD and serve much of the unincorporated area west and north of former Homestead AFB. The Rex treatment facilities have a rated capacity of 12.6 mgd and an average daily

flow of 6.2 mgd. They are supplied with raw water from five small wellfields with a total annual allocation of about 10 mgd and a maximum day allocation of 15.9 mgd from SFWMD.

WASD has plans to develop a new wellfield and water treatment plant in the south Miami-Dade area (**Miami-Dade County 1998b**). These facilities, which are scheduled to begin operation in 2005, may replace the former Rex facilities and other small south Miami-Dade wellfields and water treatment plants now owned by the county. In addition, some of the demand for water in the south Miami-Dade area, currently met with water delivered from the Alexander Orr facility, will be shifted to the new southern facility. A series of improvements to the distribution system in the south Miami-Dade area are also planned to facilitate distribution of potable water from the new southern plant.

City of Homestead

Homestead potable water facilities are located at Harris Field and Wittkop Park. Two wells are located at Harris Field and four wells at Wittkop Park. A treatment plant and elevated 500,000 gallon storage tank are located at each wellfield, where the source water is chlorinated and fluoridated during the treatment process. Total treatment capacity is 17.0 mgd, but the city is currently allocated only 9.9 mgd from the existing wells by SFWMD. Combined average daily flow is 8.1 mgd and maximum daily flow is 9.3 mgd. The system is in good operating condition. The city is planning to add two additional wells at Harris Field in 1998–2000. These new wells are expected to add approximately 2.16 mgd to the available supply.

Florida City

Florida City potable water facilities include four wells that are allocated 3.6 mgd by SFWMD, a relatively new treatment plant with a permitted capacity of 4.1 mgd, and a 225,000 gallon storage tank. Average daily flow at the treatment facility is 2.6 mgd and maximum daily flow is 3.0 mgd. The system is in good condition and performs well. A tie-in exists between Florida City and the City of Homestead for emergency use.

Former Homestead AFB

The potable water supply system for former Homestead AFB includes wells, a water treatment plant, water storage tanks, and a distribution network. The base had two wellfields, one on-base and one off-base. The on-base wellfield is no longer in use and the wells have been abandoned and properly closed. Three off-base wells, located approximately 1.5 miles west of the former base, currently provide water supply to the cantonment area and the remainder of the former base area. The off-base wells have a permitted pumping rate of 3.9 mgd. The water system is currently operated by Miami-Dade WASD under contract to the Miami-Dade Aviation Department. Ownership of the system will eventually be turned over to Miami-Dade WASD.

The water treatment plant is located at the northwest corner of the intersection of Coral Sea Boulevard and St. Lo Boulevard in the cantonment area. Since the water from the off-base wells meets current federal and state standards, the treatment plant's water softener has been dismantled. The plant currently consists of a chlorinator, water meter, two storage tanks, and a pump house. The on-grade water tanks have capacities of 300,000 gallons and 400,000 gallons. Two water tower tanks are also located outside the cantonment. One is available to provide back-up storage capacity; the other was removed in the course of constructing the Homeless Assistance Center. The maximum capacity of the plant is approximately 3.0 mgd. Because the existing plant is expensive to run, it will eventually be closed, and the WASD water distribution system will be extended to the former base.

A new water main loop was installed inside the cantonment area in 1997. Facilities outside the cantonment are still connected to the old water main, which will be replaced before Miami-Dade WASD accepts ownership of the system. Inside the cantonment, some of the newer facilities are metered; outside the cantonment, none of the facilities served by the former base water system are metered. In the non-metered areas, billing for water consumption is based on wastewater flows.

3.3.2.2 Projected Baseline Environment

Projected average daily potable water consumption in the ROI is presented in Table 3.3-2 for 2000, 2005, and 2015. The projected baseline data are calculated based on population projections presented in Section 3.1.3.

3.3.3 Wastewater

Miami-Dade WASD and various municipal utilities provide essentially all of the wastewater treatment services in Miami-Dade County. Wastewater service is provided for developed areas within the UDB, and extension of wastewater service outside the UDB is discouraged in accordance with the CDMP Water and Sewer Sub-Element Policy 1A (**Metro-Dade County 1997a**).

3.3.3.1 Existing Environment

Two agencies provide wastewater service in the ROI: Miami-Dade WASD and the City of Homestead Utilities Department. Wastewater flows from the Florida City and former Homestead AFB collection systems are treated by Miami-Dade WASD.

The average daily flows at the wastewater treatment plants in the ROI, plus the north and central districts of Miami-Dade WASD, are shown in **Table 3.3-3**. The table presents the design average daily flow (permitted capacity), the current average daily flow, and the future average daily flow after planned expansions are complete. **Table 3.3-4** presents estimated average daily wastewater generation for 1990, 1997, and the projected baseline.

Table 3.3-3. Wastewater Treatment Plant Average Daily Flows

Wastewater Treatment Plant	Design Average Flow (mgd)	Current Average Flow (mgd)	Planned Average Flow (mgd)
North District (WASD)	112.5	99.8	135.0
Central District (WASD)	143.0	122.4	143.0
South District (WASD)	85.0	79.1	112.5
City of Homestead	2.3	2.4	6.0
Total	**342.8**	**303.7**	**396.5**

Sources: **Miami-Dade County 1998b**, **James Duncan & Associates 1996b**.
mgd million gallons per day
WASD Water and Sewer Department

Table 3.3-4. Average Daily Wastewater Generation in the ROI

Wastewater Treatment Plant Service Areas	1990 (mgd)	1997 (mgd)	2000 (mgd)[1]	2005 (mgd)[1]	2015 (mgd)[1]
South District (WASD)	69.5	79.1	84.5	93.4	111.1
Florida City	0.4	0.9	1.1	1.4	2.0
Former Homestead AFB	5.0[2]	2.0	0.2	0.2	0.2
City of Homestead	2.1	2.4	3.3	4.0	5.8
Total[3]	**71.6**	**81.5**	**87.8**	**97.4**	**116.9**

Sources: **Miami-Dade County 1998b**, **City of Homestead 1995**, **James Duncan & Associates 1996a**, **Shannon 1998**.
Notes: [1] Projected wastewater generation based on projected population (see Section 3.1.3).
[2] 1990 Homestead AFB data estimated based on 2.5 times water consumption as shown in Table 3.3-2.
[3] Totals are the sum of South District and City of Homestead. Florida City and former Homestead AFB flows not included in totals because they are part of South District.
mgd million gallons per day
WASD Water and Sewer Department

Miami-Dade Water and Sewer Department

Miami-Dade WASD operates three regional wastewater treatment plants in the north, central, and south service districts. Because the system is interconnected, the service districts have flexible boundaries, and some flows from one district can be diverted to other plants in the system. Treated effluent disposal from the north and central service districts is via ocean outfall. Disposal from the south service district is via deep well injection at the South District Wastewater Treatment Plant located near the intersection of Silver Palm Drive (SW 232nd Street) and Galloway Road (SW 87th Avenue).

In December 1997, the total WASD regional system design capacity was 340.5 mgd and flows into the three plants totaled 315.2 mgd, or 92.6 percent of system capacity. Because of this limited available capacity, new sewer service connections are restricted until adequate capacity is available.

As the result of enforcement actions brought against Miami-Dade County by the State of Florida Department of Environmental Protection (FDEP) and the U.S. Environmental Protection Agency, Miami-Dade County agreed to construct more than $1.169 billion worth of improvements to its wastewater treatment plants, transmission mains, and wastewater collection system. Some of the improvements are necessary to reduce inflow and infiltration. Inflow comes from old connections of stormwater drainage systems to the sanitary sewer system, which are no longer permitted. Infiltration occurs when groundwater flows into the wastewater collection system through breaks in the pipes, hence increasing the volume of the flow and the burden on the treatment plant. Many of the improvements have been completed, and by December 1998, the total regional wastewater system capacity was expected to be 390.5 mgd.

City of Homestead

Homestead owns and operates its own sanitary sewer system, which has 2.3 mgd of wastewater treatment capacity. Through an agreement with WASD, an additional 0.8 mgd of wastewater are diverted to a WASD pump station and treated at WASD's South District Wastewater Treatment Plant. Including the diversion, the total capacity currently available to the city is 3.1 mgd. The city is in the process of enlarging its wastewater treatment plant to 6.0 mgd, which will reduce or eliminate its dependence on WASD and serve the city's needs beyond the year 2010.

Treated effluent from the Homestead treatment plant is returned to the aquifer via percolation ponds and soakage trenches at the plant site, which is located on North Flagler Avenue near Campbell Drive (SW 312th Street).

Florida City

Approximately one-third of Florida City is still on septic tanks. However, in the interest of preserving groundwater quality, the city is vigorously pursuing the elimination of septic tanks. A wastewater treatment plant, previously owned and operated by the city, was abandoned in 1989. Current wastewater treatment is provided by Miami-Dade WASD, with treatment and disposal at the South District Wastewater Treatment Plant. Sewer lines within the city limits continue to be owned and operated by the city, with new expansions and connections required of developers.

Former Homestead AFB

The former Homestead AFB domestic wastewater treatment plant was closed and decommissioned in 1984. Wastewater treatment and disposal for the former base is provided by Miami-Dade WASD under contract to AFBCA.

Wastewater flow on the former base is metered at only one location: Pump Station Echo at the intersection of Pilsen Road and Bikini Boulevard. Since 1997, the flow at the pump station has averaged 2 mgd, as indicated in Table 3.3-4. Major repairs and replacements of wastewater pipelines accomplished during 1994 through 1996 greatly reduced inflow of groundwater. Additional repairs and replacements are underway. When completed, they will further reduce inflow and result in lower flow at the metering station.

Inside the cantonment, a new wastewater collection system has recently been installed, resulting in greatly reduced inflow and infiltration. The new system has been sized to accommodate a modest amount of growth. Outside the cantonment, the old system is still in place and results in considerable infiltration of groundwater into the system. The cantonment area currently generates approximately 0.2 mgd of wastewater, and the remainder of the flow is from users outside of the cantonment and inflow.

3.3.3.2 Projected Baseline Environment

Projected average daily wastewater generation in the ROI is presented in Table 3.3-4 for 2000, 2005, and 2015. The projected baseline data were calculated based on projected population presented in Section 3.1.3.

3.3.4 Solid Waste

Three agencies provide solid waste collection services in the ROI: the Miami-Dade Department of Solid Waste Management, the City of Homestead Solid Waste Division, and the Florida City Department of Public Works. In addition, private haulers serve portions of the unincorporated area, including former Homestead AFB. The county owns and operates most of the solid waste disposal facilities in the county, although some facilities are owned by private operators.

3.3.4.1 Existing Environment

Table 3.3-5 presents estimated solid waste disposal volumes in the ROI for 1990, 1997, and the projected baseline.

Table 3.3-5. Average Daily Solid Waste Disposal in the ROI

Solid Waste Generation Area (Jurisdiction)	1990 (tpd)	1997 (tpd)	2000 (tpd)[1]	2005 (tpd)[1]	2015 (tpd)[1]
Unincorporated Area	525	597	638	705	839
City of Homestead	68	91	127	152	222
Florida City	12	10	12	15	22
Former Homestead AFB	2	1	5	5	5
Total	**607**	**699**	**782**	**877**	**1,088**

Sources: **USAF 1994a**; **James Duncan & Associates 1996a**, **1996b**; **AFRES 1997a**, **1997b**, **1997c**, **1997d**.
Note: [1] Solid waste generation in the unincorporated areas and projected solid waste generation in all areas based on projected population (see Section 3.1.3) and a waste generation rate of 7 lbs/person/day.
tpd tons per day

Miami-Dade Department of Solid Waste

The Miami-Dade Department of Solid Waste Management provides collection services for residential units in the unincorporated service area. The department also operates 15 neighborhood trash and recycling centers for residents of the unincorporated service area, including seven in the south Miami-Dade County ROI. Residents in sparsely developed areas of the county outside of the unincorporated waste collection service area are responsible for either delivering their waste to a proper disposal site or for contracting with a private hauler. Although the county offers commercial collection services, most commercial and multi-family establishments throughout the incorporated and unincorporated portions of the county contract with private haulers. Most municipalities either operate their own collection departments or contract with private haulers for single-family residential waste collection service. Countywide, the average waste generation/disposal rate (after removal of recyclables) is approximately 7 pounds per person per day.

The county maintains three major disposal sites, including the South Miami-Dade Landfill, the North Miami-Dade Landfill, and the Resources Recovery Facility. The county also has contracts to deliver waste to two private disposal facility operators. In addition, the county maintains three regional transfer stations where waste is received from county, municipal, and licensed private haulers. Waste received at transfer stations is compacted and transported to disposal sites in larger trucks, thereby reducing the number of trips to the disposal sites and enabling the county to coordinate waste deliveries to meet tonnage commitments to the Resources Recovery Facility and its various disposal contractors. As a result, service areas are not precisely defined for the disposal facilities. In general, the South Miami-Dade Landfill serves the south Miami-Dade County ROI.

Miami-Dade County has an active recycling program that removes and recycles an average of approximately 3,300 tons per day (tpd), more than one-third of the waste stream, before it reaches the landfill. Recycled materials include newspaper, glass, aluminum, plastic, steel, construction and demolition debris, yard waste, tires, and other wastes.

The current average daily waste stream in tpd (volume of waste disposed after recyclables have been removed) at each of these facilities and their remaining permitted capacities in tons are shown in **Table 3.3-6**.

Table 3.3-6. Waste Stream and Capacities at Solid Waste Disposal Facilities

Solid Waste Disposal Facilities	Average Daily Waste Stream (tpd)	Remaining Permitted Capacity (tons)
South Miami-Dade Landfill	600	9,000,000
North Miami-Dade Landfill	640	5,000,000
Miami-Dade Resources Recovery Facility	2,500	15,300,000[1]
Waste Management Landfill (private)	270 to 1,370	15,000,000
Wheelabrator Landfill (private)	0 to 275	600,000
Total		**44,300,000**

Source: **Miami-Dade County 1998b**.
Note: [1] Miami-Dade Resources Recovery Facility is permitted for 900,000 tons per year through 2015. Total Remaining Permitted Capacity assumes maximum use of Resources Recovery Facility from 1998 through 2015.
tpd tons per day

The South Miami-Dade Landfill occupies a 230 acre site located approximately 2 miles east of Black Point and approximately 3 miles northeast of former Homestead AFB. The landfill has approximately 9 million tons of remaining disposal capacity. This would be sufficient capacity to last 40 years at the present south Miami-Dade County waste generation rate of approximately 600 tpd.

The North Miami-Dade Landfill occupies a 268 acre site near the Broward County line at NW 47th Avenue. The landfill has approximately 5 million tons of remaining disposal capacity. This would be sufficient capacity to last over 20 years at the present disposal rate at this landfill of approximately 650 tpd.

The Resources Recovery Facility at 6990 NW 97th Avenue accepts approximately 2,500 tpd of waste. The facility includes a waste processing plant and an electrical generating facility to process waste and recover energy and materials. Approximately 82 tpd of recyclable material is currently recovered by this facility.

City of Homestead

The City of Homestead Solid Waste Division provides services for collection and transport of residential and commercial solid waste to the South Miami-Dade Landfill. The city has an active recycling program and provides for recycling of glass, plastics, and aluminum. Average waste generation in the City of Homestead is approximately 7 pounds per person per day.

Florida City

The Florida City Department of Public Works provides services for collection and transport of residential and commercial solid waste to the South Miami-Dade Landfill. The city has a recycling program that provides for recycling of glass, plastics, and aluminum. Average waste generation in Florida City is only 3.3 pounds per person per day, considerably less than the overall Miami-Dade County average of 7 pounds per person per day.

Former Homestead AFB

Solid waste is collected in the cantonment area and other portions of the former base by private contractors and is taken to the South Miami-Dade Landfill. A recycling program was started by the Air Force Reserve Command in 1994 and continues today. In 1997, approximately 123 tons of waste were recycled. This amount was approximately 34 percent of waste generated. The remaining 236 tons, or an average of less than 0.7 tpd, was landfilled.

3.3.4.2 Projected Baseline Environment

Projected average daily solid waste disposal volumes are presented in Table 3.3-5 for 2000, 2005, and 2015. Projected baseline data were calculated based on population projections presented in Section 3.1.3.

3.3.5 Electricity

3.3.5.1 Existing Environment

FPL provides electricity for all of Miami-Dade County, except for a portion of the City of Homestead, which has its own electrical power generation plant and distribution system. **Table 3.3-7** presents average daily electrical demand for the ROI in 1990, 1997, and the years for the projected baseline.

Table 3.3-7. Average Daily Electrical Demand in the ROI

Electrical Demand Area	1990 (MWh)	1997 (MWh)	2000 (MWh)[1]	2005 (MWh)[1]	2015 (MWh)[1]
South Miami-Dade County	23,553	27,587[a]	28,629	31,626	37,621
City of Homestead[2]	136	131	184	220	322
Former Homestead AFB	175	50	56	56	67
Total	**23,864**	**27,768**	**28,869**	**31,902**	**38,010**

Sources: **USAF 1994c**, **Baichoo 1998**, **EIA 1998**.
Notes: [1] Projected electrical demand based on projected population (see Section 3.1.3).
[2] Most of City of Homestead's electricity is purchased from FPL. Data presented is additional electricity generated by the city. 1990 is an estimate projected back from 1997 average daily net generation.
MWh megawatt hours

The total capacity of the FPL system is 16,681 megawatts (MW). FPL's system is able to meet any foreseeable power demands in the ROI because of excess capacity and ability to shift power from areas that are experiencing reduced power demands to areas that require additional power. Average daily system demand load is 9,938 MW, leaving 40 percent of the total system capacity in excess of demand. The distribution system varies between 13 kilovolt (kV) and 23 kV capacity lines, covering the entire state and crossing other electric companies' service areas.

City of Homestead

The City of Homestead owns and operates facilities for the production, distribution, metering, and sale of electricity to customers in its service area. The present service area includes approximately 60 percent of the developed area of the city, approximately 40 percent of the undeveloped area of the city, and some areas outside the city limits. The customer mix is approximately 90 percent residential and 10 percent commercial/industrial.

Most of the electricity distributed by the city is purchased from FPL (85 percent in 1997). The remainder is generated at the city's 56 MW oil-fired power plant located southwest of the intersection of Campbell Drive and U.S. Highway 1.

Former Homestead AFB

Electricity is provided to the former base by FPL. The main substation that serves the former base is located next to Mystic Lake, outside of the cantonment area. FPL owns the substation, its 1 acre site, and the power distribution system in the former base area.

Power distribution is at 13 kV via a combination of overhead and underground power lines. The distribution system inside the cantonment is mainly underground with a small portion of overhead lines near the U.S. Customs, firing range, and munitions areas. Pad-mounted transformers provide low-voltage power supplies to individually metered facilities inside the cantonment. Outside the cantonment, the power distribution is mainly overhead, and a combination of pole-mounted and pad-mounted distribution transformers provides low-voltage secondary service.

3.3.5.2 Projected Baseline Environment

Projected average daily electrical demand is presented in Table 3.3-7 for 2000, 2005, and 2015. The projected baseline data were calculated based on population projections presented in Section 3.1.3.

3.3.6 Natural Gas

City Gas Company of Florida distributes natural gas to approximately 100,000 customers in a five-county region of southeastern Florida. Approximately half of these customers are in Miami-Dade County. City Gas is the sole supplier of natural gas in south Miami-Dade County.

3.3.6.1 Existing Environment

As of May 1998, there were 31,512 natural gas customers in the south Miami-Dade County ROI. The natural gas consumption in the ROI from May 1997 to May 1998 was 37,760,987 therms, or 103,455 therms per day. The City of Homestead, Florida City, and former Homestead AFB do not have natural gas service.

3.3.6.2 Projected Baseline Environment

Based on population projections for south Miami-Dade County, the baseline average daily natural gas consumption in the ROI is projected to be 110,553 therms per day in 2000, 122,553 therms per day in 2015, and 145,278 therms per day in 2015.

3.4 AIRSPACE AND SAFETY

3.4.1 Introduction

This section discusses the management and use of airspace to support aviation activities around former Homestead AFB, flight safety, and ground safety.

3.4.1.1 Resource Definition

Airspace

Airspace is defined vertically and horizontally when describing its use for aviation purposes. Aviation-related airspace is managed by the Federal Aviation Administration, which has established policies, designations, and flight rules to protect aircraft in the airport and enroute environments, and in special use airspace areas identified for military or other governmental activities. An understanding of a region's airspace/air traffic environment and its use is necessary to determine its capability and capacity to assimilate future aviation activities into the National Airspace System (NAS). Within the NAS, aircraft operate under either Visual Flight Rules (VFR) or Instrument Flight Rules (IFR). When any significant change is planned for a region, such as a change in airport roles or an airport expansion, FAA reassesses the airspace configuration to determine if such change could adversely affect (1) Air Traffic Control (ATC) systems or facilities, (2) movement of other air traffic in the area, or (3) airspace already designated and used for other purposes (e.g., special use airspace or military training routes [MTR]).

FAA has designated four types of airspace: controlled, special use, other, and uncontrolled:

1. Controlled airspace is categorized into Classes A, B, C, D, and E. These classes identify airspace where use is strictly controlled, airspace that supports airport operations, and airspace used as designated airways affording enroute transit from place to place. These classes also indicate pilot qualification requirements, rules of flight that must be followed in the airspace, and the type of equipment required for use of the airspace.
2. Special use airspace is designated for flight activities that require confinement of participating aircraft, or that place operating limitations on non-participating aircraft.
3. Other airspace consists of areas supporting a specific activity, such as MTRs that provide low-altitude, high-speed training for military aircrews.
4. Uncontrolled airspace is designated Class G airspace and has no specific prohibitions associated with its use.

Flight Safety

The primary public concern with regard to flight safety is the potential for aircraft accidents or mishaps. Mishaps may occur as a result of mid-air collisions, collisions with manmade structures or terrain, weather-related accidents, mechanical failure, pilot error, or bird-aircraft collisions. Flight safety considerations include aircraft mishaps and bird-aircraft strikes.

Aircraft Mishaps. The Department of the Air Force defines four categories of aircraft mishaps: Classes A, B, C, and High Accident Potential (HAP).

- Class A mishaps result in a loss of life, permanent total disability, a total cost in excess of $1 million, destruction of an aircraft, or damage to an aircraft beyond economical repair. Class A mishaps include most aircraft crashes.
- Class B mishaps result in total costs of more than $200,000 but less than $1 million or result in permanent partial disability but do not result in fatalities. An example of a Class B mishap could be multiple avionics components being destroyed during a maintenance test run due to a failure or a maintenance error in connecting a wiring harness. Most Class B mishaps occur on the ground.
- Class C mishaps involve costs of more than $10,000 but less than $200,000 or a loss of worker productivity of more than 8 hours. An example of a Class C mishap could be a maintenance technician who lifts a heavy object and experiences back strain that forces the technician to miss a day or more of work.
- HAP mishaps are minor incidents not meeting any of the criteria for Class A, B, or C. Accidental superficial damage to a minor component that requires a small maintenance effort to repair it is an example of HAP.

Class C and HAP mishaps, the most common types of accidents, are relatively unimportant incidents because they generally involve minor damage and injuries and rarely affect property or the public. Class B mishaps are more critical because of the value of the level of damage that results from their occurrence. However, these mishaps rarely affect non-military persons or private property. The results of Class B mishaps are normally confined to military installations and effects are generally limited to the immediate area where the mishap occurred. This SEIS focuses on Class A mishaps because, due to their severity and potentially catastrophic consequences, they have the greatest potential to impact the general public and private property. Class B mishaps are also discussed.

The Air Force maintains statistics on Class A and B mishaps by specific aircraft types.

FAA and the National Transportation Safety Board maintain databases of safety data pertaining to civil aviation. While those data are not in an identical format to data maintained on military aircraft, comparable flight risk assessments can be generated.

Bird-Aircraft Strike Hazard. Bird-aircraft strikes constitute a safety concern because of the potential for damage to aircraft, injury to aircrews and local populations, or damage to property if an aircraft crash should occur. While any bird-aircraft strike has the potential to be serious, most result in little or no damage to the aircraft and only a minute portion result in a Class A mishap. While aircraft may encounter birds at altitudes of 30,000 feet above mean sea level (MSL) or higher, more than 90 percent of bird strikes that can be classified occur below 3,000 feet above ground level (AGL) (**USAF 1998a**).

Ground Safety

Ground safety considers safety issues associated with airport operations, including industrial safety, disaster response planning, fire and crash response capability and capacity, and other potential health and human safety concerns. Safety issues affecting areas adjacent to airports are also addressed. The ground safety analysis in this SEIS also addresses related safety issues associated with the Turkey Point Nuclear Power Plant.

3.4.1.2 Applicable Laws and Regulations

FAA is responsible for management of the NAS, and promulgates direction for the use of the NAS through Federal Aviation Regulations (FAR). Safety guidance pertaining to flight and ground activities is contained in numerous federal regulations and standards, Air Force instructions and other guidance. In addition, Air Force Technical Orders which are directive in nature, provide detailed procedures and processes to be employed when operating or maintaining equipment. Following is a summary of applicable FARs and other laws and regulations:

Federal Aviation Act of 1958 (49 U.S.C. 40101 et seq.). This legislation created FAA and charged the agency's Administrator with ensuring the safety of aircraft and the efficient utilization of navigable airspace, within the jurisdiction of the United States.

14 CFR Part 71. This regulation delineates the designation of federal airways, area low routes, controlled airspace, and navigational reporting points.

FAR Part 77. This regulation establishes standards for determining obstructions in navigable airspace, identifies requirements associated with certain construction or alteration, provides for aeronautical studies of obstructions to air navigation to determine their effects on the safe and efficient use of airspace, provides for public hearings on the hazardous effect of proposed construction or alteration on air navigation, and provides for establishing antenna farm areas.

14 CFR Part 91. This regulation describes the rules governing the operation of aircraft in the United States.

FAA Handbook 7400.2C. This establishes policy, criteria, and procedures applicable to rulemaking and non-rulemaking actions associated with airspace allocation and utilization, evaluating obstructions, airport airspace analyses, and the establishment of air navigation aides.

Air Force Instruction (AFI) 91-301. This instruction contains guidance on Air Force occupational safety, fire prevention, and health regulations governing a wide range of activities and procedures associated with safety in the workplace.

AFI 32-2001. This instruction defines the requirements for Air Force installation fire protection programs, including equipment, response times, and training.

Air Force Manual 91-201, Explosive Safety. This manual regulates and provides procedures for explosives safety and handling. It establishes criteria for quantity-distance separation, required clear zones, and standards for facilities associated with ordnance storage.

Homestead ARS Instruction 13-201. This instruction provides local operational procedures governing the conduct of aviation activities at Homestead ARS.

Reactor Site Criteria (10 CFR 100). This statute establishes the U.S. Nuclear Regulatory Commission (NRC) Guidelines for Nuclear Power Plants.

3.4.1.3 Region of Influence

The ROI for airspace (**Figure 3.4-1**) includes the airfield at former Homestead AFB, the immediate environs, and the airspace and area around the airfield within which air traffic is controlled by Miami Terminal Radar Approach Control (TRACON). This area encompasses former Homestead AFB and the airspace environment supporting arrivals and departures from Homestead ARS, which are integrated with a flow of aircraft operating to or from other nearby airports.

The ROI for flight safety includes the terminal airspace within about 5 minutes flying time of the Homestead ARS airfield. This is when aircraft are at the lowest altitude and most vulnerable to mishaps. Statistics show that the vast majority of aircraft mishaps occur relatively close to airports, generally during takeoff or landing.

The ROI for ground safety includes former Homestead AFB, safety zones extending from each end of the runway, and Turkey Point Nuclear Power Plant.

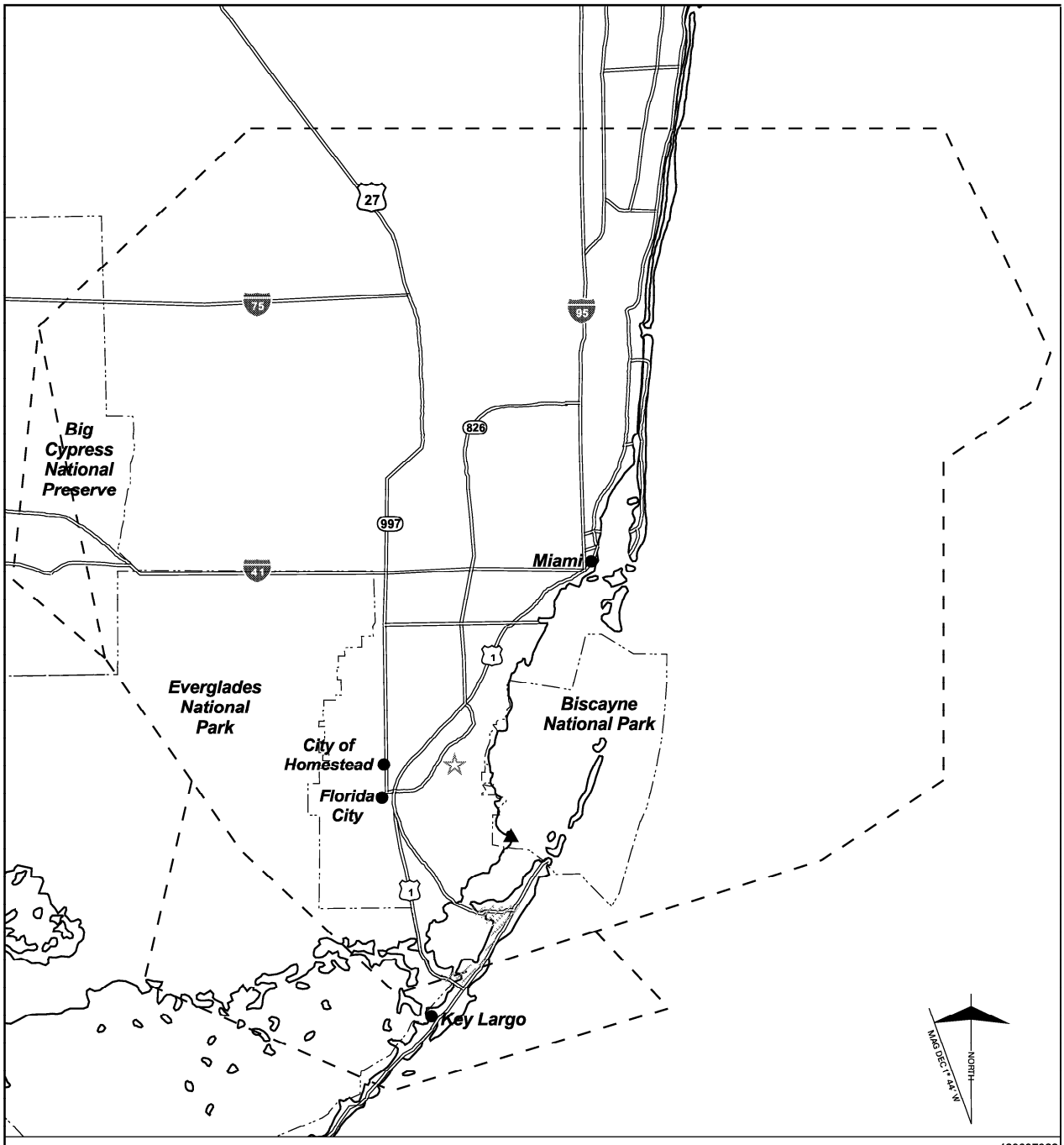
3.4.2 Airspace

3.4.2.1 Existing Environment

The Miami Approach Control Area basically encompasses the airspace within 30 nautical miles of Miami International Airport at altitudes ranging from the surface to 16,000 feet MSL. This approach control area is delegated by the regional Miami Air Route Traffic Control Center (ARTCC) to the TRACON facility at Miami International Airport for providing ATC services to air traffic operating within the area. The existing airspace structure is considered relatively efficient given the volume of traffic currently handled within the approach control area (**Dames & Moore et al. n.d.a**).

In addition to Homestead ARS, the public air carrier and general aviation airports located within the Miami Approach Control area include Miami International, Fort Lauderdale-Hollywood International, Kendall-Tamiami Executive, Opa-Locka, Dade Collier Training and Transition, Homestead General Aviation, and Opa-Locka West, as shown in **Figure 3.4-2**. These airports provide facilities for a diversity of needs ranging from commercial air transportation and cargo services to corporate and private aviation. **Table 3.4-1** summarizes the primary activity, availability of ATC services, and 1997 aircraft operations for each of those airports. In 1997, the level of general aviation operations in the region was less than half of that expected in the late 1970s. The decrease is likely due to aircraft destruction from Hurricane Andrew and the fact that many general aviation aircraft owners may have left the market (**Dames & Moore et al. n.d.a**).

Several small restricted/private use airfields, a heliport, and a seaplane base are also located within the ROI. They are not addressed due to their limited effect on airspace use. ATC procedures and defined arrival and departure routes within the Miami Approach Control Area ensure a safe and orderly flow of air traffic operating to and from the different airports within the area. Within the Miami Approach Control Area, Miami International, Kendall-Tamiami, Fort Lauderdale International, Opa-Locka, Fort Lauderdale Executive, Hollywood North Perry, Pompano, and Homestead ARS have instrument approaches for conducting operations in IFR weather conditions. Operations at the other airports are normally conducted in visual weather conditions only.



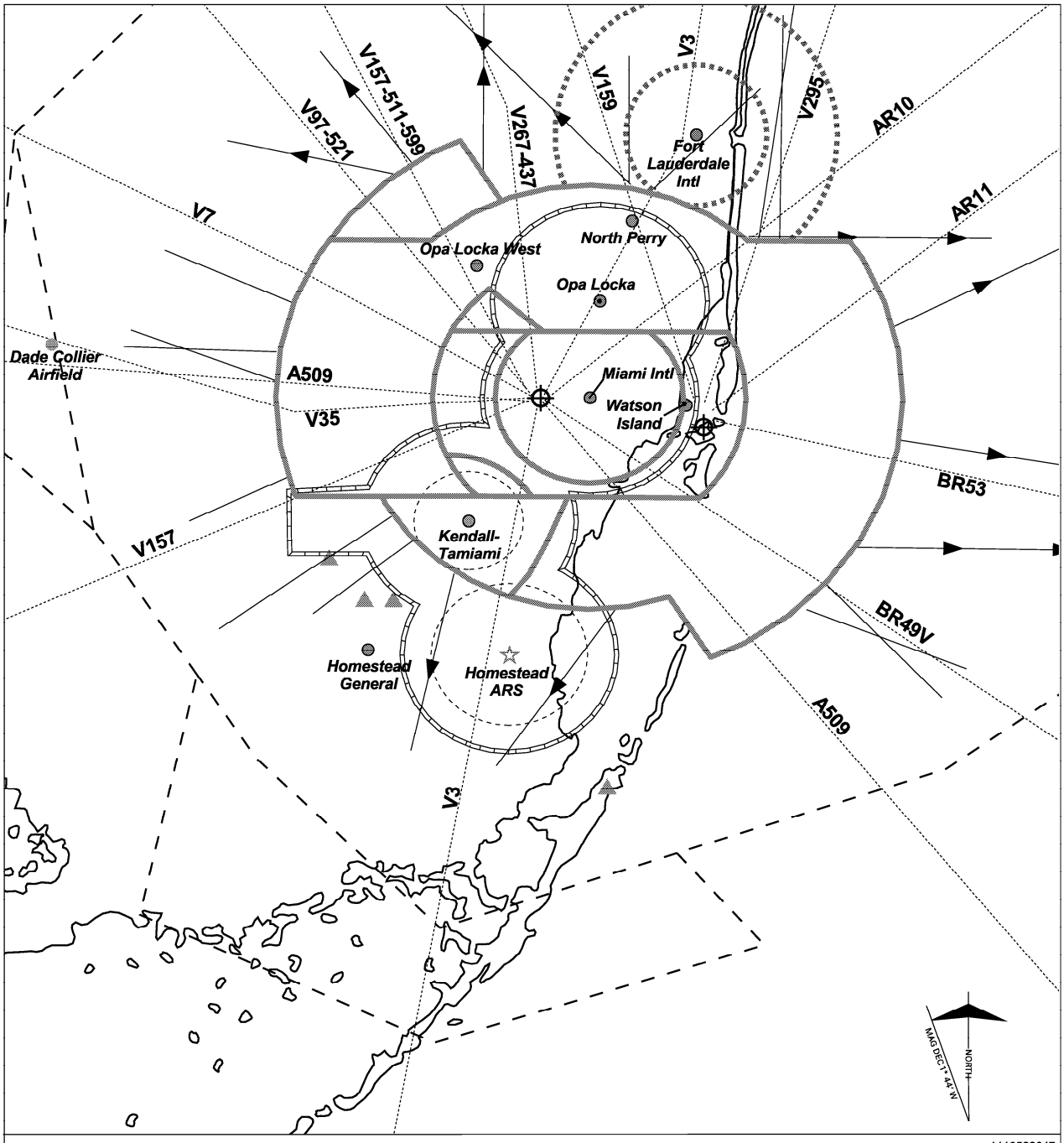
LEGEND

- Homestead ARS
- Miami Approach Control Area Boundary
- National Park or Preserve Boundary
- Crocodile Lake National Wildlife Refuge
- Major Road
- Interstate Highway
- U.S. Highway
- State Highway
- City
- Turkey Point

5 0 5 10
Scale in Miles

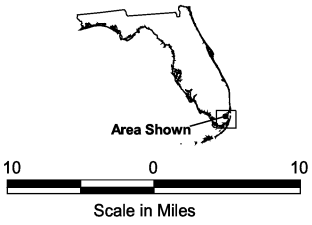
Source: SAIC

Figure 3.4-1
Region of Influence for
Airspace and Safety



LEGEND

- Miami Approach Control Area Boundary
- Class B Airspace
- Class C Airspace
- Class D Airspace
- Class E Airspace
- IFR Departure Route
- IFR Arrival Route
- Federal Airway
- Restricted/Private Airport
- Public Airport
- VORTAC/VOR



Derived from: NOAA 1988, NOAA 1998a

Figure 3.4-2
Controlled Airspace in the Region of Influence

Table 3.4-1. Estimated Current Operations at Civil Airports in the ROI

Airport	Primary Activity	Airport ATC Services	1997 Operations[1]
Homestead General	Training and Recreation	None	54,900
Dade Collier	Training	None	13,800
Kendall-Tamiami	Corporate and Training	Tower	180,700
Miami International	Air Carrier	Tower/Radar	575,600
Opa-Locka	Business and Training	Tower	118,000
Opa-Locka West	Training	None	16,000
Fort Lauderdale-Hollywood	Air Carrier	Tower/Radar	246,400

Source: Derived by Landrum & Brown from **Dames & Moore et al. n.d.a**.

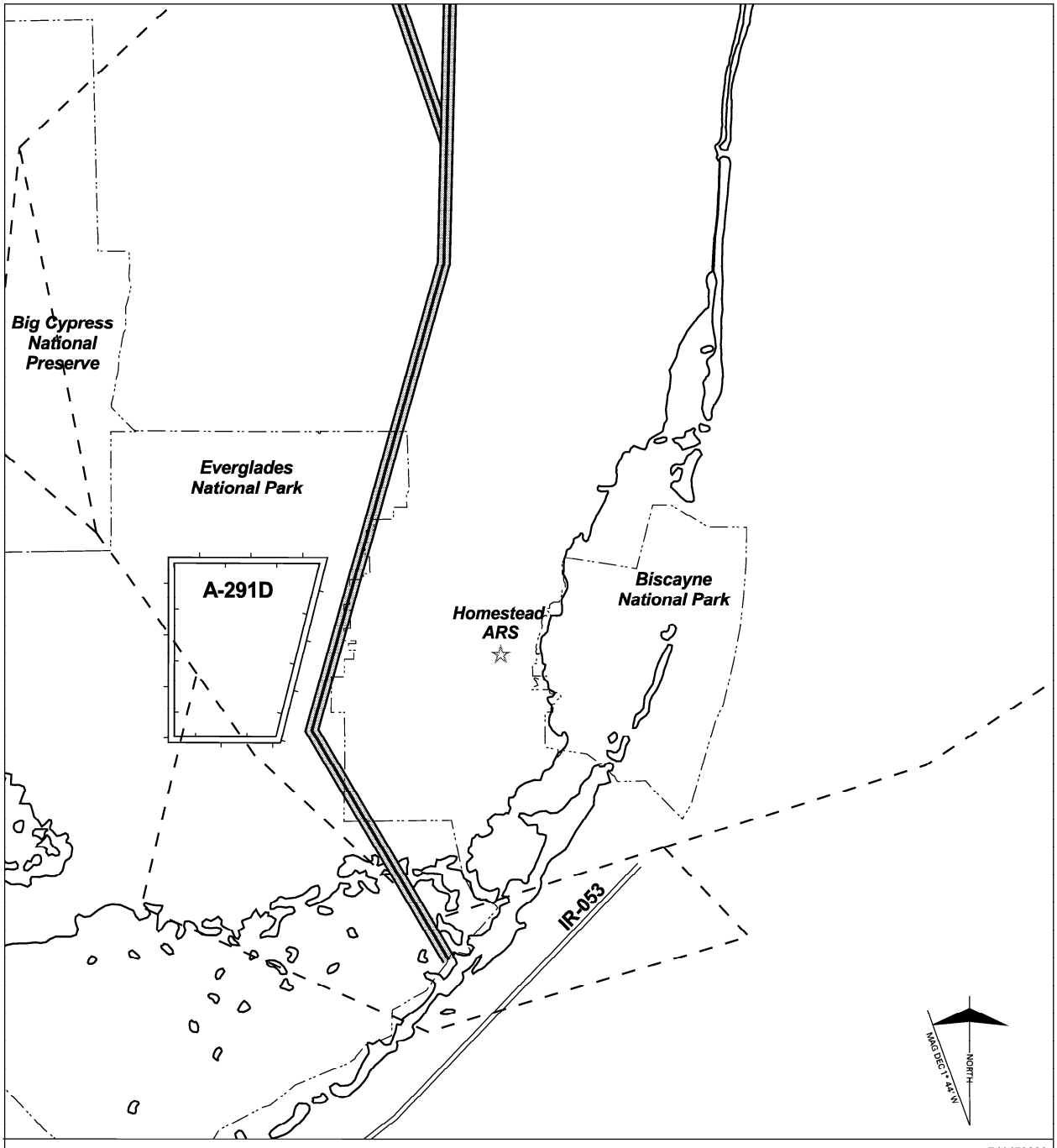
Note: [1] The percentage of operations normally remaining within the local airport traffic pattern for touch-and-go landings are Dade Collier (60–70%), Homestead General (20–30%), Kendall-Tamiami (60%), Opa-Locka (50%), and Opa-Locka West (majority) (Draft Miami-Dade County Aviation System Plan Technical Report). All numbers are approximate and rounded to the nearest hundred.

The categories of controlled airspace designated within the Miami Approach Control area (see Figure 3.4-2) include Miami International Class B, Fort Lauderdale Class C, Homestead ARS Class D, and Kendall-Tamiami Class D. Air traffic control services within the Homestead ARS Class D airspace are provided by the ARS control tower. Class E provides airspace for air traffic transition between the Miami Approach Control Area and the different Federal Airways and Jet Routes comprising the enroute airspace system in this region. Flight tracks for the VFR and radar traffic patterns and arrival/departure routes for the east and west air traffic flows for Homestead ARS are described in Section 2.1.

The only special use airspace within the ROI is Alert Area A-291D, a type of airspace charted on aeronautical maps to alert pilots to areas of concentrated flight training activities. A-291D (**Figure 3.4-3**) is located 12.5 nautical miles west of Homestead ARS. It extends from the surface to 3,900 feet MSL. Flight tracks in the area pass over it at altitudes of 4,000 feet and above. This airspace is active for military training activities between 6:00 a.m. and midnight (**NOAA 1998a**). Air traffic control ensures that non-participating aircraft transiting the lateral boundaries of the airspace maintain an altitude greater than 3,900 feet MSL, thereby guaranteeing safe separation between transiting traffic and aircraft using the airspace for training.

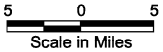
Other airspace in the ROI includes a segment of one MTR, Instrument Route (IR) 053, shown in Figure 3.4-3. Military aircraft conduct low-level flight training within the 10 nautical mile corridor of this IR between 500 feet AGL and 3,000 feet MSL. Two VFR Flyways to the west and southwest of Homestead ARS are suggested routes for VFR pilots to use in order to avoid the major controlled traffic flows of the Miami Class B airspace. ATC clearances are not required to operate within a VFR Flyway, and altitudes below 3,000 feet MSL are generally recommended along these routes, weather permitting.

Air traffic in the ROI is managed by the TRACON at Miami International Airport. To assist in the orderly flow of air traffic, a series of navigational reporting points, or "fixes," are designated around and through the airspace. These are points to which aircraft arriving at or departing from an airport are directed by air traffic controllers to establish orderly flight corridors through the airspace. These points are designated by a five-letter code (e.g., FAMIN, HEATT, JUNUR), and their location is identified as being along a compass heading and at a distance from a navigational aid facility. These fixes are also



LEGEND

- Miami Approach Control Area Boundary
- Restricted Airspace
- VFR Flyway
- MTR
- National Park or Preserve Boundary



Derived from: NOAA 1988, NOAA 1998a

Figure 3.4-3
Special Use and Other Airspace in the ROI

used to control traffic at other major regional aviation facilities. **Table 3.4-2** identifies the major fixes and their use (arrival or departure) at principal airports generating overflights over national parks. These fixes are shown on Figures 2.2-2 and 2.2-3.

Table 3.4-2. Navigational Fixes Used by Airports in the ROI

Navigational Fix	Airport		
	Miami	Fort Lauderdale	Kendall Tamiami
WORPP	A	A	A/D
WINCO	D	D	A/D
HEDLY	D	D	A/D
HEATT	A	A	A/D
VALLY	D	A/D	
SKIPS	D		A
JUNUR	A		A
EEONS	D		
MNATE	D	D	
FAMIN	A	A	A/D

Notes: A Used for arrivals
D Used for departures

3.4.2.2 Projected Baseline Environment

At Homestead ARS, levels of military and U.S. Customs aviation operations are assumed to remain constant. However, some moderate growth (between approximately 1 and 2 percent per year) is projected for other regional airports. The estimated aircraft operations projected for 2000, 2005, and 2015 are presented in **Table 3.4-3**. The only major anticipated airport improvement in the ROI is construction of a fourth runway at Miami International.

Table 3.4-3. Estimated Future Aircraft Operations at Airports in the ROI

Airport	2000[1]	2005[1]	2015[1]
Homestead General[1]	34,100	34,100	34,100
Dade Collier[1]	19,700	20,800	23,000
Kendall-Tamiami[1]	254,800	254,800	254,900
Miami International[2]	634,400	685,400	780,900
Opa-Locka[1]	265,000	265,000	265,000
Opa-Locka West[1]	65,000	65,000	65,000
Fort Lauderdale-Hollywood	261,200	285,800	335,000

Source: **ViGYAN Inc. 1993**; derived from **Dames & Moore et al. n.d.a**.
Notes: [1] Forecasts for 2000, 2005, and 2015 are interpolated from Aviation System Plan forecasts.
[2] See Appendix A.

3.4.3 Flight Safety

3.4.3.1 Existing Environment

Flight safety risks are estimated based on type of aircraft and number of flying hours, and take into account nearby wildlife habitat. This section addresses existing aircraft mishap risks in general and risks associated with bird-aircraft collision hazards specifically.

Aircraft Mishaps

Based on historical data on mishaps at all installations and under all conditions of flight, the military services calculate Class A and B mishap rates per 100,000 flying hours for each type of aircraft in the inventory. Combat losses are excluded from these mishap statistics. For any flight activity, the estimated time spent by a specific aircraft can be used to calculate the expected annual flight time in a particular airspace area. The Class A mishap rate per 100,000 flying hours is used to compute a statistical projection of anticipated time between Class A and B mishaps. This section provides estimates for Class A mishaps. In evaluating this information, it must be understood that those data are statistically predictive and do not forecast actual mishaps. The actual causes of mishaps are due to many factors, not simply the amount of flying time of the aircraft.

In 1992, Homestead AFB was a Tactical Air Command installation. Shortly thereafter, Tactical Air Command became Air Combat Command. The 31st Tactical Fighter Wing was the host unit and was equipped with F-16 aircraft. Detailed operations data were not retained by the Air Force and are not available for that time. General data predating realignment of the base can be used to estimate flight safety at that time (**USAF 1994a**).

The Air Installation Compatible Use Zone (AICUZ) study prepared for Homestead AFB in 1988 indicated that the aircraft assigned to the base in 1987 flew an average of 502 daily operations; approximately 69 percent were by F-16s, 27 percent by F-4s, and 4 percent by C-130s (**USAF 1994a**). If it is assumed that each operation averaged approximately 5 minutes in the airspace around the airfield, total annual flight hours would have been approximately 7,505 for F-16s, 2,937 for F-4s, and 435 for C-130s.

Based on the lifetime history of Class A mishaps for those aircraft, the 1987 mishap rates per 100,000 flight hours were 6.44 for F-16s, 5.92 for F-4s, and 1.17 for C-130s (**USAF 1998b**). Applying these rates to the estimated 1987 flight hours, an F-16 could statistically have been expected to be involved in a Class A mishap in the ROI once every 2.1 years, an F-4 once every 5.7 years, and a C-130 once every 196.5 years.

Units currently operating out of Homestead ARS include the 482 FW, Detachment 1 of the 125 FW (FANG), and the U.S. Customs Service. The 482 FW flies F-16s, the 125 FW flies F-15s, and the Customs Service flies a variety of aircraft. All aviation activity conducted on Homestead ARS is guided by detailed processes and procedures documented in an Air Traffic Control and Airfield Management Instruction. This documentation is directive in nature, and compliance with all procedures is mandatory (**AFRC 1997**).

Approximately 12,000 F-16 and 1,100 F-15 operations are conducted annually at Homestead ARS. If each operation involves approximately 5 minutes in the airspace around the airfield, this results in 1,000 F-16 hours and 92 F-15 hours annually. Current lifetime Class A mishap rates per 100,000 flying hours are 4.43 for F-16 aircraft and 2.51 for F-15 aircraft Air Force-wide (**USAF 2000**). These rates indicate

that, statistically, an F-16 would be expected to experience a Class A mishap in the airspace around the airfield once every 23 years and an F-15 once every 433 years.

The last actual Class A mishap experienced at the installation occurred in 1990. An F-16 aircraft on a maintenance check flight experienced an engine malfunction on take-off. The pilot circled the airfield but had insufficient power to land safely. The aircraft crashed on the runway during approach (**Dunaway 1998**). Other, more recent mishaps experienced by the 482 FW were outside the ROI in over-water training airspace. The most recent involved an F-16 aircraft which crashed on an MTR enroute to Avon Park Range.

Other aircraft currently fly through the ROI, either enroute to other areas or from/to other airports in the region. Mishap risks associated with those flights are not available.

For F-16 aircraft, the lifetime Class B mishap rate per 100,000 flying hours is 0.57; for F-15 aircraft it is 3.75 (**USAF 2000**). Multi-engine aircraft frequently have higher Class B mishap rates than single-engine aircraft. This is due, in part, to their ability to continue flying after losing one engine. If a multi-engine aircraft loses an engine in flight, it may be able to land safely using its remaining engines. The mishap would then be categorized based on the dollar value of the failed component. If a single-engine aircraft experiences an engine failure, it would undoubtedly have a Class A mishap since the aircraft would crash. In the last 10 years, the 482 FW has experienced no Class B mishaps (**Dunaway 1998**).

Bird-Aircraft Strike Hazard

Data maintained by the Air Force's Bird-Aircraft Strike Hazard (BASH) team show that, from January 1985 through February 1998, there were 34,856 documented bird-aircraft strikes worldwide involving Air Force aircraft. Of these, 23 resulted in Class A mishaps. These occurrences constituted approximately 0.06 percent of all reported bird-aircraft strikes. Furthermore, 33,262 strikes (more than 95 percent) were classified as non-damaging to aircraft (**USAF 1998a**).

The Air Force BASH Team has also developed a Bird Avoidance Model (BAM) that assesses the relative risk of bird-aircraft strikes throughout the United States on a month-by-month basis. Throughout all of southern Florida, the BAM assesses risk as low to moderate throughout the year (**USAF 2000**).

For aircraft operating in the immediate vicinity of Homestead ARS, bird-aircraft strike data maintained by the 482 FW indicate that bird-aircraft strikes occur about once every 2 months. The vast majority of these strikes involves small birds and results in little or no damage to aircraft. In the last two years, only one large bird, a vulture, was involved in a bird strike (**Dunaway 1998**).

Wading birds (e.g., wood storks, ibis, egrets) and migratory waterfowl (e.g., ducks, geese, and swans) are hazardous birds to low-flying aircraft because of their size and their propensity for migrating in large flocks at a variety of altitudes and times of day. Migratory birds typically move at night and generally fly at altitudes between 1,500 to 3,000 feet above the ground during the fall migration and from 1,000 to 3,000 feet during the spring migration. The potential for bird-aircraft strikes is highest in migration corridors (flyways) or where birds congregate for foraging or resting (e.g., open water bodies, rivers, and wetlands).

Raptors, shorebirds, gulls, herons, and songbirds also pose a hazard. Peak migration periods for raptors, especially eagles, are from October to mid-December and from mid-January to the beginning of March. Although songbirds are small, usually less than one pound, they can pose a hazard. During nocturnal

migration periods, they navigate along major rivers, typically at altitudes between 500 to 3,000 feet above the ground.

The current frequency and severity of bird strikes does not indicate a significant safety risk. Approximately 0.03 percent of the annual sorties operating from Homestead ARS experience a bird strike. Nevertheless, since bird-aircraft strikes are always a safety concern in aviation activities, steps to manage and minimize this risk are ongoing at Homestead ARS. In recent years, the 482 FW has developed a comprehensive bird-aircraft strike hazard reduction plan (**AFRC 1996b**). The plan provides guidance to flying and maintenance organizations, focusing on habitat control to make the immediate area around the airfield unattractive to birds. Because much of the area around the main cantonment contains ideal habitat for numerous bird species, direction is also provided on techniques for dispersing birds. These techniques include using bioacoustics (noise) and small pyrotechnic charges (roughly equivalent to a 12 gauge shotgun shell) to scare off birds (**AFRC 1996b**). Work is continuing on vegetation control in the canals on the base (**AFRC 1998b**).

When the risk of bird strikes is high, certain restrictions may be placed on flight operations. These can range from limiting closed patterns, to imposing altitude restrictions, to completely curtailing flight operations until the hazard is mitigated (**AFRC 1996b**). Although some operational limitations may occur several times a month, they are typically about 15 minutes in duration, lasting only until the unit's wildlife biologist can disperse the congregated birds.

In order to foster the awareness of operations personnel in detecting high-risk conditions, the unit BASH Plan provides information about habits and behavior patterns of birds that have been detected around Homestead ARS in varying numbers and at different times of the year. The plan indicates that operators should be aware that fish-eating and insect-eating birds, long-legged waders, waterfowl, raptors, cranes, gulls, crows, ravens, and other smaller birds can present potential hazards. It advises that birds such as loons, grebes, pelicans, cormorants, mergansers, cranes, gulls, goatsuckers, crows, and ravens can be present in large numbers in the early morning and evening as they transit to and from their roosting sites and feeding areas. The plan indicates that wading birds such as herons, egrets, ibises, and storks, which are attracted by water bodies, are active during the day.

Migrating waterfowl are specifically addressed in the plan because they may be concentrated in resting and feeding areas, and flights at generally higher altitudes from sunset to midnight could involve large numbers of birds. The guidance provided in the plan indicates that the greatest waterfowl concentrations can be expected during the fall migration period (October and November).

Raptors (hawks, falcons, kites, eagles, and vultures) are also birds identified in the plan that may be found at higher altitudes. These birds soar using thermal currents. Personnel are advised that these birds are usually active from mid-morning until late afternoon, with most migratory flight activity expected during the day (**AFRC 1996b**).

Additional information on the types of birds expected to be found on and around Homestead ARS, as well as details on numbers and types of birds identified during field surveys, are contained in Section 3.11 and in Appendix G.

Homestead ARS' Bird Hazard Working Group monitors the success of bird control efforts. Efforts to control turkey vultures on the ground have been effective, but vultures soaring at higher altitudes have been difficult to control. Cattle egrets, which are appearing in increasing numbers, disperse with the use of pyrotechnics. There has been little success in dispersing birds from the county landfill located to the

north of the base. This problem remains an active subject of study by the Homestead ARS natural resources manager working with state and local natural resources personnel.

3.4.3.2 Projected Baseline Environment

Based on current expectations, military operations at Homestead ARS are assumed to continue unchanged through 2015. Therefore, the risk of aircraft mishaps and bird-aircraft strikes is expected to remain as described above. No significantly increased or decreased flight safety risk is anticipated.

3.4.4 Ground Safety

3.4.4.1 Existing Environment

Airport Safety

Day-to-day operations and maintenance at Homestead ARS are performed in accordance with applicable Air Force Instructions, Air Force Technical Orders, and standards prescribed by Air Force Occupational Safety and Health requirements. Handling, processing, storage, and disposal of hazardous by-products of these activities are accomplished in accordance with applicable federal and state requirements.

The Homestead ARS airfield is equipped with aircraft arresting systems (**USAF 1994a**). These are mechanical safety systems used to prevent an aircraft from overrunning the end of the runway. These systems significantly minimize accident risk in the immediate vicinity of the runways. The airfield is equipped with two E-5 (tail hook) cables and two BAK-12/14 arresting systems located at each end of the runway. Detailed procedures for both aircrews and ground personnel concerning the use of these emergency systems are contained in Homestead ARS Instruction 13-201 (**AFRC 1997**).

The airfield has specific areas designated for loading live ordnance, parking aircraft loaded with live ordnance, arming and dearming ordnance and guns, and positioning aircraft with hot brakes. Safety zones are established around these areas to minimize risk to personnel. If a landing aircraft experiences a fire risk due to overheated brakes, special parking areas are established at each end of the runway. Explosive safety issues are managed by specifying points to arm and dearm ordnance and to handle explosive cargo. The arm/dearm areas are also located at each end of the runway. During these operations, the movement of taxing aircraft on the ramp may be curtailed to ensure that no aircraft passes directly in front of the aircraft carrying the ordnance being armed, and that no conflicts exist involving safe separation distances. Explosive cargo transfer is only accomplished using the “hot cargo” pad. This area is located at the northeastern end of the runway. Depending on the cargo, it is possible that the explosive safety zone associated with the specific cargo could extend past the present cantonment boundaries. FANG F-15 aircraft on alert at Homestead ARS are also armed with ordnance. The alert area is near the cantonment boundary. When armed, these aircraft are parked in an area where the explosive safety arc extends past the current cantonment boundary (**AFRC 1997**). However, in all cases, the safety arcs are confined within the boundaries of former Homestead AFB and are generally limited to the airfield.

All F-16 aircraft carry a small amount of hydrazine, which is part of the aircraft’s emergency power unit. Hydrazine is a toxic chemical and is carried in a sealed canister. All processing, handling, and storage of hydrazine are accomplished by trained personnel using approved Air Force technical data. Maintenance actions involving the emergency power unit are performed in a facility designed and built to minimize risk associated with the handling of hydrazine.

Ordnance supporting the unit's military mission is stored in approved facilities. There are no waivers or safety deficiencies associated with explosive ordnance storage or handling at Homestead ARS.

The fire department at Homestead ARS provides fire and crash response for all areas of former Homestead AFB. The fire department is party to a mutual aid agreement with Miami-Dade County. The county performs fire code enforcement for portions of the former base no longer under Department of Defense control.

During flight, some aircraft emergencies may develop that could require the aircrew to jettison external stores mounted on the aircraft (e.g., ordnance, radar pods, and external fuel tanks). If such action were required, and the emergency permits, aircrews would fly to designated areas, make every attempt to ensure that the area is clear using visual observation and radar, and release the stores. For non-fighter aircraft, the jettison area is over water. For fighter aircraft, it is on the Homestead ARS airfield (**AFRC 1997**). During the last 20 years, no aircraft have jettisoned any external stores in either area.

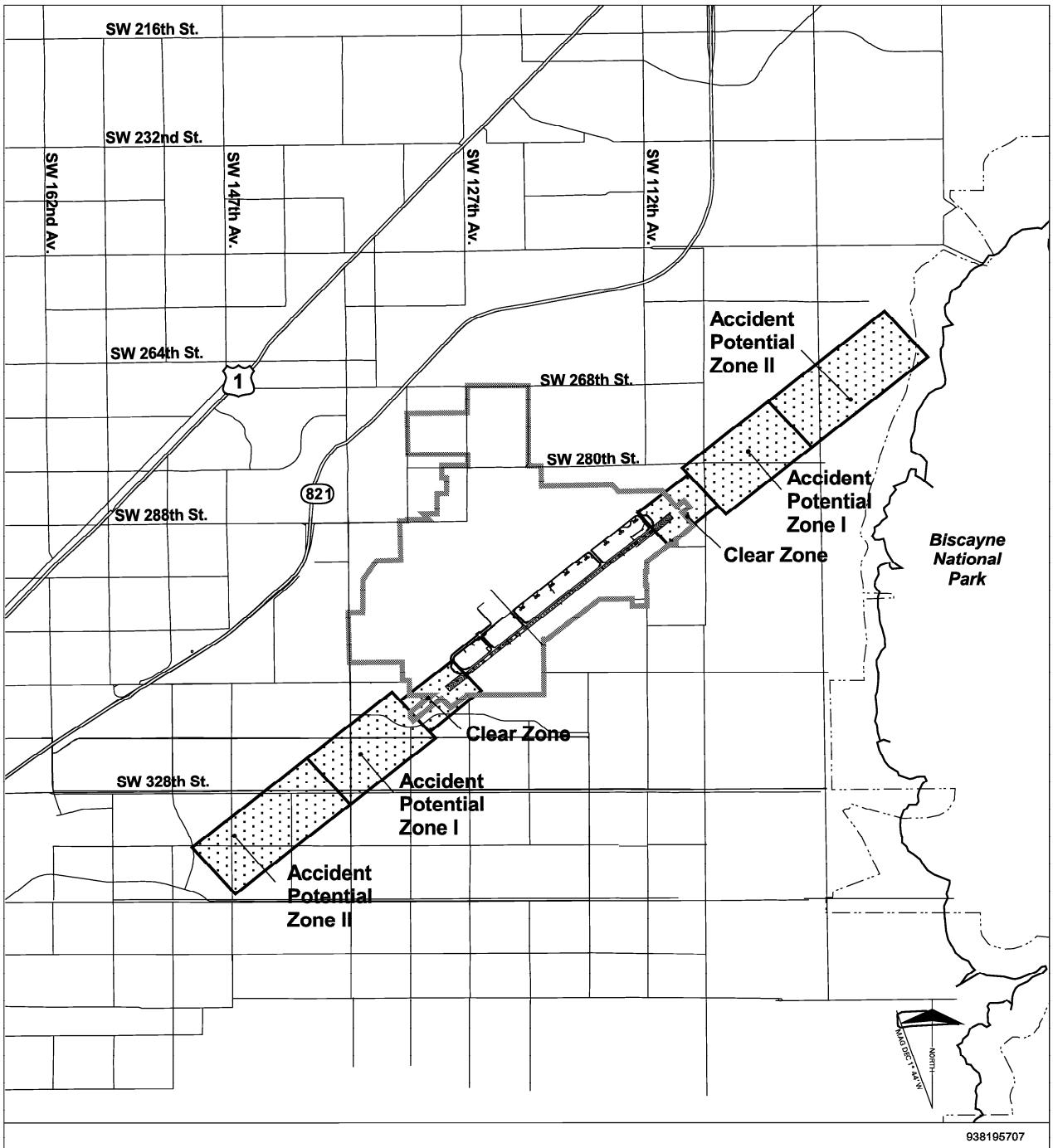
Although highly unusual, an emergency condition during flight could create the need to release or "dump" excess fuel carried on the aircraft. At Homestead ARS, there is no designated procedure or specified area for this to be accomplished, but if an emergency occurred, the aircrew would receive specific direction from the 482 FW Disaster Response Team (**AFRC 1996a**).

Air Installation Compatible Use Zones

Historic experience has shown that the majority of aircraft mishaps occur on takeoff from or landing at an airfield, in areas on either end of the runway. The Air Force developed the AICUZ program to define zones where certain land uses are incompatible with aircraft operations due to the higher risk of aircraft accidents. The purpose of the program is to inform local planning authorities of these risks and make recommendations that can be adopted in local plans to reduce risks.

The AICUZ program defines zones around Air Force airfields to minimize the results of a potential aircraft accident. At each end of the airfield is a clear zone (CZ) where occupied facilities are generally prohibited. Safety zones are areas where height restrictions are placed on structures to eliminate hazards to aircraft. Accident potential zones (APZ) are defined by the area where historic experience has shown most aircraft accidents occur. These zones were defined based on a study conducted in 1973 of 369 accidents that occurred between 1968 and 1972. It showed that 56 percent of the accidents occurred on the runway or within the CZ. Almost 13 percent occurred within the APZs. The remaining 31 percent occurred in all other locations. The study was updated with data through 1990 with nearly identical results (53 percent on the runway and CZs, 16 percent in the APZs, 31 percent elsewhere).

APZ I is an area beyond the CZ that is considered to have enough of an accident risk to recommend that land uses in the zone be limited to light industrial, manufacturing, transportation, communications, utilities, wholesale trade, open space, and agricultural uses. Uses that concentrate people in small areas are not recommended. Accident risk in APZ II is less than APZ I but still high enough to discourage uses that concentrate high densities of people in small areas. Recommended land uses within APZ II include all of those considered compatible with APZ I, as well as low-density residential, service, and retail trade. Further information on land uses within these areas is provided in Section 3.6. **Figure 3.4-4** shows the AICUZ safety zones at Homestead ARS.



LEGEND

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

1 0 1
Scale in Miles

Derived from: AFRES 1997e

Figure 3.4-4
AICUZ Safety Zones
at Homestead ARS

Turkey Point Nuclear Power Plant

In the late 1960s, Florida Power and Light Company began construction of a nuclear power plant at Turkey Point, located approximately 5 miles southeast of Homestead AFB. This construction augmented the location's already-operating two units, which are fossil-fueled generators. An operating license was obtained in the early 1970s. As part of the plant's licensing requirements, an EIS was prepared which included an assessment of risks associated with aviation activity in the plant's vicinity. Federal statutes and NRC policy guidelines require the annual risk of an aircraft accident resulting in radiological consequences greater than the guidelines established in 10 CFR 100.10 to be less than 1×10^{-7}. If the risk is greater, then 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 (**NRC 1981**). The stipulated dosage rates are either a total body exposure in excess of 25 rems (the once in a lifetime accidental or emergency dose for radiation workers) or a total radiation dose in excess of 300 rems to the thyroid (**NRC 1998**). The use of these dose exposure standards is not intended to imply that they constitute acceptable limits for emergency doses to the public under accident conditions. Rather, they are reference values intended to be used to evaluate reactor sites with respect to potential accidents of exceedingly low probability of occurrence and low risk of public exposure to radiation. The risk assessment done by FPL showed all requirements were satisfied.

Standard operating procedures at Homestead ARS require avoidance of the Turkey Point Nuclear Power Plant during takeoffs, landings, or closed patterns. In 1994, FPL responded to the NRC's requirement to provide plant-specific "Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities" for Turkey Point Units 3 and 4. The IPEEE submittal discussed the risk of crash involving aircraft operating from Homestead ARS and concluded that Turkey Point Units 3 and 4 had no significant vulnerability to aircraft crashes (**FPL 1994**). Since Units 1 and 2 are fossil-fueled units, no specific risk analysis was required for them.

3.4.4.2 Projected Baseline Environment

Ground safety procedures described above are anticipated to continue at Homestead ARS into the foreseeable future. If the airfield or other former base property is conveyed to another owner, the Air Force and FANG will retain an easement or other procedure for the safety arcs that extend beyond the cantonment.

NRC licensing procedures are assumed to continue to ensure that the Turkey Point Nuclear Power Plant IPEEE complies with safety requirements.

3.5 NOISE

3.5.1 Introduction

Noise addressed in this SEIS focuses on sound levels produced by aircraft operating into and out of former Homestead AFB and their effect on the surrounding areas and areas subject to aircraft overflight. More detailed data and information are presented in Appendix E and in a Technical Memorandum prepared in support of the SEIS (**Landrum & Brown 1999b**). This section summarizes baseline noise conditions in the communities surrounding Homestead ARS and in the nearby national parks and refuges.

3.5.1.1 Resource Definition

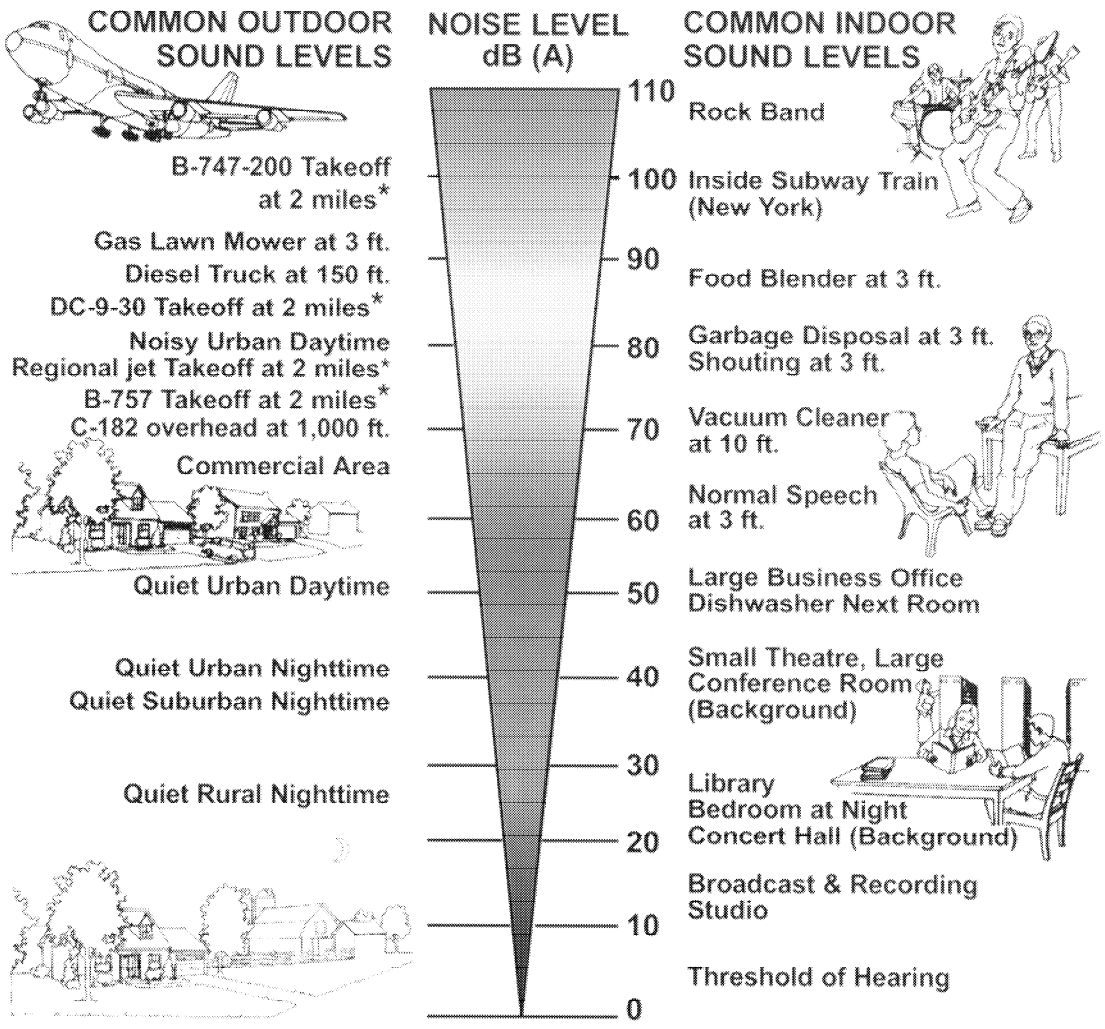
Noise is often defined as unwanted sound. Noise and sound are physically the same, the difference being in the subjective opinion of the receiver. The physical characteristics of sound include its intensity, frequency, and duration. Sound is created by acoustic energy, which produces minute pressure waves that travel through a medium, like air, and are sensed by the eardrum. This may be likened to the ripples in water that would be produced when a stone is dropped into it. As the acoustic energy increases, the intensity, or amplitude, of these pressure waves increases, and the ear senses louder noise.

The frequency of sound is measured in cycles per second, or hertz (Hz). This measurement reflects the number of times per second the air vibrates from the acoustic energy. Low frequency sounds are heard as rumbles or roars, and high-frequency sounds are heard as screeches. In addition to loudness and frequency, the duration of noise events and the number of times noise events occur during given periods are also important considerations in the way people perceive noise and its intrusiveness.

Because the human auditory system can detect changes in sound pressure level over a range of 1 to over 10 million units of pressure, sound pressure levels are measured using a logarithmic scale in units called decibels (dB). The decibel scale from zero to 110 covers most of the range of everyday sounds, as shown in **Figure 3.5-1**. An increase of 10 dB is generally perceived as being twice as loud, although it incorporates a tenfold increase of noise energy. Sound pressures of two separate sounds cannot be directly added because of the logarithmic nature of sound measurement. For example, if a sound of 60 dB is added to another sound of 60 dB, the total is a 3 dB increase to 63 dB, rather than a doubling to 120 dB. This 3 dB doubling rate is a result of logarithmic addition.

Although the human auditory system responds to changes in frequency over a range from less than 10 to over 10,000 Hz, it is most sensitive to those in the 1,000 to 8,000 Hz range. A measurement scale has been developed which emphasizes these frequencies. Sounds measured using this scale are termed "A-weighted." In this SEIS, all noise levels are presented in A-weighted decibels, since this measurement standard is most representative of the response of the human auditory system to complex noise sources.

The word "metric" is used to describe a standard of measurement. As used in environmental noise analysis, there are many different types of noise metrics. Each metric has a different physical meaning or interpretation, and each metric was developed by researchers in an attempt to represent the effects of environmental noise. The noise metrics considered in this SEIS to assess noise from aircraft operations are the Day-Night Average Sound Level (DNL), Peak Hour Equivalent Sound Level (Leq(h)), Maximum Sound Level (LAmax), Sound Exposure Level (SEL), and Time Above (TA). Each is briefly described below.



* From runway end along the Takeoff path.

(180b)HS 7.5.00.nc

Source: Landrum & Brown 1999b

Figure 3.5-1
Comparative Noise Levels

Day-Night Average Sound Level. The DNL metric is a type of equivalent sound level (Leq) which represents the logarithmic decibel average of all measured noise events during a 24 hour period. DNL takes into account the sound levels of all individual events, the number of times those events occur, and whether those events occur during the day or at night. The DNL metric was developed to account for the greater annoyance caused by sound intrusion at night. It augments the nighttime equivalent sound level occurring between 10:00 p.m. and 7:00 a.m. by 10 dB before combining it with the daytime equivalent sound level for the period between 7:00 a.m. and 10:00 p.m. DNLs typically reflect the average weighted 24 hour cumulative noise energy level over the period of one year. Cumulative noise metrics like DNL are often described by using a dosage relationship. An analogy between rainfall and noise is sometimes helpful to further explain the relationship between DNL and noise as it is heard by the listener. If the rainfall dropped during each of a series of passing showers were considered analogous to individual aircraft overflights, the total rainfall accumulated during a day would be analogous to the total noise energy. A rain gauge does not show the rain associated with each storm, but, rather, measures the total for the entire period of rainfall. Every shower increases the amount of rain in the gauge. Heavier showers increase the amount more than light showers, and longer showers increase the amount more than shorter ones. The same is true for noise. Every aircraft event increases the total daily dose, loud events increase the noise dose more than quieter ones, and events that stretch out longer in time increase the noise dose more than shorter ones. The penalty factor of the DNL metric further modifies the dosage by applying additional noise dosage during the night hours.

The typical description of DNL as a daily "average" can leave people with the impression that the maximum levels which attract their attention are being devalued or ignored. This is not the case. Just as all the rain that falls in a rain gauge during a day counts toward the total, all sounds are included in the daily noise dose that underlies the DNL. None of the noise is being ignored, even though the DNL is often numerically lower than many maximum A-levels. The noise dose includes all aircraft events, all noise levels that occur during the time period. Every added event, even the quiet ones, will increase the noise dose, and therefore increase the DNL. DNL recognizes in a single metric people's annoyance with individual noise events, with the number of noise events, and with noise events that occur during nighttime hours. DNL values correlate well with independent tests of annoyance from all sources of noise.

A Federal Interagency Committee on Noise (FICON), which included FAA, the Air Force, and USEPA, reviewed the adequacy of current noise metrics in the early 1990s and supported DNL as the primary cumulative noise exposure metric. DNL can be related to studies showing the percent of people highly annoyed by various noise levels to assess noise impacts on populations, and it can be related to federal guidelines on land uses that are considered compatible or not compatible with levels of noise exposure.

Peak Hour Equivalent Noise Level. Represented as Leq(h_{peak}) or Leq(h), this metric provides a measure of the cumulative noise energy from all aircraft operations during the "busiest" hour of operations by an airport (peak hour of average day in peak month). Expressed in average decibels, this metric is an indication of the average sound level during the period when the largest number of aircraft operations is forecast. This is not necessarily the loudest period of the day, but rather the busiest. It is possible that a limited number of loud noise events, such as military training flights, might occur during an hour when few civil operations occur, resulting in a high average noise level. Conversely, a large number of training flights by small single-engine general aviation aircraft, which are not very loud compared to military jets, may result in the busiest hour traffic with relatively small average noise levels. In general, however, the selection of the peak hour of operations normally provides a representative cross section of the daily traffic mix experienced at the airport. In this case, calculating the busiest airport hours as though they occur at the same time of day for all airports in the evaluation tends to produce a conservatively high Leq(h) value. Leq(h) was calculated for a network of locations within Biscayne and Everglades NPs, Big

Cypress National Preserve, and Crocodile Lake NWR. The metric is used to compare, among various alternatives, the noise levels during the busiest periods of the day.

Maximum Sound Level. The maximum sound level, denoted by the symbol LAmax, is the loudest aircraft noise level that is expected to occur at any specific time during the period of evaluation. It may occur only infrequently (e.g., once every few days) or several times a day. The level is highly dependent on the location of the aircraft relative to the location exposed (lateral and vertical distance) and the type of aircraft measured (jet or propeller). The measure is used to describe the loudest single aircraft event decibel level at each location evaluated.

Sound Exposure Level. The SEL, also denoted by the symbol L_{AE}, describes the acoustic energy present at a measured location over a stated time interval. For aircraft noise exposure assessments, SEL is most frequently used to describe the noise energy that is generated during a single aircraft event. It is expressed as a single decibel number that accounts for all the energy that occurs during a noise event and compresses that energy as if it had all occurred during a single second. SEL is used as the base unit in the development of DNL and Leq measures of cumulative noise exposure. It is also used to describe noise exposure patterns for specific aircraft. For the SEIS, the peak SEL that occurs at least once daily for a combination of aircraft type and flight path is reported. An exception is that SEL values reported in Chapter IV of Appendix E for special assessments in the national parks provide the maximum expected SEL, regardless of frequency of flight.

Time Above. Time Above refers to the number of minutes per average day of operation that a location will be exposed to aircraft noise above a threshold selected by the evaluator. For communities in the vicinity of an airport, the threshold usually selected is the general level of speech interference (65 dBA). That level is used for community TA analysis in this SEIS. For national parks and refuges, the threshold level selected for TA analysis in the SEIS is the traditional ambient, which includes all sounds except aircraft (e.g., wind, water, wildlife, park visitors, cars, boats, mechanical sounds).

The Time Above Ambient (TAamb) metric is indicative of the amount of daily time that aircraft noise would be above an average level of other existing environmental noises. This does not mean that every minute of aircraft noise above the traditional ambient level would be annoying to people or considered to be an adverse impact. TA only reports that daily duration of aircraft noise above a certain level; it does not report how loud the aircraft events are. Other metrics report loudness. Neither does the use of the traditional ambient as a threshold of measurement mean that aircraft could never be heard at other times. Under certain conditions, aircraft can be heard below the ambient level. The point at which noise sources below the ambient can be detected is extremely difficult to determine. Important variables include noise frequency characteristics of ambient sound at each location, the frequency characteristics of each aircraft type, weather, terrain, and the state and attentiveness of the listener. The total calculated TA at each site is not all consecutive minutes of noise, but is spaced throughout the day corresponding to aircraft overflights.

Impacts on Humans

Noise may have detrimental impacts on the human environment. To different degrees, it may interfere with activities such as face-to-face conversation, telephone use, enjoyment of radio and television, sleep, recreation, and wildlife observation. The social impact of unwanted sound is an area of great concern and one that has received much attention, particularly around airports.

Very high noise levels can adversely affect human hearing. Federal workplace standards for protection from hearing loss allow a time-average level of 90 dB over an 8 hour work period, or 85 dB over a

16 hour work period. The most conservative criterion suggests a level of 70 dB over a 24 hour period to assure no measurable hearing loss after a 40 year exposure. Because humans are not generally out of doors continuously for 24 hour periods, a level of 75 dB has been adopted as a conservative threshold for continuous noise exposure to affect hearing.

Nonauditory health effects of noise can include diseases other than hearing loss, such as hypertension or nervous disorders, which can be attributable to noise exposure. There is no published evidence that such effects have occurred at noise exposure levels below those protective against noise-induced hearing loss, described above. Addressing the use of a 24 hour average of 75 dB as a threshold for health effects, the lead paper at the National Institutes of Health Conference on Noise and Hearing Loss in 1990 stated, "The nonauditory effects of chronic noise exposure, when noise is suspected to act as one of the risk factors in the development of hypertension, cardiovascular disease, and other nervous disorders, have never been proven to occur as chronic manifestations at levels below these criteria." (**Air National Guard 1997**)

Many studies of human response to noise have been performed. Since human response to noise stimuli is based on individual human perception, it is very subjective and not easily submitted to objective testing. The variability in the way individuals react to noise makes it impossible to accurately predict how any one person will react to a given noise. However, when communities are considered as a whole, trends emerge which relate noise to annoyance. Statistical dose-response relationships of people to transportation noise have been developed using social surveys. Case histories and social surveys suggest that community response to aircraft noise is affected by cumulative exposure, including how loud the noise is and the frequency of events.

Figure 3.5-2 depicts the results of studies conducted by Schultz on the correlation of DNL with percent people surveyed who were "highly annoyed' (according to the Schultz curve). The Air Force also conducted similar studies, with the results shown in Figure 3.5-2.

Annoyance is a summary measure of the general adverse reaction of people to noise that generates speech interference (including inability to use the telephone, television, radio, or recordings satisfactorily), sleep disturbance, or simply interferes with the desire for a tranquil environment. Currently, the best available measure of the human response to noise is the percentage of the population characterized as "highly annoyed" by long-term exposure to noise of a specified level expressed in terms of DNL. The updated Schultz curve remains the best available source of empirical dosage-effect information to predict community response to transportation noise. Statistically, around 13 percent of the population is highly annoyed by transportation noise at the DNL 65 dB level. The curve indicating the percent of people highly annoyed rises more sharply as noise exposure increases above DNL 65 dB.

It should be noted that community response to noise is a term used to describe the annoyance of groups of people exposed to environmental noise sources in residential settings. Further research needs to be done to either verify the applicability of the Schultz curve to special environments that are not residential settings such as national parks and wildlife refuges or, if not verified, to develop a comparable indicator of human response in such environments.

Whenever intrusive noise exceeds approximately 65 dB indoors, there will be some degree of interference with speech communication. An SEL of 85 dB represents the exterior noise level at which normal conversation is considered to be disrupted inside a well-insulated structure at conversation distances of three feet or more. Good insulation will attenuate noise by about 20 dB, and conversation is typically considered to be disrupted by noise levels of 65 dB or louder.

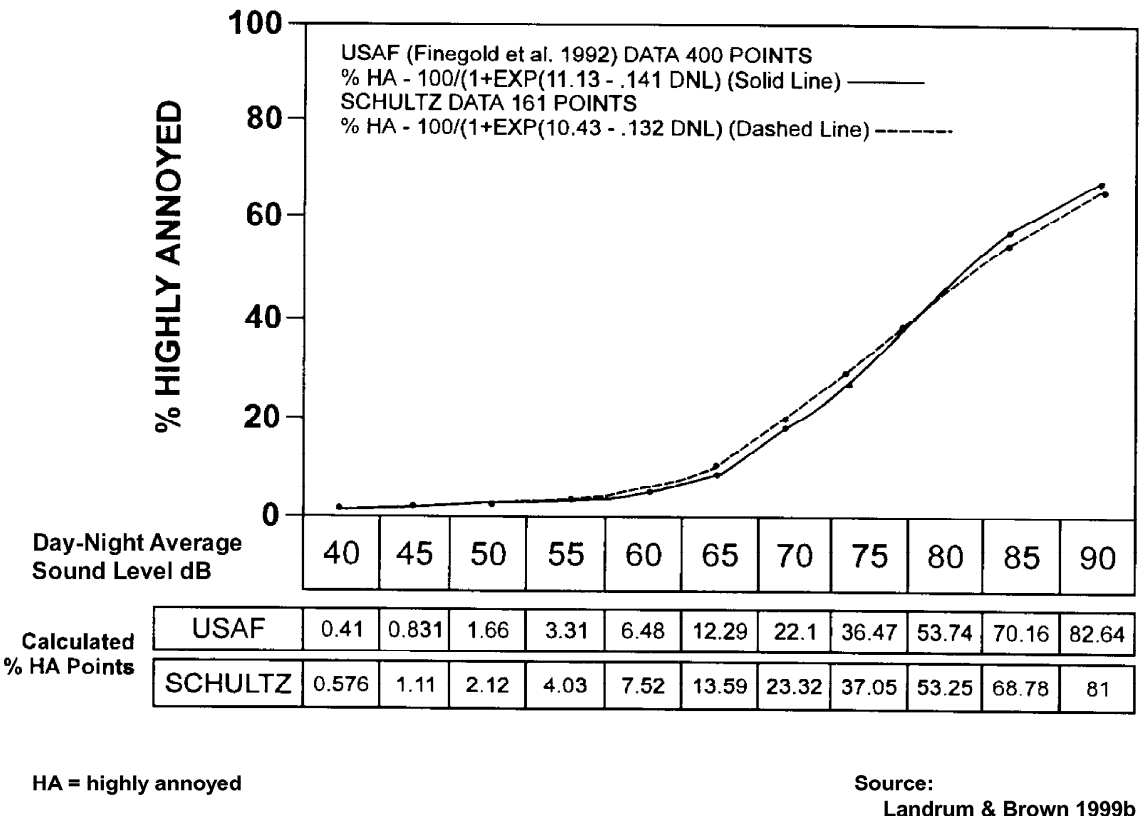


Figure 3.5-2. Relationship Between DNL and Percent Highly Annoyed

Social surveys show that interference with sleep is noted as a contributor to annoyance for nearly 8 percent of people at a 60 dB interior noise level. Psychological studies show that sleep interference can exist without a person being consciously awakened. Numerous studies on sleep interference have been conducted, with varying conclusions as to the effect of noise on sleep. One study concluded that, with adjustments for comparable measures of noise, it can be expected that approximately 30 percent of the people could be aroused or awakened if indoor levels reach 80 to 95 dBA, depending on whether windows are open or closed and on the quality of construction.

The temperature conditions in south Florida do not require the levels of weatherproofing as colder climates. They do, however, result in windows being closed a majority of the year for home air conditioning. Structural insulation is known to reduce the noise levels between outside and inside. The attenuation rate from outside to inside is assumed to be approximately 20 dB for all climates within the United States. Therefore, residences located in areas receiving exterior steady noise exposure of 75 dBA to 80 dBA (55–60 dBA inside) should allow for normal conversations inside at typical conversational distances 97 percent to 99 percent of the time.

3.5.1.2 Applicable Laws and Regulations

Laws, regulations, and guidelines related to aircraft noise exposure and effects are summarized below.

Noise Control Act of 1972. This act gave the FAA broad authority to regulate aircraft for the purpose of noise abatement and established the statutory framework for federal regulation of aircraft source noise.

Noise Standards: Aircraft Type and Airworthiness Certification (14 CFR Part 36). This regulation establishes certification standards for measuring and limiting aircraft noise at the source.

Operating Noise Limits (14 CFR Part 91, Subpart I). This regulation prescribes the source noise standards that aircraft must meet in order to operate within the United States.

Aviation Safety and Noise Abatement Act of 1979, as amended (49 U.S.C. 2101 et seq.). This act directed FAA to establish a single system of measuring noise that accounts for intensity, duration, frequency, and time of occurrence and for which there is a highly reliable relationship between noise exposure and people's reactions to noise. The act further directed FAA to identify land uses which are normally compatible with various exposures of individuals to noise. Finally, the act established a voluntary comprehensive airport noise compatibility planning program for airports.

Airport Noise Compatibility Planning (14 CFR, Subchapter I, Part 150). This regulation establishes DNL as the single system for measuring noise, contains compatible land use guidelines, and sets forth the criteria and procedures for airport noise compatibility planning.

Airport Noise and Capacity Act of 1990. This act mandated the phase out within the continental United States of all Stage 2 aircraft over 75,000 pounds by December 31, 1999. It placed statutory requirements and limitations on proposed airport noise restrictions that would affect Stage 2 and Stage 3 aircraft.

Notice and Approval of Airport Noise and Access Restrictions (14 CFR Part 161). This regulation prescribes procedures and criteria for the proposal and adoption of airport noise restrictions.

FAA Orders 1050.1D/E, Environmental Impacts, Policies and Procedures, and 5050.4A Airport Environmental Handbook. These orders govern FAA compliance with the National Environmental Policy Act and provide guidance on airport noise analysis significance criteria for airport development projects.

National Park Service Act of 1916 (Organic Act [16 U.S.C. §1]). This act states the fundamental purpose of the NPS is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.

National Park Service Reference Manual on Soundscape Preservation and Noise Management (RM 47). This reference manual includes Director Order 47 on soundscape preservation, as well as applicable policies and procedures, technical guidance on planning, monitoring, education, noise prevention and mitigation, and other information designed to help field managers and staff meet their responsibilities.

Presidential Memorandum for the Heads of Executive Departments and Agencies (April 22, 1996). This Presidential Memorandum mandates additional planning for addressing the impacts of transportation on national parks. The memorandum said that intrusion of low-altitude aircraft can "mar the natural beauty of the parks and create significant noise problems…" and can interfere with wildlife, cultural resources, and visitor enjoyment.

3.5.1.3 Region of Influence

The ROI for the noise analysis includes the community surrounding Homestead ARS that is or could be exposed to elevated noise levels from aircraft operations, Biscayne and Everglades NPs, Crocodile Lake NWR, and Big Cypress National Preserve (**Figure 3.5-3**).

3.5.2 Existing Environment

The existing environment has been characterized by both measuring and modeling sound levels. Measured sound levels were taken by FAA and NPS contractors at a total of 37 sites in Biscayne and Everglades NPs, Crocodile Lake NWR, and Big Cypress National Preserve. Modeled sound levels were calculated for the entire ROI using the enhanced version of the FAA Integrated Noise Model (INM).

Prior to its closure, Homestead AFB was the home of a much greater number of military aircraft operations than use the Air Reserve Station under existing conditions. Information included in the 1988 AICUZ study was drawn upon to provide a historical frame of reference for past conditions before Hurricane Andrew (**Landrum & Brown 1999b**). The amount of aircraft noise exceeded current levels both on a cumulative and single event basis. Appendix E includes pre-realignment noise contours and grid point analysis.

3.5.2.1 Field Measurements

Sound measurements were conducted by the John A. Volpe National Transportation Systems Center for FAA at 29 sites between August 10 and August 20, 1998 (**Fleming et al. 1999**). In addition, NPS contracted with Sanchez Industrial Design, Inc. (SID) to conduct ambient noise level measurements at 16 sites in the area between September 18 and October 5, 1997, and at an additional four sites between November 17 and 20, 1998[1]. Twelve of the sites measured by SID were also measured by the Volpe Center. **Figure 3.5-4** shows the location of the measured sites. All sites measured by the Volpe Center are designated with an initial letter "M" (including those also measured by SID). Sites measured by SID only are designated with initial letters "SD." The primary metric used to characterize ambient noise for this study is the Leq for the period of monitoring (in most cases, 3 hours) and the 10 second maximum and minimum Leq values observed for the same sampling period. **Table 3.5-1** lists the sites, indicates which were measured by each contractor, and provides the map designator for each site.

These measurements were used to describe the ambient sound environment in four ways:

- Existing Ambient—all sounds associated with a given environment, including aircraft.
- Traditional Ambient—all sounds except for aircraft.
- Natural Plus Visitor Self-Noise (N+VSN)—all sounds of nature and visitor-generated self-noise, excluding all mechanical sounds. Visitor self-noise includes voices, footsteps, and other sounds that a visitor creates.
- Natural Ambient—the natural sound conditions, including all sounds of nature (e.g., wind, water, wildlife) and excluding all human and mechanical sounds.

[1] In 1998, SID also conducted additional 24 hour noise monitoring, and this set of data is available through NPS. Monitored data do not allow for the identification of the different ambients measured for the SEIS.

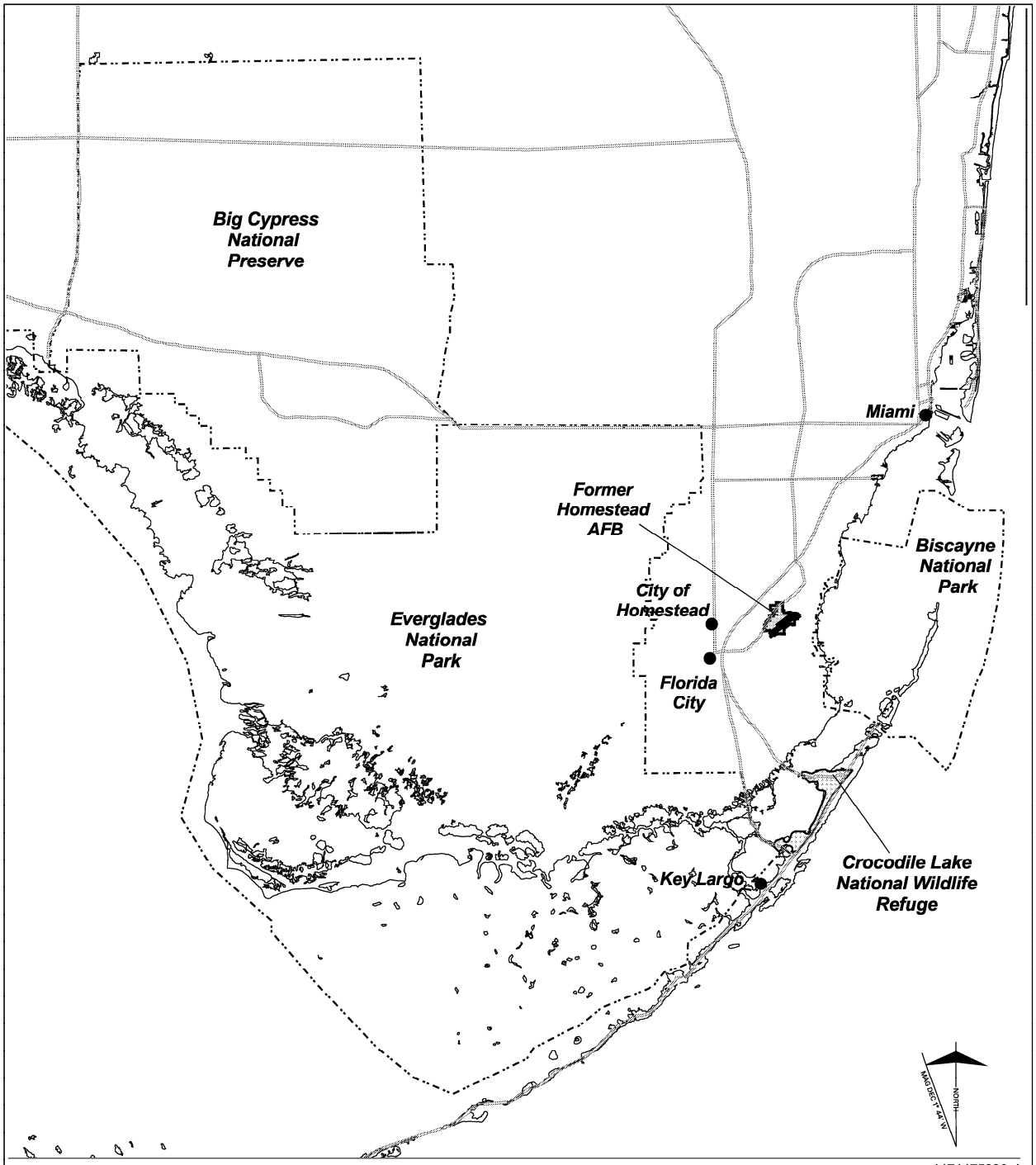
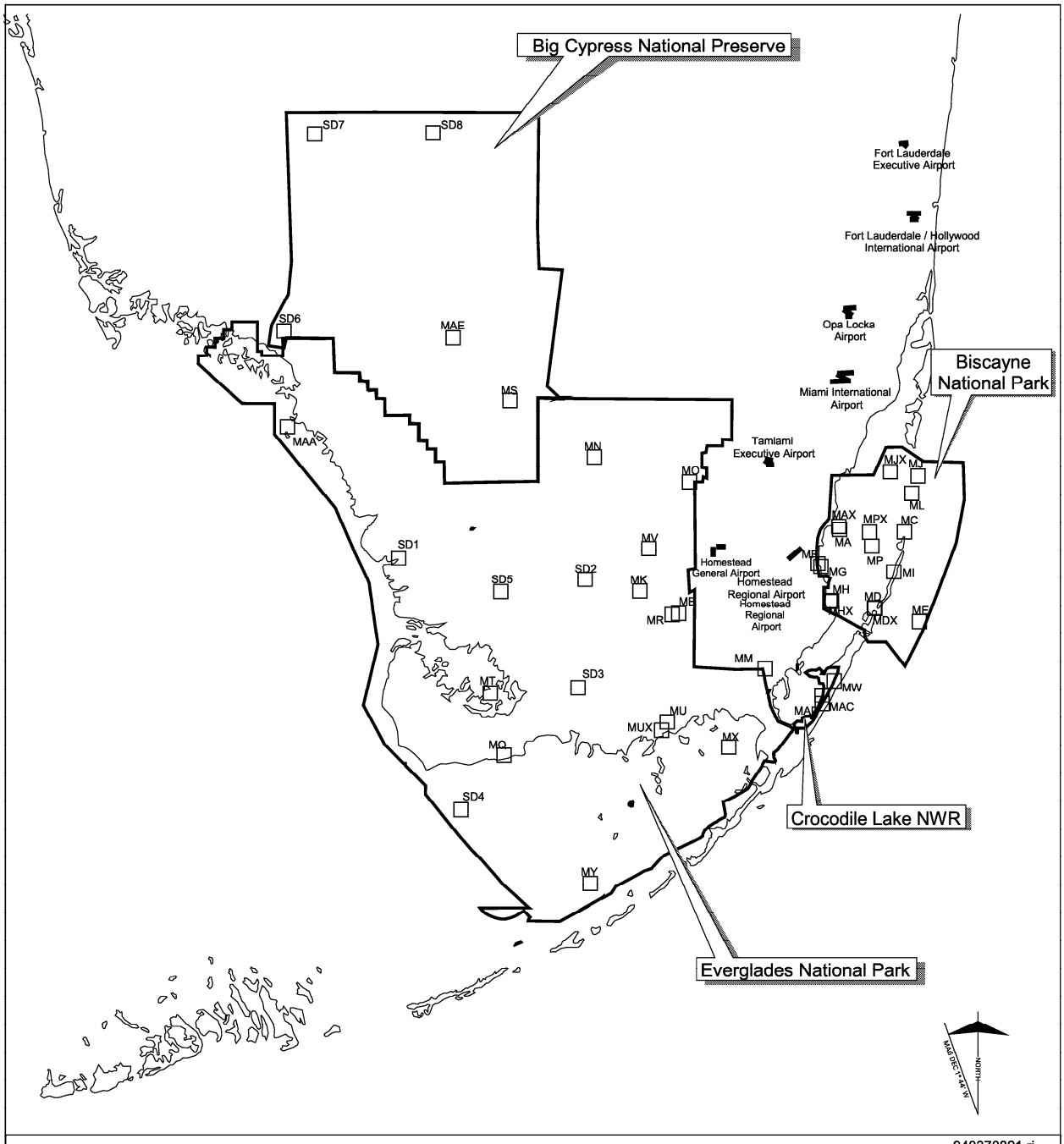


Figure 3.5-3
Region of Influence for Noise



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LEGEND

- Location Point
- National Park Boundary

10 0 10 20

Scale in Miles

Source:
Landrum & Brown 1999b

Figure 3.5-4
Noise Sites Measured by Volpe Center and SID

Table 3.5-1. Average Measured Ambient Sound Levels

Index Number	Map Desig-nator	Site Name and Location	Dates of Measurement	Average Measured Ambient Sound Level (dB)			
				Traditional	Existing	Natural	Natural Plus Visitor Self-Noise[1]
Biscayne National Park							
A *	MA	Black Point	8/10–12/98	51.8	54.6	51.3	51.2
C * Bis2 **	MC	Boca Chita	8/10,13,15/98 9/18,20/97	48.2	50.7	40.8	43.0
I * Bis8 **	MI	Elliot Key	8/12,15,17/98 9/20,22/97	48.6	49.0	49.8	50.4
P * Bis5 **	MP	Featherbed Bank Central to East Bay	8/12,14,15/98 9/22/97	49.6	49.4	50.9	54.0
F * Bis4 **	MF	Fender Point	8/11,14/98 9/21/97	47.3	52.1	41.6	41.1
H *	MH	Mangrove Key	8/11,15/98	45.1	44.9	27.9	42.9
E * Bis6 **	ME	Pacific Reef Reef off Caesar Creek	8/11,15/98 9/22/97	51.6	51.4	50.4	48.6
D * Bis7 **	MD	Rubicon Key	8/11,14/98 9/20,22/97	49.8	50.2	43.0	46.3
L * Bis3 **	ML	Soldier Key	8/13,16/98 9/21,23/97	56.2	58.0	50.3	60.2
J *	MJ	Stiltsville	8/12,16,17/98	54.9	55.7	***	53.2
G * Bis1 **	MG	Visitors Center	8/11,16/98 9/18,20/97	56.2	59.5	47.7	59.1
Everglades National Park							
B * Ever2 **	MB	Anhinga Trail	8/10,12,15/98 10/2,5/97	54.2	52.2	55.4	55.6
Y *	MY	Buchanan Key	8/19/98	45.8	45.7	44.6	45.3
O *	MO	Chekika	8/10,17/98	41.0	45.7	40.4	40.6
M *	MM	Eastern Panhandle	8/13/98	54.9	54.5	59.5	59.5
V *	MV	Eastern Sparrow	8/18/98	31.2	48.7	31.2	31.2
Q * Ever6 **	MQ	Eco Pond	8/14/98 10/1,3/97	47.2	47.9	45.7	48.0
R *	MR	Hidden Lake	8/15,17/98	36.0	39.8	36.4	36.2
U *	MU	Little Madeira Bay	8/18,20/98	46.7	47.3	43.9	43.9
X * Ever8 **	MX	North Nest Key	8/18/98 10/5/97	39.9	42.1	40.1	40.1
AA *	MAA	Pavilion Key	8/20/98	45.4	46.1	45.5	45.6
K *	MK	Pinelands	8/12,13,19/98	46.5	47.1	46.6	47.5
N *	MN	Shark Valley	8/13,16/98	45.7	46.3	45.1	43.9
T *	MT	Whitewater Bay	8/17/98	42.0	44.0	38.0	38.0
Ever1 **	SD1	Broad River Campground	10/2/97	46.2	46.1	43.8	NA
Ever4 **	SD2	Pa-hay-okee Overlook	9/30/97	39.7	39.9	39.0	NA
Ever5 **	SD3	Nine Mile Pond	10/1/97	44.6	44.5	40.0	NA
Ever7 **	SD4	Carl Ross Key	10/3/97	43.2	43.2	43.2	NA
Ever9 **	SD5	Canepatch Campground	11/19/98	39.0	38.9	37.0	NA

Index Number	Map Designator	Site Name and Location	Dates of Measurement	Average Measured Ambient Sound Level (dB)			
				Traditional	Existing	Natural	Natural Plus Visitor Self-Noise[1]
Crocodile Lake National Wildlife Refuge							
AD * CL10 **	MAD	Barnes Sound	8/19/98 11/20/98	39.2	43.3	38.0	36.0
W *	MW	Hardwood Hammock	8/18/98	41.3	44.1	39.7	41.7
AC *	MAC	Mangrove Inlet	8/18/98	40.8	41.1	32.8	32.8
Big Cypress National Preserve							
S *	MS	Golightly	8/16,17/98	49.3	48.8	42.3	42.4
AE *	MAE	National Scenic Trail	8/20/98	43.5	58.4	44.6	44.9
BigC2 **	SD6	Halfway Creek	11/17/98	64.0	64.0	34.0	NA
BigC3 **	SD7	Bear Island	11/18/98	33.7	38.5	33.0	NA
BigC4 **	SD8	National Scenic Trail	11/18/98	34.1	34.6	34.0	NA

Source: Federal Aviation Administration, *Characteristics of Ambient Sound Levels at Four Southern Florida National Properties*, January 1998, Table 9, page 130, and individual site records of measurements provided by Volpe Center and SID.

Notes: * Sites measured by Volpe Center.
** Sites measured by SID.
*** No natural ambient measured. Manmade sounds dominated during 100 percent of the measurement time.
[1] Based on measurements by Volpe Center; data not calculated by SID.
NA Not available

In measuring ambient noise in the national parks and refuges, FAA and NPS consultants used a methodology developed jointly by NPS and FAA that has been used for ambient measurements in national parks for the last several years. This methodology is described in the FAA report, *Draft Guidelines for the Measurement and Assessment of Low-Level Ambient Noise*. Recently, NPS has suggested a different methodology to determine the natural ambient (see Appendix H). As part of this methodology, NPS has recommended that an "L_{90}" metric be used to characterize the natural ambient. L_{90} is the A-weighted sound energy level that is exceeded 90 percent of the time and is the metric NPS has indicated it will use in its soundscape management initiatives, including the soundscape plan for Biscayne NP.

The FAA disagrees with the use of L_{90} for several technical reasons. L_{90} is a statistical measure that represents the quietest 10 percent of data. The quietest 10 percent of data does not include the full range of natural sounds. Thus, L_{90} represents a minimum level, not an average level. Moreover, the simple L_{90} statistical approach to data analysis can result in contamination of the data because it does not distinguish sources of sounds and includes all sounds, including man-made sounds such as aircraft.

The L_{90} metric was briefly considered for the Grand Canyon National Park noise analysis, but it was not regarded by FAA and NPS as reasonably representative of the natural ambient. Recently, an independent technical committee of acousticians investigating Grand Canyon noise assessment methodology reiterated that manned noise measurement systems are superior to unmanned noise monitors and to simple statistical methods for analyzing ambient sound levels. The FAA and NPS used this guidance to conduct an extensive program of manned noise measurements at Grand Canyon in September 1999. Absent manned noise measurement systems and analytical procedures, unmanned monitoring and use of L_{50} would provide a more representative statistical calculation of the natural ambient than L_{90}. In sample

checking, FAA found reasonable agreement between L_{50} statistical calculations and the measured natural ambient Leq values reported for the SEIS analysis.

The traditional ambient is used as a baseline in this SEIS because it includes all of the existing environment's noises except for aircraft. The aircraft noise component of the existing environment can be more accurately described using computer modeling instead of short-term measurement data. The SEIS uses computer modeling of aircraft noise to evaluate how aircraft activity at Homestead ARS over the national parks and refuges, in addition to aircraft noise from other airports in the vicinity, would affect the existing environment.

NPS does not agree that the traditional ambient level is the appropriate metric for characterizing ambient sound levels in Biscayne and Everglades NPs. NPS has expressed its view that the natural ambient is the proper basis for defining the affected environment in those parks as it is more consistent with the mandates on the NPS of the National Park Service Organic Act and NPS policy and practice. The reason the traditional ambient was selected for the SEIS analysis was to assess the entire affected environment (i.e., all sounds that are present), rather than only a portion of the affected environmental sounds (such as the natural sounds). Comparisons of aircraft noise to average measured natural sounds at specific national park locations can be done using data in Table 3.5-1.

Measurements were used to develop mapping of traditional ambient sound levels throughout Biscayne and Everglades NPs and Crocodile Lake NWR, as described in the Volpe Center's technical report (**Fleming et al. 1999**). Ambient mapping was not done for Big Cypress National Preserve because of its distance from Homestead ARS and the few measurements performed there. Therefore, TAamb was not calculated for Big Cypress National Preserve.

Traditional ambient sound levels measured at the sites ranged from a low of 31.2 dB at Eastern Sparrow in Everglades NP to a high of 64.0 dB at Halfway Creek in Big Cypress National Preserve. The majority of the traditional measured sound levels were between 45 and 55 dB. For two sites where nighttime measurements were made (Black Point and Mangrove Key), traditional ambient sound levels were within 3 dB of daytime measurements. Table 3.5-1 indicates the average traditional ambient, existing ambient, natural ambient, and natural plus visitor self-noise measurements associated with each location. Traditional, existing, and natural ambient measurements were calculated by combining the Volpe (FAA consultant) and SID (NPS consultant) measurements at sites measured by both. N+VSN was only captured in the Volpe measurements.

At many of the sites, especially in Biscayne NP, very little data were measured under a natural ambient state due to the abundance of noise associated with manmade activity (mostly mechanical sounds). It may also be noticed, when comparing ambient categories on Table 3.5-1, that the natural ambient sound level is not always the lowest ambient relative to other ambient values. At some sites, the sound of nature at close range, in particular insect-related activity, was so loud that it effectively masked other sounds that occurred at greater distances from the noise receiver. It should also be noted that, while the measurements are believed to be generally representative of sound levels in those locations, they were taken over a limited period of time and during a limited season and could vary over a longer time frame. However, the measured ambient levels are likely to be conservative (i.e., lower on average) because the summer/fall seasons when the measurements were taken are generally quieter than winter due to lower visitor activity and wind.

3.5.2.2 Noise Modeling

Modeling Approach

A computer model was used to determine the noise exposure patterns related to aircraft operations in the airport environs and national parks and refuges. Aircraft information used in computer modeling comes from air traffic control radar data and airport operations data. These sources are more complete and reliable than short-term field measurements in establishing an annual baseline for aircraft noise effects. In addition, computer modeling is the only way to evaluate future aircraft noise effects of different levels of airport use and alternative flight tracks for the Proposed Action and alternatives, since these do not presently exist and so cannot be measured. The modeling of existing aircraft noise facilitates comparisons with potential future conditions and alternatives.

A modified version of the INM, Version 5.2a, was used in this study to predict noise levels now present or expected to be present in the areas influenced by aircraft operations at former Homestead AFB. The INM is FAA's standard methodology for predicting and assessing aircraft noise in and around airports. It is a computer model which, during an average 24 hour period at an airport, accounts for each aircraft flight along flight paths leading to or from the airport, or overflying it. Flight path definitions are coupled with data in the program database relating to noise levels at varying distances and engine power settings for each distinct type of aircraft selected.

Sound levels calculated by this model have been extensively validated against measured data and proven to be highly accurate. Because of the sensitivity of the national parks and resources in south Florida, the FAA developed a special version of the INM to support this SEIS (**Fleming et al. 1999**).

For this study, modifications were made to the INM by the Volpe Center to enhance the model's capabilities to predict noise levels (**Fleming et al. 1999**). These enhancements include:

- Modification of the over ground noise propagation equations to incorporate spectral data better representative of current aircraft.
- Incorporation of different attenuation rates for hard (water) and soft (grass) surfaces.
- Inclusion of Traditional Ambient noise level mapping at the NPS properties and national wildlife refuge for use in Time Above assessments

Reasonableness checks with measured data indicate that the modeled results correlate well with the noise measurements taken by FAA. The model enhancements, which improved the noise analysis for unique sound characteristics in southern Florida, were incorporated into the public version of INM in the recent September release of version 6.0.

The model computes contours by calculating sound levels at regular grid locations on ground level around the airport. The distance to each aircraft in flight is computed, and the associated noise exposure of each aircraft flying along each flight path within the vicinity of the grid location is determined. Additional corrections are applied for excess air-to-ground attenuation, acoustical shielding of aircraft engines by the aircraft body, and speed variations. The logarithmic acoustical energy levels for each individual aircraft are then summed for each grid location. For the DNL metric, a penalty is applied to nighttime operations. The cumulative values of noise exposure at each grid location are then used to interpolate contours of equal noise exposure for reference DNL levels (e.g., DNL 65 dB, 70 dB, etc.). For this study, contour analysis was used to describe DNL dispersion patterns in excess of 60 dB and SEL patterns over 85 dB associated with the principal aircraft types forecast for use at Homestead.

For the grid point analyses, the model computes the acoustic data at individual locations selected by the user. Data on acoustic energy and peak noise levels were computed for each aircraft overflight in the vicinity of the selected point. For this study, point noise level data include DNL, LAmax, SEL, and TAamb for the average annual day. In addition, Leq(h) levels are presented for the peak hour of operation. These levels include aircraft operating from Homestead ARS in combination with aircraft operating from other airports in the region.

To activate the INM, a variety of user-supplied input data is required. These include a mathematical definition of the airport runways relative to a base reference point, the mathematical description of ground tracks above which aircraft fly, and the assignment of specific aircraft with specific engine types to individual flight paths from each runway end. Optionally, the user may adjust standard performance information to account for air traffic control or the use of noise abatement procedures. Aircraft not included in the model's database may also be defined for modeling. The input data used to prepare the noise exposure contours and grid point data for the study are described in the following section.

INM Data

Use of the INM requires the preparation of extensive input data for each operating condition to be evaluated. For this study, the operations from several airports other than Homestead ARS were included to provide a more comprehensive assessment of noise impacts and conditions to be expected in the ROI. The activity in place or expected to be in place at four busy regional airports, from which aircraft are known to overfly the ROI, was incorporated into the analysis. These airports are Miami International, Fort Lauderdale-Hollywood International, Kendall-Tamiami Executive, and Homestead General Airports. Operations from other airports in the region are either not known to overfly the ROI or generate such small numbers of operations as to be inconsequential to aircraft noise level analysis. The principal airports generating low-altitude traffic (below 5,000 feet) over the ROI are Kendall-Tamiami and Homestead General, while Miami and Fort Lauderdale-Hollywood International Airports generate high-altitude traffic (above 5,000 feet) over the ROI.

Table 3.5-2 presents the estimated current average daily operations at Homestead ARS. These operations are based on operational information from 1997 and represent the current estimate of annual operations of a representative year.

Table 3.5-2. Current Average Daily Operations at Homestead ARS

Aircraft	Runway 05			Runway 23			Total	
	Arrival	Departure	Closed Pattern	Arrival	Departure	Closed Pattern	Daily	Annual
F-15	1.26	1.14	0.22	0.10	0.24	0.06	3.02	1,100
F-16	9.10	9.08	12.24	0.78	0.78	0.94	32.92	12,000
Other	2.94	2.96	7.58	2.14	2.14	0.62	18.38	6,724
Total	**13.30**	**13.18**	**20.04**	**3.02**	**3.16**	**1.62**	**54.32**	**19,824**

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

In order to characterize the existing environment, the INM was programmed to address the flight tracks used by the military and government aircraft operating out of Homestead ARS, shown in Section 2.1. Military and government aircraft were assigned to each flight track based on actual historical use.

3.5.2.3 Community Noise

Community noise information describes the aircraft-related sound levels from takeoffs and landings at Homestead ARS that result in significant and moderate levels of aircraft noise. Aircraft noise exposure at levels of DNL 65 dB and higher is generally considered to be significant, with levels between 60 and 65 dB considered to be moderate. The principal metric for analyzing community noise is DNL. SEL footprints are also provided for select aircraft to reflect noise levels that can be expected from individual aircraft operations.

DNL Contours

DNL contours at 60, 65, 70, and 75 dB for current aircraft operations at Homestead ARS are presented in **Figure 3.5-5**. These contours encompass a total of 6,458 acres. The area within each contour is presented in **Table 3.5-3**, which also identifies the estimated population and number of dwelling units within each contour.

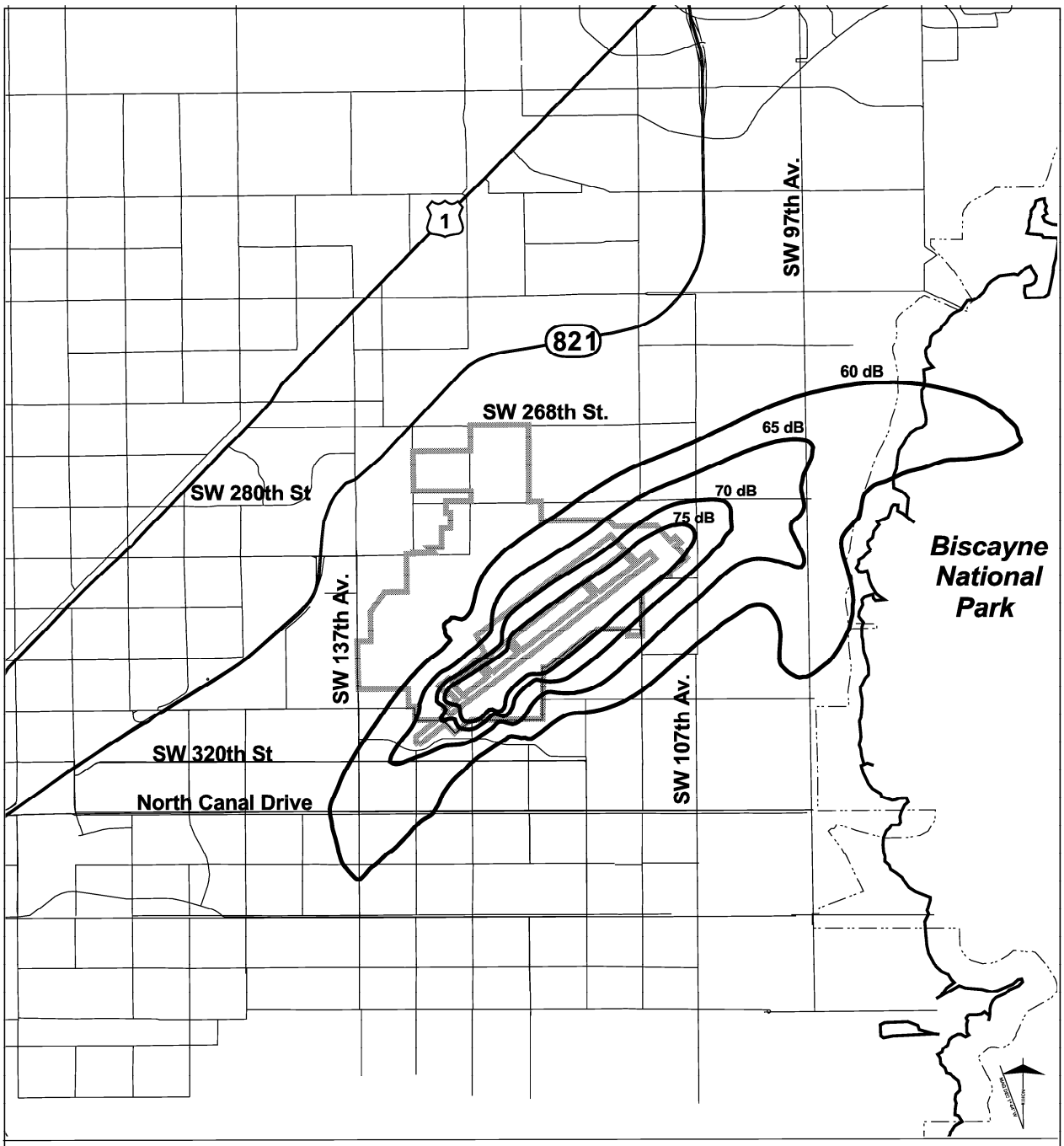
Table 3.5-3. Area, Dwelling Units, and Population Within Existing DNL Contours

	DNL				
	60–65 dB	**65–70 dB**	**70–75 dB**	**Above 75 dB**	**Total Above 60 dB**
Acres within former Homestead AFB	390	372	301	666	1,728
Acres outside former Homestead AFB	3,322	1,062	301	45	4,730
Total acres	3,712	1,434	602	710	6,458
Dwelling units[1]	202	95	0	0	297
Population[1]	1,148	656	0	0	1,804

Source: **Landrum & Brown 1999b**.
Note: [1] All located outside the boundaries of former Homestead AFB.

The majority of the area within the noise contours is located to the northeast of the airport, reflecting the predominant traffic flow of departures. The DNL 75 dB contour is almost entirely contained within the boundaries of former Homestead AFB, passing beyond the boundary by about 1,300 feet to the northeast and reaching east to SW 107th Avenue. To the south, it passes just beyond the boundary adjacent to the runway. The DNL 70 dB contour is similar in shape, but larger than the 75 dB contour. It extends northeastward approximately 2,000 feet farther than the 75 dB contour to SW 280th Street, but remains almost entirely within former base property to the southwest. Along its southern portion, the 70 dB contour includes an area adjacent to the airport that is devoted to agricultural use. The DNL 65 dB contour extends approximately 1.6 miles northeast of the former base, ending at SW 97th Avenue. The bulges and hook in the contour shape are indicative of turns along flight paths flown by military aircraft in either departures or closed patterns. To the southwest, the DNL 65 dB contour extends slightly more than 0.5 mile outside the former base along the extended centerline of the final approach, reaching to SW 320th Street.

The 60 dB contour extends from beyond North Canal Drive in the southwest to over Biscayne Bay in the northeast, crossing the boundary into Biscayne NP. It includes a southward turning hook associated with departures and pattern operations by military jets in northeast traffic flow and a southward bend at the west end of the contour associated with similar operations in southwest traffic flow.



LEGEND

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

1 0 1
Scale in Miles

Derived from:
Landrum & Brown 1999c

Figure 3.5-5
DNL Contours for Current Operations at Homestead ARS

SEL Footprints

As an indication of single event noise levels produced by current military aircraft, sound exposure contours, in SEL, were prepared for the F-16 aircraft. The F-16 was selected because it is the dominant aircraft at Homestead ARS. For this evaluation, locations that have SEL measurements of 85, 90, 95, and 100 dB are presented. The 85 dB SEL value represents the exterior noise level at which normal conversation is considered to be disrupted inside a well-insulated structure at conversation distances of three feet or more. Good insulation will attenuate noise by about 20 dB, and conversation is typically considered to be disrupted by noise levels of 65 dB or louder.

Figure 3.5-6 displays the SEL footprint for the F-16 military fighter jet aircraft taking off and landing on Runway 5. The contours shown represent the combined sound energy from one departure and one arrival on Runway 5 compressed into one second. The contour follows the departure pattern that turns to the south after takeoff and climbs to approximately the south boundary of Biscayne NP prior to turning to the west. Near the airport, the pattern bulges to the sides of the runway in the area where the aircraft would use afterburner power during takeoff. The afterburners are turned off shortly after takeoff, before the aircraft reaches Biscayne NP. As the aircraft reaches an altitude of approximately 1,000 feet, the shape of the highest level contours begins to narrow and taper as the aircraft climbs. The intermediate level contours taper as the aircraft continues to gain altitude and speed in leaving the airport environs. In contrast, there is a much smaller footprint associated with the approach operation (landing) from the southwest. This reflects the lower power levels and rapid descent used during landing.

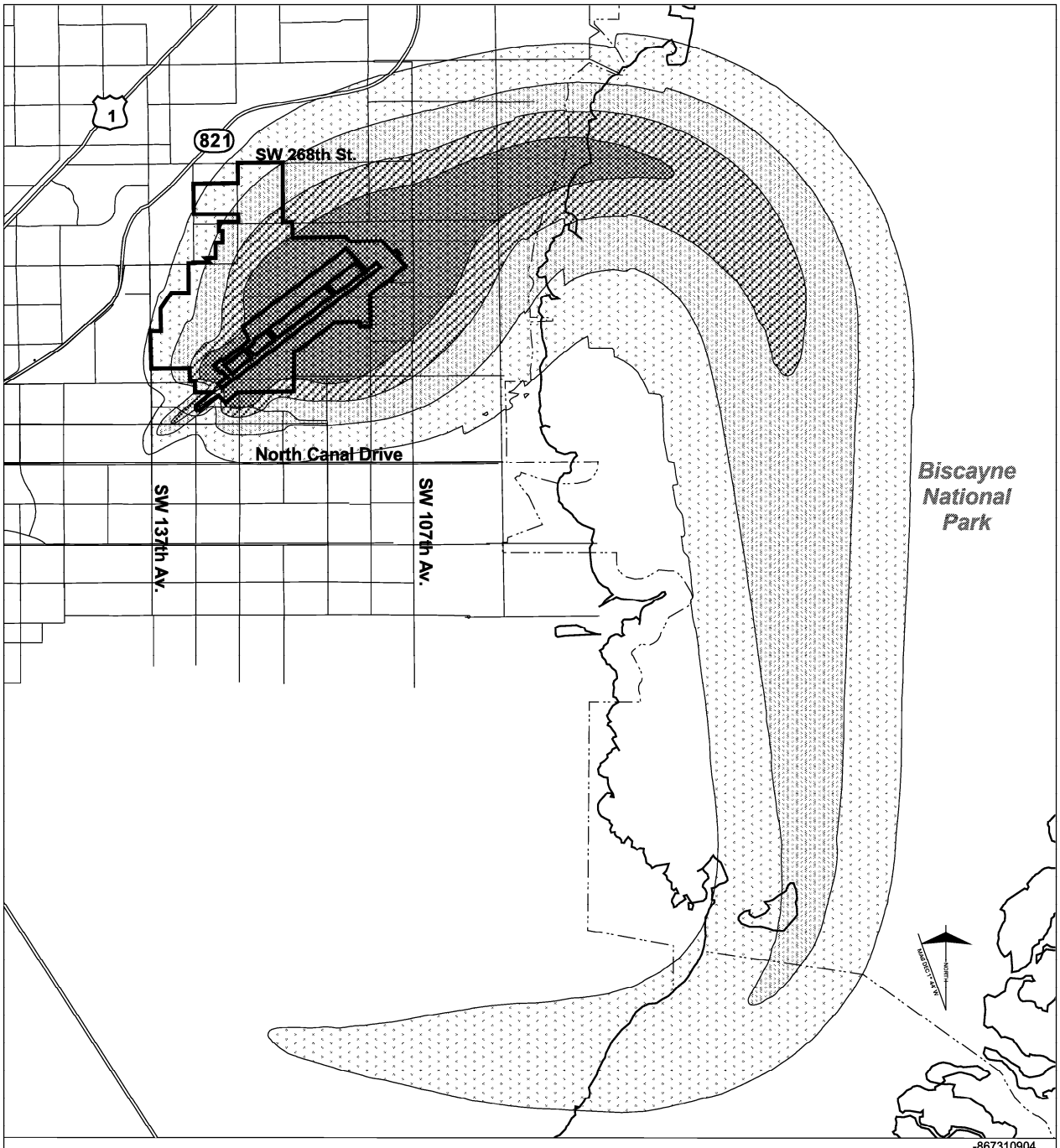
Grid Point Analysis

In addition to DNL and SEL contour analysis, aircraft noise effects on the community were characterized by a grid point analysis covering a 40 square mile area around the airport. The analysis involved 161 points on a grid spacing of 0.5 nautical miles between points. The grid, shown in **Figure 3.5-7**, is designated with the initial letter "F." The findings are discussed in Appendix E. In addition, 12 sample points were examined in detail (**Figure 3.5-8**). Current aircraft-related noise at those locations is presented in **Table 3.5-4**.

3.5.2.4 National Parks and Refuges

A key purpose of the noise analysis is to assess the extent to which the affected sound environment in the national parks and refuge would be estimated to change with various reuse alternatives. In the SEIS noise analysis, the affected sound environment includes all sounds that exist, both natural sounds and human-made sounds. Explanations regarding the selection of the traditional ambient sound level as a baseline and the analysis of aircraft noise in relation to this baseline are provided in Section 3.5.2.1 and in Sections 4.5 and 4.14.

Natural sounds are identified as a resource by the National Park Service. The management of natural sounds and soundscapes within the National Park System is based on NPS' legal mandate for protecting resources unimpaired. Natural sounds and the valued tranquility they inspire are characterized by NPS as the natural ambient sound conditions found in parks. NPS directives in the process of being issued will require park managers to explicitly assess the quality of the soundscapes in their parks and to take necessary planning steps, either through revisions to the General Management Plans (GMPs) or by developing special "implementation plans" if there are no revisions to the GMPs anticipated in the near future.



LEGEND

SEL
- 100 db
- 95 db
- 90 db
- 85 db

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

1 0 1
Scale in Miles

Derived from:
Landrum & Brown 1999b

Figure 3.5-6
SEL Contours for One F-16
Departure and Arrival

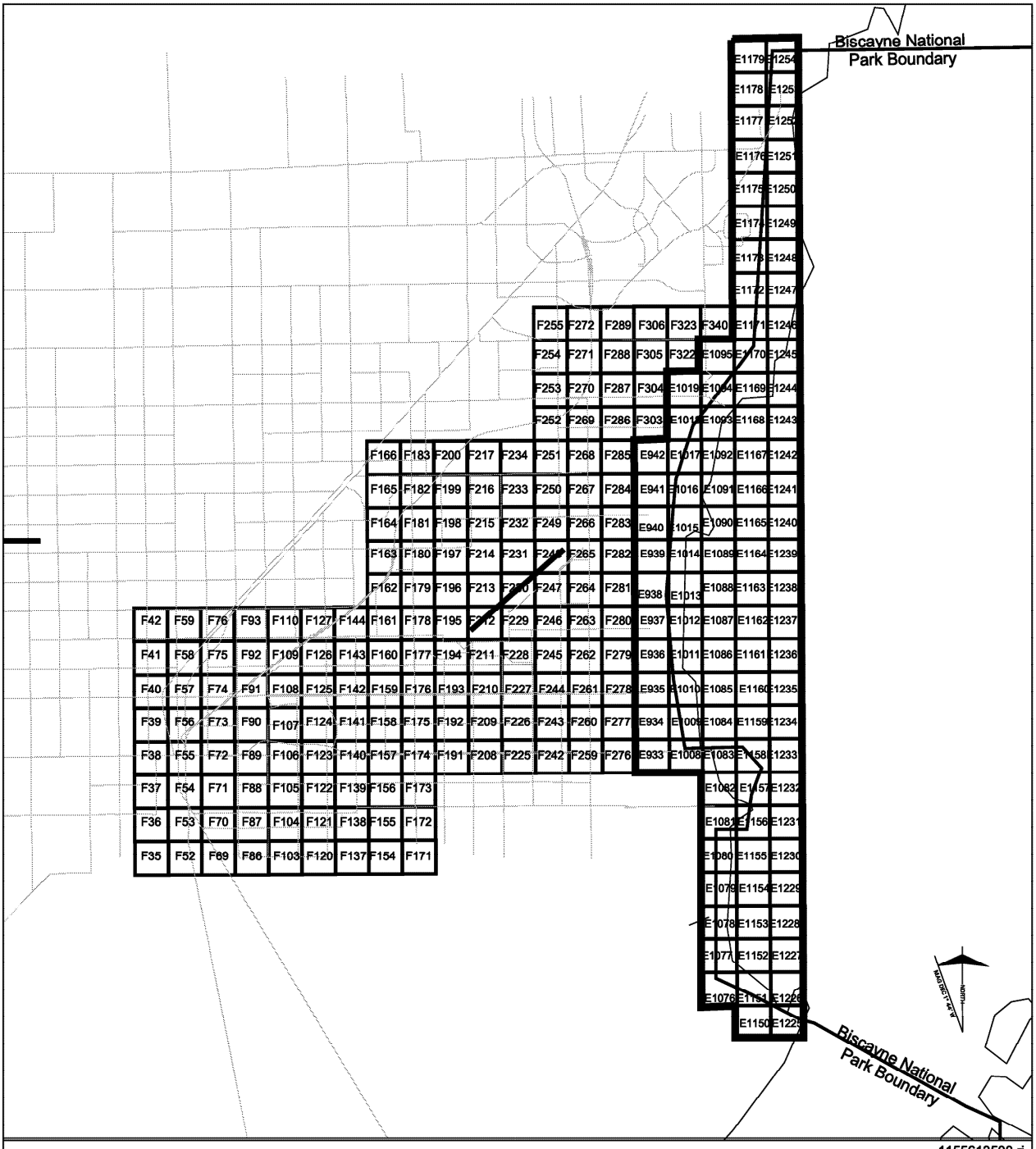
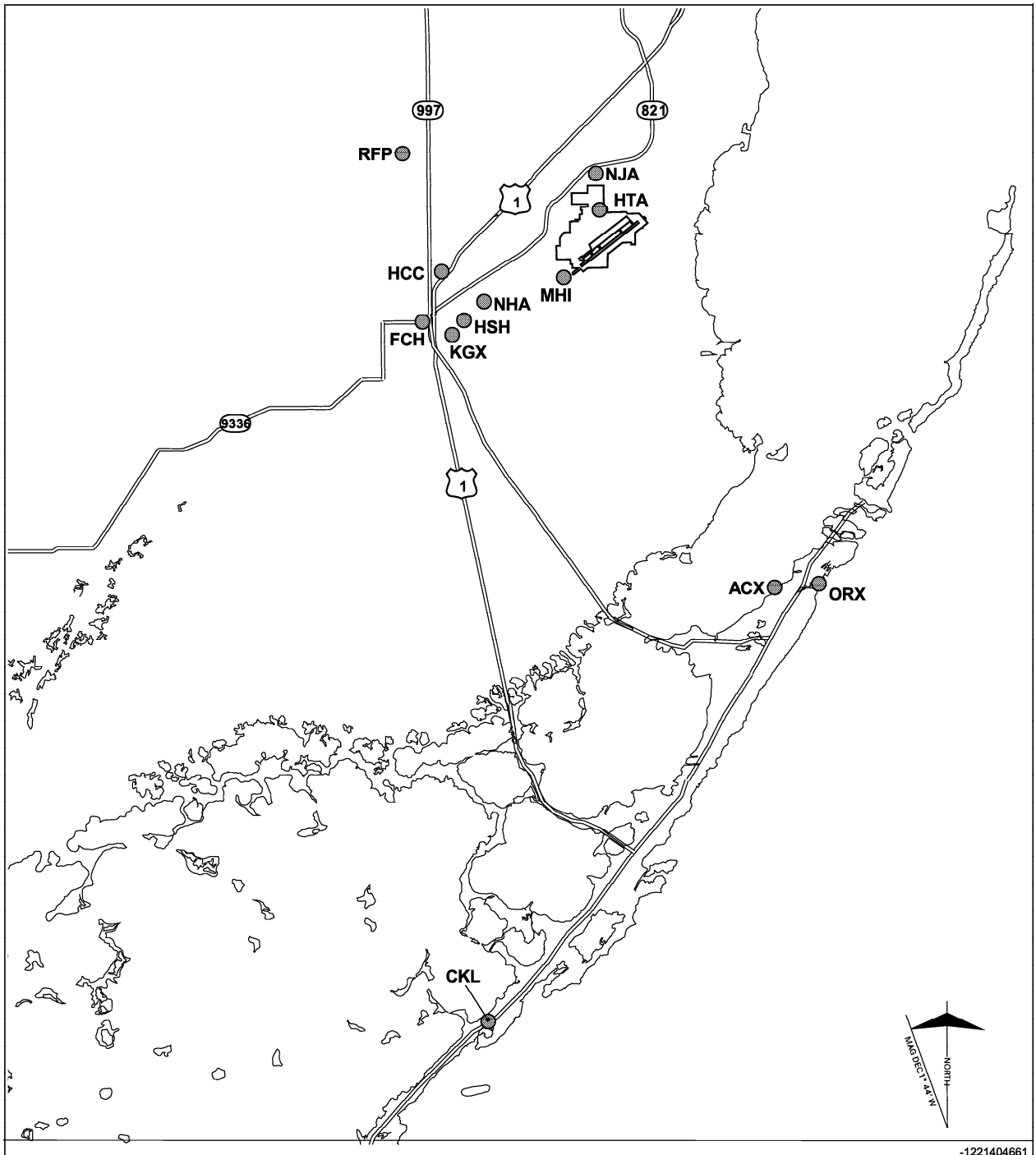
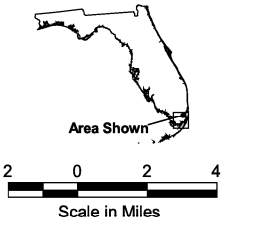


Figure 3.5-7
Community Grid Index



LEGEND

- Noise Analysis Point
- Former Homestead AFB
- Major Road
- U.S. Highway
- State Highway



Derived from:
Landrum & Brown 1999c

Figure 3.5-8
Sample Community Noise
Analysis Point Locations

Table 3.5-4. Current Noise Levels at Sample Community Locations

Location	Map Designation[1]	DNL (dB)	LAmax (dB)	Time Above[2] (minutes)
Miami-Dade County Community College–Homestead Campus	HCC	39	71	1
Keys Gate Community	KGX	43	97	2
South Dade Center	MHI	70	107	86
Naranja	NJA	45	78	5
Homeless Trust Center	HTA	54	83	16
Homestead High School	HSH	43	80	2
Nursing Home	NHA	44	83	2
Florida City City Hall	FCH	39	72	1
Redland	RFP	37	74	<1[3]
Ocean Reef Community	ORX	35	77	<1[3]
Angler's Club	ACX	35	77	<1[3]
Key Largo	CKL	22	69	0

Source: **Landrum & Brown 1999b**.
Notes: [1] See Figure 3.5-8.
[2] Time above DNL 65 dB.
[3] <1 = less than 1 minute.

The National Park Service is currently preparing a draft Soundscape Management Plan for Biscayne NP. It is being prepared in Environmental Assessment (EA) format for public review and comment, and it will identify and evaluate alternatives available to NPS for managing and mitigating noise sources that intrude upon the natural soundscape. This draft plan/EA has not yet been completed, and the specific outcome of this effort is not known at this time. National park soundscape planning and management are in a very early phase, and no soundscape plan has yet been developed for any national park. Biscayne NP will be the first. Soundscape preservation will also be addressed in a revision to the General Management Plan for Everglades NP. This revision is expected to begin soon.

There is some anticipated similarity between the scope of the SEIS analysis and the scope of analysis for soundscape planning in Biscayne NP. Like the SEIS, the scope of noise to be addressed in soundscape planning will include noise from all sources inside the park and from without. Aircraft noise data from the SEIS are available to NPS and are likely to be used to the extent considered appropriate by NPS for the aircraft noise component of soundscape planning. However, unlike the SEIS, the baseline condition to be used by NPS for national park soundscape planning is the natural ambient sound level—that is, the condition that exists absent human-made sounds.

Differences in statutory mandates, policy perspectives, and purposes can result in differences in analytical approaches to noise assessment. Neither the assessment approach suitable to the SEIS nor the approach suitable to NPS soundscape planning negates the other. The SEIS is structured to assist the Air Force and FAA in making decisions about property disposal and airport-related issues, and the SEIS uses a noise assessment approach that is the most appropriate for these purposes.

As can be seen in Figures 3.5-5 and 3.5-6, the DNL 60 dB contours and the F-16 SEL contour extend into Biscayne NP. To characterize the existing noise environment in these areas (including Biscayne NP),

point noise levels were calculated in a grid pattern for each area. For this analysis, several different regular grids were defined to describe various noise conditions in the national parks and refuges. The grid points are numbered and mapped on **Figures 3.5-9 through 3.5-12**. Two grids were defined in Everglades NP and Big Cypress National Preserve. One was designed to provide information at points spaced on a 4 nautical mile interval across all of Big Cypress and the great majority of Everglades NP (grid A); the other was spaced on 2.5 nautical mile intervals over the eastern portion of Everglades NP (grid B) in the area closest to the former base to provide greater resolution data. A grid with intervals of 0.5 nautical miles was applied to Crocodile Lake NWR (grid C), and a fourth grid with intervals of 2.5 nautical miles was used for Biscayne NP (grid D). A supplemental grid spacing based on 0.5 nautical miles between points was added to provide higher data resolution in areas in western Biscayne NP. This set of 102 supplementary points is designated as grid E and is depicted in Figure 3.5-7. In addition to grids for the national parks and refuge, a grid (grid B in the Addendum to Appendix E) was developed to cover South Florida Water Management District lands in the vicinity of Homestead. Each grid point number is consistently used to report point noise data in this document. In addition to the grid points, noise data were calculated for the measured locations (see Figure 3.5-4), 12 community locations (see Figure 3.5-8), two locations in Florida Keys National Marine Sanctuary, one location each in John Pennekamp and Bill Baggs Cape Florida State Parks and Key Largo Hammocks State Botanical Site, and supplemental point locations shown in **Figure 3.5-13**. The supplemental points are discussed in the Biological Resources analysis (Section 4.11). A total of 539 points were calculated.

The noise levels calculated for these locations include aircraft from Homestead ARS and Miami and Fort Lauderdale-Hollywood International Airports, Kendall-Tamiami Executive Airport, and Homestead General Aviation Airport. These four airports currently have much higher traffic levels than Homestead ARS. Flight tracks for Opa-Locka Airport do not pass over the national parks. No flight track data were available for Everglades City Airport.

Grid mapping was generated for three metrics: LAmax, Leq(h), and TAamb in minutes per day. **Figure 3.5-14** presents the modeled LAmax levels associated with current operations. The pattern of maximum decibel levels is indicative of the flight paths flown by aircraft from Homestead ARS and Miami International Airport. Noise from operations at Homestead General, Kendall-Tamiami, and Fort Lauderdale-Hollywood Airports appear to have little to no effect on the maximum noise levels in the four areas studied. Over Biscayne NP, aircraft departing Homestead ARS to the northeast and making immediate turns to the south have been calculated to produce maximum sound levels in excess of 85 dB, while northeasterly departures or aircraft departing MIA to the southeast have been calculated to produce maximum sound levels in excess of 75 dB. Over Everglades NP, the highest maximum sound levels are produced under the western helicopter corridor, the long, straight-in approaches from the west and the VFR flyway along the eastern side of the park. Modeled maximum sound levels above 55 dB extend along the centerline approach to Homestead ARS from the southwest.

The modeled Leq(h) levels for existing conditions are presented on **Figure 3.5-15**. This figure shows a pattern comparable to the LAmax pattern in that the highest levels of exposure are found over Biscayne NP, under the departure paths from Homestead ARS. The great majority of the higher Leq(h) levels mapped for the existing condition are located at Biscayne NP and along the eastern edge of Everglades NP. Most locations in Biscayne NP are influenced principally by traffic from Homestead ARS, and a lesser extent by traffic from Miami International Airport and other regional airports. The eastern portion of Everglades NP is affected more by general aviation traffic from Homestead General and Kendall-Tamiami Airports, as well as commercial traffic from Miami International Airport.

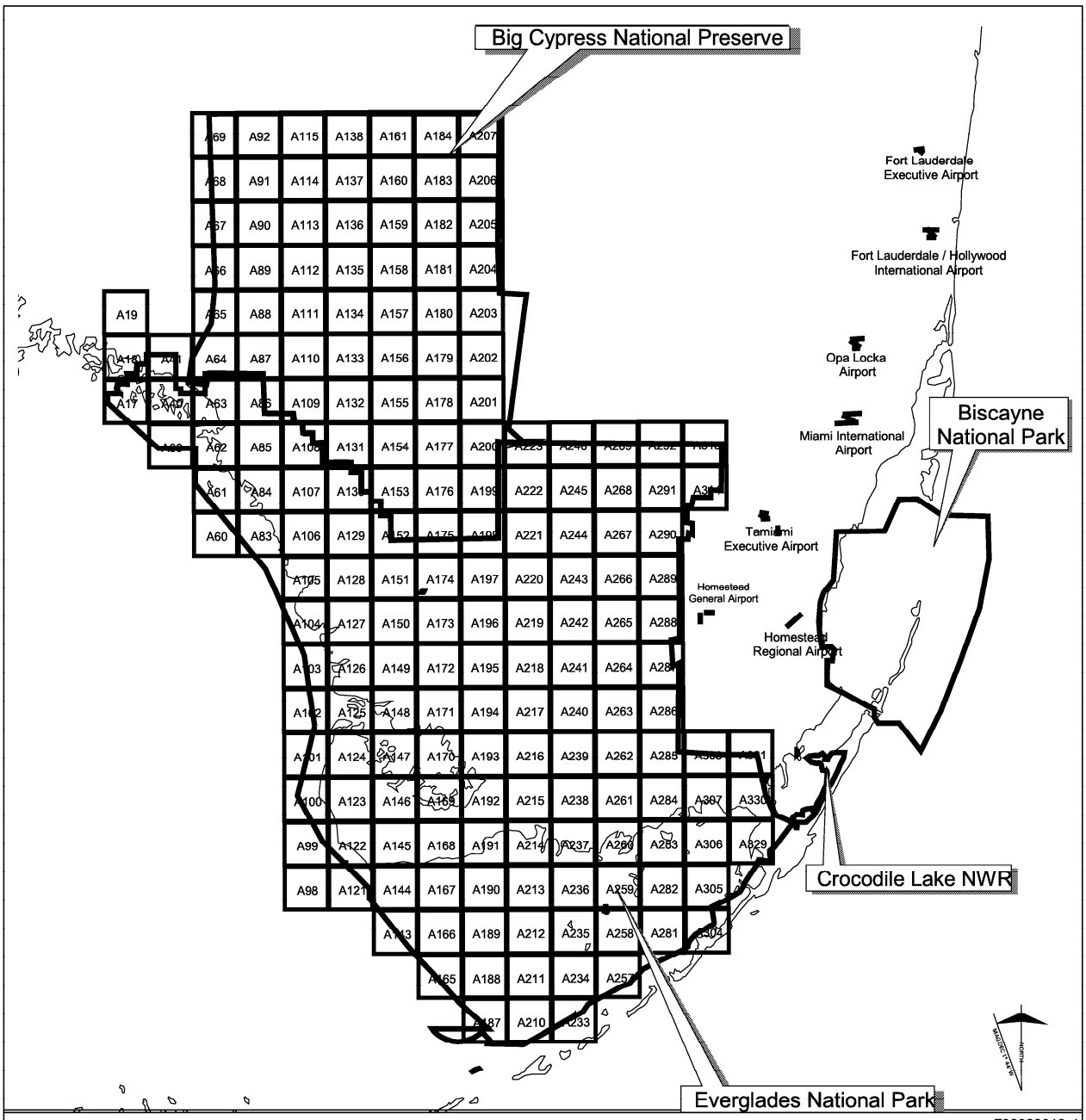
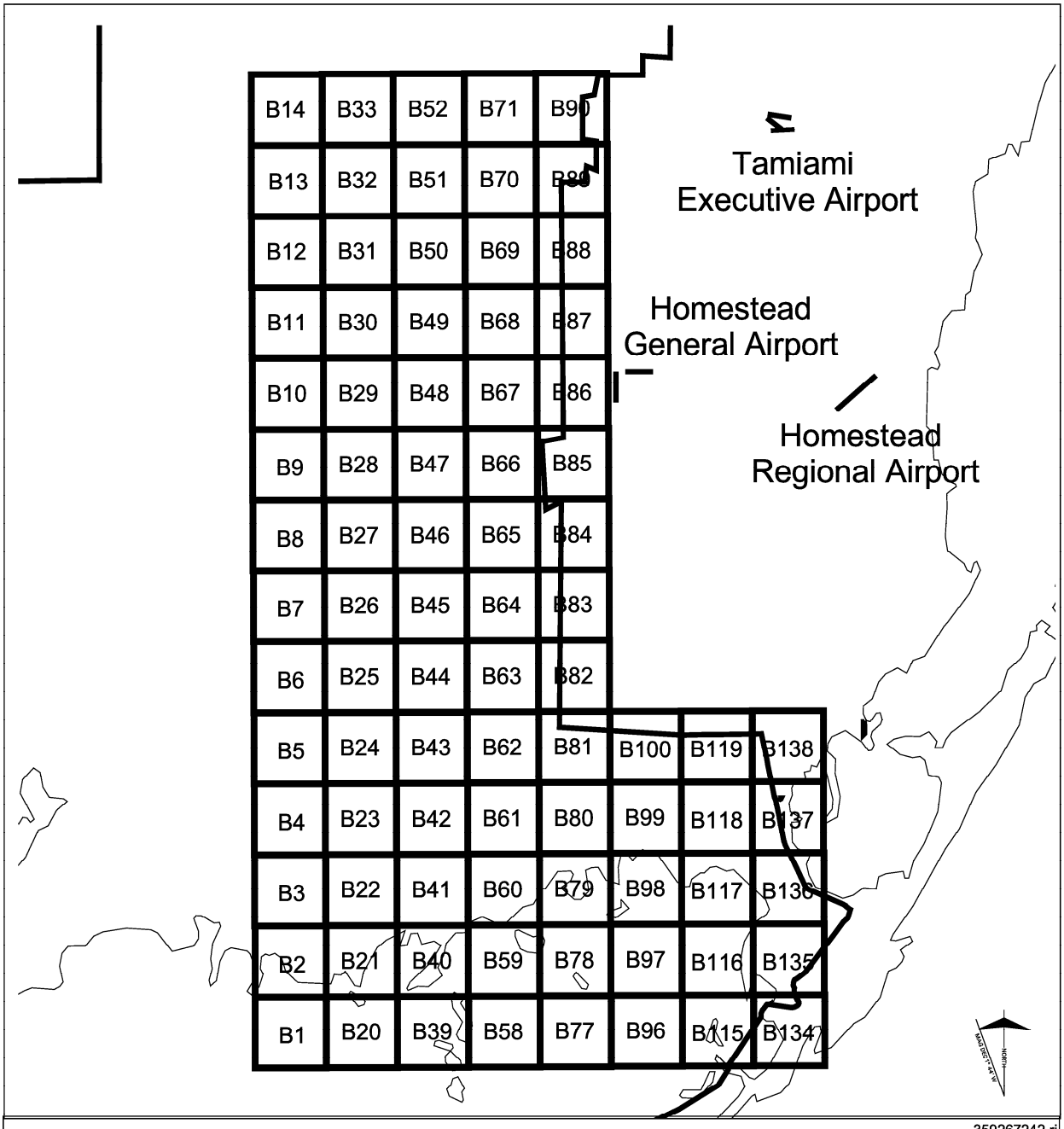


Figure 3.5-9
Everglades National Park and Big Cypress National Preserve Grid Index



LEGEND

Everglades National Park Boundary

Eastern Everglades National Park Grid Interval 2.5 Miles

5 0 5

Scale in Miles

Source:
Landrum & Brown 1999b

Figure 3.5-10
Eastern Everglades National Park Grid Index

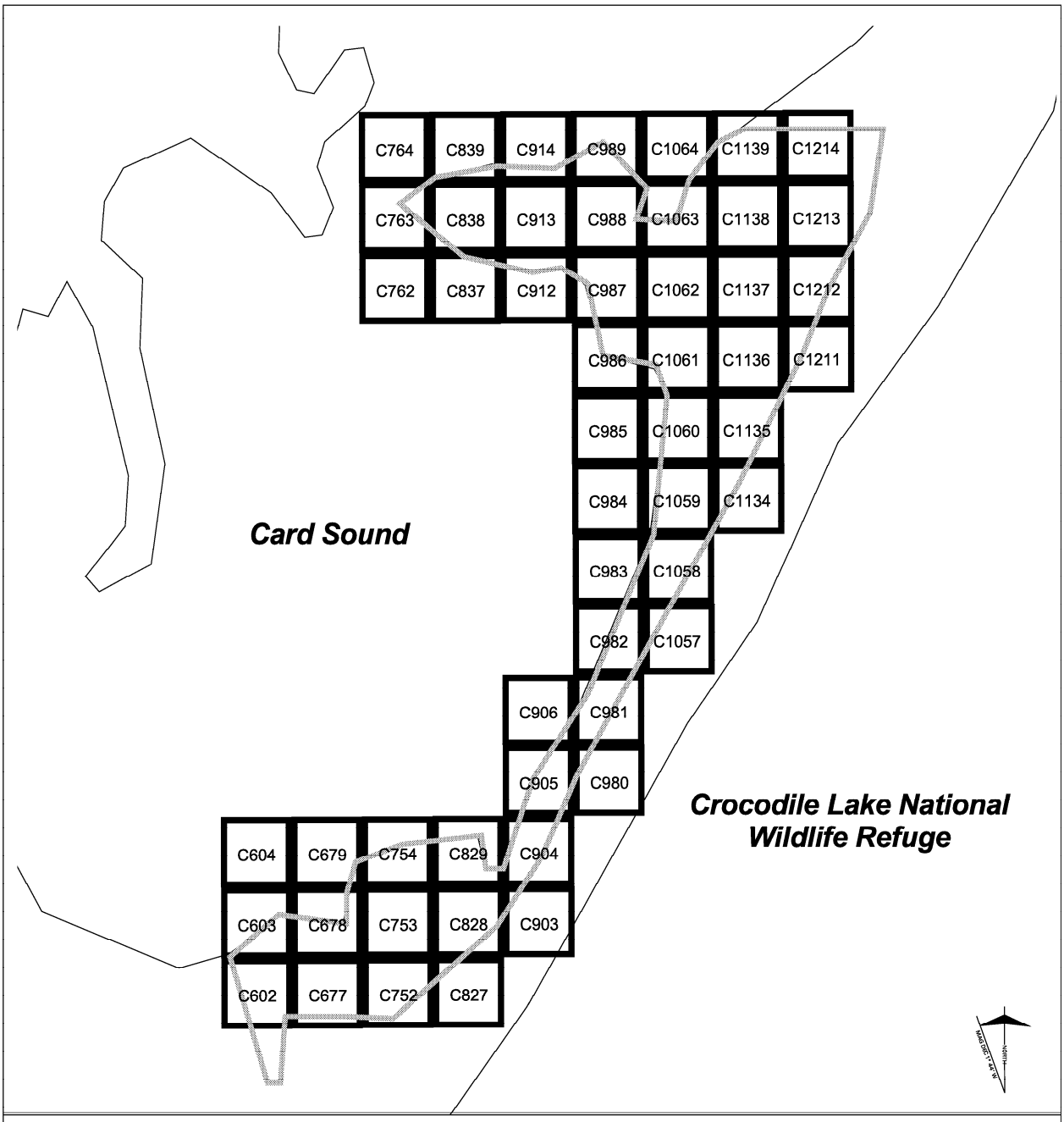


Figure 3.5-11
Crocodile Lake National Wildlife Refuge Grid Index

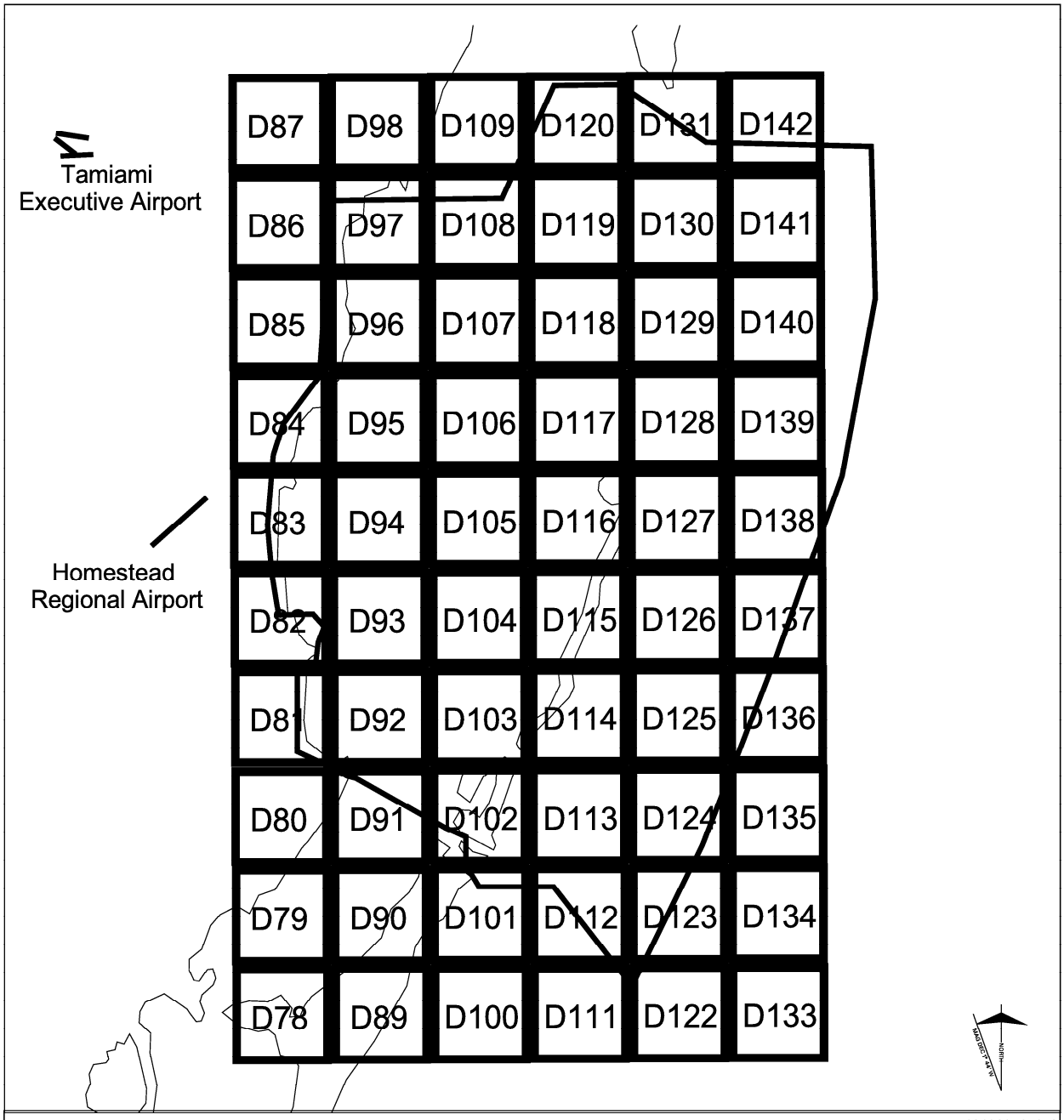


Figure 3.5-12
Biscayne National Park
Grid Index

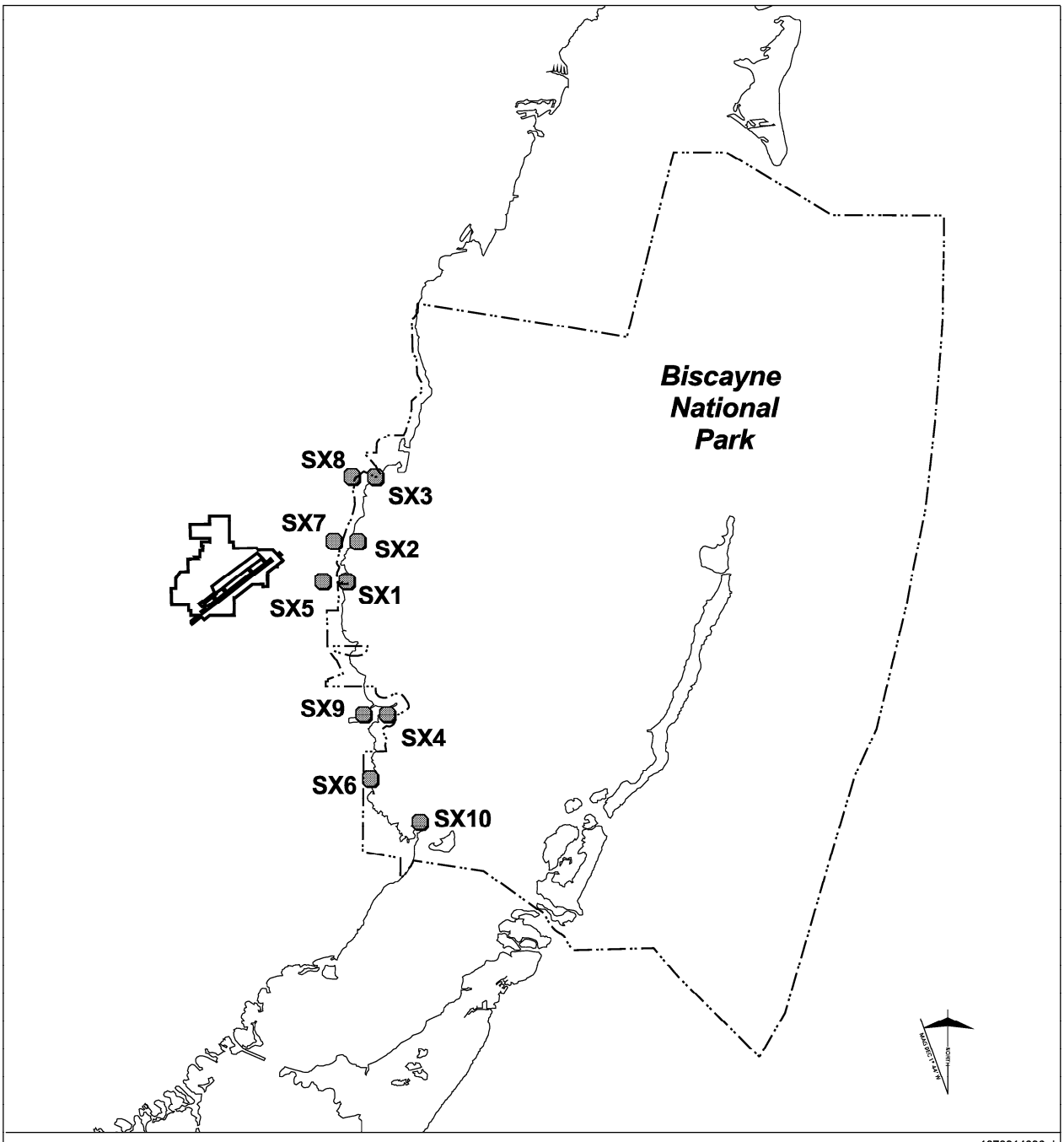
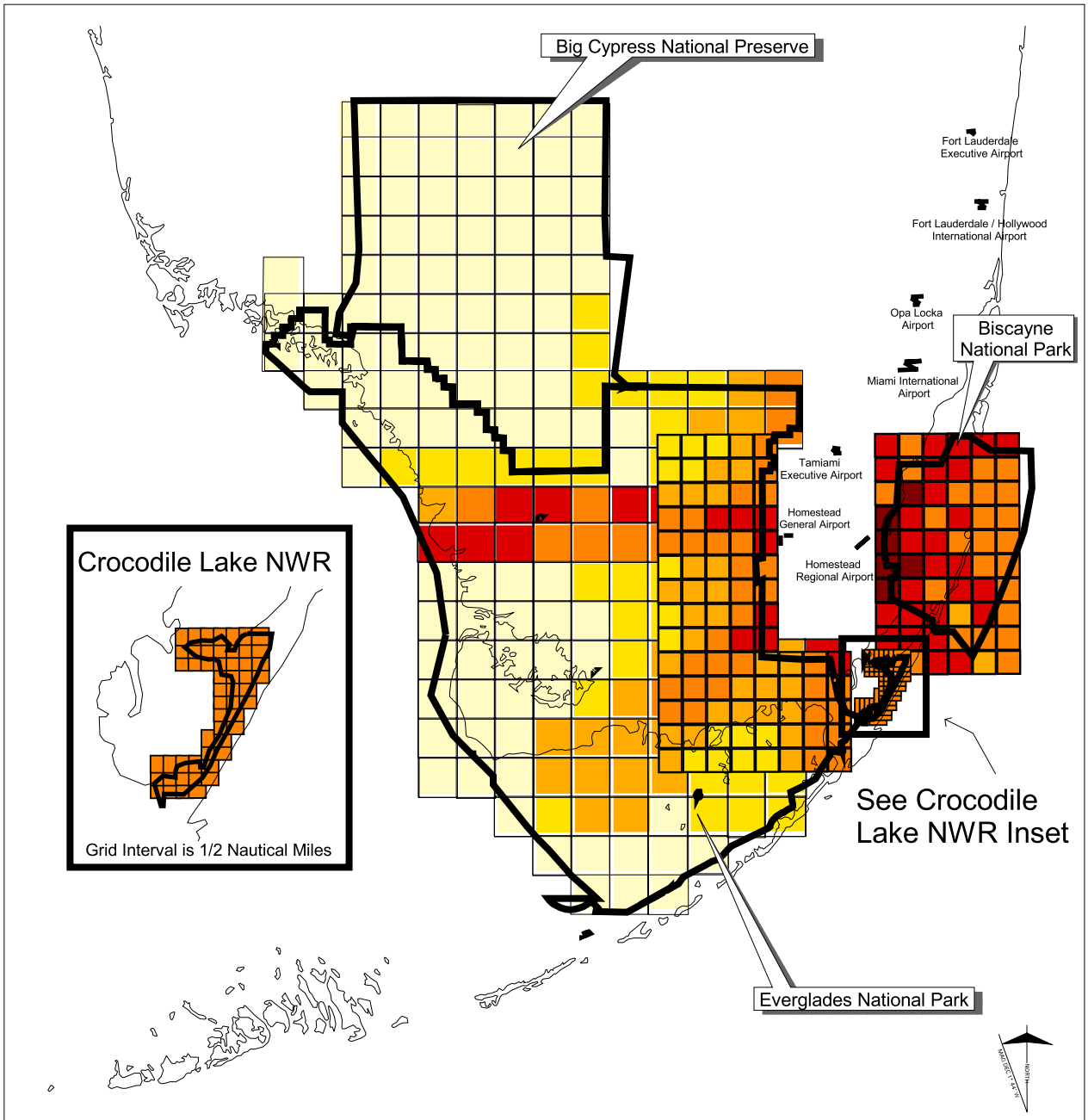


Figure 3.5-13
Supplemental Noise Analysis Point Locations



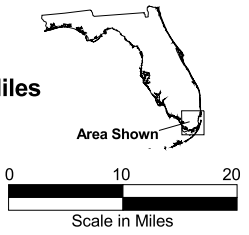
-1692520133 rj

LEGEND

- Crocodile Lake NWR Grid Interval 0.5 Nautical Miles
- Eastern Everglades and Biscayne National Park Grid Interval 2.5 Nautical Miles
- Everglades National Park Grid Interval 4.0 Nautical Miles

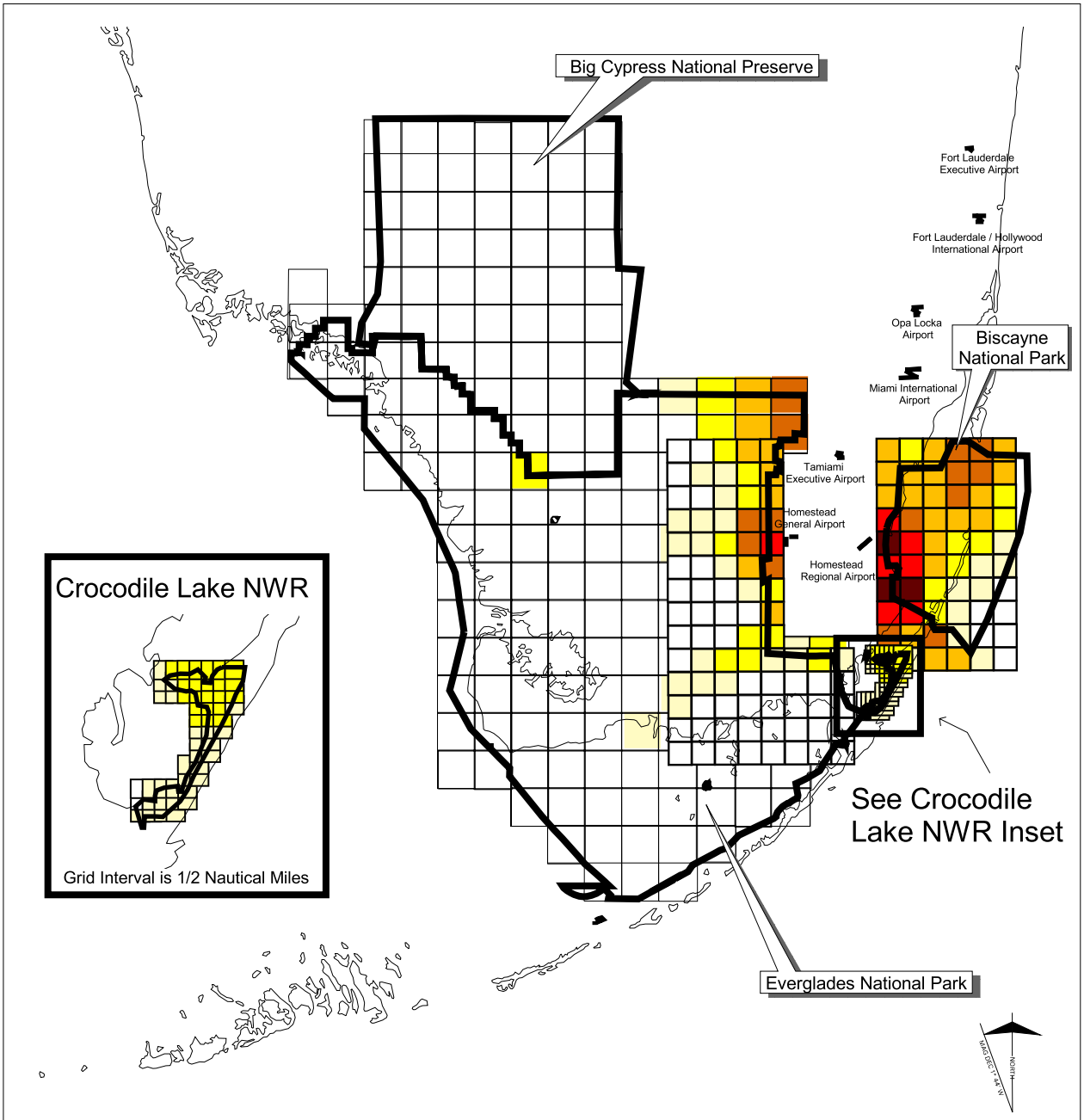
LAmax Level

- <45 dB
- 45.1 - 55 dB
- 55.1 -65 dB
- 65.1 - 75 dB
- 75.1 - 85 dB
- > 85 dB



Source:
Landrum & Brown 1999b

Figure 3.5-14
Existing Condition
LAmax



LEGEND

Crocodile Lake NWR Grid Interval 0.5 Nautical Miles

Eastern Everglades and Biscayne National Park Grid Interval 2.5 Nautical Miles

Everglades National Park Grid Interval 4.0 Nautical Miles

Peak Leq (h) Level

- **< 30.0 dB**
- **30.0 - 35.0 dB**
- **35.1 - 40.0 dB**
- **40.1 - 45.0 dB**
- **45.1 - 50.0 dB**
- **50.1 - 55.0 dB**
- **55.1 - 60.0 dB**
- **> 60 dB**

-1692520133 rj

10 0 10

Scale in Miles

Source:
Landrum & Brown 1999b

Figure 3.5-15
Existing Condition
Peak Leq(h)

Figure 3.5-16 presents the modeled TAamb for the existing conditions. The map indicates that areas under the departure or approach paths to/from MIA and Kendall-Tamiami Airports experience the longest duration of Time Above the ambient noise levels. The relatively low volume of traffic at Homestead ARS contributes to the Time Above ambient levels in the vicinity of the base, but for much shorter periods than associated with the busier airports.

3.5.3 Projected Baseline Environment

No changes are projected at Homestead ARS for 2000 and 2005. By 2015, C-141 transport aircraft, which are transient users of Homestead ARS, are expected to be replaced by C-17 aircraft. This change has been incorporated in the projected baseline noise calculations. In addition, these calculations reflect forecast changes in aviation operations at the four other airports in the region included in the analysis.

3.5.3.1 Community Noise

The modeled baseline DNL contours for 2000 and 2005 are identical to the contours for the current conditions (see Figure 3.5-6). No changes to the way aircraft fly, the anticipated fleet mix, or the number of operations are anticipated. The change to C-17 aircraft by 2015 is expected to have virtually no effect on the noise contours, presented in **Figure 3.5-17**. The areas within each contour band are almost identical to the areas within the contours of the existing condition (see Table 3.5-3), with a small decline in area within the DNL 60 dB contour from 6,458 to 6,451 acres in 2015. No changes are expected in the DNL 70 or 75 dB contours. Projected baseline DNL at the 12 sample locations shown in Figure 3.5-8 is not projected to change by more than 1 dB from the levels presented in Table 3.5-4, and LAmax and Time Above levels are anticipated to remain the same through 2015.

3.5.3.2 National Parks and Refuges

The effect of military and government aircraft operations from Homestead ARS is not assumed to change over the period of analysis. Forecast changes in aviation traffic from other airports may affect point noise levels at some locations where current noise levels are very low. Where noise impacts may be shown to decrease in later years, the contributing factor is the phasing out of noisier aircraft from the existing civil fleet at four other airports in the region (by 2015 and beyond). The only change in the baseline condition at Homestead ARS is the replacement of the C-14 transport aircraft with C-17 aircraft, which is not expected to produce major noise decreases.

Modeled LAmax and Leq(h) levels are projected to remain virtually unchanged over the time period. The average time above ambient for points shown in Figures 3.5-14, 3.5-15, and 3.5-16 is projected to increase from 13.3 to 16.3 minutes by 2015, due to changes in regional air traffic. **Table 3.5-5** depicts the calculated noise levels for Leq(h) and LAmax, and **Table 3.5-6** provides TAamb for existing and future baseline conditions at the measured points depicted in Figure 3.5-4.

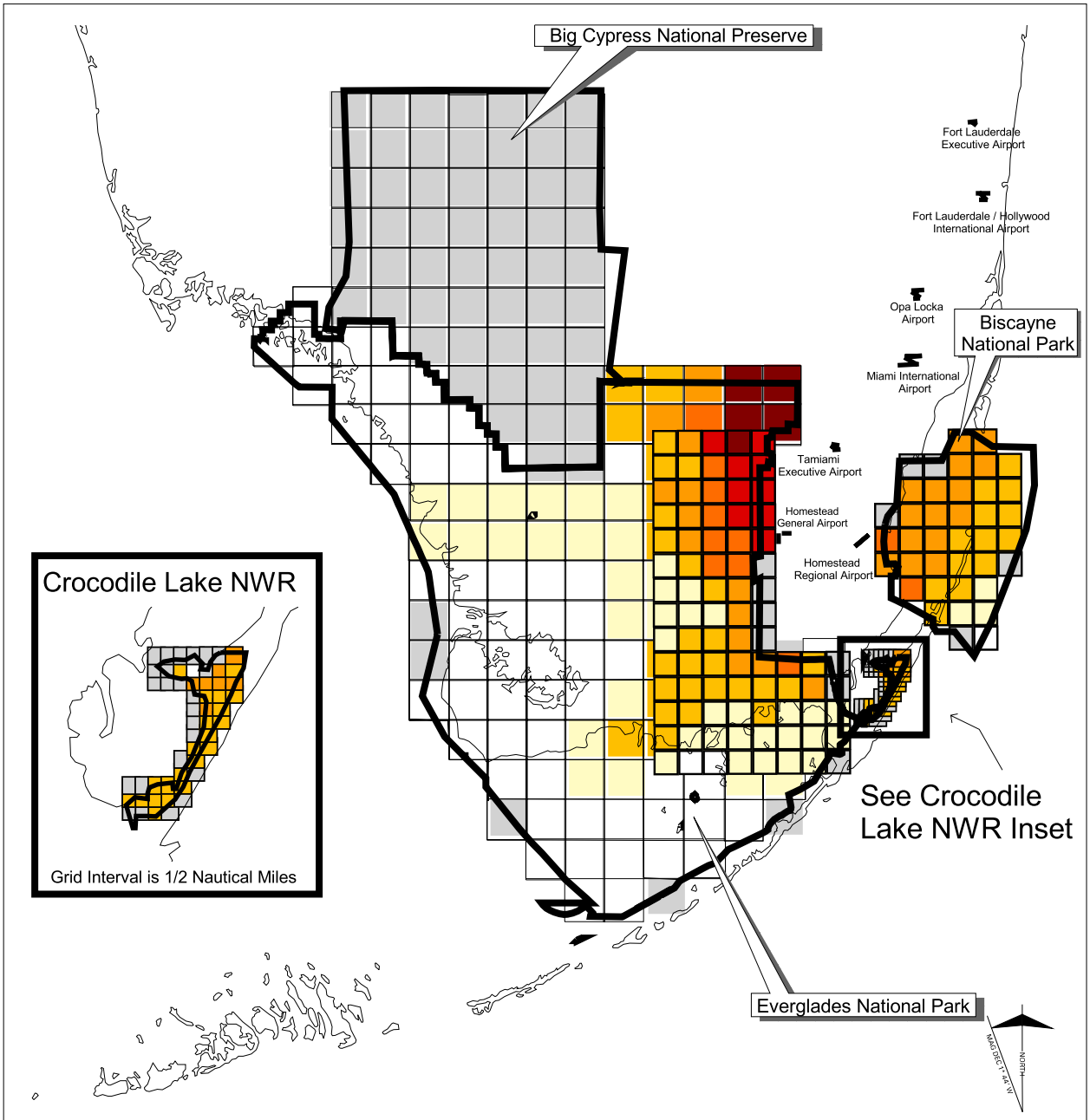
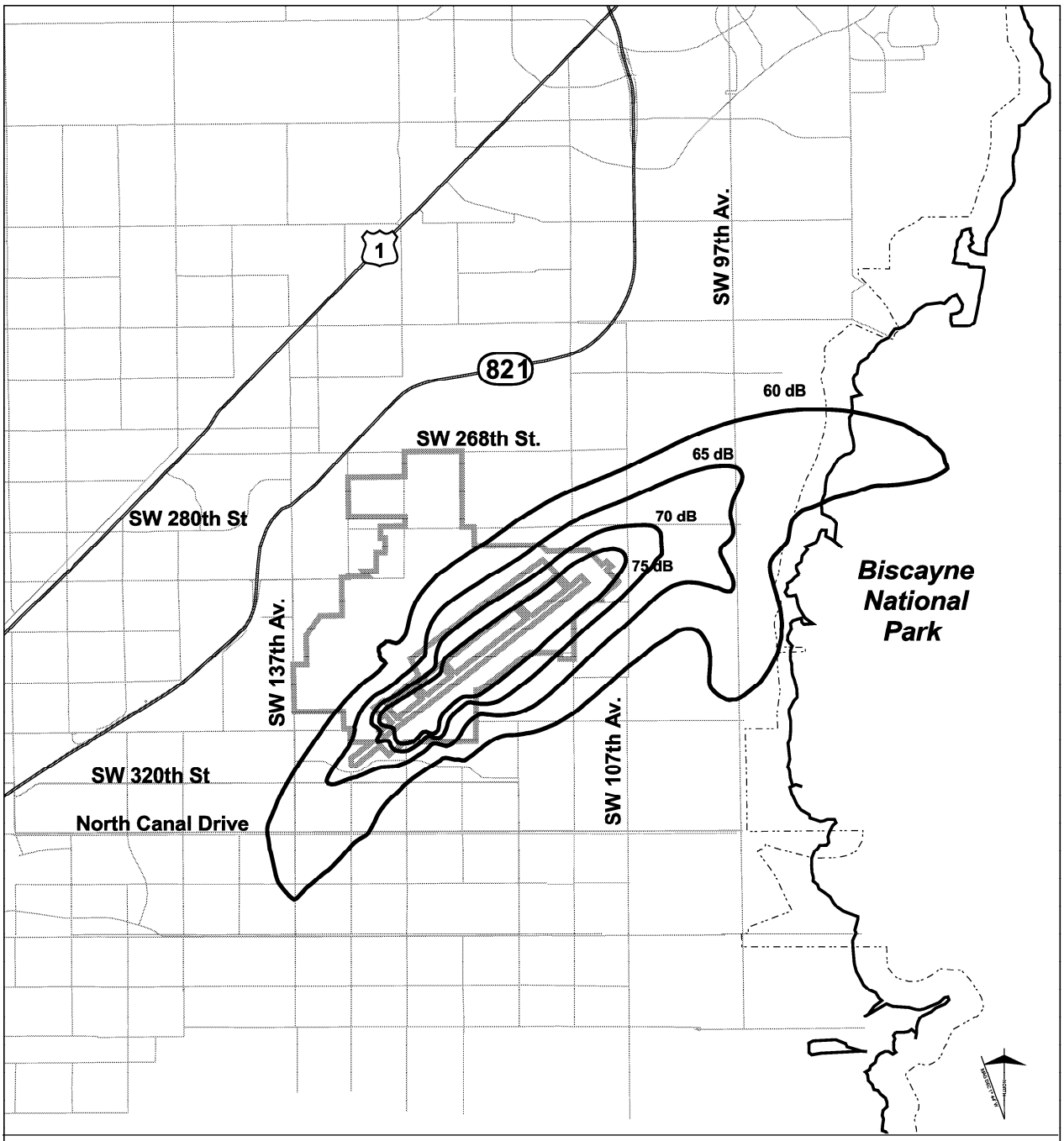


Figure 3.5-16
Existing Condition
Time Above Ambient Level

*** Traditional Ambient (excluding aircraft noise) is used to define ambient levels.**



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LEGEND

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

1 0 1
Scale in Miles

Derived from:
Landrum & Brown 1999b

Figure 3.5-17
2015 Projected Baseline DNL Contours at Homestead ARS

Table 3.5-5. Modeled Current and Projected Baseline Leq(h) and LAmax Levels at Measurement Points

Measurement Point	Leq(h) (dB)				LAmax (dB)			
	Current Level	Projected Baseline			Current Level	Projected Baseline		
		2000	2005	2015		2000	2005	2015
MA	44.0	46.6	46.6	46.4	79.9	79.9	79.9	79.9
MAA	5.7	7.7	8.2	9.7	30.9	30.9	30.9	30.9
MAC	30.4	34.8	34.8	34.9	72	72	72	72
MAD	30.6	35.0	35.0	35.1	72.6	72.6	72.6	72.6
MAE	10.3	14.2	14.1	15.2	33	33	33	33
MAX	43.6	45.7	45.7	45.5	85.8	85.8	85.8	85.8
MB	24.8	27.8	28.4	28.2	63.9	63.9	63.9	63.9
MC	39.5	36.0	36.3	33.6	66.8	66.8	66.8	64.1
MD	33.5	35.9	36.1	36.0	66.6	66.6	66.6	66.6
MDX	33.3	35.7	35.8	35.8	66.5	66.5	66.5	66.5
ME	26.1	28.1	28.2	28.5	74.9	74.9	74.9	74.9
MF	50.6	55.1	55.1	55.0	94.7	94.7	94.7	94.7
MG	49.8	54.3	54.3	54.2	94	94	94	94
MH	53.3	58.0	58.0	58.0	85.7	85.7	85.7	85.7
MHX	53.0	57.6	57.6	57.6	85.3	85.3	85.3	85.3
MI	35.7	33.9	34.1	33.7	77	77	77	77
MJ	45.1	41.9	42.1	38.6	69.9	69.9	69.9	66.8
MJX	46.7	43.3	43.1	40.2	78.9	78.9	78.9	78.9
MK	19.4	24.2	24.4	24.8	55.3	55.3	55.3	55.3
ML	43.3	39.9	40.1	37.1	74.5	74.5	74.5	74.5
MM	38.3	42.8	42.8	42.8	82.4	82.4	82.4	82.4
MN	20.9	26.2	26.1	26.8	42.7	42.7	42.7	42.7
MO	34.5	39.8	40.5	40.1	64.8	64.8	64.8	63.1
MP	40.7	39.1	39.5	37.9	81.5	81.5	81.5	81.5
MPX	41.9	39.5	39.5	37.6	70.1	70.1	70.1	70.1
MQ	11.4	15.4	15.5	15.8	63.1	63.1	63.1	63.1
MR	23.2	25.6	25.8	26.1	61.5	61.5	61.5	61.5
MS	14.9	19.4	20.0	20.1	47	47	47	47
MT	8.9	11.4	12.0	12.9	39.6	39.6	39.6	39.6
MU	17.3	21.8	21.9	22.1	56.8	56.8	56.8	56.8
MUX	16.4	20.8	20.9	21.1	55.7	55.7	55.7	55.7
MV	30.1	35.5	35.6	36.0	78.2	78.2	78.2	78.2
MW	30.7	35.0	35.0	35.2	72.4	72.4	72.4	72.4
MX	19.3	23.6	23.7	23.8	57.8	57.8	57.8	57.8
MY	5.4	6.6	7.3	8.4	33.9	33.9	33.9	33.9
SD1	18.2	22.6	22.6	22.7	70.6	70.6	70.6	70.6
SD2	17.7	22.8	23.5	23.6	52.1	52.1	52.1	52.1
SD3	16.2	20.5	20.6	20.8	61.3	61.3	61.3	61.3
SD4	5.4	7.8	8.2	9.2	41.5	41.5	41.5	41.5
SD5	12.2	15.4	15.8	16.7	42.5	42.5	42.5	42.5
SD6	5.0	7.1	7.1	9.1	19.6	19.6	19.6	24.8
SD7	0.7	0.3	1.1	3.9	18.7	18.7	18.7	24.4
SD8	4.5	4.4	5.1	7.6	21.9	21.9	21.9	27.7

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

Table 3.5-6. Modeled Current and Projected Baseline TAamb Levels at Measurement Points

Measurement Point	TAamb (minutes)			
	Current Level	Projected Baseline		
		2000	2005	2015
MA	19.1	14.6	15.1	13.2
MAA	0	0	0	0
MAC	4.0	4.0	4.0	4.0
MAD	0	0	0	0
MAE	0	0	0	0
MAX	18.9	14.2	14.9	12.9
MB	1.7	0.9	1.3	1.3
MC	11.2	5.1	5.8	3.0
MD	6.7	5.2	5.6	5.6
MDX	5.9	4.6	4.9	5.0
ME	0.2	0.2	0.2	0.2
MF	56.9	51.7	52.9	52.3
MG	20.3	19.1	18.8	18.8
MH	40.4	35.8	36.5	36.6
MHX	40.2	35.7	36.3	36.4
MI	5.0	2.3	2.2	2.1
MJ	14.4	7.0	8.0	2.9
MJX	16.8	9.1	10.3	4.5
MK	0.2	0	0.2	0.2
ML	11.1	5.0	5.5	2.0
MM	0	0	0	0
MN	0	0	0	0
MO	26.5	25.0	26.3	27.9
MP	15.7	9.6	10.7	8.0
MPX	18.3	10.4	11.8	7.5
MQ	0.1	0.1	0.1	0.1
MR	5.9	5.4	5.6	6.0
MS	0	0	0	0
MT	0	0	0	0
MU	0.1	0	0.1	0.1
MUX	0.1	0	0.1	0.1
MV	52.9	51.3	54.2	63.5
MW	9.0	8.9	8.9	8.9
MX	1.5	1.3	1.5	1.5
MY	0	0	0	0
SD1	0.4	0.4	0.4	0.4
SD2	0.3	0.1	0.3	0.3
SD3	0.4	0.4	0.4	0.4
SD4	0	0	0	0
SD5	0	0	0	0
SD6	0	0	0	0
SD7	NA	NA	NA	NA
SD8	NA	NA	NA	NA

Source: **Landrum & Brown 1999b**.
NA Not available

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3.6 LAND USE AND AESTHETICS

3.6.1 Introduction

This section addresses general land use, including land use plans and policies, special use areas such as national parks and preservation areas, agriculture as a particular land use, and aesthetics. Land use overlaps a number of other resource topics. Information relevant to land use is also contained in Sections 3.1 (housing information), 3.4 (Air Installation Compatible Use Zone information), 3.5 (noise and soundscape management), and 3.11 (biological resources in national parks and other wildlife management areas).

3.6.1.1 Resource Definition

Land use includes residential, commercial, industrial, utility, agricultural, recreation, other developed uses, and undeveloped lands. Land uses are regulated by management plans, policies, ordinances, and regulations, and statutes that determine the types of uses that are allowable or that protect specially designated or environmentally sensitive uses. In this section, separate subsections are provided for specially designated land use areas and agriculture. Specially designated land use areas include national and state parks, preserves, refuges, and other areas designated by law for specific uses and/or protection.

Aesthetics addresses the natural (landforms, water bodies, vegetation) and human-made (buildings, fences, signs) features that give a particular environment its aesthetic qualities. A visual impression of an area is derived from the type, arrangement, and contrast between these features. Although individual viewers' aesthetic values can differ, an overall landscape character can be assigned to an area. Some areas (e.g., scenic highways, parks, historic buildings) are specifically identified for preservation of their visual character.

3.6.1.2 Applicable Laws and Regulations

The following is a summary of the most relevant laws and regulations that apply to land use and aesthetics.

Yellowstone National Park Act of 1872. This act set aside public land for public enjoyment and opened the way for the creation of the National Park Service.

National Park Service Organic Act (*39 Stat. 535; 16 U.S.C. Chapters 1, 2, 3, and 4*). This act established the National Park Service (NPS) within the Department of the Interior and designated its responsibilities. It identified the fundamental legal purpose, philosophy, and policy guidance for areas within the NPS as "to conserve the scenery and the natural and historic objects and the wildlife therein and to provide the enjoyment of the same in such a manner and by such a means as will leave them unimpaired for the enjoyment of future generations."

Everglades Establishment Act of 1934. This statute permanently reserved the Everglades as a wilderness and dictated that no development should interfere with the intact preservation of the flora and fauna and the essential primitive natural conditions then prevailing in the area.

General Authorities Act of 1970. This act combined all areas administered by the National Park Service in one National Park System.

Redwood National Park Act, as amended in 1978. This act reasserted the system-wide high standard of protection prescribed for national parks and monuments for the common benefit of all the people of the

United States, to protect their high public values and the purposes for which each unit was originally established. The act states, "the authorization of activities [within National Parks] shall not be exercised in derogation of the values and purposes for which these various areas have been established…."

Land and Water Conservation Fund Act of 1964. This act provided grants to state and local governments for acquisition and conservation in perpetuity of park lands and development of outdoor recreation facilities. It also provided funding for land purchases by the National Park Service, U.S. Fish and Wildlife Service, U.S. Forest Service, and federal land managing agencies.

National Outdoor Recreation Act of 1963. This act declared a national policy to support recreation activities; the National Park Service provides national leadership and coordination of this public-private partnership.

National Trails System Act of 1968, as amended. This act established the National Trails System, including Historical, Recreational, and Scenic Trails; the National Park Service provides national leadership and coordination for the public-private partnership program.

Reorganization Act of 1933. This act transferred a number of the national memorials, parks, and monuments to the National Park Service, virtually doubling the size of the agency.

Wild and Scenic Rivers Act of 1968, as amended. This act established the National Wild and Scenic Rivers System; the National Park Service maintains the National Rivers Inventory and provides national leadership and coordination.

Wilderness Act of 1964. This act established the National Wilderness Preservation System as an overlay designated by Congress, which can be applied to any qualified federal public land; recognized the pristine, undeveloped condition of these lands; and statutorily assured they are maintained in that condition.

Public Law 90-606. In 1968, Congress designated the Biscayne National Monument, citing its "rare combination of terrestrial, marine, and amphibious life in a tropical setting of great natural beauty." Then in 1980, Congress redesignated and expanded the monument by establishing Biscayne NP in order to preserve and protect the unique area for the education, inspiration, recreation and enjoyment of present and future generations.

Everglades National Park Protection and Expansion Act of 1989 (16 U.S.C., Chapter 1, Subchapter LIV). This act increased protection for Everglades NP and assured better management of the resources in and around the park.

Everglades Forever Act of 1994 (Florida Statutes 373.4592). This statute provides for a comprehensive clean-up/restoration plan for the Everglades to address water quality, water quantity, and water timing problems.

Water Resources Development Act of 1996. Section 528 of this act, Everglades and South Florida Ecosystem, codified the South Florida Ecosystem Restoration Task Force and broadened its mission, role, and membership to include state, local, and tribal governments. It defined the south Florida ecosystem as the area consisting of the lands and waters within the boundary of the South Florida Water Management District, including the Everglades, the Florida Keys, and the contiguous near-shore coastal waters of south Florida. It also provided guidance related to public participation in resource development.

Omnibus Water Resources Development Act of 1996. This act requires that the U.S. Army Corps of Engineers (USACE) develop a Comprehensive Restoration Plan for the Everglades and its related ecosystems, in conjunction with the South Florida Ecosystem Restoration Task Force and the C-111 Project. This project is intended to restore natural hydrologic conditions in eastern portion of Everglades NP, and the south Florida ecosystem, including the coastal estuaries such as Florida Bay and Biscayne Bay, through increased flows to Taylor Slough and Florida Bay.

Coastal Zone Management Act of 1972 (CZMA). Due to an increase in development and growth pressures on coastal resources, this act serves to preserve, protect, promote, and—where possible—restore or enhance the resources of the national coastal zone for the present and future generations. These coastal resources include wetlands, floodplains, estuaries, beaches, dunes, barrier islands, coral reefs, and the plant and wildlife that utilize these habitats. State participation in the CZMA is voluntary; however, development and implementation of the plan by states is encouraged with federal financial assistance. Under CZMA provisions, all federal agencies must determine whether their activities are consistent with approved state coastal management programs. In order to receive concurrence in Florida, a federal agency submits information to the Florida state clearinghouse for review and to determine whether its actions conducted in or adjacent to the state coastal zone could impact coastal zone resources.

Public Law 100-91, National Park Overflights Act of 1987. This act directed the U.S. Forest Service and NPS to conduct studies of aircraft overflights which may be impacting visitors or resources of the National Forest System Wilderness and the national parks and report the results to Congress.

National Park Service Regulations on Resource Protection, Public Use, and Recreation (36 CFR Part 2). These regulations establish National Park Service policies prohibiting unreasonable noise in camping areas between the hours of 10:00 p.m. and 6:00 a.m. (§2.10(a)(4)) and operation of motorized equipment or machinery that exceeds a noise level of 60 decibels measured on A-weighted scale at a distance of 50 feet (§212(a)(1)).

National Park Service Regulations on Boating and Water Use Activities (36 CFR Part 3). These regulations establish National Park Service policies prohibiting operation of a vessel to exceed a noise level of 82 decibels measured at a distance of 82 feet (§3.7).

Florida Statutes, Chapter 163, Part II, the Local Government Comprehensive Planning and Land Development Regulation Act. This act utilizes and strengthens the existing role, processes, and powers of local governments in the establishment and implementation of comprehensive planning programs to guide and control future development. This regulation also encourages cooperation between other municipalities, counties, and regions.

Florida Statutes, Chapter 186, the Florida State Comprehensive Planning Act of 1972. This act addresses most aspects of state and regional planning, including the creation, membership, duties, and powers of the regional planning councils, as well as the preparation, revision, and implementation of the state comprehensive plan.

Florida Statutes, Chapter 187, State Comprehensive Plan. The plan, "a direction-setting document," provides long-range policy guidance for the organized social, economic, and physical growth of the state. Some of the topics addressed include education, children, the elderly, public safety, health, marine, coastal, and water resources, air quality, and land use.

Florida Statutes, Chapters 235 and 236. These apply to many aspects of the state's educational facilities and school finance and taxation, respectively.

Florida Statutes, Chapter 288, Commercial Development and Capital Improvement. Part X, Defense Conversion and Transition, includes provisions related to military base reuse plans, base closure and reuse, base disposition, and base retention. A specific legislative intent itemizes ten policies of the State of Florida to be implemented once the federal government determines disposition of military bases, lands, or installations to be necessary. The legislation provides that communities affected by defense base closures and realignments may amend their comprehensive plans by either amending each element or adding a new element specifically addressing reuse of military lands.

Florida Statutes, Chapter 373, Florida Water Resources Act of 1972. This act created five water management districts in the state. The management districts were charged with responsibility for safeguarding water resources, flood control, and environment protection and enhancement. In 1981, the Florida Legislature created the Save Our Rivers program and provided funding through the Water Management Lands Trust Fund (§373.59) to acquire environmentally sensitive lands. This was supplemented by Preservation 2000 in 1990, which has been replaced by Florida Forever, created in 1999.

Florida Statutes, Chapter 380. Chapter 380 deals with land and water management in three parts. Part I, the Florida Land and Water Management Act of 1972, ensures well-planned development and water management systems to protect the health, safety, and quality of life of Florida residents. Part II, the Florida Coastal Management Act, protects, maintains, and develops Florida's natural, economic, and recreational coastal resources through coordinated management. Part III, Florida's Communities Trust Act, establishes a non-regulatory agency that assists local governments in bringing comprehensive plans into compliance and implementing the goals and objectives related to the conservation of natural resources and the resolution of land use conflicts.

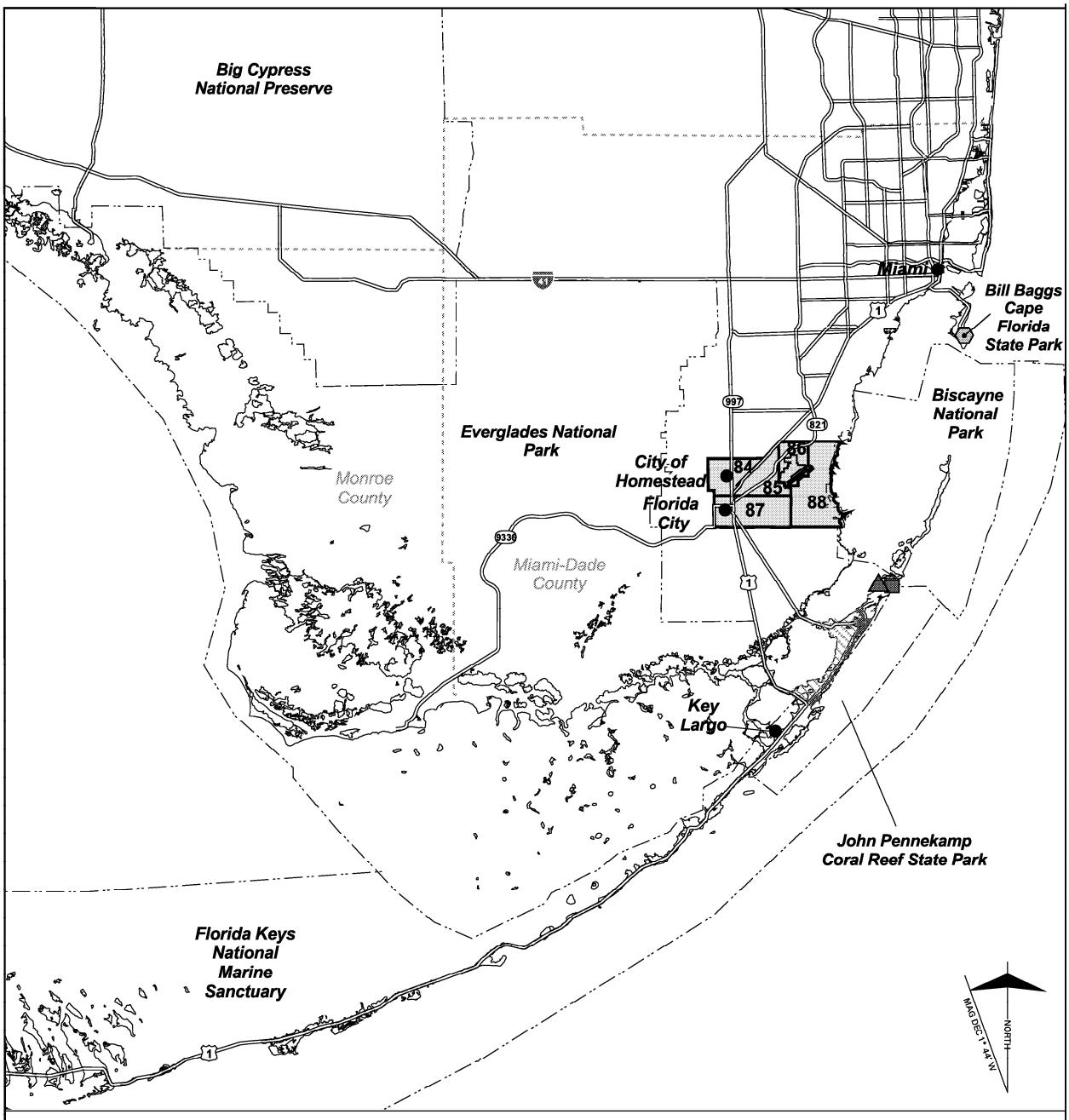
Florida Statutes, Chapter 590, Section 590.125, Open Burning Authorization By the Division. This section of the Florida Statutes provides for the "application of prescribed burnings as a land management tool that benefits the safety of the public, the environment, and the economy of the state."

Miami-Dade County Code, Chapter 33. This county code sets forth zoning ordinances for Miami-Dade County. The code establishes area requirements, dwelling standards, site plan reviews, and permitted and accessory uses. *Miami-Dade County Code, Article XXXV, Sec. 33-292 through 303*. This code established zoning for former Homestead AFB. It provides for the division of the base into districts within which height, open space, building coverage, density, and type of future land uses are defined in conformity with the general plan. The code established airport hazard areas, structure height limitations, use restrictions, hazard marking and lighting, and permitting and zoning procedures.

3.6.1.3 Region of Influence

The ROI for land use and aesthetics (**Figure 3.6-1**) includes former Homestead AFB and surrounding lands that could be affected by activities associated with the development of former base property. This includes:

- Lands comprising former Homestead AFB, including Homestead ARS and lands conveyed or in the process of being conveyed for reuse.
- The community surrounding former Homestead AFB which may be affected by aircraft operations at the airfield or by secondary development and population growth related to reuse of former base property. Specifically, this ROI includes portions of Miami-Dade and Monroe Counties between Eureka Drive and Key Largo, with special emphasis on the Transportation Analysis Districts (TADs) encompassing and immediately surrounding former Homestead AFB (TADs 84, 85, 86, 87, and 88). These TADs also include the Cities of Homestead and Florida City.



LEGEND

- Former Homestead AFB
- 84 Transportation Analysis District
- County Boundary
- Park, Preserve, or Sanctuary Boundary
- Crocodile Lake National Wildlife Refuge
- Key Largo Hammocks State Botanical Site
- City
- Ocean Reef Club
- Anglers Club
- Major Road
- Interstate Highway
- U.S. Highway
- State Highway

5 0 5 10 15
Scale in Miles

Source: SAIC

Figure 3.6-1
Region of Influence
for Land Use and Aesthetics

- National and state park lands, refuges, preserves, and management lands that could experience land use or aesthetics impacts from activities at the former base. This includes portions of Biscayne and Everglades National Parks, Big Cypress National Preserve, Crocodile Lake National Wildlife Refuge, Florida Keys National Marine Sanctuary, John Pennekamp Coral Reef State Park, Bill Baggs Cape Florida State Recreation Area, the Southern Glades Wildlife and Environmental Area, and the Model Lands Basin.

3.6.2 Plans, Policies, and Programs

The following is a summary of the plans, policies, and programs related to land use in the ROI. These plans, policies, and programs usually outline the existing and future development and management of land uses. Land uses requiring special resource protection are also outlined in these plans.

Air Installation Compatible Use Zone. This program was developed by the Air Force to minimize development in areas on or adjacent to military airfields that is incompatible with aviation operations. The AICUZ program provides recommendations to local governments on land uses compatible with exposure to aircraft noise and safety considerations.

Director's Order #41, Wilderness Preservation and Management. The purpose of this order is to provide accountability, consistency, and continuity to the National Park Service's wilderness management program and to otherwise guide NPS efforts in meeting the letter and spirit of the 1964 Wilderness Act.

Director's Order #47, Soundscape Preservation and Noise Management. The National Park Service Reference Manual on Soundscape Preservation and Noise Management (RM 47) includes applicable policies and procedures, technical guidance on planning, monitoring, education, noise prevention and mitigation, and other information designed to help field managers and staff meet their responsibilities.

Director's Order #55, Interpreting the National Park Service Organic Act. This order provides a detailed interpretation of the provisions of the National Park Service Organic Act to help NPS managers ensure the law is properly and consistently applied throughout the national park system. It describes the NPS' obligation to conserve park resources and values, independent of any risk that those resources and values may be impaired. It indicates that NPS managers must seek ways to avoid, or minimize to the greatest degree practicable, adverse impacts on park resources and values, recognizing that the laws give NPS the management discretion to allow impacts when necessary and appropriate to fulfill the purposes of a park, so long as the impact does not constitute impairment. Impairment is defined as "an impact that, in the professional judgement of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values." The order indicates that "an impact would be more likely to constitute an impairment to the extent it affects a resource or value whose conservation is necessary to fulfill specific purposes identified in establishing legislation or proclamation of the park; key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents." It specifies that impairment may occur from visitor activities, NPS activities, or activities undertaken by concessionaires, contractors, and others operating in the park.

Guiding Principles of Sustainable Design. This guide articulates principles to be used in the design and management of tourist facilities in national parks that emphasize environmental sensitivity in construction, use of non-toxic materials, resource conservation, recycling, and integration of visitors with natural and cultural settings. It's goal is to provide a basis for achieving sustainability in facility planning and design, emphasize the importance of biodiversity, and encourage responsible decisions (**NPS 1994**).

Draft Resource Management Plan for Biscayne National Park (1995). This plan outlines resource management issues facing the park and presents strategies for dealing with them. Specific projects designed to attain park goals are also presented and prioritized in a logical and systematic order.

Biscayne National Park General Management Plan, Development Concept Plan, Wilderness Study, and Environmental Assessment (1983). The proposed general management plan for this area combines a philosophy of resource protection with that of assuring visitor enjoyment through interpretation and the continuation of established recreational activities. A critical part of the plan is a public transportation system that will make the park more accessible to the non-boating public. The proposed plan would have no significant impact upon the environment.

Everglades National Park Master Plan (1979). While dated, this plan contains information still applicable today regarding the Everglades NP. The plan provides a description of the park, resource management, land classifications, wilderness descriptions, interpretation and education, use and development, and land acquisition and jurisdiction. It also contains management objectives that reflect the park management's needs and goals relative to the master plan.

Draft Biscayne National Park Soundscape Preservation and Noise Management Plan (2000). In order to preserve and restore the natural (ambient) sounds within Biscayne NP, agency planners are preparing a Soundscape Preservation and Noise Management Plan that identifies significant individual sounds within the park, describes current soundscapes, sets goals for future soundscapes, and identifies the information and actions needed to achieve these goals.

Florida Coastal Management Plan (FCMP). Florida not only has the nation's second longest intertidal shoreline, just under 8,500 miles, but also has more than 10 million people living in 35 coastal counties. The State of Florida has implemented FCMP, consisting of 23 Florida Statutes, to aid in the preservation, protection, and development of the state's natural, biological, cultural, and economic resources. Florida's coastal zone encompasses the entire state and its territorial waters. Eleven state agencies and four water management districts administer the FCMP. Any federal actions occurring within the state must be reviewed by the state for consistency with the FCMP. Upon receiving federal agency information, Florida must review and provide concurrence or objection within 60 days following the receipt of the required information. If Florida does not provide consistency concurrence or objection within 60 days, the federal action in question is presumed to be consistent with the FCMP.

South Florida Regional Planning Council's Strategic Regional Policy Plan. This plan promotes a unified regional district while achieving a livable, sustainable, and efficient community. Under this plan, the south Florida region will revitalize urban areas, facilities, housing, and services. The region will also protect, manage, and sustain natural resources. In keeping with the plan's vision, south Florida will also achieve a competitive, diversified economy through human and technological developments. The region will also devise strategies to address land use, natural resources, transportation, economic, and public facilities issues.

Comprehensive Plan for the Restoration of the Everglades (January 1996). In response to the restudy efforts of the Central and Southern Florida (C&SF) Project and federal legislation, the Comprehensive Plan for the Restoration of the Everglades provides direction for restoring the Everglades for present and future generations to enjoy. Specifically, the basis of the plan includes efforts to reestablish the natural hydrologic patterns, as well as the acquisition and protection of key parcels of land that border Everglades NP. The U.S. Department of the Interior, the State of Florida, and a Federal Interagency Task Force prepared the plan on the Everglades. The Comprehensive Plan consists of four elements, including (1) legislative authority for the plan and related restoration activities; (2) accelerated land acquisition;

(3) increased scientific research to guide restoration efforts; and (4) sources of federal, state, and private-sector funding.

South Florida National Parks Coordinated Management Framework Draft (1997). South Florida region contains four significant national park units. This plan initiates a combined planning process that includes Dry Tortugas NP, Everglades NP, Big Cypress National Preserve, and Biscayne NP. The framework document sets the purpose and significance of each park and presents individual and collective goals that reflect conditions the park managers envision for the future. These collective goals are intended to help shape, and where possible, unify future management decisions.

Florida Keys National Marine Sanctuary Final Management Plan and EIS (1997). This plan provides information about the important need for the Florida Keys National Marine Sanctuary and the tools that have been developed for its management. The final plan contains a comprehensive approach at protecting a marine community as diverse as that in the Florida Keys. The 2,800 acre sanctuary includes various wildlife management refuges, state parks, wildlife management areas, ecological reserves, sanctuary preservation areas, and special-use areas. Great White Heron, Key West, Key Deer, and Crocodile Lake National Wildlife Refuges managed by the U.S. Fish and Wildlife Service are contained in this plan as an integrated ecosystem management approach to resource protection (**NOAA 1998b**).

Eastward Ho! (1995). This program is an initiative of the Governor's Commission for a Sustainable South Florida. Created by Executive Order 94-54, the Governor's Commission for a Sustainable South Florida was charged with ensuring that a healthy Everglades ecosystem can coexist with and be mutually supportive of a sustainable south Florida economy. The Commission's recommendations focus on slowing the urban sprawl that is filling up wetlands and agricultural areas, and bringing vitality back to older urban areas. The objectives are to encourage in-fill and redevelopment of lands not adjacent to the Everglades, and to attract a larger percentage of the projected growth to existing urban areas (**PBS&J 1997a**).

Miami-Dade County Comprehensive Development Master Plan (CDMP) (1997). The CDMP provides long-range goals, objectives, and policies guiding development in Miami-Dade County through 2015. Maps, narratives, and policy statements address both incorporated and unincorporated areas of the county. Presented in twelve sections, the CDMP describes the general policies addressing future development-related issues as required by Florida State Code ("Local Government Comprehensive Planning and Land Development Regulation" sections 163.3161 through 163.3245). The Land Use Plan (LUP) map of the CDMP includes (1) Miami-Dade County's policy regarding the next 10 years of development permitted in certain geographic areas; (2) future land use standards; (3) the reserved agricultural area; and (4) protected, environmentally significant areas of Miami-Dade County. The Urban Development Boundary (UDB) on the LUP map indicates where urban development may be approved. The Urban Expansion Area of the map displays projections where development may be warranted within the next 20 years. All zoning decisions, county facilities, and services must conform to the CDMP policies and the LUP map (**Metro-Dade County 1997a**).

South Dade Land Use and Water Management Plan. This plan was prepared by Miami-Dade County to provide an integrated land use and water management plan for southeastern areas of the county. The plan directs the comprehensive management of land uses and surface and groundwater quality, quantity, timing, and distribution (**PBS&J 1997a**). The South Dade Land Use and Water Management Plan has received USACE support as a Critical Project but the work to complete the plan has yet to begin.

Homestead Comprehensive Plan (1995). This plan provides goals, objectives, and policies for the City of Homestead as required by Florida State Code ("Local Government Comprehensive Planning and Land Development Regulation" sections 163.3161 through 163.3245). It identifies the population and land use

changes that followed the hurricane and provides a plan to assist in the redevelopment and growth of Homestead between 1995 and 2000. The Land Use element of the plan includes current and future land use patterns and provides for historic preservation and economic development. Other elements include traffic circulation, housing, conservation (including the impacts of surrounding land use on the former base), recreation and open space, intergovernmental coordination, and capital improvements. The 1996 *Evaluation and Appraisal Report* of the plan focuses on conditions current in 1996 and strategies to assist the city in implementing the plan (**City of Homestead 1995**).

Florida City Comprehensive Development Master Plan (1996). This plan provides goals, objectives, and policies for the development of the Florida City as required by Florida State Code ("Local Government Comprehensive Planning and Land Development Regulation" sections 163.3161 through 163.3245). It addresses land use needs, recreational analysis and needs, economic analysis and needs, utilities, transportation, and public and governmental interaction. Land use policies include adoption of a land use map addressing land use compatibility, diversification of land use, and applicability of natural and historic resources. The plan also includes building and zoning codes to ensure the compatibility of adjacent land uses (**James Duncan & Associates 1996a**).

Monroe County Year 2010 Comprehensive Plan (1996). This plan provides goals, objectives, and policies guiding the pattern of development in Monroe County as required by Florida State Code ("Local Government Comprehensive Planning and Land Development Regulation" sections 163.3161 through 163.3245). The plan addresses the unique environmental character of the county, especially the large areas of mangrove trees fringing the shoreline and numerous small islands, many of which are below the mean high water level, making defining "land" in the county difficult (**Monroe County 1996**).

Homestead Base Reuse Plan (1995). This plan consists of a series of amendments to the CDMP required to accommodate the reuse plan for Homestead AFB. A series of studies and planning processes were undertaken by Miami-Dade County, the local community, the U.S. Air Force, and the Miami-Dade County Aviation Department to develop a plan for the reuse of the base and determine the impact of that reuse on the surrounding community. These processes culminated in a plan for a dual-use (military and civilian) aviation facility (**Metro-Dade County 1995a**). Miami-Dade County has since adopted additional amendments to the CDMP to reflect approvals given by the Florida Administration Commission in April 1998 to allow initial development of a regional airport at former Homestead AFB.

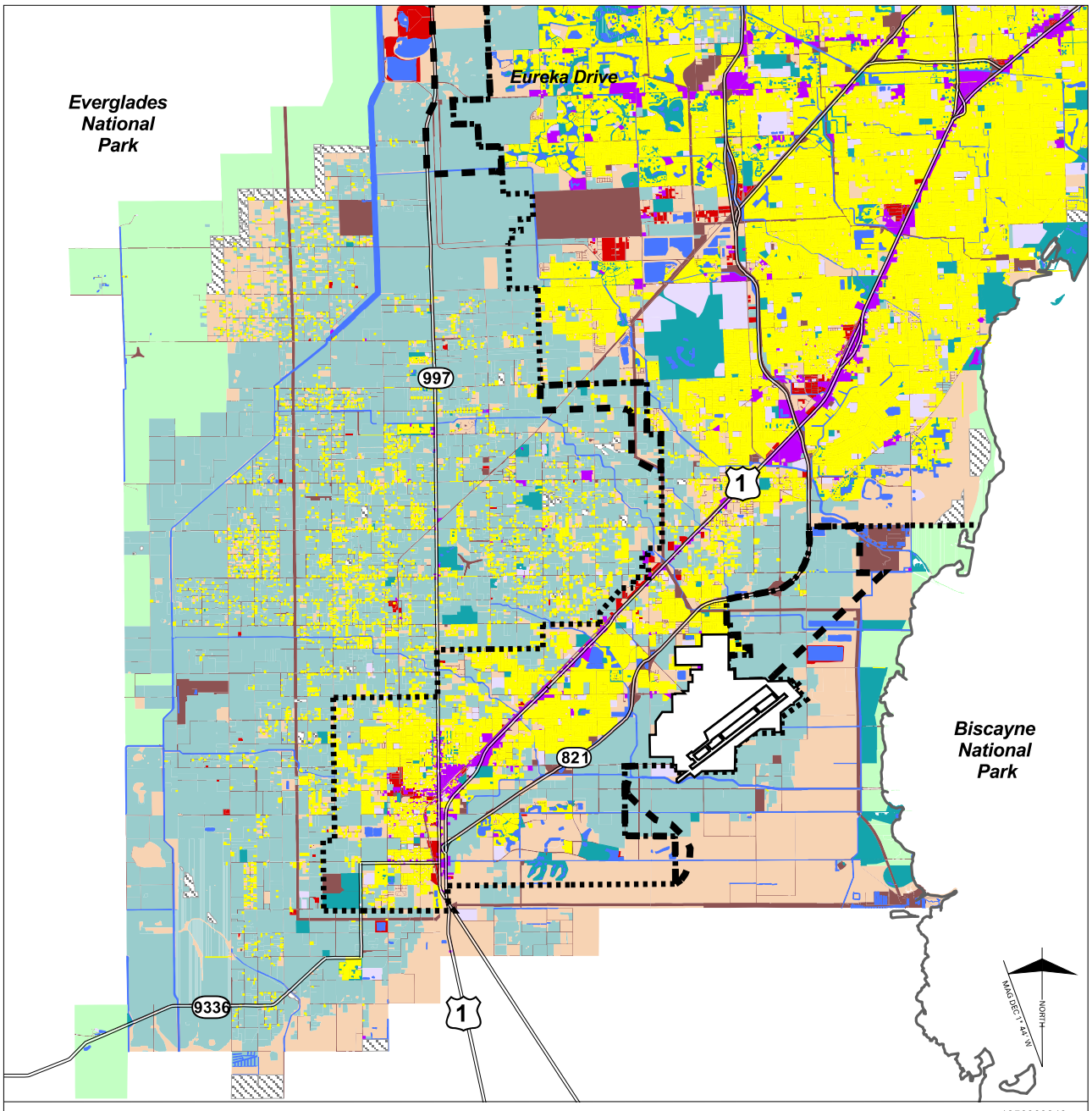
3.6.3 Community Land Use

This section describes land use in the communities extending from Eureka Drive to Key Largo, including southern Miami-Dade County, Redland, City of Homestead, City of Florida City, 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. It does not include the national and state parks, preserves, and sanctuaries, which are described separately in Section 3.6.4.

3.6.3.1 Existing Environment

Miami-Dade County

The portion of Miami-Dade County in the ROI extends from Eureka Drive south to the Miami-Dade-Monroe County line. The western boundary of the county is located approximately 30 miles inside Everglades NP, while the eastern boundary skirts along the coastline inside Biscayne NP. **Figure 3.6-2** depicts available information on general land uses in southern Miami-Dade County in 1994, which is the most recent information available.



LEGEND

Land Use
- Agricultural
- Commercial
- Industrial
- Institutional
- National Parks
- Recreational
- Residential
- Transportation/Utilities
- Protected Lands
- Vacant, Unprotected
- Water

- Former Homestead AFB
- Urban Development Boundary
- Urban Expansion Area
- Major Road
- U.S. Highway
- State Highway

1 0 1 2
Scale in Miles

Derived from:
Metro-Dade County 1998c,
Metro-Dade County 1998e,
Metro-Dade County n.d.c

Figure 3.6-2
Land Use in South
Miami-Dade County, 1994

The Miami-Dade County CDMP identifies an Urban Development Boundary within which most development is confined (see Figure 3.6-2). Development outside the UDB is highly restricted, and supporting infrastructure is very limited. Residential development outside the UDB is restricted to one dwelling unit per 5 acres. The CDMP also identifies an Urban Expansion Area (UEA) which will be opened to development after 2000.

Table 3.6-1 presents community land uses in the portion of the ROI in Miami-Dade County that is south of Eureka Drive all the way to the southern county boundary. As the table indicates, outside of the national parks, the largest areas are water and open lands designated for environmental protection. Together, they comprise about 63 percent of the area. The principal land use is agriculture. Most development occurs within the UDB and to the west and north of former Homestead AFB and along U.S. Highway 1. The highest densities of development occur north of the former base, with primarily residential and commercial land uses, and within the boundaries of the City of Homestead and Florida City.

Table 3.6-1. Land Use in South Miami-Dade County, 1994

Land Use	Total Acreage[1]	Acreage Inside the UDB	Acreage Outside the UDB	Percent of the Total
Residential	16,630	12,322	4,308	4.7
Commercial	1,315	1,201	114	0.4
Industrial	893	565	328	0.2
Institutional	4,141	3,481	660	1.2
Recreation	1,774	1,042	732	0.5
Transportation/Utilities	11,128	1,533	9,595	3.1
Agriculture	64,192	10,005	54,187	18.0
Vacant, Protected[2]	66,914	299	66,615	18.7
Vacant, Unprotected[3]	31,040	8,929	22,111	8.7
Water	158,798	1,765	157,033	44.5
Total	**356,825**	**41,142**	**315,683**	**100.0**

Source: **Miami-Dade County 1998c**.
Notes: [1] Includes the area south of Eureka Drive, excluding national park land.
[2] Open lands designated for environmental protection. No development is permitted on these lands.
[3] Open lands available for development.

Residential densities vary throughout the ROI. Large lot or estate development at 1 to 2.5 dwelling units per acre occurs in areas west of the City of Homestead and Florida City. In the vicinity of former Homestead AFB, the residential density is primarily 1 to 5 dwelling units per acre.

As defined by the CDMP, the land south of the former base is primarily open space. This open space is further classified by Miami-Dade County's Environmentally Endangered Lands (EEL) Program as either protected or unprotected vacant lands. Protected vacant lands are acquired under the EEL Program (**Young 1998a**). Protected vacant lands encompass 9.2 percent or approximately 66,914 acres in the ROI. These lands include wetlands, biologically sensitive lands, and other lands with valuable environmental characteristics, recreation uses, or scenic appeal. Unprotected vacant lands include lands owned privately, government owned or controlled, and under development. This designation applies to vacant lands that have not been acquired for protection under one of the county's environmental protection programs and

are therefore available for development. Although designated in the CDMP as unprotected vacant land, permitted uses on these lands may include agricultural, rural residential, resource-based activities, recreation, or conservation.

Miami-Dade County owns and operates over 1,200 acres of park land south of Eureka Drive. Over half of the 1,200 acres consists of nature preserves and environmental areas, while the remaining area consists of developed and undeveloped parks and marinas (**Miami-Dade County 1998a**). Preston B. Bird and Mary Heinlein Redland Fruit and Spice Park, a county park located 12 miles west of the former base, encompasses 30 acres with more than 500 species of fruit, nut, and spice trees from throughout the world. (See Figure 3.14-2 in Section 3.14 for the location of specific parks near former Homestead AFB.)

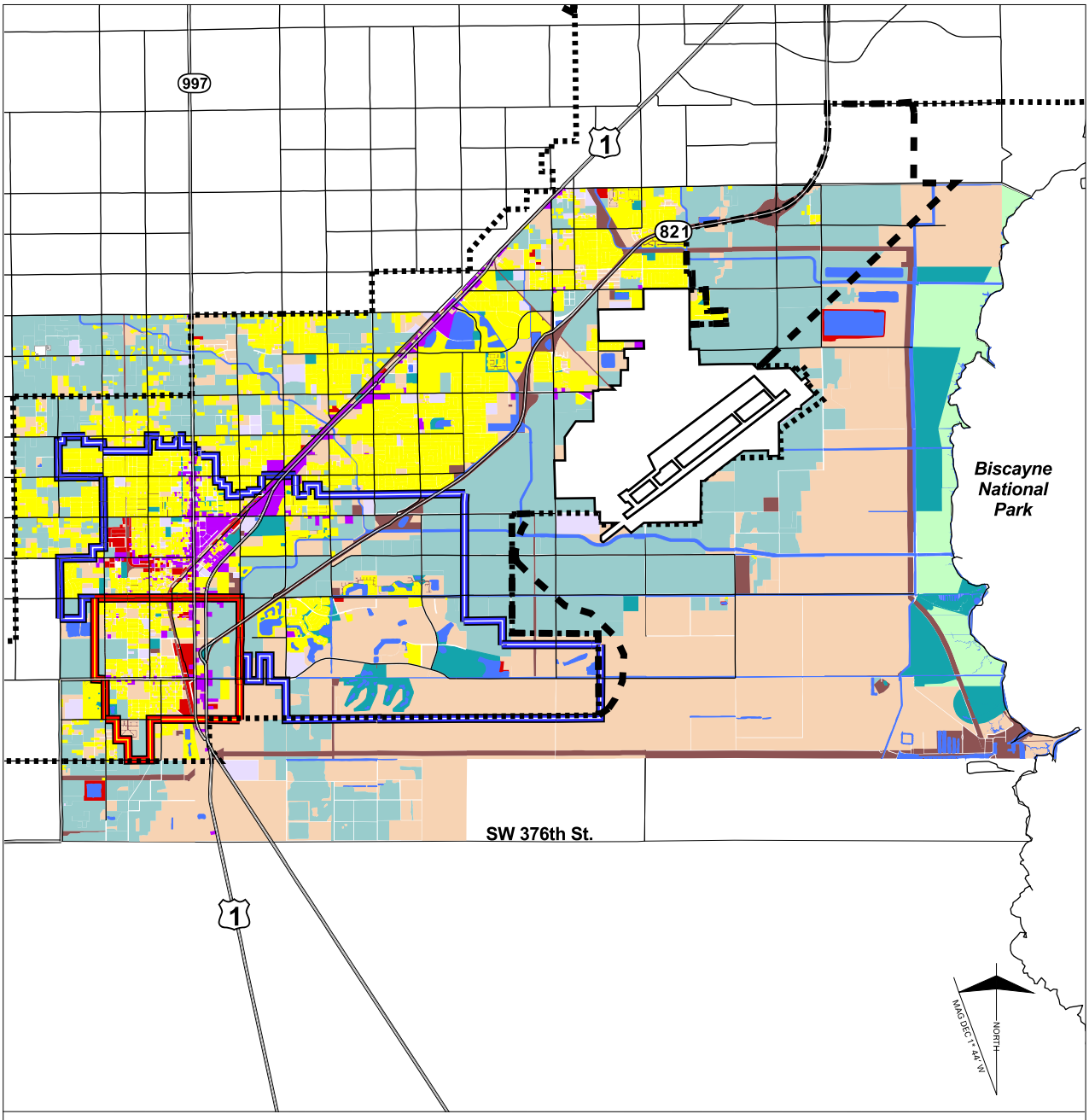
Transportation Analysis Districts Adjacent to Former Homestead AFB. Five TADs incorporate and surround former Homestead AFB: TADs 84, 85, 86 (which includes the former base), 87, and 88 (see Figure 3.6-1). This is the area most likely to be exposed to elevated aircraft noise and other direct and many of the indirect effects from reuse activities on former base property. **Figure 3.6-3** shows land use within the five TAD area in 1994, the most recent mapped data available from Miami-Dade County. As the figure shows, land use within this area ranged from a mix of residential and urbanized uses west of the former base to agricultural and protected vacant lands to the east and south toward Biscayne NP.

Table 3.6-2 provides information on land use in the five TADs in 1994. These TADs encompass the areas currently exposed to Day-Night Average Sound Levels of 60 dB and higher from Homestead ARS (see Figure 3.5-5), as well as areas within safety zones in the Air Force's Air Installation Compatible Use Zone program (see Figure 3.4-4). As described in Section 3.4, the AICUZ is an Air Force program for identifying areas in the vicinity of an Air Force base that might be exposed to hazards from aircraft operations. The basic objective of the AICUZ program is to achieve compatible land uses on public and private lands in the vicinity of military airfields by controlling incompatible development through local actions. The AICUZ study for former Homestead AFB provided land use guidelines for development within CZs, APZs, and high noise zones. Miami-Dade County, through the CDMP, adopted the Homestead AFB AICUZ guidelines to provide for land use compatibility in the vicinity of Homestead ARS. The AICUZ program incorporated land use compatibility guidelines adopted by the Federal Interagency Committee on Urban Noise (FICUN).

Table 3.6-2. Land Use Within Transportation Analysis Districts

Land Use (acres)	TAD				
	84	**85**	**86**	**87**	**88**
Residential	2,399	2,034	950	518	17
Commercial	286	252	18	52	0
Industrial	185	104	132	294	1,765
Institutional	242	195	2,580	69	5
Recreation	63	116	140	188	1,548
Transportation	1,120	1,104	557	483	385
Agriculture	2,613	2,773	1,537	1,965	2,710
Vacant, Unprotected	832	658	431	3,880	7,771
Vacant, Protected	11	0	0	0	2,178
Total	**7,751**	**7,236**	**6,345**	**7,449**	**16,379**

Source: Miami-Dade County Transportation Analysis Zone data for 1994.



LEGEND

Land Use
- Agricultural
- Commercial
- Industrial
- Institutional
- National Park
- Recreational
- Residential
- Transportation/Utilities
- Vacant, Unprotected
- Water

- Former Homestead AFB
- City of Homestead Municipal Boundary
- Florida City Municipal Boundary
- Urban Development Boundary
- Urban Expansion Area
- Street
- Major Road
- U.S. Highway
- State Highway

1 0 1
Scale in Miles

Derived from:
Landrum & Brown 1999b,
Metro-Dade County 1992b,
Metro-Dade County 1998c,
Metro-Dade County 1998e,
Metro-Dade County n.d.c

Figure 3.6-3
Land Use Within the Five TADs
in the Vicinity of Former Homestead AFB, 1994

A reconnaissance survey of the areas immediately adjacent to the former base and northeast and southwest of the runway thresholds was performed in connection with this SEIS to update the 1994 residential land use data. **Figure 3.6-4** shows residential areas identified in the survey and the approximate number of housing units in each area. The figure also shows the AICUZ safety zones and the existing DNL contours. Land use within the CZs and APZ I is primarily agriculture and open space. Industrial, agricultural, recreation, and vacant land uses also found under APZ I are generally considered compatible land uses. Some residential use is located in the southern APZ I. Residential uses are generally not considered compatible uses in APZ I. Land uses within APZ II include open space, agriculture, industrial, and recreation (**Dames & Moore et al. n.d.b**). These land uses are considered compatible with APZ II.

The City of Homestead and Florida City are located within TAD 84. Land use in these cities is described below.

City of Homestead. The City of Homestead serves as the center of Miami-Dade County's agricultural industry. The City of Homestead provides cultural, business, and economic opportunities for the area. Surrounded on the north, west, and east by unincorporated Miami-Dade County and on the south by Florida City, the city comprises approximately 13.4 square miles.

Table 3.6-3 identifies land uses in the City of Homestead in 1995 (**City of Homestead 1995**). Since Hurricane Andrew, approximately 487 acres of previously undeveloped land have been developed for primarily residential and commercial land uses. The city also annexed approximately 1,400 acres to the east.

Table 3.6-3. Land Use in the City of Homestead, 1995

Land Use	Acres	Percent of Total
Residential	2,178	25.4
Commercial	417	4.9
Industrial	146	1.7
Institutional	230	2.7
Parks & Recreational Open Space	376	4.4
Transportation, Communications, Utilities	1,060	12.3
Agriculture	2,655	31.0
Undeveloped	1,351	15.7
Inland Water	164	1.9
Total	**8,577**	**100.0**

Source: **City of Homestead 1995**.

The City of Homestead has two categories of residential development: low density, up to five dwelling units per acre, and medium density, up to 10 dwelling units per acre. Low-density residential development occurs primarily in the northwest corner of the city and along Florida's Turnpike. Medium-density development occurs in the center of town bordering the commercial and institutional areas. Southeast of town, adjacent to Florida's Turnpike and extending south to SW 352nd Street, is a 3,275 acre planned regional activity center (**City of Homestead 1995**). Currently the site includes two large recreational facilities, light industrial and office uses, hotels, and some single family and multi-family development, with an average density of no more than 10 dwelling units per acre. The activity center has the capacity to be further developed with similar uses.

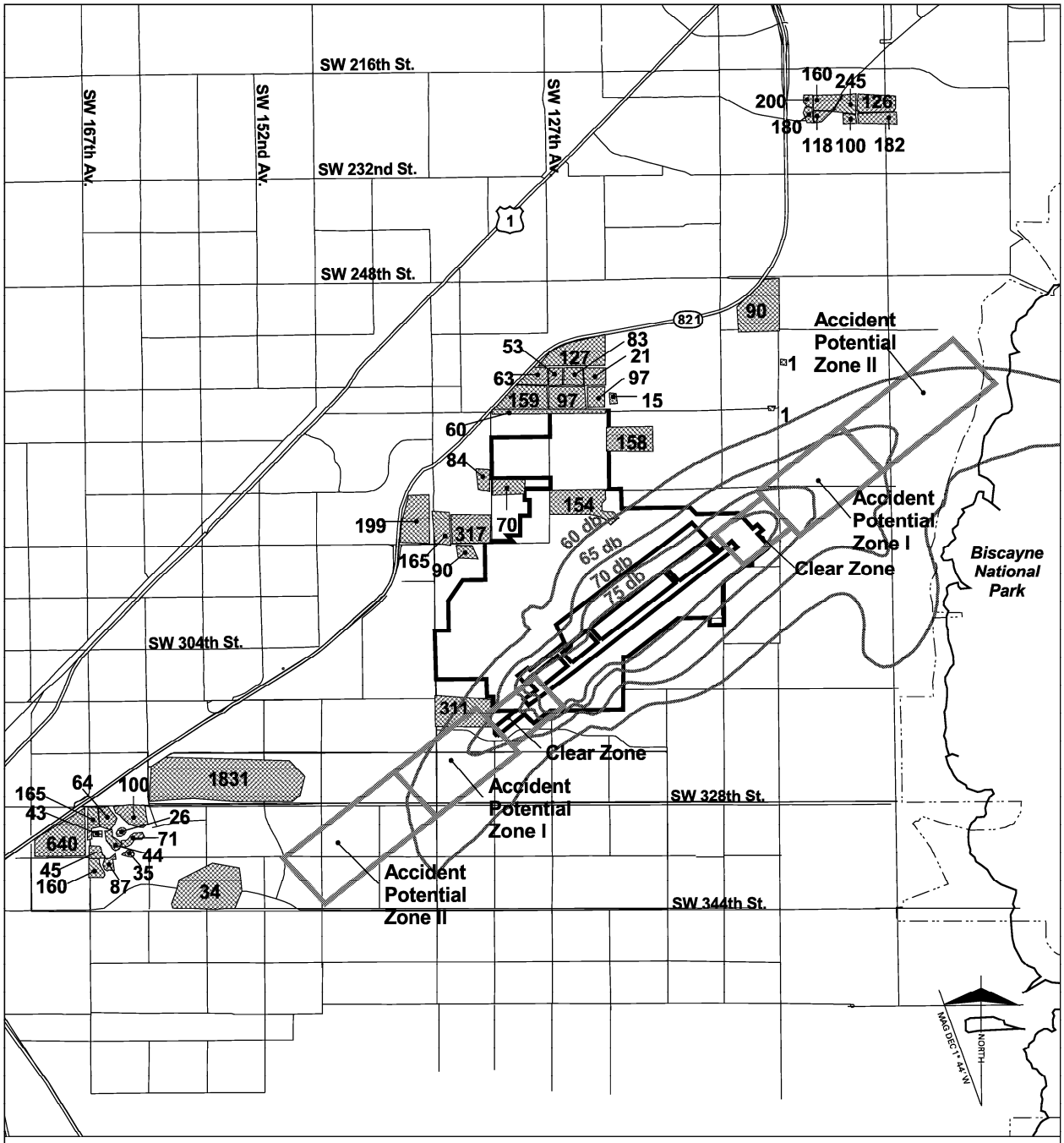


Figure 3.6-4
Housing Units in the
Vicinity of Homestead ARS

The City of Homestead currently has 148 acres of public parks. The Homestead Parks Department maintains 14 parks consisting primarily of developed recreation areas, picnic facilities, and sports fields. In addition, the department maintains three undeveloped parks with open space, trails, and nature areas.

Also within the city, two new facilities, the Miami-Dade-Homestead Motorsports Complex, a state-of-the-art racing facility, and the Homestead Sports Complex have been constructed. The Motorsports Complex is located on 343 acres in southeast Homestead and contains seating for over 50,000 visitors. The 186 acre Sports Complex seats 6,500 but can be expanded to seat 9,000; it provides parking for over 3,900 vehicles.

Florida City. Florida City is approximately 5 miles southwest of former Homestead AFB and is adjacent to the City of Homestead (refer to Figure 3.6-1). Florida's Turnpike ends and merges with U.S. Highway 1 inside the municipal boundaries of Florida City. **Table 3.6-4** presents existing land uses in Florida City.

Table 3.6-4. Land Use in Florida City, 1996

Land Use	Acres	Percent of Total
Residential	327	16.2
Commercial	107	5.2
Industrial	79	3.9
Institutional	97	4.8
Park and Recreation	21	1.0
Public Rights-of-Way	321	16.0
Vacant	1,068	52.9
Total	**2,020**	**100.0**

Source: **James Duncan & Associates 1996a**.

Florida City has experienced significant growth in residential and commercial land uses, while little industrial growth has occurred. Land use west of the city is primarily vacant or agricultural, with some single-family residential development. East of the city is mainly undeveloped land with few roadways or facilities (**James Duncan & Associates 1996a**). Little development has occurred to the south, with the exception of a trailer park that borders the city limits. The areas near U.S. Highway 1 and Florida's Turnpike are designated for commercial and industrial uses, but the majority of this acreage is vacant. A large percentage of the vacant land is comprised of environmentally sensitive wetland areas south of East Palm Drive and east of U.S. Highway 1. The city is presently pursuing the annexation of adjacent unincorporated areas east and west of the current city limits.

Florida City has four parks and service areas. Fasulo Park is the largest in the city, with approximately 9 acres of open land, beach, and a pavilion. Loren Roberts Park includes two baseball diamonds, two tennis courts, two basketball courts, playground equipment, a recreation room, and a concession stand on under 9 acres. A 1 acre park is located adjacent to the Community Center. Washington Park, 1.5 acres, provides playground facilities. A 2.8 acre portion of pineland located south of West Palm Drive and east of SW 8th Avenue is designated as Conservation and Recreational State Land.

Former Homestead AFB. Former Homestead AFB is located 4 miles northeast of the City of Homestead and approximately 1.5 miles inland from Biscayne Bay. In 1990, airfield land uses on the base included the runway, taxiways, parking aprons, hot cargo pad, navigational aids, and helicopter landing pads. The northeast-southwest instrument runway is 11,200 feet long and 300 feet wide. The aircraft parking apron

is adjacent to the northwest side of the runway. The helicopter landing pads are located between the aircraft parking apron and the runway. The airfield land use areas received minimal damage as a result of Hurricane Andrew.

When the base was active, it included air traffic control facilities, aircraft hangars, a number of training and maintenance facilities, weather facilities, air freight terminals, radar/aircraft guidance systems, and helicopter operations facilities. The USACE estimated 46 of the 82 aviation support facilities received greater than 50 percent damage from Hurricane Andrew.

Industrial land uses included numerous utility and maintenance facilities. According to the USACE damage assessment, 37 of the base's 151 industrial facilities were damaged by Hurricane Andrew. Institutional (medical) facilities included the former base hospital and pharmacy, which were on the northern portion of the base by the north entrance gate. The structures were more than 50 percent damaged by Hurricane Andrew. Commercial land uses consisted of administrative and community type facilities. Twenty-six of the 40 commercial structures were considered damaged by greater than 50 percent in the USACE damage assessment. Residential land uses on the base included four large clusters of family housing on the northern portion of the base and unaccompanied dormitory-style housing. All of the residential structures were damaged by the hurricane.

Currently, a large portion of the base remains open or vacant land, with the exception of the cantonment area. The cantonment is in the center of the base extending to the western border. This area contains newly constructed administration, maintenance, and training facilities. There is a fenced munitions area south of the runway and another cantonment on the northeast end of the runway used as an alert area by the Florida Air National Guard.

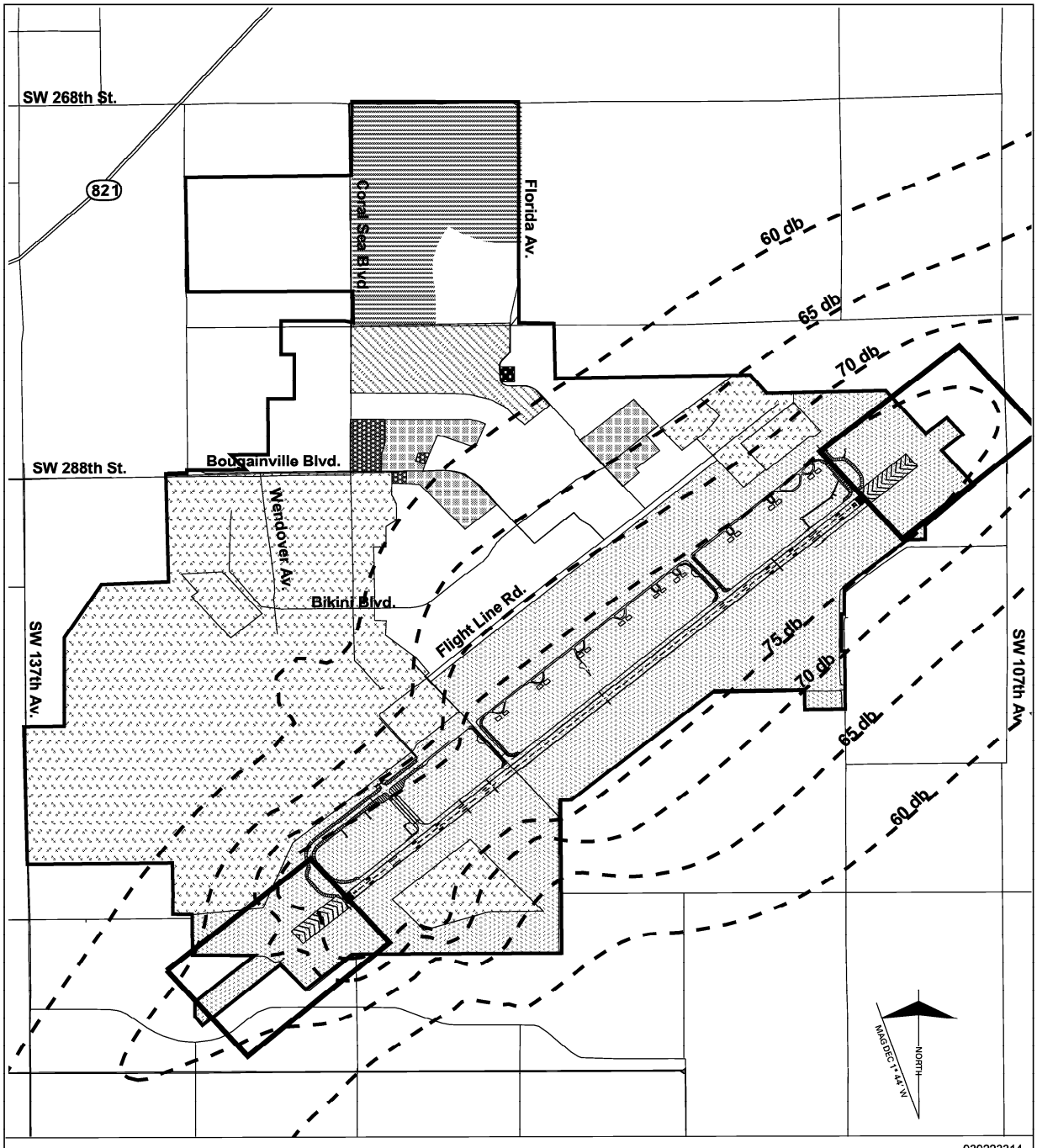
Former base lands outside the cantonment were declared excess when the base was identified for realignment. As Section 2.1 indicates, some parcels have been conveyed or proposed for conveyance to various entities for reuse. Existing and planned reuse land uses include military, institutional, commercial, residential, and recreational uses. A small parcel identified as utility land use contains the electrical substation for the former base lands.

Figure 3.6-5 shows existing land use on the former base property, along with the AICUZ clear zones and noise contours from military and government aircraft operations at Homestead ARS. The figure shows that areas exposed to DNL 60 dB and higher include military and institutional land uses and vacant surplus lands. A small portion of the Homeless Trust Center (designated as residential in Figure 3.6-5) lies within the 60 dB contour. No structures are in this area.

Monroe County

Monroe County is made up of the western portion of the tip of the Florida peninsula (largely consisting of Everglades NP and Big Cypress National Preserve) and 822 islands, only about 30 of which are inhabited. The western half of Everglades NP and the southern tip of Big Cypress National Preserve are also largely uninhabited. The islands (Florida Keys) of Monroe County are connected to the mainland by an overseas highway that was built by the state utilizing defunct railroad bridges between Key Largo and Key West.

Most of Monroe County is outside the ROI expected to be affected by reuse of the former Homestead AFB. The area within the ROI (excluding the national park lands) encompasses Key Largo and includes Ocean Reef and Key Largo Angler's Club, gated communities located in upper Key Largo (see Figure 3.6-1). Both communities consist primarily of a mix of residential, recreation, and some commercial development, along with a large amount of protected land and native area. They are located on the northern tip of Key Largo just south of the southern boundary of Biscayne NP, just north of a



LEGEND

Land Use
- Airfield
- Commercial
- Institutional
- Military
- Recreational
- Residential
- Utilities
- Vacant (surplus)

- Former Homestead AFB Boundary
- AICUZ Clear Zone
- Noise Contour
- Street
- State Highway

Derived from:
Landrum & Brown 1999b,
PBS&J 1998d

Figure 3.6-5
Existing Land Use
on Former Homestead AFB

portion of the boundary to Crocodile Lake National Wildlife Refuge, and surrounded on three sides by the Florida Keys National Marine Sanctuary. The private community and member owned Ocean Reef Club has a five-star Inn and conference center, several restaurants, a number of golf courses, full security and emergency facilities, small grammar school, multi-denominational church, medical center, full-service marina, small shopping village, several other recreational facilities, and a private airfield (**Buck 1998**). Key Largo Angler's Club, directly south of Ocean Reef, is an exclusive private fishing club which includes a mix of residential development within the gated community.

3.6.3.2 Projected Baseline Environment

Based on population projections for the ROI, presented in Section 2.1.3, land use patterns in the area surrounding former Homestead AFB are assumed to change by 2015. Meeting the increased demand for development will likely result in a decrease in agricultural lands and vacant land available for development (i.e., not protected). For analysis purposes, it is estimated that about 4,000 acres of agricultural land in south Miami-Dade County could be converted to development by 2015 primarily for

residential uses. Another 4,500 acres of unprotected vacant land in the south county could be developed. Most of the land affected is likely to be within the UDB and could expand into the UEA if it is made available for development.

3.6.4 Special Use Areas

This section describes specially designated land use areas recognized for having unique qualities or designated by acts of Congress or other statutes to preserve their unique characteristics for the sustained enjoyment of people and for conservation. These areas may be managed for a specific purpose or for a

number of activities. National parks, preserves, marine sanctuaries, and wildlife refuges exist within the ROI. These federal lands each have different legislative and policy mandates that may be briefly summarized as follows:

- NPS administers national parks and preserves. A national park (1) must possess nationally significant natural, cultural, and recreational resources; (2) must represent a natural/cultural theme or type of recreational resource; (3) must be sufficient in size and appropriate configuration to ensure long-term protection and public use; and (4) requires direct NPS management rather than alternative protection by other agencies. National preserves must possess many of the same attributes as a national park; however, a national preserve may permit hunting, trapping, or resource extraction if it does not jeopardize the areas natural values. Each unit maintains specific management provisions.
- The National Oceanic and Atmospheric Administration (NOAA) administers national marine sanctuaries. Sanctuaries must possess many of the same attributes as a park or preserve; however, they are designated within unique marine environments. They receive specific conservation and management attention in order to protect the area resources while allowing compatible uses.
- Administered by the USFWS, national wildlife refuges are intended to conserve, protect, and enhance fish and wildlife and their habitats. Wildlife refuges also provide research opportunities and suitable recreational activities.

Other specially designated areas in the ROI include state parks, lands purchased through the Save Our Rivers and Conservation and Recreation Lands programs, and locally designated special land uses.

Figure 3.6-1 shows federal and state parks, national preserves, and national marine sanctuaries and wildlife refuges in the ROI. The following sections describe the principal special use areas in the ROI.

3.6.4.1 Existing Environment

National Park Service Lands

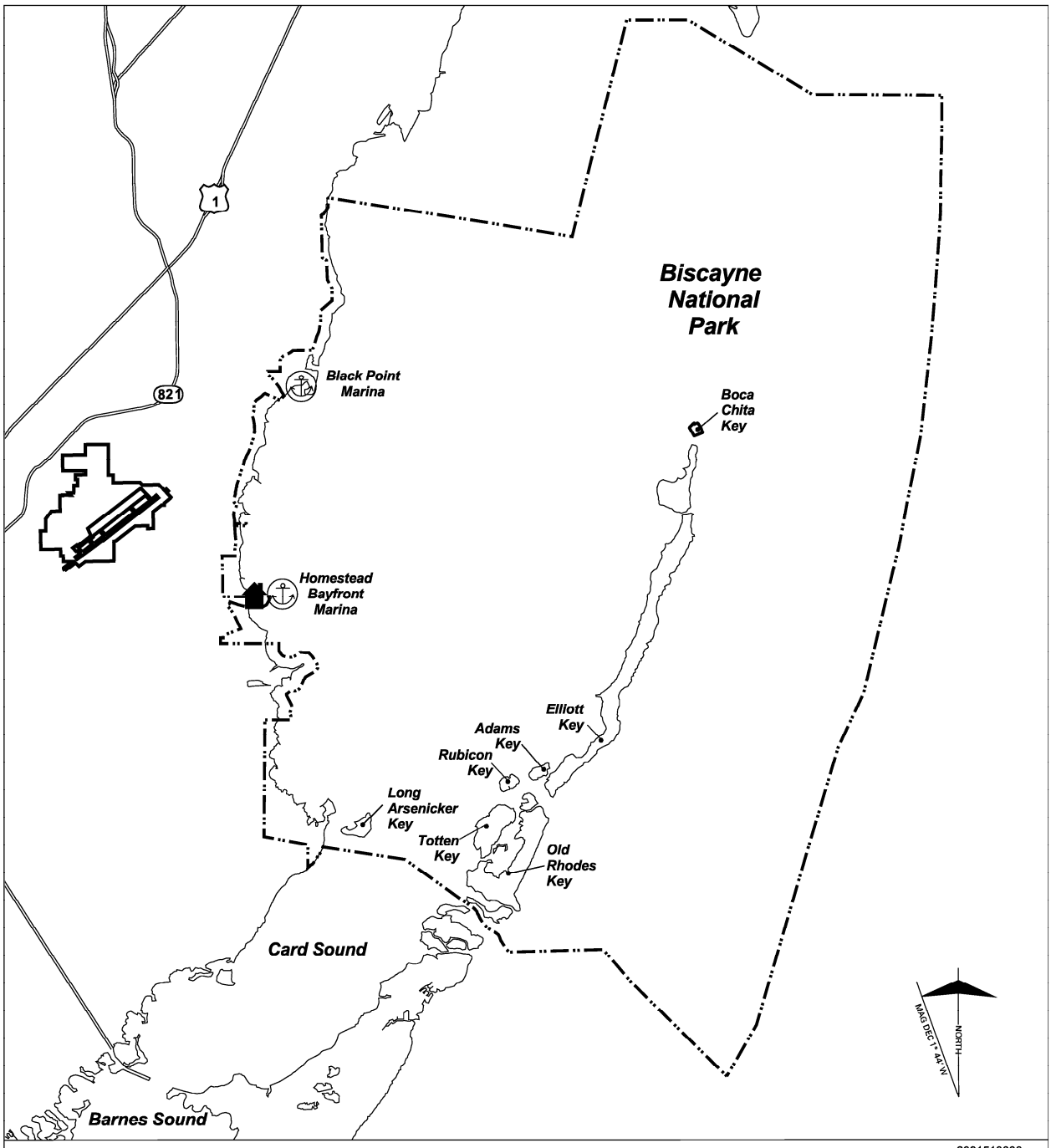
National Park Service lands in the ROI include Biscayne and Everglades NPs and Big Cypress National Preserve. The two national parks are managed by NPS in accordance with the National Park Service Organic Act to conserve their resources and provide enjoyment in a manner that will leave them unimpaired for the enjoyment of future generations. The NPS considers that an action or activity violates the mandate to preserve park resources and values when it would permanently impair essential park resources that are fundamental to the values and purposes for which a park was established. The Organic Act does not govern Air Force or FAA actions.

At each national park, the park management determines whether a resource is essential and whether a resource is impaired. In making this determination, park managers principally consider the park's enabling legislation and other relevant legislation and park plans, spatial and temporal extent of the impacts, the cumulative extent of the resource impacts, the resources and processes being impacted and their ability to adjust to those impacts, and the relationship of the impacted resources and processes to the rest of the park ecosystem. In addition, mandates contained in legislation such as the Wilderness Act, the Endangered Species Act, the Clean Air Act, the Clean Water Act, and the National Environmental Policy Act are applied to the analysis. When considering potential impairments, NPS policy mandates that managers err on the side of caution; therefore, potential impairments are treated in the same manner as known impairments.

Natural sounds are identified as a resource by the National Park Service. Natural sounds and the valued tranquility they inspire are characterized by NPS as the natural ambient sound conditions found in parks. NPS management is based on the policy that park visitors and generations to come have a legislated right to expect that NPS will preserve the opportunities to hear and enjoy the sounds of animals, water, wind, and other natural phenomena unimpaired. It is the responsibility of park managers to determine soundscape resources or values at risk and seek to prevent, redress, or mitigate impacts. The risks to park soundscapes are determined at the local level where consideration can be given to the purpose of the park unit, its resources, the effects on visitors, and the effects on park operations and adjacent activities.

Biscayne National Park. Biscayne NP (**Figure 3.6-6**) is located between Miami and Key Largo in southern Florida. Established as a national monument in 1968, it was enlarged to 181,500 acres and designated as a national park in 1980. Biscayne NP receives about 500,000 visitors per year, or an average of 1,400 visitors per day, with most activity on weekends and holidays (**PBS&J 1995a**). The park was originally established to preserve and protect for the education, inspiration, recreation, and enjoyment of present and future generations a rare combination of terrestrial, marine, and amphibious life in a tropical setting of great natural beauty. Besides its unique combination of habitats, the park is unusual because it is about 95 percent water, except for a narrow strip of mangroves along the coast and small barrier islands (keys) between the ocean and the bay. The mangroves lining the banks and islands were devastated during Hurricane Andrew. While much of the vegetation has grown back, the mangroves are much shorter than other mangroves of that age.

Park visitors enjoy activities such as boating, canoeing, diving, fishing, kayaking, nature viewing, overnight mooring, sailing, snorkeling, swimming, and water skiing. Within the park, the sheltered section of Biscayne Bay contains 43 keys and about 20 miles of mainland mangrove shoreline. Activities such as camping, hiking, and nature viewing occur in these areas.



LEGEND

- Former Homestead AFB
- Park Boundary
- Convoy Point Visitor Center
- Major Road
- U.S. Highway
- State Highway

2 0 2 4
Scale in Miles

Derived from: NPS 1999d

Figure 3.6-6
Biscayne National Park

NPS management policies are applied to park lands and waters according to a standard system of management zones and subzones. In general, management zones reflect the most appropriate uses and management philosophies for specific areas within parks. The zoning is based on the park's enabling legislation, NPS policies, and a thorough understanding of park resources and their capability to support uses consistent with the park's management objectives (**NPS 1983**). At Biscayne NP, the management objectives for the four planning units (mainland, bay, barrier system, and reef tract) were considered in defining management zones. As shown on **Figure 3.6-7**, the zones and subzones are often continuous from one planning unit to the next.

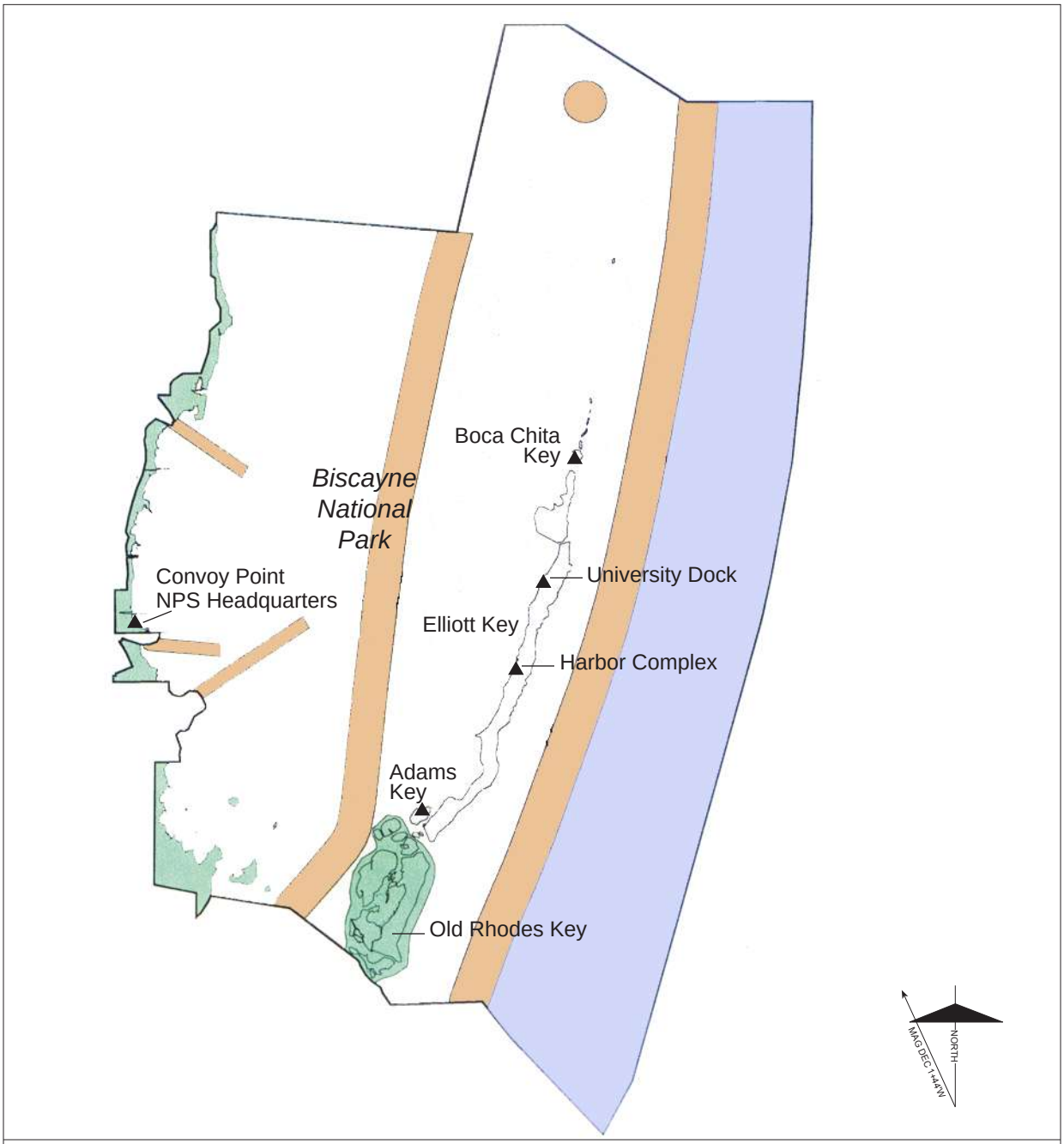
Convoy Point, located in south Miami-Dade County, is the official land side entrance to the park. It provides non-boating visitors the ability to experience the park first hand. The new Visitor Center provides descriptions and interpretations of park resources. It also offers views of the bay from the second story veranda. The boardwalk and jetty permit visitors to walk out into the bay while remaining on land. Contemplative recreation, fishing, picnicking, kayaking and canoeing occur at Convoy Point. Daily diving/snorkeling reef trips and glass-bottom boat tours are available through the concession. Two county marinas are located along the parks mainland boundaries, Black Point Marina and Homestead Bayfront Marina. Visitors can enter the park waters by boat from both locations as well as view the park through the bay channel.

The objective for managing the near-shore bay coastal area is to preserve its natural state. The central to eastern portions of the bay constitutes the crux of the park from both a natural resource and visitor use perspective. Within the clear shallow waters of the bay, dense beds of turtle grass and patches of algae, sponges, and soft corals nurture a diverse collection of marine and estuarine life. The bay is an essential nursery for spiny lobster, pink shrimp, and several gamefish and the rich biotic community supports important commercial and sport fisheries. Infrequent boat traffic utilize the center of the bay along the Intracoastal Waterway, and the bay waters to the east supports a wide range of recreational uses, including sailing, motor boating, kayaking, water-skiing, swimming, snorkeling, nature viewing, and fishing.

The barrier system includes the multitude of undeveloped islands or keys, as well as the natural features that distinguish the bay from the Atlantic Ocean. One particular feature is the Safety Valve located in the northern most portion of the park. The surrounding shallow channelized sea grass flats act as a natural barrier between the bay and the Atlantic Ocean.

Three keys in the park's barrier system provide developed recreation sites:

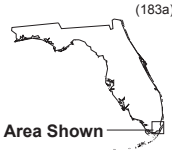
- Boca Chita Key is one of the most popular visitor areas within the park. Boat docks, limited public restrooms, swimming areas, picnic areas, hiking opportunities, nature viewing, and primitive camping are available on the island. A portion of the key has received federal designation as a national historic district for buildings constructed in the 1930s. This designation acknowledges the significance of the area for its design, prominent architect, and association with important people and events in Miami's history.
- Elliot Key, the largest of the barrier islands within the park, provides visitors overnight boat docks, picnic areas, swimming areas, small isolated beaches, two campgrounds, an oceanside boardwalk, full public restrooms with showers, and drinking water. A self-guided nature trail is located on this key, as well as a Park Ranger's residence.
- Adams Key is the least developed of the three keys, but provides public day-use boat dock, limited public restrooms, a picnic area, a covered pavilion, five special use tent pads, and a shoreline and interior island nature trail. Prior to Hurricane Andrew, the NPS's environmental education camps for grade-schoolers used the site. Biscayne NP is relocating the ongoing program back to Adams Key.



LEGEND

- Natural Environment
- Historic and Natural Preservation
- Protected Natural Area
- Special Use
- ▲ Park Development

(183a)HS 7.5.00.nc



Not to Scale

Source: NPS 1983

Figure 3.6-7
Management Zoning–Biscayne National Park

Old Rhodes Key, located in the southern section of the park, represents the remote portion of the barrier system. The keys in this area are fairly isolated from other regions of the park and are representative of a back country experience. In this area of the barrier system, the line of keys widens but is more frequently broken by narrow, winding creeks and lagoons. People on sailboats, flat boats, kayaks, and canoes enjoy the area's remoteness.

The fourth management area, the Coral Reef Tract, is the destination for park visitors wanting to experience the living kaleidoscope of the northern most reef tract in the continental United States. From the surface, water, a limitless horizon, and an endless sky pervade the visitor's experience. In and around the living reefs, a huge and diverse population of fish and other marine creatures abound, as well as numerous cultural resources including the remains of historical shipwrecks. Sailing, motor boating, and fishing also occur within the area.

Fishing is very popular within the park. The park is well known for its bonefishing, a sport unique to southern Florida. Reef fishing, stone crabbing, blue crabbing, and lobstering all occur in the park; however, the bay and tidal creeks are a Lobster Sanctuary where lobsters are protected. Overall fishing within the park is predominately regulated under state law.

The Superintendent of Biscayne NP has identified four influences from outside the park as having the most serious potential impacts on park resources: water pollution, reduced surface water and groundwater inflows, loss of undeveloped buffer land, and noise. The water resources issues are addressed in more detail in Section 3.10. As Section 3.6.3.2 indicates, ongoing growth and development are expected to reduce vacant and agricultural lands in the region, some of which may be providing a buffer between Biscayne NP and increasing urban development. The fourth issue, noise, is the subject of an ongoing initiative by Biscayne NP to develop a Soundscape Preservation and Noise Management Plan and Environmental Assessment to evaluate and manage the park's natural soundscape resources.

The National Park Service Policies, the document that incorporates the results of legislation, litigation, and operating practices, contains the following provision concerning soundscape management:

> The National Park Service will preserve, to the greatest extent possible, the natural soundscapes of parks. Natural soundscapes exist in the absence of human-caused sound. The natural soundscape is the aggregate of all the natural sounds that occur in parks, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive, and can be transmitted through air, water, or solid materials. Some natural sounds in the natural soundscape also are part of the biological or other physical resource components of the park. Examples of such natural sounds include:
>
> - Sounds produced by birds, frogs, or katydids to define territories or aid in attracting mates;
> - Sounds produced by bats or porpoises to locate prey or navigate;
> - Sounds received by mice or deer to detect and avoid predators or other danger; and
> - Sounds produced by physical processes, such as wind in the trees, claps of thunder, or falling water.
>
> The Service will restore degraded soundscapes to the natural condition wherever possible, and will protect them from degradation due to noise (undesirable human-caused sound).
>
> Using appropriate management planning, superintendents will identify what levels of human-caused sound can be accepted within the management purposes of parks. The frequencies, magnitudes, and durations of human-caused sound considered acceptable will vary throughout the

> park, being generally greater in developed areas and generally lesser in undeveloped areas. The Service will monitor in and adjacent to parks human activities that generate noise that adversely affects park soundscapes, including noise caused by mechanical or electronic devices. The Service will take action to prevent or minimize all noise that, through frequency, magnitude or duration, adversely affects the natural soundscape or other park resources or values, or that exceeds levels that have been identified as acceptable to, or appropriate for, visitor uses at the sites being monitored.

The Biscayne National Park Soundscape Preservation and Noise Management Plan reflects the policy guidance cited above and is being prepared to address control of a range of human-caused sounds, with particular emphasis on park-generated sounds, visitor noise, and the sound of recreational motorboats.

Everglades National Park. Located in the southern Florida peninsula, Everglades NP (**Figure 3.6-8**) is the largest remaining subtropical wilderness in the continental United States. Covering 1.5 million acres, it is surrounded by a complex of protected federal lands consisting of Big Cypress National Preserve, Florida Keys National Marine Sanctuary, and Biscayne NP (see Figure 3.6-1). The main visitors' center at the eastern edge of the park is located about 17 miles southwest center of former Homestead AFB.

The park was established in 1947 to preserve the habitat and environment of the "river of grass." The park also contains both fresh and saltwater areas, open prairies, tropical hardwood forests, offshore coral reefs, sloughs and swamps, lakes and ponds, and mangrove forests. These areas provide a habitat to a wide variety of wildlife (refer to Section 3.11, Biological Resources, for a description of the habitats found in the Everglades NP).

The park contains 82 miles of surfaced roads, 156 miles of trails (including canoe trails), and 5 miles of surfaced trails. Elevated boardwalk trails include the Anhinga Trail, Pa-hay-okee Overlook, Mahogany, Hammock, Eco Pond, West Lake, and Shark Valley. The Hell's Bay Canoe Trail (8 miles) and the Wilderness Waterway (99 miles) are designated National Trails. Three campgrounds are located in the park: Long Pine Key, Flamingo, and Chekika. There are also 48 designated backcountry campsites (accessible by boat), five visitor centers, a research facility, and two environmental education camps.

As shown on **Figure 3.6-9**, the park is divided into a number of management classifications. There are no high-density recreation areas (Class I) in the park now, nor are any recommended. All the major developments and the major access roads to these developments are designated as general outdoor recreation areas (Class II). (These are not shown on Figure 3.6-9 because the scale is too small for them to be visible.) Natural environment areas (Class III) include buffer lands around the major developments, the waters along the gulf coast and Florida Bay, and inland water routes that permit motorboats. Outstanding natural areas (Class IV) include the habitats and rookeries of endangered species, such as crocodile, sea turtle, wood stork, and others; the mud- and grassbanks of Florida Bay; part of the Ten Thousand Islands; and the Shark River Slough. The remaining undeveloped and roadless lands, including nearly all submerged lands, are classified as primitive areas (Class V). Lands representative of all the major ecosystems found in the park are included in this class. Significant historic sites, Indian shell mounds, an Indian cemetery, and lands along the northern park boundary reserved for the use of the Miccosukee Indians are classified as historical and cultural areas (Class VI) (**NPS 1979**).

The Everglades have received numerous ecological distinctions. Everglades NP has been designated a World Heritage Site, a Biosphere Reserve, and a Wetlands of International Significance. It also received Wilderness designation in 1978. In 1989, the Everglades Expansion Act added East Everglades (107,600 acres) to the park. Chekika State Park was donated by the State of Florida in 1991 and is located within Everglades NP.

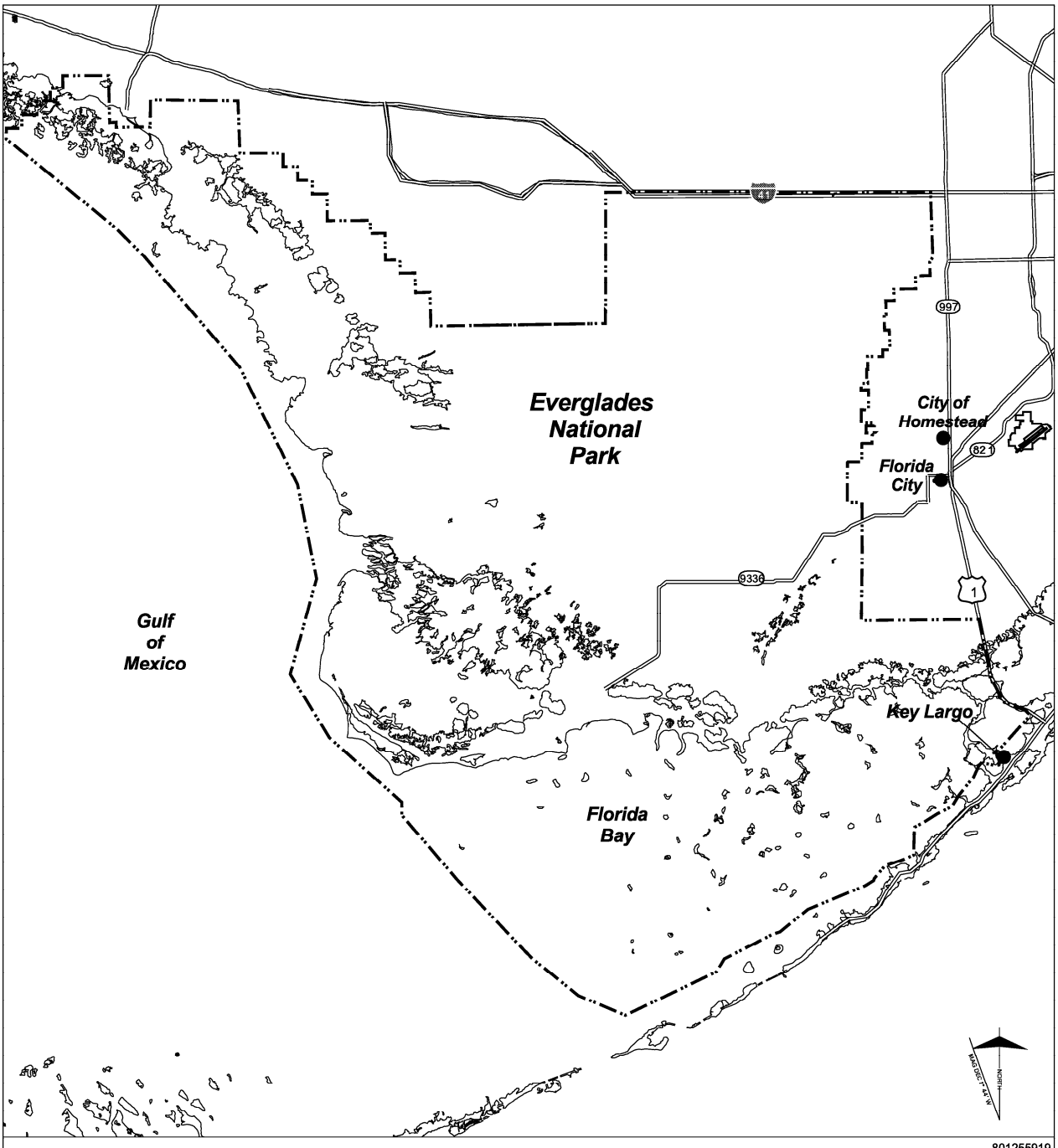
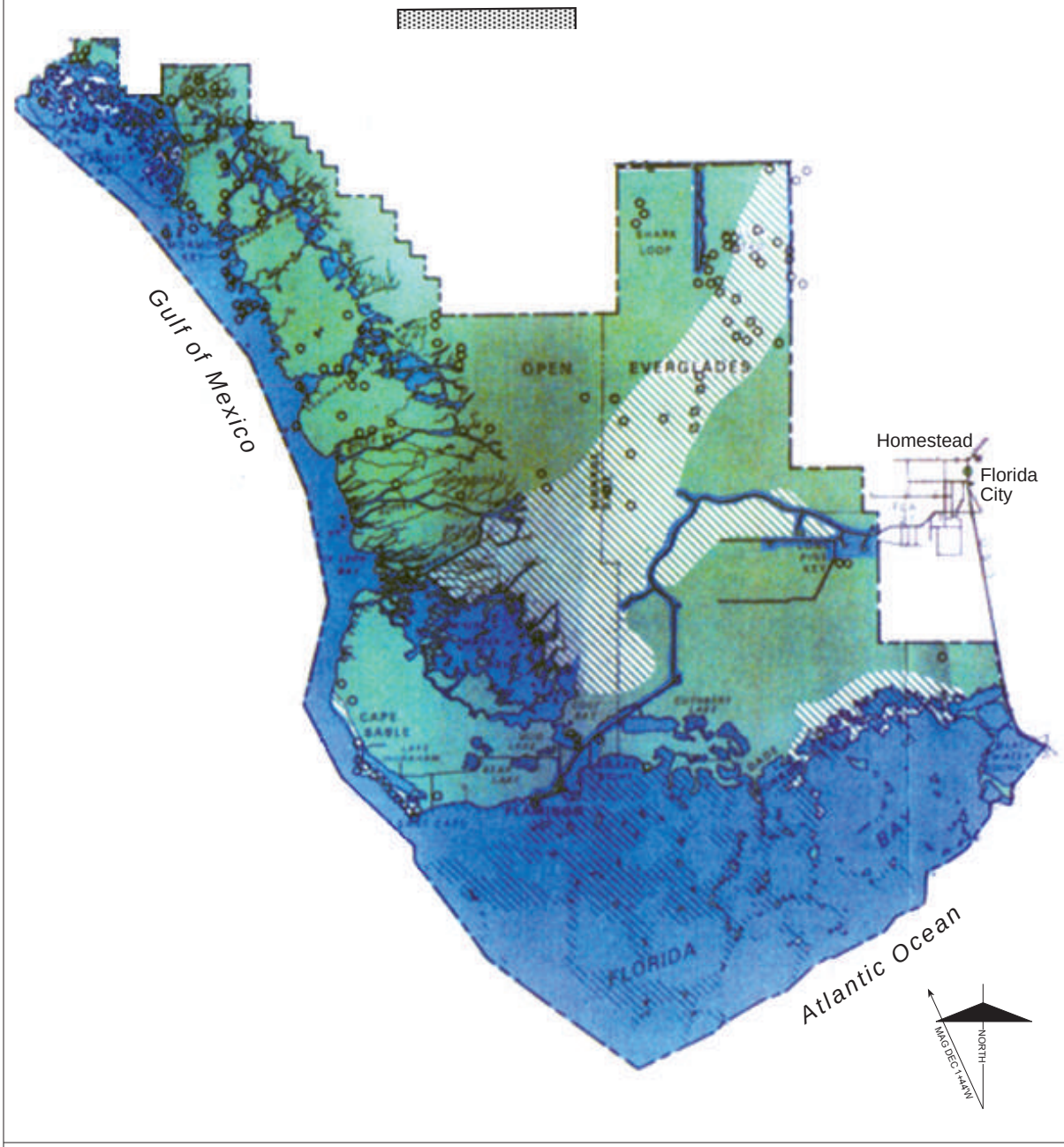


Figure 3.6-8
Everglades National Park



LEGEND

- **Primitive Area**
- **Natural Environment Area**
- **Outstanding Natural Area**
- **Historical/Cultural Site**

(182)HS 7.5.00.nc

Not to Scale

Source: Ferro 1999b

Figure 3.6-9
Land Classification–Everglades National Park

The park's authorizing legislation mandated that it be managed as "…wilderness, (where) no development…or plan for the entertainment of visitors shall be undertaken which will interfere with the preservation intact of the unique flora and fauna of the essential primitive natural conditions now prevailing in this area." This mandate to preserve wilderness is one of the strongest in the legislative history of the National Park System. Management objectives (also known as Mission Goals) for Everglades NP include the restoration and protection of the park in ways that allow natural processes, functions, cycles, and biota to be reestablished and maintained in perpetuity, reestablishing pre-Euro-American hydrological conditions and providing park visitors a variety of opportunities to experience the park's unique subtropical wilderness values.

With the passage of Public Law 95-625 creating 1,296,500 acres of wilderness and 81,900 acres of potential wilderness in the park, Everglades NP became part of the National Wilderness Preservation System. Each of the wilderness management agencies develops policies under which these lands are managed and protected. NPS policies state that wilderness areas are managed for the use and enjoyment of the American people to ensure they are left unimpaired for future use and enjoyment as wilderness. The protection of these areas, the preservation of their wilderness character, and the gathering and dissemination of information regarding their use and enjoyment as wilderness are primary management activities in the wilderness areas. The public purpose of wilderness in the national parks includes the preservation of wilderness character and wilderness resources in an unimpaired condition, as well as the purposes of recreational, scenic, scientific, education, conservation, and historical use. As defined in the Wilderness Act, wilderness characteristics are embodied in areas where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain; of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation; which generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; which is protected and managed so as to preserve its natural conditions; and which has outstanding opportunities for solitude or a primitive and unconfined type of recreation.

Outside of the water areas, most activities in the park are concentrated on the trails along the main park road that leads from the entrance west of the City of Homestead to the Ernest F. Coe Visitor Center, the Royal Palm Visitor Center, the Pa-hay-okee Overlook, and south to the Flamingo Visitor Center on Florida Bay. The park receives about 1 million visitors per year, with most use on weekends and holidays (**Table 3.6-5**) (**NPS 1999b**).

The Flamingo Lodge is the only lodging available in the park. It is open year-round. Campgrounds are located at three places in the park, with tent and RV sites. All three campgrounds are open year round. Backcountry camping is also available. There are three sites accessible by foot and 43 additional sites available in Florida Bay, along the Gulf Coast, and inland, accessible by canoe or boat.

Boating is popular in the Everglades, as many parts of the park are only accessible from the water. There is a marina at Flamingo Visitor Center. Fishing, in the inland and coastal waters of the Everglades, is also excellent and can be enjoyed year-round. Freshwater and saltwater fishing require separate Florida fishing licenses.

Water management is the critical issue facing the Everglades, whose watershed begins in central Florida's Kissimmee River basin. Summer storms flooding there once started a shallow, wide river flowing southward to the Gulf of Mexico. Elaborate water controls now disrupt the natural flow. South Florida's freshwater supply comes from rain on the Kissimmee River basin and southward, mostly in May through October.

Table 3.6-5. Everglades NP Visitor Use in 1998

Month	Royal Palm	Shark Valley	Everglades City	East Everglades	Total
January	48,607	10,067	33,680	—	92,354
February	48,550	15,999	45,805	—	110,354
March	47,394	10,624	50,705	—	108,723
April	36,106	9,079	40,488	—	85,673
May	26,463	6,838	34,070	2,218	69,589
June	17,170	3,528	32,795	1,656	55,149
July	17,789	4,101	41,870	1,151	64,911
August	18,561	4,624	38,855	9,060	71,100
September	10,509	3,787	31,445	337	46,078
October	18,586	6,412	37,508	990	63,496
November	26,944	9,392	39,105	1,999	77,440
December	31,449	10,041	38,943	1,636	82,069
Total	**348,128**	**94,492**	**465,269**	**19,047**	**926,936**

Source: **NPS 1999b**.

The Everglades National Park Protection and Expansion Act emphasized the importance of preserving and restoring the natural ecological system. The act recognized that there are significant adverse effects to the ecosystem from external sources and set a policy for the ecosystem. It directs the Secretary of the Army (USACE) to improve water delivery and to restore natural systems in conjunction with the Central and Southern Florida Project. It also directed the Secretary of the Army to protect natural values in all work on the C-111 canal. To this end, the park has become the subject of an extensive ecosystem restoration project intended to restore much of the natural flow of water which has been disturbed by a network of canals and control structures.

Everglades National Park is addressing the park's natural soundscapes and impacts from noise intrusions within the formal amendment process to the park's General Management Plan.

Big Cypress National Preserve. Big Cypress National Preserve is located north of Everglades NP, 33 miles from Homestead ARS (see Figure 3.6-1). Congress designated it as one of the first national preserves in 1974 to ensure the preservation, conservation, and protection of the natural scenic, floral and faunal, and recreational values of the Big Cypress Watershed. The importance of this watershed to the Everglades NP was a major consideration for its establishment. This 728,000 acre preserve includes hiking trails, primitive campsites, and visitor center. Campfire programs and education programs are also offered. Swamp buggies, all terrain vehicles, and four-wheel drive vehicles with a permit are allowed on designated improved trails (**NPS 1998a**). Congress specified that fishing, trapping, and frogging would also be permitted, under strict limitations, within the preserve.

Florida Keys National Marine Sanctuary

Under the management of the Department of Commerce and NOAA, the Florida Keys National Marine Sanctuary (FKNMS) (see Figure 3.6-1) was established by an act of Congress with the purpose to protect its resources and their conservation, recreation, ecological, historical, research, educational, and aesthetic values through comprehensive long-term management. FKNMS consists of approximately 2,800 square nautical miles of coastal and oceanic waters, and the submerged lands thereunder, surrounding the Florida Keys, and extending north to the boundary of Everglades NP and Biscayne NP and south-westward to

encompass the Dry Tortugas. All previously existing marine sanctuaries or parks remain but are now included within the boundaries of the FKNMS. Within the sanctuary waters are spectacular, unique, and nationally significant marine environments, including seagrass meadows, mangrove islands, and extensive living coral reefs. The areas nearest to former Homestead AFB include a narrow stretch of water along Biscayne NP's eastern boundary, Card Sound, Barnes Sound, and the waters on both sides of Key Largo (see Figure 3.6-1).

The main management goal of FKNMS is to ensure the sustainable use of the Keys' marine environment by achieving a balance between comprehensive resource protection and multiple, compatible uses of those resources. Sanctuary resources are threatened by a variety of direct and indirect impacts. Direct impacts include boat groundings, propeller dredging of seagrasses, and diver impacts on coral. Indirect impacts include marine discharges of waste, land-based pollution, and external sources of water quality degradation. In order to protect these resources, parts of the refuge are not open to the public.

Between June 1995 and May 1996, there were 6,005,723 visitors to the Florida Keys. Among those visitors, 4,761,253 came to recreate. Of the over 4 million recreationists, 1,596,470 were snorkelers and scuba divers, 1,086,373 were recreational fishers, and 1,456,303 came to view the wildlife or study nature (**NOAA 1998b**).

Crocodile Lake National Wildlife Refuge

Crocodile Lake National Wildlife Refuge (see Figure 3.6-1) was established in North Key Largo in 1980 to protect and preserve critical habitat for the federally endangered American crocodile. The refuge consists of over 6,700 acres of mangrove wetlands and hardwood hammock. Future plans call for the acquisition of an additional 200 acres of inholdings located within the refuge boundary. Due to the small size of the refuge and the sensitivity of the habitat and wildlife to human disturbance, the refuge is closed to all public use. Access to the refuge is by Special Use Permit only. Adjacent inshore waters are managed as part of the Florida Keys National Marine Sanctuary.

State Lands

State Parks

John Pennekamp Coral Reef State Park is located in Monroe County off U.S. Highway 1 in Key Largo (see Figure 3.6-1). The park is managed by FDEP Division of Recreation and Parks. It contains numerous miles of coral reefs, seagrass beds, and mangrove swamps. It extends 3 miles into the Atlantic Ocean and is approximately 25 miles long. The park was established to protect and preserve a portion of the unique living coral reef. Adjacent to the southern boundary of Biscayne NP, visitors often access John Pennekamp Coral Reef State Park through Biscayne NP. It is also included as a part of the Florida Keys National Marine Sanctuary.

Bill Baggs Cape Florida State Recreation Area, named after the late Miami newspaper editor who advocated the designation of the area as a state park, is located at 1200 South Crandon Boulevard in Key Biscayne (see Figure 3.6-1). The park is part of a large barrier island ecosystem with protected plant and animal life. Cape Florida offers 1.25 miles of beachfront for swimming, shoreline fishing, and general recreation. Guided tours of the historic Cape Florida Lighthouse and Cultural Complex are available. Eighteen covered pavilions are available for picnicking. Overnight boat mooring is available in the adjacent "No Name Harbor."

South Florida Water Management District Lands

South Florida Water Management District is the steward of over 17,930 square miles of land in south and parts of central Florida (**SFWMD 2000c**). SFWMD considers several characteristics of a property prior to acquisition, such as manageability, surface and groundwater systems, and habitat and species diversity. Management of property acquired under the Save Our Rivers program includes restoration and protection of the natural state and maximizing water resources, fish and wildlife populations, and native plant communities. Various public recreation uses are permitted when appropriate to the environmental sensitivity of the area (**SFWMD 1998**). Areas within the ROI managed by SFWMD are shown in **Figure 3.6-10** and briefly described in the following paragraphs.

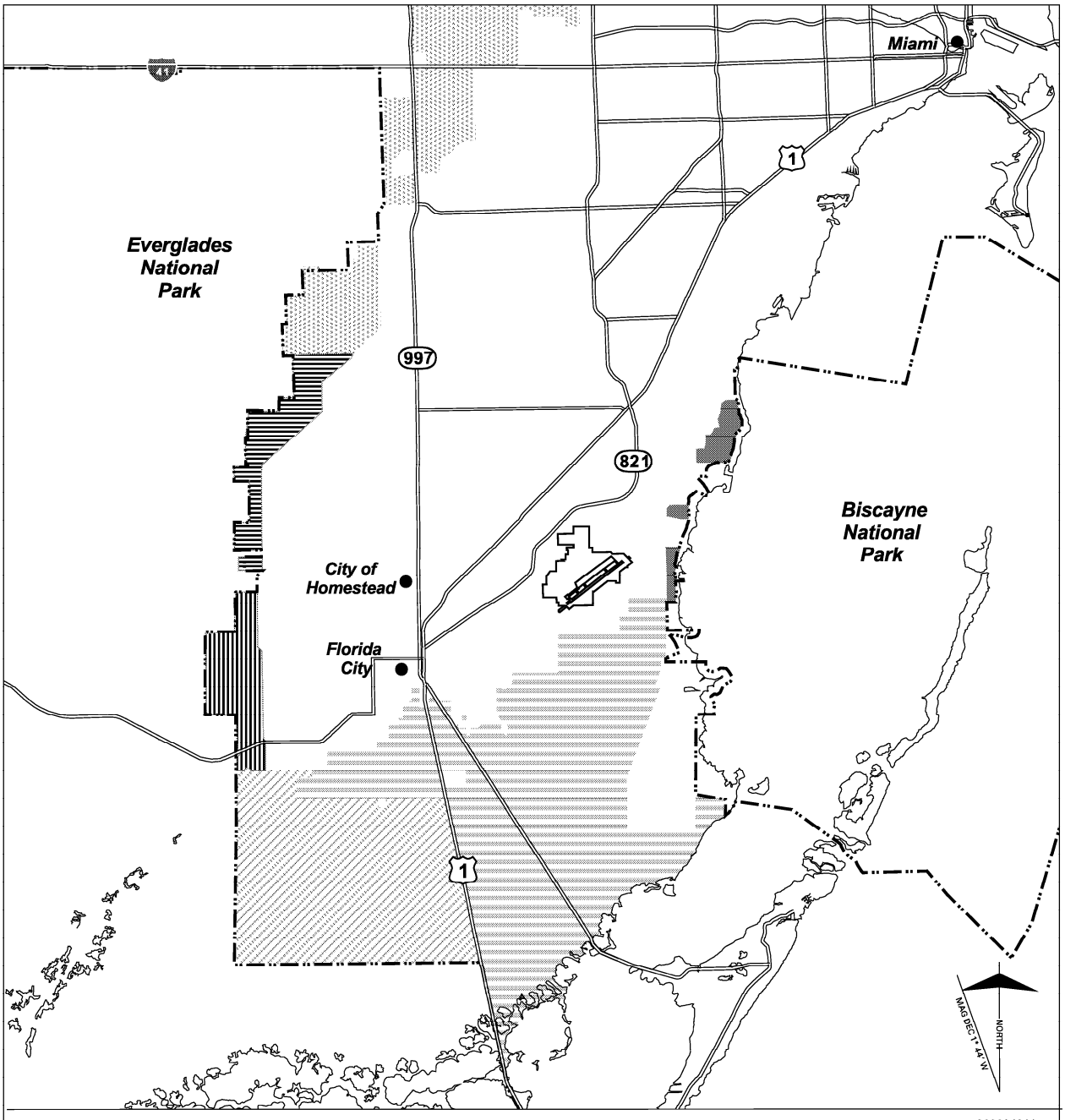
The Biscayne Coastal Wetlands are considered a priority acquisition for the year 2000. Three units, comprising 2,241 acres, would provide additional protection to Biscayne NP. Red, black, and white mangroves in good condition typify the relatively exotic-free vegetation (**SFWMD 1999a**).

Approximately 66,400 acres of marshes, reservoirs, and groundwater recharge areas comprising the East Coast Buffer serve to separate the water conservation areas from developed lands to the east. Most of the land within the buffer is undeveloped, although some agricultural use exists. A primary management consideration is the restoration and enhancement of wetland habitat in the buffer. The area's ability to capture and store water presently released to the ocean will play an important part in restoring natural hydrologic conditions to the Everglades (**SFWMD 2000a**). Public use of this area is limited.

The Frog Pond/L31N Transition Lands project consists of 5,200 acres of agricultural land known as the Frog Pond and 5,250 acres of L31N Transition Lands to its south. The immediate purposes of this project are improvements to the hydropattern in marshes of eastern Everglades NP and to the freshwater flow to Florida Bay. Aesthetic benefits to the entrance of the park and public recreation uses (greenway trail) are also considerations (**SFWMD 2000b**).

The Model Lands Basin in southern Miami-Dade County includes a variety of vegetation communities, both freshwater and estuarine. Wet prairies interspersed with tree islands are the dominant freshwater communities. The estuarine areas are primarily vegetated by red, white, and black mangroves. The natural communities have suffered severely from invasion by exotic species in the northwest corner of this area, but are otherwise in excellent condition. These lands provide habitat for many threatened and endangered species, including the Florida panther, American crocodile, wood stork, and silver palm. The basin is federally designated critical habitat for the American crocodile (see Section 3.11). The lands are part of a contiguous wildlife corridor with Everglades NP, the Southern Glades, Biscayne NP, Crocodile Lake NWR, Key Largo Hammocks State Botanical Site, John Pennekamp State Park, and Florida Keys National Marine Sanctuary (**SFWMD 1998**). A primary source of overland water to Biscayne NP, Card and Barnes Sounds, and Manatee Bay, this area serves as a barrier to further inland saltwater intrusion. Although not yet completely open to the public, there are opportunities for hiking and boating (**SFWMD 1999a**). SFWMD is in the process of compiling a fire management plan for the Model Lands.

The Southern Glades Wildlife and Environmental Area consists of over 30,000 acres of Everglades sawgrass marsh and tropical hardwood hammock (**SFWMD 1999a**). The natural vegetation is in good condition, except in the transitional areas adjacent to agricultural land, which have been invaded by exotic species. Current eradication practices include prescribed burns and other methods of plant control. The Fish and Wildlife Conservation Commission currently manages this area to serve as a recharge for the Biscayne Aquifer and to provide water to restore the ecological functions of Everglades NP and Florida Bay. It is part of the same wildlife corridor as the Model Lands Basin. Permitted recreation activities include hiking, boating, hunting, fishing, and horseback riding (**SFWMD 1998**).



LEGEND

- Biscayne Coastal Wetlands
- East Coast Buffer
- Frog Pond
- L31N Transition Lands
- Model Lands Basin
- Southern Glades
- National Park Boundary
- Former Homestead AFB
- City
- Major Road
- Interstate Highway
- U.S. Highway
- State Highway

4 0 4
Scale in Miles

Source: SFWMD 1999b,
Miami-Dade County 2000b

Figure 3.6-10
Save Our Rivers Program Lands

The Florida Fish and Wildlife Conservation Commission has a fire management plan for the Southern Glades that includes extensive prescribed burning in accordance with Section 590.125(3) of the Florida Statutes. Prescribed burns are conducted to maintain critical habitat areas and reduce the fuel buildup that can contribute to dangerous wildfires. If wildfires occur in the dry season, muck fires can result, which are more difficult to extinguish and produce more smoke.

Key Largo Hammocks State Botanical Site

Acquisition of the lands now composing Key Largo Hammocks State Botanical Site began in 1982 in order to preserve the largest remaining contiguous tract of West Indian rockland hammock in the continental United States. The bulk of the park is located in north Key Largo, abutting Crocodile Lake NWR to the south and Ocean Reef to the north (see Figure 3.6-1). The Florida State Division of Recreation and Parks manages the park's approximately 2,340 acres. Its main objectives are the preservation, restoration, and interpretation of environmentally unique and irreplaceable lands within an area of critical state concern. Permitted uses are limited primarily to aesthetic, educational, and recreational enjoyment of the site. Programs emphasize interpretation of the park's natural and cultural resources (**FDEP 1998a**).

Local Special Land Uses

Since the establishment of the Miami-Dade County Department of Environmental Resources Management (DERM) in 1974, the county has developed programs such as the Northwest Wellfield Protection Plan to protect the Biscayne Aquifer, a sole source aquifer for drinking water (**Metro-Dade County 1997a**). DERM has identified acquisition projects for special lands that are considered endangered under the EEL Program, the State Conservation and Recreation Lands program, and the SFWMD Save Our Rivers projects. **Figure 3.6-11** depicts these acquisition projects.

The EEL Program is designed to protect areas in Miami-Dade County that are most environmentally significant and most susceptible to degradation (**Metro-Dade County 1997a**). The program covers over 51,000 acres identified for acquisition, with specific areas ranging in size from 1 acre to over 40,000 acres. The largest area is within the Model Lands Basin, jointly held by the county and SFWMD, which includes over 40,000 acres of fresh water wetlands. To date, 9,000 acres of the Model Lands have been acquired by the county (**Young 1998b**). All of the Model Lands have been assigned Priority A status; therefore, the EEL Program is authorized to pursue 100 percent of the funding to complete acquisition.

The Miami-Dade County CDMP has also identified Environmental Protection Areas considered environmentally sensitive and susceptible to environmental degradation, where degradation would adversely affect the supply of potable fresh water or environmental systems of county, regional, state, or national importance (**Metro-Dade County 1997a**). These lands are characteristically high-quality marshes, swamps, and wet prairies, and are not suited for urban or agricultural development. These areas, shown on Figure 3.6-11, include the following:

- Environmental Protection Subarea A (national parks and preserves and state water conservation areas). This subarea contains the land and water areas within the authorized boundaries of the Big Cypress National Preserve, Everglades NP, Biscayne NP, and SFWMD water conservation area No. 3. Land uses and activities in the national parks and Big Cypress National Preserve are outlined in management plans for those areas. Uses and activities in the water conservation areas are governed by SFWMD (**Metro-Dade County 1997a**).

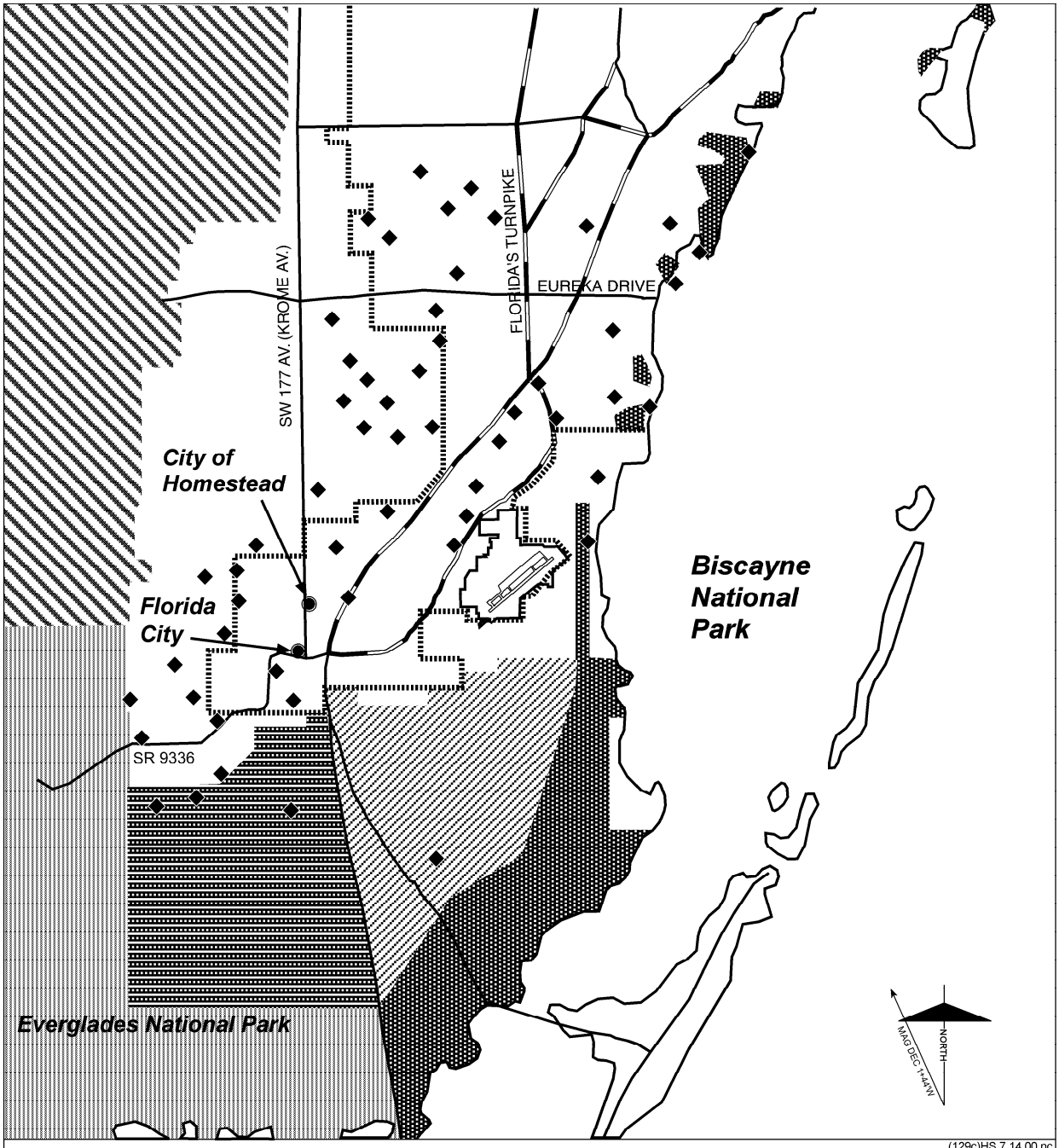


Figure 3.6-11
Miami-Dade County Designated Environmentally Endangered Lands and Environmental Protection Subareas

- Environmental Protection Subarea B (Everglades National Park Expansion Area). This Environmental Protection Subarea includes the area known as the Northeast Shark River Slough and Upper Taylor Slough Basin. It contains portions of the basins that have not been significantly altered by drainage or rock plowing. Those areas are also the subject of planning by federal and state agencies to remedy degraded hydrologic and biotic conditions in the Everglades.
- Environmental Protection Subarea D (Southern Glades, identified as the Canal-111 wetlands on Figure 3.6-11). This area is traversed by Canal-111 and is the subject of a federal study seeking to remedy degraded hydrological and biotic conditions in the southeastern portion of Everglades NP. Most of this area is under the ownership of SFWMD. The remainder of the land is proposed for acquisition under the state Save Our Rivers Program (**Metro-Dade County 1997a**).
- Environmental Protection Subarea E (southeast wetlands). This area is low lying, poorly drained, flood prone, and characterized predominantly by high-quality wetland communities (**Metro-Dade County 1997a**).
- Environmental Protection Subarea F (coastal wetlands and hammocks). This area includes all coastal wetlands that are not within the authorized boundaries of Biscayne or Everglades NPs. These areas are low-lying, flood prone, and characterized predominantly by coastal wetland communities.

Developments within these areas can be considered on a case-by-case basis, except in the following locations:

- The Northwest Wellfield Protection Area, located west of Florida's Turnpike between Okeechobee Road and NW 12th Street, and the West Wellfield Protection Area west of SW 157th Avenue between SW 8th Street and SW 42nd street.
- Water conservation areas, Biscayne Aquifer recharge areas, and Everglades buffer areas designated by the SFWMD.
- The Redland area south of Eureka Drive.

3.6.4.2 Projected Baseline Environment

Over the next 20 years, the population of south Miami-Dade County is expected to grow. This growth will increase demand for residential, commercial, and industrial lands. Lands currently devoted to specially designated land uses are expected to remain relatively unchanged. Recreational use of Biscayne and Everglades NPs, FKNMS, and state parks can be expected to increase with the population growth.

3.6.5 Agriculture

3.6.5.1 Existing Environment

Approximately 9 percent of the land in Miami-Dade County is designated for agricultural use. As Table 3.6-1 indicates, for the area south of Eureka Drive (excluding national park land), agriculture represents about 18 percent of the land. Agricultural uses are largely located within the unincorporated areas of the county.

The average farm size in the county is 44 acres, which is substantially less than the state-wide average of 306 acres. This small acreage may be attributed to the large number of farms that have less than 10 acres (1,129 of 1,891, plus 515 between 10 and 49 acres in size). Agricultural uses include traditional and tropical vegetables, tree crops, and commercial ornamental horticulture. Commercial ornamental horticulture experienced an increase of nearly 40 percent between 1987 and 1992 (**Degner et al. 1997**).

Table 3.6-6 presents uses on existing agricultural lands in south Miami-Dade County in 1990 and 1994. Within the ROI there were approximately 10,000 acres of agricultural land inside the UDB and over 54,000 acres outside the UDB in 1994.

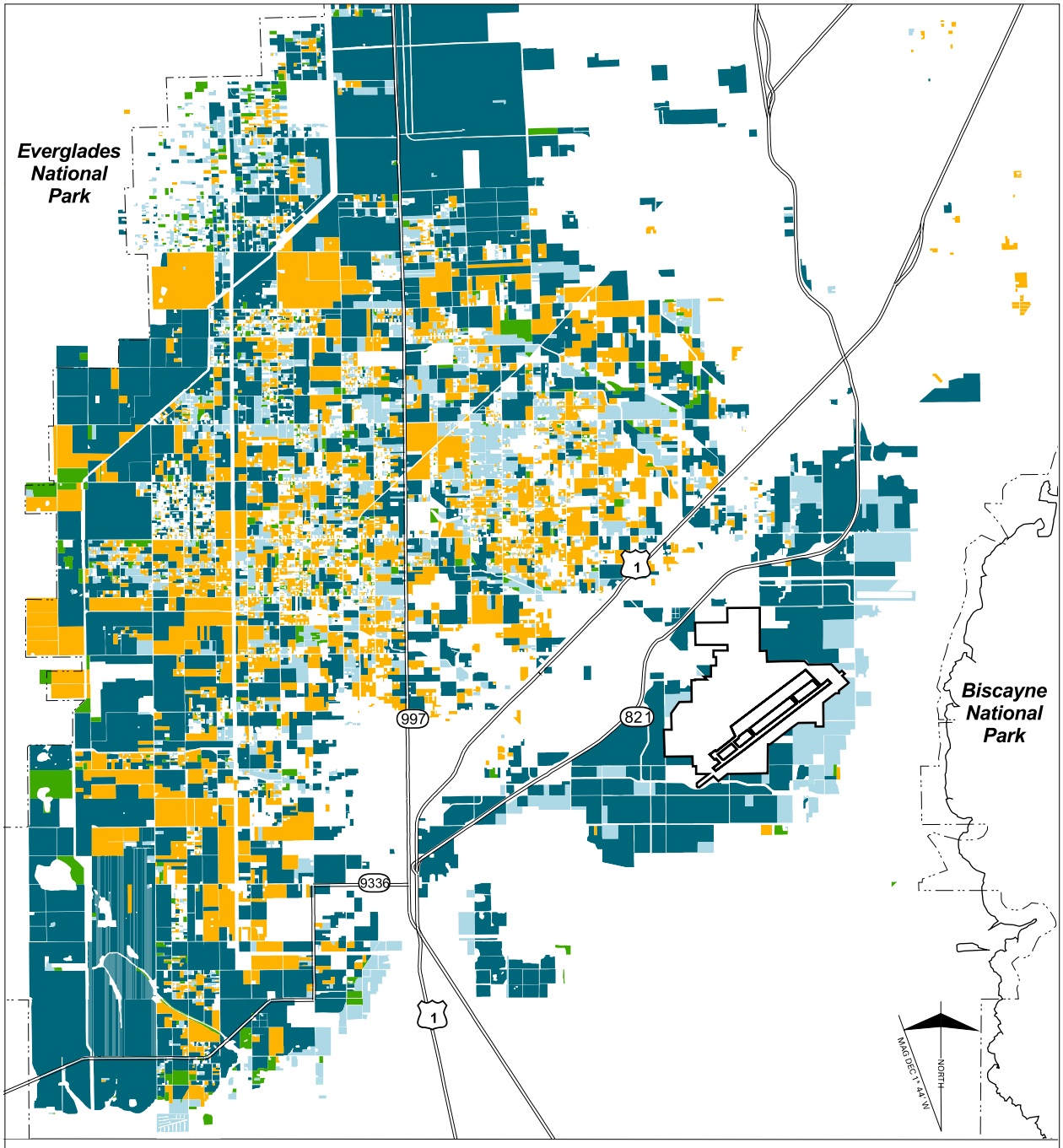
Table 3.6-6. Agricultural Land Uses in South Miami-Dade County

Agricultural Uses Outside the UDB	1990 (acres)	1994[1] (acres)	Percent Change
Groves	17,020	15,342	–10
Row and Field Cropland	28,430	29,487	4
Pasture	369	375	2
Horse Training and Stables	522	527	1
Poultry	8	8	0
Fallow	2,003	1,793	–10
Plant Nurseries	6,010	6,224	4
Fish Farms	174	175	1
Farm Storage Area	123	141	15
Other	115	115	0
Total	**54,774**	**54,187**	
Agricultural Uses Inside the UDB	**1990 (acres)**	**1994 (acres)**	**Percent Change**
Groves	2,209	1,989	–10
Row and Field Cropland	6,840	5,910	–14
Pasture	73	68	–7
Horse Training and Stables	67	67	0
Fallow	289	392	36
Plant Nurseries	1,614	1,494	–7
Fish Farms	—	14	100
Farm Storage Areas	54	70	30
Total	**11,146**	**10,005**	
Total Agricultural Land	**65,920**	**64,192**	

Source: **Miami-Dade County 1998c**.
Note: [1] 1994 data are most current data available.

Figure 3.6-12 depicts agricultural land uses in southern Miami-Dade County in 1994 (**Miami-Dade County 1998c**). The CDMP refers to these areas as the best agricultural land remaining in the county. The CDMP further specifies that only compatible uses will be permitted within agricultural areas, including residential development with a minimum lot size of 5 acres, agricultural support service establishments, packing houses, and other appropriate uses. The agricultural district (AU) zoning implements these plan recommendations.

The area around the City of Homestead is used intensively for commercial agricultural purposes. Commercial agricultural production is centered in the area known as the Redland and in the southeastern area around former Homestead AFB, known locally as the East Glade.



LEGEND

Agricultural Land Use
- Fallow
- Groves
- Row and Field Cropland
- Other Agriculture

- Former Homestead AFB
- Park Boundary
- Major Road
- U.S. Highway
- State Highway

2 1 0 2
Scale in Miles

Derived from:
Metro-Dade County 1998c

Figure 3.6-12
Agricultural Land Use in
South Miami-Dade County

Redland, located northwest of the former base, is a diverse agricultural community that has retained its rural character in the midst of increased urbanization in the region. The town is named after its potholes of red clay on top of an immense layer of oolite rock. During the early twentieth century, pioneer homesteaders developed ways to manipulate the difficult soils, called plow breaking or scarifying. Their reformed agricultural methods transformed the land to a superior agricultural producing area. Farmers in Redland grow citrus, strawberries, squash, corn, tomatoes, and beans. The climate and soils allow novel crops to be raised in Redland, including passion fruit, lychee nut, mamey sapote, and atamoya.

According to the *Economic Impact of Agriculture and Agribusiness in Dade County, Florida* (**Degner et al. 1997**), Hurricane Andrew was responsible for extensive crop loss. The effects of the hurricane are still evident in some tropical fruit groves even after six years. Grove crops and ornamental plant nurseries were particularly hard hit by Hurricane Andrew. Approximately 57 percent of the lime acreage was destroyed, as was about one third of the mango and avocado groves. Many other types of tropical fruit groves were also heavily damaged. Nurseries sustained heavy losses of shade houses, greenhouses, and plant material. Overall, the acreage devoted to agricultural has changed little since Hurricane Andrew and remains the primary land use of south Miami-Dade County.

In the last five years, two pests, Mediterranean fruit fly (Medfly) and citrus canker, have both been introduced into Miami-Dade County. Given the distribution of the pests, it is possible that they were introduced through Miami International Airport, either by passengers carrying infested food or in agricultural products. Both pests are extremely injurious to agricultural products.

Although the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service (APHIS) maintains one of the largest inspection services in the country at Miami International Airport, and has inspection teams also working in Fort Lauderdale and Orlando, it is almost impossible to totally prevent the entry of all pests. When pest species are found, APHIS, in collaboration with Florida Department of Agriculture and Consumer Services, plans and carries out eradication and quarantine programs whenever they are feasible. The state also has internal programs that can restrict the intrastate, as well as the interstate, transport of potentially infected/ infested agricultural products.

The Medfly is one of the world's most destructive fruit pests. It infests more than 250 different plants that are important for food producers, homeowners, and wildlife. It is considered the greatest pest threat to Florida's $1.5 billion citrus crop, as well as endangering numerous other economically significant crops, including tomatoes, peppers, and a variety of tropical fruits.

The last apparent introduction of the Medfly into Miami-Dade County, in 1998, has apparently been brought under control (no Medflies have been found since shortly after the outbreak initially occurred) by aggressive spraying of malathion and release of large numbers of sterile Medflies. Parts of Miami-Dade County were placed under quarantine by the USDA to prevent its spread from the Miami area, but the quarantine was recently lifted because of its eradication in Miami-Dade County (63 FR 45392).

Citrus canker is a plant disease that affects plants and plant parts, including fresh fruit, of citrus and citrus relatives. Citrus canker can cause defoliation and other serious damage to the leaves and twigs of susceptible plants. It can also cause lesions on the fruit of infected plants, rendering the fruit unmarketable, and cause infected fruit to drop from trees before reaching maturity (64 FR 4777).

In 1996, the USDA quarantined a 144 square mile area of Miami-Dade County because of the presence of citrus canker in predominantly residential neighborhoods. In February 1999, the USDA published an interim rule (64 FR 4777) extending the quarantine area in Miami-Dade and Broward counties to 507 square miles. The revised area included the area in Miami-Dade County that was quarantined in

1996. As of March 2000, the quarantine area extends south to Florida Bay and east of Canal 111 to the outer boundary of the upper keys of Biscayne NP (**FDOACS 2000**).

3.6.5.2 Projected Baseline Environment

As noted in Section 2.1.3, for the purposes of analysis, projected baseline growth and development in the ROI is estimated to result in an estimated decrease of about 4,000 acres of agricultural lands in south Miami-Dade County by 2015.

3.6.6 Aesthetics

3.6.6.1 Existing Environment

Visual resources are the combination of natural and human-made features that give a particular environment its aesthetic qualities. The importance of a change in visual resources is influenced by public values, goals, awareness, and concern regarding visual quality. Visual sensitivity is a key factor in assessing how important an effect on a visual resource may be, under what conditions the effect is seen, and whether or not it represents an impact.

NPS has defined scenic vistas (or viewsheds) and clear night skies as two of the natural resources and values it is charged to protect. Like clean air and water, wildlife, and sounds of nature, a clear, dark night sky is considered an intrinsic part of the national park experience. The National Park Service Organic Act states that NPS shall, among other things, "…conserve the scenery…." The following quote from NPS Management Policies further describes this mandate. Chapter 1:3 states that:

> "The individual parks contain various tangible natural and cultural features such as animals, plants, waters, geologic features, historic buildings and monuments, and archeological sites. They also have intangible qualities such as natural quiet, solitude, space, scenery, a sense of history, sounds of nature, and clear night skies that have received congressional recognition and are important components of people's enjoyment of parks. These NPS Management Policies use the terms resources and values to mean the full spectrum of tangible and intangible attributes for which parks have been established and are being managed."

Miami-Dade County

The terrain of southern Florida is very flat, providing little topographic relief. The visual character is defined by vegetation, urban structures, water, and sky. The water and sky provide the most dominant visual characteristic to the county's viewshed. Tropical vegetation and urban structures define the viewshed in the immediately surrounding areas along highway corridors. Except when looking out over the ocean, vegetation and urban development define the general skyline.

Rural areas of Miami-Dade County are typified by wide, flat fields of row crops (tomatoes, beans, potatoes, and squash) flanked by stands of tall trees along the public rights-of-way. Other agricultural enterprises are also common, particularly tropical fruit orchards and nurseries. Structures within rural areas are mainly farm homes and outbuildings including large storage structures and sheds. Single family homes are one to two stories surrounded by yards, gardens, and outbuildings. Many large outbuildings are constructed of metal with sloped roofs.

Within the urban areas of the City of Homestead and Florida City, a common mix of building types and styles may be found. Most residential structures are single story and reflect building designs common

since 1940. Commercial areas resemble many American communities with convenience, department, and super store chains dotting major roads and intersections. Surface parking lots dominate these developments with tall freestanding signs and minimal landscaping.

Some urban streets have landscaped medians, as well as other streetscape improvements. Landscape materials include palm trees, flowering shrubs, and lawns. Common along the major streets, surrounding the urban areas, are billboards advertising visitor services and destinations.

The City of Homestead has been designated a main street community; a small historic area downtown will be the focus of this preservation and design assistance effort. Florida City also has an historic area surrounding the new city hall. Downtown structures are two to three stories in height and reflect a mix of architectural styles.

The Redland contains a number of historic buildings that give it an appearance from another era. Quaint, traditionally detailed wood frame houses, churches, and stores line the streets, with decorative front porches and gabled and hipped roofs.

Former Homestead AFB is largely surrounded by rural areas, although there are some neighboring single family homes and limited commercial development. Since Hurricane Andrew, numerous structures on base have been cleared leaving open areas with overgrown vegetation and some visible concrete foundations. Other structures remain standing but are vacant, unusable, and scheduled to be cleared. New construction has occurred primarily within the cantonment area. These structures comply with established design requirements specifying material, color, and roof systems. New buildings are typically low, light-colored stucco, with tile roofs.

Monroe County

Monroe County is made up of Everglades NP and Big Cypress National Preserve and 822 islands (keys), with very few inhabitants and developed areas. The scenic 113 mile Overseas highway leading from Key Largo to Key West dissects the county. About 100 keys are linked to one another by 42 bridges along this drive. Small, green mile markers dot the highway. Bridges connecting the keys provide expansive views of the ocean, sky, and, in some cases, small islands and reef outcroppings. The keys vary from flat to rock beach areas to lush tropical landscapes. As islands of rock, sandy beaches are not common and are mostly restricted to the Atlantic side of the larger keys.

Geographically and physiographically, the Florida Keys are built on top of the submerged foothills of the very old Appalachian mountains. A 2 mile thick layer of limestone lies on top of these foothills, covered in the upper keys by the skeleton of an ancient coral reef, and in the lower keys by a naturally cemented limestone rock called Miami Oolite. No point in the Florida Keys is more than 4 miles from water.

Around Key Largo, clusters of buildings, such as diving and tackle shops, and marinas are surrounded by hammock tree forests and other types of tropical vegetation. Various small commercial and private structures supporting the local fishing and diving opportunities are located sporadically along the highway. Most urban-type development consists of small clusters of buildings. Catering to sport fishing, the outstanding visual features in large marinas are the outriggers and tuna towers of the sportfishing fleets. Hotels, motels, restaurants, water sports charters, and related activities are found in more developed areas of the keys.

National Parks

The mission of the NPS is "…to promote and regulate the use of the…national parks…which purpose is to conserve the scenery and the natural and historic objects and the wild life therein…." *The National Park Service Organic Act (16 U.S.C. 1, 2, 3, and 4).* The national parks in the ROI contain various tangible natural and cultural features such as animals, plants, waters, geologic features, historic buildings and monuments, and archeological sites. They also have intangible qualities such as natural quiet, solitude, space, scenery, a sense of history, sounds of nature, and clear night skies that have received congressional recognition and are important components of the parks.

Biscayne National Park. There are many values associated with Biscayne NP. The park provides opportunities to enjoy aquatic recreation, but the park also contains a wide variety of natural, cultural, and scenic land and water areas. The authorizing legislation for Biscayne NP specifically identifies it as "a rare combination of terrestrial, marine, and amphibious life in a tropical setting of great natural beauty."

Biscayne NP uplands are situated in the mangrove and coastal glades physiographic province. This zone was formerly characterized by low lying wetlands but has been drained for farming and urban development (**Alleman et al. 1995**).

Biscayne NP has four distinct areas: Biscayne Bay, the upper Florida Keys, the underwater reefs, and the mainland mangroves. The bay area provides views of very clear, crystal blue water. The upper Florida Keys are small islands filled with vegetation and wildlife. These islands are a focal point and the dominant landform in the bay. The underwater reefs are teeming with coral and colorful fish. The mangroves are unique vegetation recognized by their twisted root system growing along the coastal shoreline.

Because 95 percent of the park is water, the most definitive landscape character is the water and sky. Very little beachfront exists, so most views are from the water or the keys. Miami can be seen from the northern area of the park and Boca Chita Key. The Turkey Point Nuclear Power Plant and the Miami-Dade County landfill are dominant features from many areas of the bay.

Aircraft from Homestead ARS, Miami International Airport, and other airports in the region fly over Biscayne NP and are transient visual features. Figures 2.1-3, 2.1-4, and 2.1-5 show flight tracks from Homestead ARS that extend over the park. Flight tracks from other airports in the region are shown in Appendix E.

Everglades National Park. Everglades NP is the largest remaining sub-tropical wilderness in the continental United States and is the third largest park in the United States, outside Alaska. The park has extensive fresh and saltwater areas, open Everglades prairies, and mangrove forests. Abundant wildlife includes rare and colorful birds, and the park is the only place in the world where alligators and crocodiles exist side by side. As described by Marjory Stoneman Douglas in *The Everglades: River of Grass*, "Nothing anywhere else is like them; their vast glittering openness, wider than the enormous visible round of the horizon, the racing free saltness and sweetness of the their massive winds, under the dazzling blue heights of space…. The miracle of the light pours over the green and brown expanse of saw grass and of water, shining and slow-moving below, the grass and water that is the meaning and the central fact of the Everglades of Florida."

The Everglades is a low, flat plain, shaped by the action of water and weather. In the summer wet season it is a wide, grassy river. In the winter season the edges of the sloughs are a dry grassland. Though Everglades NP is often characterized as a freshwater marsh, several very distinct habitats exist within its boundaries, described below, that provide a contrast to the grassland area.

Florida Bay is the largest body of water within Everglades NP. It contains over 800 square miles (2,072 square kilometers) of marine bottom. Seagrass covers much of this area. The seagrass shelters fish and shellfish and sustains the food chain that supports all higher vertebrates in the bay.

Mangrove forests are found in the coastal channels and winding rivers around the tip of south Florida. A dense forest of gnarled trees and a protruding root system, mangroves emerge from water and mud along tidal waters, where freshwater from the Everglades mixes with saltwater. Red mangroves, identified by their stilt-like roots, and the black and white mangroves thrive in tidal waters, where freshwater from the Everglades mixes with saltwater. During the dry months, wading birds congregate here to feed. Many bird species nest in the mangrove trees.

The coastal prairie is an arid region of salt-tolerant vegetation located between the tidal mud flats of Florida Bay and dry land that is periodically flooded by hurricane waves and buffeted by heavy winds. It is characterized by succulents and other low-growing desert plants that can withstand the harsh conditions.

Large prairies with marl sediments, a calcareous material that settles on the limestone, border the deeper sloughs. The marl allows slow seepage of the water but not drainage. Though the sawgrass is not as tall and the water is not as deep, freshwater marl prairies look a lot like freshwater sloughs.

The slough is the deeper and faster-flowing center of a broad, marshy river. This “fast” flow moves at a leisurely pace of 100 feet (30 meters) per day. Dotted with tree-islands called hammocks or heads, this vast landscape channels life-giving waters from north to south. Everglades NP contains two distinct sloughs: Shark River Slough, the “river of grass,” and Taylor Slough, a narrow, eastern branch of the “river.” There are no surface connections between the two. A series of other sloughs through the Big Cypress Swamp supply freshwater to western Florida Bay and the Ten Thousand Islands.

The cypress tree is a deciduous conifer that can survive in standing water. These trees often form dense clusters called cypress domes in natural water-filled depressions. The trees in the deep soil at the center grow taller than those on the outside.

Hammocks are dense stands of hardwood trees that grow on natural rises of only a few inches in the land. They appear as teardrop-shaped islands shaped by the flow of water in the middle of the slough. Many tropical species such as mahogany, gumbo limbo, and cocoplum grow alongside the more familiar temperate species of live oak, red maple, and hackberry. Because of their slight elevation, hammocks rarely flood. Shaded from the sun by the tall trees, ferns and airplants thrive in the moisture-laden air inside the hammock.

The slash pine is the dominant plant in this dry, rugged terrain that sits on top of limestone. The pines root in any crack or crevice where soil collects in the jagged bedrock. Fire is an essential condition for survival of the pine community, clearing out the faster-growing hardwoods that would block light to the pine seedlings. Pine bark is multi-layered, so only the outer bark is scorched during fires. The pinelands are the most diverse habitat in the Everglades, consisting of slash pine forest, an understory of saw palmettos, and over 200 varieties of tropical plants.

Flight tracks from Homestead ARS (see Figures 2.1-3 and 2.1-4) and other airports in the region (see Appendix E) pass over Everglades NP, and aircraft overflights are transient visual features in the park.

3.6.6.2 Projected Baseline Environment

Baseline population growth in the ROI will result in increased urban development with the potential to modify views and landscapes that are currently rural or suburban in nature. Much of Miami-Dade County south of Eureka Drive is water or protected open land, which would not be expected to change. Although agricultural lands in south Miami-Dade County are estimated to decrease by approximately 4,000 acres by 2015, agriculture will continue to be the dominant land use in the remaining area. Therefore, the overall visual context of open, rural, and agricultural landscapes can be expected to continue. Transportation corridors and destination areas will experience increases in traffic and visitation, potentially reducing the sense of solitude in some areas, especially in the national parks. However, park management programs are expected to provide continued protection of the resources.

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3.7 HAZARDOUS MATERIALS, HAZARDOUS WASTE, AND PETROLEUM PRODUCTS

3.7.1 Introduction

This section describes the affected environment associated with hazardous materials, hazardous waste, petroleum products, and the Installation Restoration Program (IRP) sites at former Homestead AFB.

3.7.1.1 Resource Definition

The terms "hazardous materials" and "hazardous waste" refer to substances defined as hazardous by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA). Hazardous materials include substances subject to release reporting under 40 CFR Part 032. In general, hazardous materials include substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health or the environment when released into the environment. Petroleum products include petroleum-based fuels, oils, and their wastes. Hazardous waste includes solid wastes identified as characteristic or listed wastes in 40 CFR 261.3. Used oil refers to petroleum products that have been contaminated by physical or chemical impurities, as defined in 40 CFR 279.1. The IRP is an Air Force program to identify, characterize, and remediate environmental contamination from past activities at Air Force installations.

3.7.1.2 Applicable Laws and Regulations

The management of hazardous materials and hazardous waste is governed by specific environmental statutes. The key statutes include:

Comprehensive Environmental Response, Compensation and Liability Act of 1980 (42 U.S.C. 9601–9675) as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. CERCLA/SARA regulates the prevention, control, and compensation of environmental pollution.

Community Environmental Response Facilitation Act (CERFA) (42 U.S.C. 9620). This act amended CERCLA to require that, prior to termination of federal activities on any real property owned by the federal government, agencies must identify real property where hazardous substances were stored, released, or disposed of.

Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 (42 U.S.C. 11001–11050). EPCRA requires emergency planning for areas where hazardous materials are manufactured, handled, or stored and provides citizens and local governments with information regarding potential hazards to their community.

Resource Conservation and Recovery Act (42 U.S.C. 6901–6992). RCRA established standards and procedures for handling, storage, treatment, and disposal of hazardous waste.

Federal Facility Compliance Act (FFCA) of 1992 (P.L. 102-426). This act provides for a waiver of sovereign immunity on the part of federal agencies with respect to federal, state, and local requirements relating to RCRA solid and hazardous waste laws and regulations.

Pollution Prevention Act of 1990 (42 U.S.C. 13101–13109). This act encourages minimization of pollutants and waste through changes in production processes.

Florida Statutes Chapter 403 and Florida Administrative Code (FAC) Chapter 17. USEPA has delegated to the State of Florida the authority to conduct a hazardous waste management program in compliance with the RCRA regulations. The state regulations must be as stringent as the federal RCRA regulations.

USEPA Regulation on Identification and Listing of Hazardous Waste (40 CFR Part 261). This regulation identifies solid wastes subject to regulation as hazardous and to notification requirements under RCRA.

USEPA Regulation on Standards for the Management of Used Oil (40 CFR Part 279). This regulation delineates requirements for storage, processing, transport, and disposal of oil that has been contaminated by physical or chemical impurities during use.

USEPA Regulation on Designation, Reportable Quantities, and Notification (40 CFR Part 302). This regulation identifies reportable quantities of substances listed in CERCLA and sets forth notification requirements for releases of those substances. It also identifies reportable quantities for hazardous substances designated in the Clean Water Act.

3.7.1.3 Region of Influence

The ROI for hazardous materials (**Figure 3.7-1**), hazardous waste, and petroleum products encompasses former Homestead AFB property and areas that could be exposed to a release of hazardous substances from the former base or have been exposed to such releases in the past. Based on previous environmental studies, there are no known areas where contamination from past hazardous material or hazardous waste releases have migrated off base except through the stormwater canal system (**Engineering-Science 1997b**, **Bartol 1998**, **Mitchell 1998**). Studies of Military Canal, which drains most of the former base, have shown sediment contamination. Therefore, the ROI for this section is defined as the boundary of former Homestead AFB, (including canals and reservoirs) and Military Canal, and the nearby roads over which hazardous materials or waste could be transported.

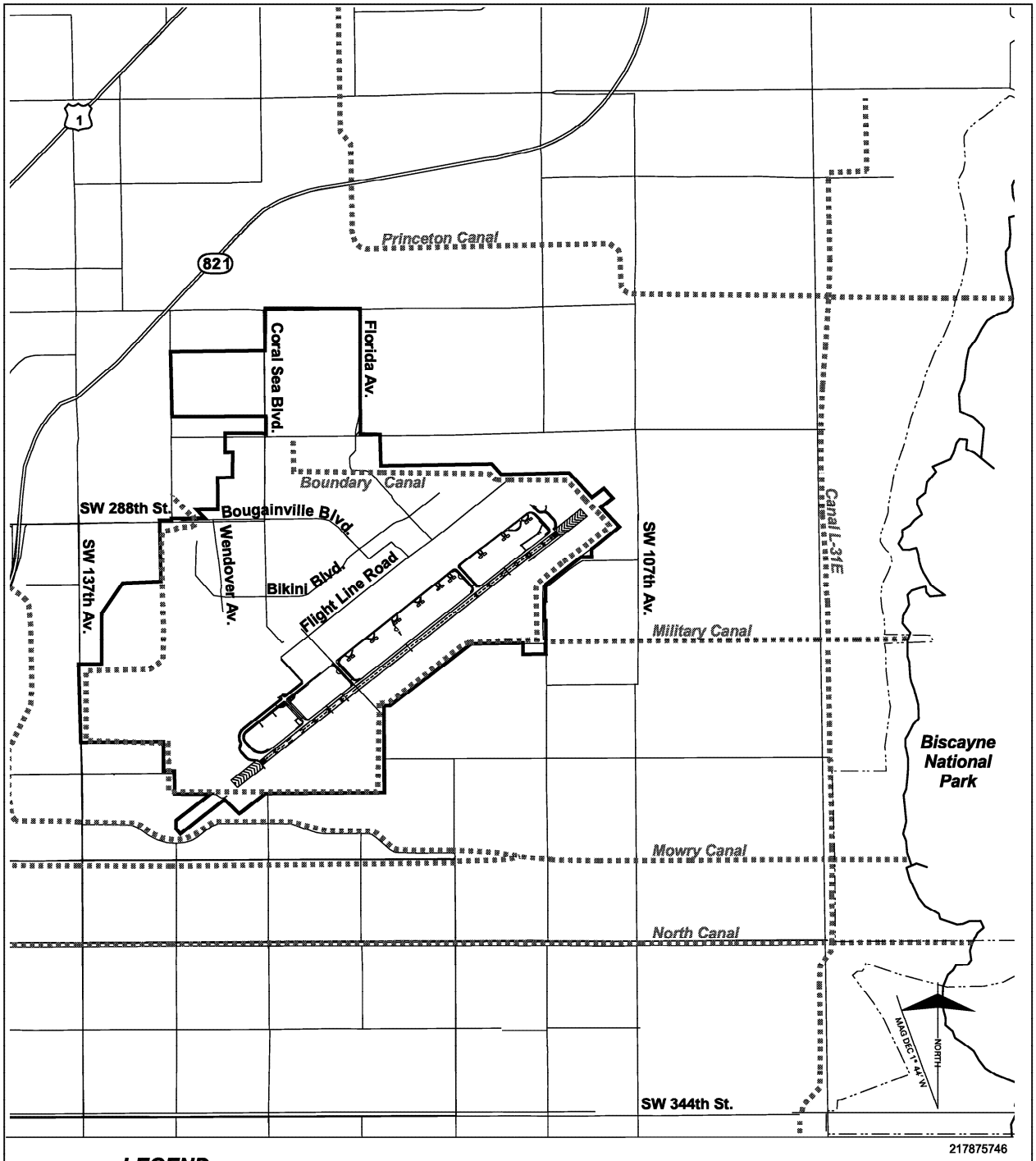
3.7.2 Hazardous Materials and Petroleum Products

3.7.2.1 Existing Environment

In the late 1980s and early 1990s, hazardous materials and petroleum products were used and temporarily stored in industrial and maintenance complexes throughout Homestead AFB. The base industrial shops maintained, fabricated, and repaired aircraft components and ground support equipment, while the maintenance shops tended the facilities and grounds. The hazardous materials commonly used at these complexes included cleaning solvents, corrosives, compressed gases, pesticides, paints and thinners, and photochemicals. Hazardous materials and petroleum products were used throughout the former base, but were primarily concentrated near the airfield. A comprehensive list of all hazardous materials stored in each building during a 1992 survey is found in Appendix A of the Basewide Environmental Baseline Survey (**Engineering-Science 1993a**).

The following paragraphs describe current hazardous materials management on former Homestead AFB disposal property, Homestead ARS, and the surrounding area.

Former Homestead AFB Disposal Property. In the middle to late 1990s, management of hazardous materials on portions of former Homestead AFB identified for disposal has been limited to locating and transporting hazardous materials to the RCRA-permitted hazardous waste storage facility at Building 604. This facility sustained relatively little hurricane damage and provided a safe storage location for hazardous materials pending redistribution or transport off site (**USAF 1994a**).



LEGEND

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

0.5 0 0.5
Scale in Miles

Source: SAIC

Figure 3.7-1
Region of Influence
for Hazardous Materials,
Hazardous Waste, and Petroleum Products

Currently, a limited number of hazardous materials and petroleum products (e.g., fuels, hydraulic fluids, and oils) are used outside of the Homestead ARS cantonment. Most of these materials are for vehicles and heavy machinery used in rehabilitating or constructing facilities. Paints, thinners, solvents, and other hazardous materials common to the construction industry are in use as facility rehabilitation and construction continues. In addition, the office and janitorial supplies found in most active facilities usually contain hazardous materials. Pesticides for plant and insect control are brought on site by an outside contractor and applied as needed.

All of the underground storage tanks (UST) and most of the above-ground storage tanks (AST) on the disposal property have been cleaned out and removed in accordance with Air Force and state regulations. As shown in **Figure 3.7-2**, seven hazardous materials ASTs remain on disposal property, including:

- 200 gallon diesel AST at Building 545, Sanitary Sewer Pump Station
- 2,000 gallon diesel AST at Building 618, Storage Facility
- 2,000 gallon gasoline AST at Building 618, Storage Facility
- 2,000 gallon diesel AST at Building 769, Pump Station
- 300 gallon diesel AST at Building 822, Generator Building
- 1,200 gallon diesel AST at Building 875, Storm Drainage Pump Station
- 230 gallon diesel AST at Building 893, Electric Power Station

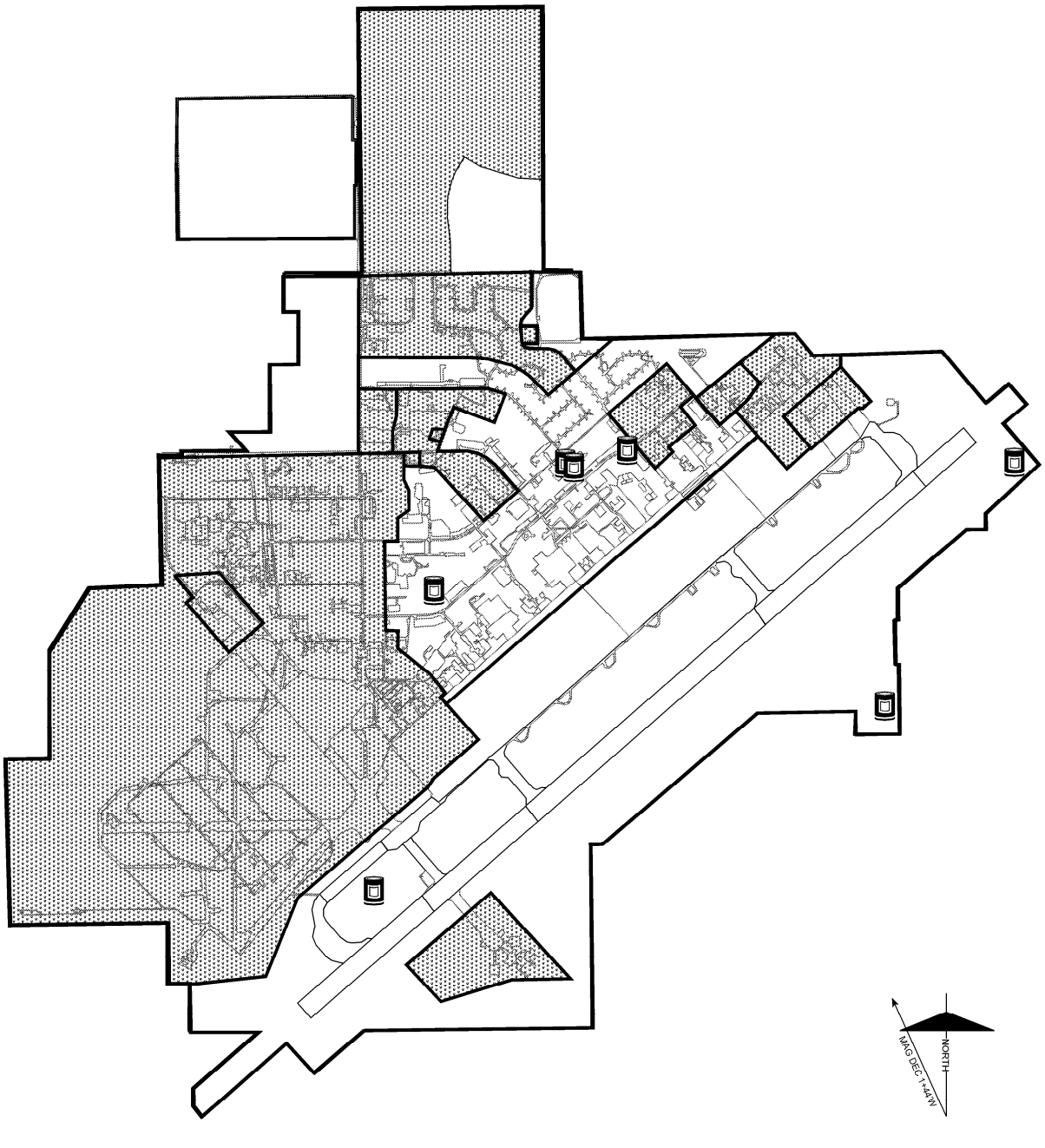
Miami-Dade County Aviation Department leases property at the airfield. A few small aircraft from Wyatt Aviation occasionally use the airfield, and a 1,000 gallon aviation fuel tanker truck is used to refuel these aircraft. No aircraft maintenance is performed on disposal property (**Lomill 1998**).

According to representatives from the Homeless Trust, Parks Department, Job Corps, and Public Schools, minimal amounts of hazardous materials (e.g., paints and lubricants) are being used on the property as part of the construction and rehabilitation activities (**Summers 1998**, **Mallack 1998**, **Halasz 1998b**). Based on the visual survey, the bank and credit union use hazardous materials only as part of typical janitorial and maintenance operations.

Homestead ARS. Hazardous materials and petroleum products are used and temporarily stored in industrial and maintenance complexes throughout the cantonment. The base industrial shops maintain, fabricate, and repair aircraft components and ground support equipment, while the maintenance shops tend the facilities and grounds. The hazardous materials commonly used at these complexes include cleaning solvents, corrosives, compressed gases, pesticides, paints and thinners, and photochemicals.

Hazardous materials are managed in accordance with Air Force waste minimization guidance. These include procedures such as inventory control, supply inspection, recycling, process changes, and solvent substitution designed to reduce the need for hazardous materials. Hazardous materials management practices are evaluated annually under the Environmental Compliance Assessment and Management Program for compliance with applicable regulations (**Mitchell 1998**).

Heating oil and jet fuel are stored on the cantonment in underground and above-ground storage tanks. Currently, there are 12 regulated ASTs and 7 regulated USTs within the cantonment. In addition, two 1,000 gallon heating oil USTs (Building 475 and 478) are not regulated but are monitored by DERM (**Mitchell 1998**).



LEGEND

Former Homestead AFB Boundary

Roads or pavement

Existing Above-Ground Storage Tank

Retained Property and
Completed and Proposed Transfers

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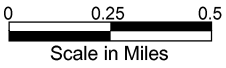


Derived from:
Engineering-Science 1993b,
Engineering-Science 1997a

Figure 3.7-2
Existing Above-Ground Storage Tanks on
Former Homestead AFB Disposal Property

Surrounding Area. According to the FDEP waste management database, south Miami-Dade County contains numerous commercial industries that use hazardous materials. These industries include automotive service centers, photography laboratories, paint shops, dry cleaners, print shops, and metalworking shops that service county residents (**FDEP 1998b**). These facilities use a variety of hazardous materials (e.g., solvents, oils, and fuels), as shown in **Table 3.7-1**.

Table 3.7-1. Typical Hazardous Materials Used in South Miami-Dade County

Facility Type	Facilities in Miami-Dade County (1997)[1]	Average Residents Per Facility[2]	Estimated Facilities in South County[3]	Projected Facilities in South County[4]	Typical Hazardous Materials at Each Facility
Automotive Service Centers	4,930	420	389	570	Gasoline Diesel Motor oil Antifreeze Lead-acid batteries Solvents Lubricants
Photography Laboratories	1,503	1,378	119	174	Developer Fixer Silver
Paint Shops	880	2,353	69	102	Paint Thinner Solvents Stripper
Dry Cleaners	500	4,141	39	58	Perchloroethylene Cleaners
Print Shops	57	36,326	4	7	Ink Cleaning solvents Processing chemicals Lubricating oils
Metalworking Shops	10	207,057	1	1	Cutting oils Solvents Acids

Source: **FDEP 1998b**, **Abrahante 1999**.

Notes:
[1] Based on DERM survey from June 30, 1997, to July 1, 1998, which received responses from 30 percent of the small quantity generators in Miami-Dade County. DERM personnel stated that the number of facilities within each category may be divided by 30 percent to estimate the total number of facilities within the county. For the purposes of estimation, these facilities are assumed to be distributed proportional to population throughout Miami-Dade County.
[2] Based on a 1997 Miami-Dade County population of 2,070,573.
[3] Based on a 1995 population of 163,235 south of Eureka Drive; 1997 population data not available at subcounty level.
[4] Based on a projected 2015 population of 239,592 south of Eureka Drive.

These commercial industries provide essential services for county residents (e.g., car repair, film development, and suit cleaning) and are, therefore, located in commercial zones relatively near residential areas. Assuming these facilities are relatively uniformly distributed according to population, the estimated number of industries in southern Miami-Dade County (based on 1995 population data) is shown in Table 3.7-1.

In addition to the hazardous materials used by the commercial industries, each resident will also use small amounts of hazardous material (e.g., fuels, oils, and cleaning agents) as part of daily living. Even buildings used primarily for administrative purposes will use common hazardous materials such as ink, cleaners, and lubricants during normal maintenance operations.

3.7.2.2 Projected Baseline Environment

Hazardous materials management and use in 2000, 2005, and 2015 are expected to remain approximately the same as current conditions within former Homestead AFB. Homestead ARS will continue to use the "pharmacy" system for just-in-time distribution of hazardous materials. This system allows better tracking of hazardous materials and generates less waste.

The number of automotive service centers, paint shops, dry cleaners, and print shops in the vicinity of former Homestead AFB is assumed to increase in proportion to the population increases. The projected number of facilities that could be expected to be located in south Miami-Dade County by 2015 is shown in Table 3.7-1, assuming the ratio of facilities to population remains constant (e.g., one automotive service center will be constructed for every 420 new residents in the surrounding area). Based on this assumption, the projected increase in population in south Miami-Dade County between 1995 and 2015 should increase the number of commercial hazardous materials generators by the same percentage. However, the volume of hazardous materials used by each industry could decrease over time due to anticipated advances in pollution prevention technology.

3.7.3 Hazardous and Petroleum Waste

3.7.3.1 Existing Environment

In the late 1980s and early 1990s, hazardous waste and used oils were generated and temporarily stored in industrial and maintenance complexes throughout Homestead AFB. The base industrial shops maintained, fabricated, and repaired aircraft components and ground support equipment, while the maintenance shops tended the facilities and grounds. The hazardous wastes commonly generated at these complexes included waste solvents, antifreeze, paint filters, and batteries.

Hazardous wastes were managed at 16 locations on the base. The majority of these facilities were satellite accumulation points at which up to 55 gallons of hazardous wastes could be accumulated for an indefinite time. A 90 day accumulation point, at which an indefinite quantity of hazardous wastes could be accumulated for up to 90 days before being moved to the permitted hazardous waste storage facility, was operated at the Corrosion Control Shop in Building 720. A RCRA-permitted hazardous waste storage facility was operated in Building 604 for management of hazardous waste generated throughout the base.

Used oil was generated at 14 locations on Homestead AFB. The used petroleum was collected, removed from the base, and recycled by a contractor in accordance with applicable regulations. Some of the recovered JP-4 was used during firefighter training exercises on base.

The following paragraphs describe current hazardous waste and used oil management on former Homestead AFB disposal property, Homestead ARS, and the surrounding area.

Former Homestead AFB Disposal Property. In the mid- to late 1990s, large quantities of hazardous wastes were generated from the cleanup of hurricane damage. These were stored at the Building 604 hazardous waste storage facility pending disposal.

Currently, operations on the disposal property do not generate hazardous waste or used oil, other than minimal wastes from maintenance of existing facilities. These wastes are carried off site by contractors (**Bartol 1998**). Wyatt Aviation does not perform aircraft maintenance on the county-leased property at the airfield (**Lomill 1998**). There are no satellite accumulation points or 90 day accumulation points for hazardous waste on the disposal property. The RCRA-permitted hazardous waste storage facility at Building 604 has been cleaned and was closed in 1997.

According to representatives from the Homeless Trust, Parks Department, Job Corps, and Public Schools, hazardous wastes are not being generated on these properties (**Summers 1998**, **Mallack 1998**, **Halasz 1998b**). Based on the visual survey, the bank and credit union do not generate hazardous wastes.

Homestead ARS. Hazardous waste and used oil are generated and temporarily stored in the industrial and maintenance complexes throughout the cantonment. The industrial shops maintain, fabricate, and repair aircraft components and ground support equipment, and the maintenance shops tend the facilities and grounds. The hazardous wastes commonly generated at these complexes include calcium hypochlorite, batteries, and aerosols. These wastes are temporarily stored at satellite accumulation points, at which up to 55 gallons of hazardous wastes can be accumulated prior to disposal.

Hazardous waste and used oil are managed in accordance with the Homestead ARS hazardous waste management plan. The plan details the regulatory requirements for managing hazardous waste and used oil, from generation through recycling (for fluorescent bulbs, oil filters, and nickel-cadmium batteries) or disposal off station (for polychlorinated biphenyls, aerosols, and liquid paint waste). Hazardous waste management practices are evaluated annually under the Environmental Compliance Assessment and Management Program for compliance with applicable regulations.

The Air Force Reserve manages the hazardous wastes generated at the Florida Army National Guard, Florida Air National Guard, and U.S. Customs (**Mitchell 1998**). Based on 1997 quarterly waste generation data, 367,204 pounds of hazardous wastes were generated in 1997 (**Table 3.7-2**) (**Allen 1998**). These included 2,342 pounds of hazardous waste disposed of off site (from paint wastes, lithium batteries, used rags, and aerosols), 65,645 pounds of hazardous waste recycled off site (from fuels, oils, and solvents), and 299,217 pounds of special project hazardous waste (from lead-based paint abatement and fuel hydrant cleanouts). Currently, the Air Reserve Station is considered a small quantity generator of hazardous wastes because less than 1,000 kg per month of hazardous wastes are disposed of off site.

Table 3.7-2. Summary of 1997 AFRC Hazardous Waste Report

Recurring Hazardous Wastes Manifested for Disposal	Total Generation in 1997
Excess Materials	64 lbs
Paint Wastes	590 lbs
Paint Filters	755 lbs
Paint Rags	453 lbs
Nickel-Cadmium Batteries	459 lbs
Lithium Batteries	16 lbs
Aerosols	5 lbs
Battery Acid	0 lbs
Total Disposed	**2,342 lbs**

Recurring Hazardous Wastes Manifested for Recycling	Total Generation in 1997
Fuels	42,942 lbs
Oils	10,715 lbs
Solvents	7,672 lbs
Fluorescent Tubes	431 lbs
Nickel-Cadmium Batteries	2,463 lbs
Sandblasting Beads	1,422 lbs
Oil/Water Separator Wastes	0 lbs
Oil Filters	0 lbs
Total Recycled	**65,645 lbs**

Source: **Allen 1998**.

Surrounding Area. Miami-Dade County contains numerous commercial industries that generate hazardous wastes, including 8,387 small quantity generators of hazardous waste (less than 1,000 kg per month of hazardous waste) and 122 large quantity generators of hazardous wastes (greater than 1,000 kg per month of hazardous waste) (**Griffith 1998**, **Abrahante 1999**). According to the FDEP waste management database, the small quantity generators include automotive service centers, photography laboratories, paint shops, dry cleaners, print shops, and metalworking shops that service the county residents (**FDEP 1998b**). These facilities generate a variety of hazardous wastes (e.g., used oils, lead-acid batteries, used paint thinner, and dry cleaner waste), as shown in **Table 3.7-3**.

Table 3.7-3. Hazardous Wastes Generated in Miami-Dade County in 1997

Hazardous Waste Type	Number of Facilities in Survey[1]	Annual Volume (pounds)	Percent of Total Waste Volume in Miami-Dade County Survey
Used Oils and Other Lubricants	1,427	11,899,692	49%
Lead-Acid Batteries	666	3,852,908	16%
Uncrushed Oil Filters	772	1,638,581	7%
Spent Antifreeze	348	965,855	4%
Crushed Oil Filters	92	888,053	4%
Mineral Spirits—Parts Cleaner	920	811,872	3%
Photographic Wastes	451	708,653	3%
Wastewater with Heavy Metals	188	567,048	2%
Wastewater with Toxic Organics	93	477,919	2%
Absorbents with Solvent	927	406,838	2%
Used Paint Thinner	264	352,596	1%
Absorbents with Oil	586	295,927	1%
Discarded Gasoline, Diesel, or Other Fuel	10	219,154	1%
Dry Cleaner Waste Condensate	100	139,266	1%
Perchloroethylene Still Bottoms	99	134,002	1%
Other Hazardous Wastes (e.g., fluorescent lamps, spent solvents, pesticides, etc.)	Various	854,320	3.5%
Survey Total		***24,212,684***	***100%***
Total County Estimate[2]		**80,708,947**	

Source: **FDEP 1998b**, **Griffith 1998**, **Abrahante 1999**.

Notes: [1] Based on the 2,516 small quantity hazardous waste generators in Miami-Dade County that submitted reports to the FDEP waste management database in 1997 (estimated 30 percent of the total number of generators). Some generators have multiple waste types.

[2] In accordance with DERM guidance, these numbers were divided by 30 percent to approximate the total volume within the county.

As shown in the table, over 40,000 tons per year of hazardous wastes are generated by small quantity generators while serving approximately 2 million Miami-Dade County residents. This translates into an average of 39 pounds per resident.

According to their biennial hazardous waste reports, the large quantity generators in Miami-Dade County gradually decreased generation of hazardous waste 49 percent from 2,282 tons per year in 1991 to

1,156 tons per year in 1997, while the county population increased 5.6 percent over that same period (**Griffith 1998**). Thus, the generation of hazardous waste from large quantity generators (primarily large manufacturing facilities and aviation maintenance companies) has not been proportional to the population increases. The large quantity generators produce less than 5 percent of the hazardous waste generated within Miami-Dade County and, therefore, have less impact than the small quantity generators. Based on the biennial reports, no large quantity generators are presently located in the vicinity of former Homestead AFB (**USEPA 1998b**).

In addition to the hazardous wastes generated by the commercial industries, each resident also generates small amounts of hazardous wastes as part of daily living. These hazardous wastes include household cleaners (drain openers, oven cleaners, wood cleaners, metal polishes), automotive products (oil additives, rust solvents, fuel injector cleaners, air conditioning refrigerants, starter fluids), home maintenance products (paint thinner, paint stripper, adhesives), and lawn and garden products (herbicides and pesticides). Although it is difficult to quantify the amount of hazardous waste directly generated by each resident, studies performed in various locations have found the following:

- According to the Fairfax County (Virginia) Household Hazardous Waste Coordinator, 387,020 pounds of household hazardous waste were collected by the county in 1998 (**Taylor 1998**). A total of 15,519 residents participated in the program out of a population of 927,630. Although each resident disposed of 25 pounds of hazardous waste on average, it is difficult to extrapolate these data to all residents.
- A Los Angeles County waste management study in 1979 found that 0.00147 percent of the total waste stream delivered to the landfills contained household hazardous wastes (**Freeman 1989**).
- A City of Albuquerque waste management study in 1983 found that 96,300 dwelling units generated 800 tons of household hazardous waste annually. This equaled 0.5 percent of the total residential waste stream (**Freeman 1989**).

3.7.3.2 Projected Baseline Environment

Environmental personnel at Homestead ARS expect hazardous waste disposed of off site to be reduced by 10 percent by 2000 (from 2,342 pounds per year in 1997 to 2,108 pounds per year in 2000) (**Mitchell 1998**). The installation of a new high-efficiency paint spray booth will account for most of the reduction. Thereafter, reductions of 2 percent in 2005 (from 2,108 pounds per year to 2,066 pounds per year) and 2 percent in 2015 (to 2,025 pounds per year) are expected (**Mitchell 1998**).

Estimating future hazardous waste generation in the surrounding area is affected by population increases and improvements in pollution prevention technology. For example, increases in population can be expected to proportionally increase the number of automotive service stations and dry cleaners. However, improvements in pollution prevention technologies (e.g., changing to less hazardous solvents) will reduce the volume of hazardous wastes generated by these activities. Using available information of current generation rates, every new resident could be expected to generate 39 pounds per year of hazardous waste indirectly (from service industries in the surrounding area) and 25 pounds per year of hazardous waste directly (from household hazardous materials use). While this is probably an overestimation, it is not possible to quantify the reductions that might result from improved pollution prevention measures. Therefore, assuming the population in south Miami-Dade County will be 239,592 in 2015, and assuming each resident continues to generate waste at the same average rate, about 7,700 tons of hazardous waste can be expected to be generated in the south county in 2015.

3.7.4 Installation Restoration Program Sites

The IRP established a process to evaluate past disposal sites, control the migration of contaminants, assess potential hazards to human health and the environment, and conduct environmental restoration activities. The IRP is conducted in accordance with Section 211 of SARA and the Defense Environmental Restoration Program. The Air Force coordinates IRP activities with USEPA and FDEP.

3.7.4.1 Existing Environment

Homestead AFB was listed on USEPA's National Priorities List on August 30, 1990. Effective March 1, 1991, the Air Force entered into a Federal Facility Agreement (FFA) with USEPA Region IV and Florida Department of Environmental Regulation (now known as FDEP). FDEP was designated the state agency responsible for the federal programs carried out under this agreement. The FFA established a procedural framework and schedule of deadlines for developing, implementing, and monitoring appropriate response actions at Homestead AFB, in accordance with CERCLA and applicable state regulations.

An April 1993 RCRA Facility Assessment identified 68 Solid Waste Management Units (SWMUs) which, based on historic practices and visual inspection, required investigation (**Woodward-Clyde 1994**). The regulatory agencies agreed that these SWMUs could be investigated under the IRP rather than under the RCRA Corrective Action Program; however, the IRP investigation and possible cleanup were required to comply in substance with RCRA regulations.

Former Homestead AFB Disposal Property

A summary of the 31 SWMUs (out of the 68 total) found on former AFB disposal property is presented in **Table 3.7-4**. The other 37 SWMUs are found in the Homestead ARS cantonment. As the table shows, the regulatory agencies have concurred that 18 of the SWMUs require no further action due to the results of confirmation sampling. The remaining 13 SWMUs are being investigated under the IRP program as CERCLA operable units (OUs) or FDEP petroleum sites. The location of each OU on the former base is shown in **Figure 3.7-3**.

A summary of all IRP sites located on former Homestead AFB property is presented in **Table 3.7-5**. The 24 IRP sites have been separated into three categories: CERCLA OUs, FDEP petroleum sites, and closed sites. Fifteen sites (out of the 24) have been designated as OUs in accordance with the FFA and are undergoing remedial investigation in accordance with CERCLA. Another five sites are being investigated and remediated as needed under the FDEP Petroleum Contamination Site Cleanup Criteria (FAC 62-770). The remaining four IRP sites require no further action, with the concurrence of regulators.

Feasibility studies are ongoing at the following OUs:

- Former Wastewater Treatment Plant/Former Incinerator Ash Disposal Area/Outfall Canal (OU-11). Elevated organic and metal compound concentrations were found in the soils and sediments as a result of contamination from drying bed sludge, incinerator ash, and stormwater runoff of maintenance-related wastes and fuel spills. The Air Force is conducting a Feasibility Study on the appropriate method to use to remediate Military Canal sediments. A draft report was issued in August 2000 (**Montgomery Watson 2000**). Based on the outcome of this study and regulatory and public review, a remediation method will be selected and implemented.

Table 3.7-4. Solid Waste Management Units on Former Homestead AFB Disposal Property

SWMU No.	Bldg. No.	Facility	Investigation Results/ Recommended Action	Final Determination
1	—	Contractor Storage Area located approximately 1,000 feet east of Mystic Lake	No Further Action	Included in OU-18
2	—	Former Construction Debris Landfill in northeast corner of Contractor Storage Yard	RCRA Feasibility Investigation	Included in OU-18
3	796	Disaster Preparedness Facility (Training Classroom)	No Further Action	No Further Action
4	795	Aircraft Maintenance Equipment Storage Facility	Oil/Water Separator Removed	No Further Action
5	781	Inter American Air Force Academy Aircraft Maintenance Facility	No Further Action	No Further Action
6	782	Aircraft Maintenance Facility	No Further Action	No Further Action
7	779	Aircraft Maintenance and Mobility Processing Center	Oil/Water Separator Removed	No Further Action
8	776	Aircraft Maintenance Facility	No Further Action	No Further Action
9	771*	Inter American Air Force Academy Aircraft Maintenance Facility	No Further Action	No Further Action
10	—	Parking lot northwest of Building 767, New Contractor Storage Area	AST Closed	Included in OU-30
11	768	Wash Rack Facility	Confirmation Sampling Not Complete	Included in SS-20
12	761*	AGE Maintenance Facility (Paint Booth)	RCRA Feasibility Investigation	Included in OU-22
13	762*	AGE Maintenance Facility (Equipment Storage)	No Further Action	No Further Action
14	763	AGE Maintenance Facility (Supply Storage)	No Further Action	Included in SS-20
15	764*	AGE Maintenance Building	RCRA Feasibility Investigation	Included in OU-22
16	755	Non-Destructive Inspection Laboratory	RCRA Feasibility Investigation	Included in OU-31
17	750	Propulsion (Engine) Maintenance Facility	Oil/Water Separator Removed	Included in OU-26
18	741	Aircraft Maintenance Facility	No Further Action	No Further Action
19	742	Flammable Storage Building	No Further Action	No Further Action
20	720*	Aircraft Washrack Facility and adjacent ramp area used for aircraft washing	IRP	Included in OU-6
21	708*	Aircraft Fuel Tank Maintenance Facility and adjacent pavement area	Oil/Water Separator Removed	No Further Action
22	711*	Refueling Truck Maintenance and Parking Yard	Oil/Water Separator Removed	No Further Action
31	—	Outdoor staging area adjacent to Buildings 618 and 619	No Further Action	Included in OU-20
32	619	Base Supply Hazardous Material Storage Facility	No Further Action	Included in OU-21

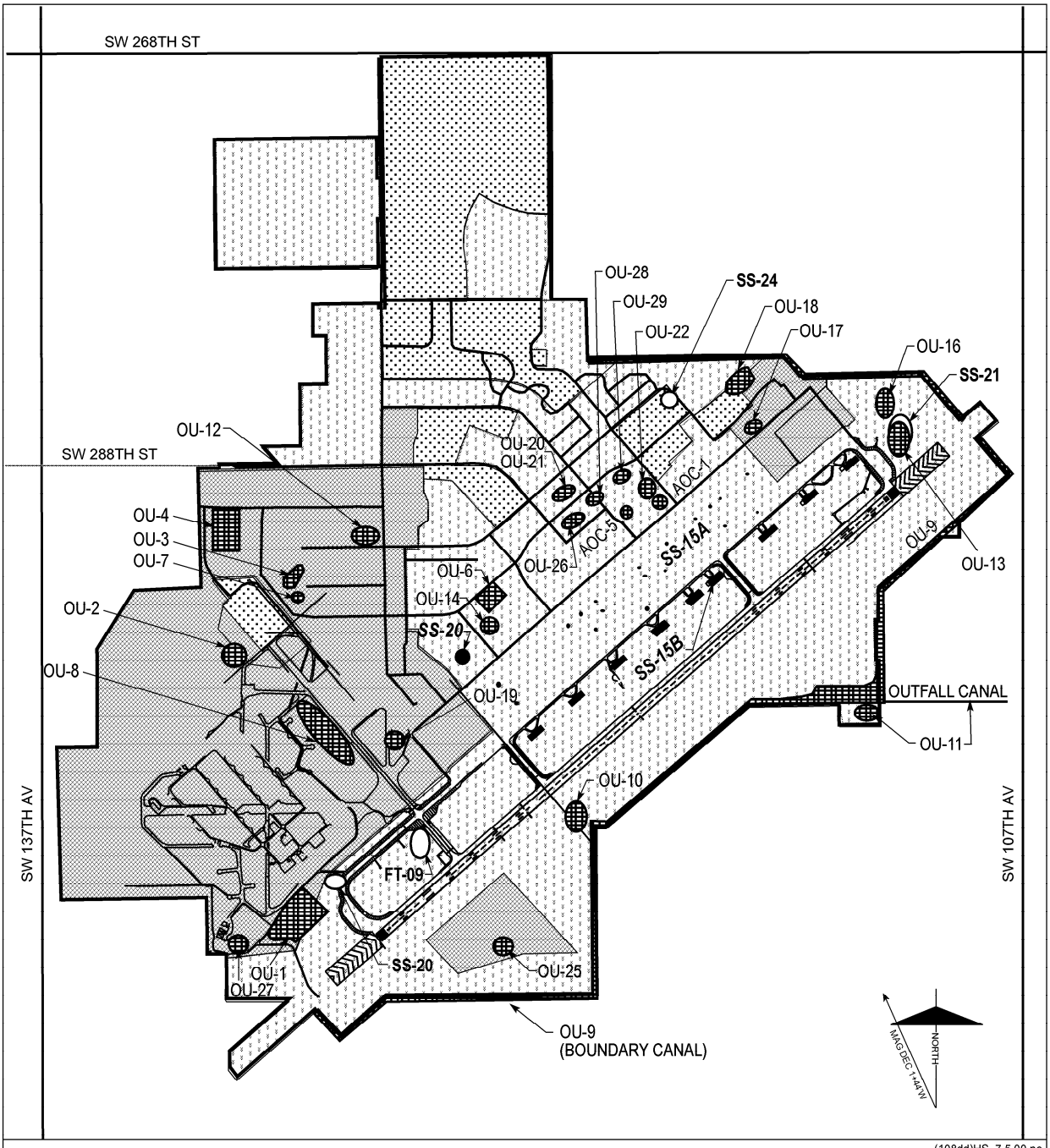
SWMU No.	Bldg. No.	Facility	Investigation Results/ Recommended Action	Final Determination
33	—	Outdoor Storage Yard adjacent to Building 624	No Further Action	No Further Action
34	606	DRMO Storage Facility	No Further Action	No Further Action
35	607	DRMO Storage Facility	No Further Action	No Further Action
36	608*	DRMO Storage Facility	No Further Action	No Further Action
37	—	Wet Cell Battery Storage in corner of DRMO yard	No Further Action	No Further Action
60	745	Aircraft Fabrication (Metal Working) Facility	RCRA Feasibility Investigation	Included in OU-26
62	—	Transformer Staging Area next to Building 615	No Further Action	No Further Action

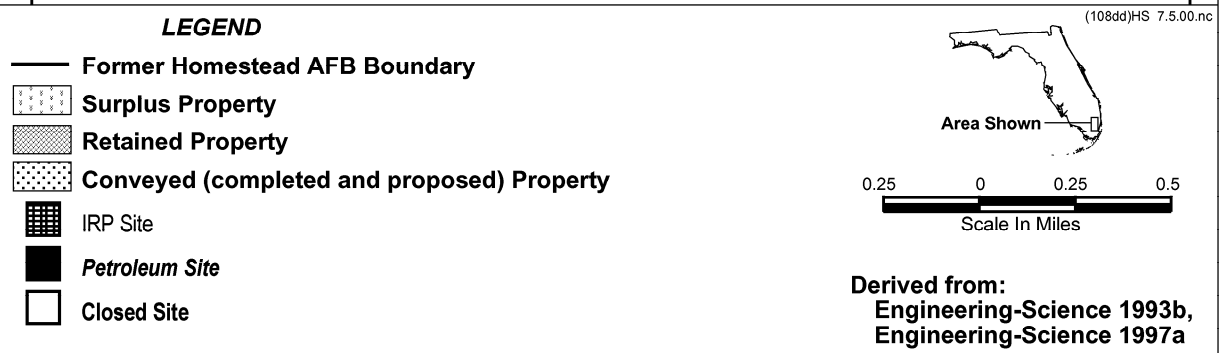
Source: **USAF 1994a**, **Woodward-Clyde 1994**, **Engineering-Science 1997b**, **Bartol 1998**.
* Building demolished
AGE aerospace ground equipment
AST above-ground storage tank
DRMO Defense Reutilization and Marketing Office
IRP Installation Restoration Program
OU operable unit
RCRA Resource Conservation and Recovery Act
SWMU Solid Waste Management Unit

- Outdoor Staging/Hazardous Materials Storage Areas (OU-20/21). Elevated metals concentrations were found in soils as a result of contamination from various stored wastes. The Air Force is now performing a Feasibility Study for these two sites.
- Former Contractor Storage Area (OU-30). Elevated organics and metals concentrations were found in the soils as a result of contamination from the various stored wastes (formerly known as Area of Concern [AOC] 1). A Feasibility Study is currently being performed for this OU.
- Non-Destructive Inspection Lab (OU-31). Elevated organics and metals concentrations were found in the soils as a result of contamination from various stored oils (formerly known as AOC 5). A Feasibility Study is now in progress.

Remedial action is ongoing at four of the OUs (OU-18, OU-26, OU-28, and OU-29) and at two of the petroleum sites (SS-15B and SS-20 [Buildings 711 and 766]). Remedial actions have been completed at OU-6 and SS-20 [Buildings 990 and 996], with closeout anticipated in the future. Long-term groundwater monitoring and natural attenuation studies are being conducted at SS-15A. No further action was recommended at five OUs (OU-10, OU-14, OU-16, OU-17, and OU-22). One petroleum site (SS-20 [Buildings 760, 798, 935]) is awaiting closeout. Although a draft final record of decision has been prepared for OU-9, the decision has been deferred at the request of regulators until further decisions are made on OU-11.

Remedial actions typically involve excavation of contaminated surface soil or removal of floating petroleum product from groundwater. The most common contaminants are fuel, arsenic, and polynuclear aromatic hydrocarbons in surface soils and jet fuel in groundwater. Overall, most of the contamination sources have been removed from the former base, and most of the remaining remedial actions involve groundwater monitoring and/or natural attenuation. Natural attenuation works well due to the relatively flat gradient that allows groundwater contamination to remain near the source and be degraded by microorganisms. Appendix C of the Parcel-Specific Environmental Baseline Survey contains a summary of the range of contaminants detected at the OUs in soil and groundwater (**Engineering-Science 1997b**).





Derived from:
Engineering-Science 1993b,
Engineering-Science 1997a

Figure 3.7-3
Installation Restoration
Program Sites on Former Homestead AFB

Table 3.7-5. IRP Site Summary on Former Homestead AFB Disposal Property

Site ID [Former IDs]	Site Name	Site Description	Current Status	Next Phase
OU-6 [SP-7, SS-3] CERCLA	Oil Spills at Aircraft Wash Rack (Building 720)	Hazardous wastes transported to storage tanks near wash rack between 1970 and 1980; tanks frequently overflowed.	Remedial Action Complete	Closeout
OU-9 [SD-27] CERCLA	Boundary Canal	Boundary Canal constructed on base perimeter in 1942 to drain surface water, act as a ground-water barrier, and lower water table.	Draft Final RI/BRA	On hold until decisions made on OU-11
OU-10 [LF-1, LF-12] CERCLA	Construction Debris Landfill	Site was open dump operated by PanAmerican Air Ferries before 1943; refuse disposed of here between 1943 and 1953.	No Further Action	Closeout
OU-11 [D-1, D-2, LF-19, WP-23] CERCLA	Former Wastewater Treatment Plant/Ash Disposal Area/Outfall Canal	Sewage treatment plant and incinerator operated here; domestic and industrial wastewaters treated from the 1950s to 1983; treated water discharged to Outfall (Military) Canal.	Draft Feasibility Study	Record of Decision
OU-14 [SS-26] CERCLA	Drum Storage (Building 720)	55 gallon drums of paint and solvent-related wastes stored here from early 1980s to 1985.	No Further Action	Closeout
OU-16 [SS-31] CERCLA	Hawk Missile Site/Drum Storage (Building 898)	Site contains missile pad used to store drums of paint thinners, pesticides, motor oils, and hydraulic oils.	No Further Action	Closeout
OU-17 CERCLA	C-130 Hangar Fuel Spill (Building 793)	C-130 damaged during Hurricane Andrew released up to 2,000 gallons of JP-4.	No Further Action	Closeout
OU-18 [SWMU-1,2] CERCLA	Contractor Storage/ Construction Debris Landfill	Storage area used since the early 1980s for pipes, equipment, paint, empty containers, and tools; visual inspection identified oil staining and paint spillage; landfill used to dispose of crushed asphalt.	Remedial Action	Long Term Monitoring
OU-20/21 CERCLA	Outdoor Staging Area/ Hazardous Materials Storage (Buildings 618/619)	OU-20, a parking lot, and OU-21, a flammables and acid storage area, used for hazardous waste storage since 1992.	Feasibility Study	Proposed Plan/ Record of Decision
OU-22 CERCLA	Aerospace Ground Equipment Maintenance/Paint Booth (Buildings 761/764)	Used for storage, maintenance, and repair of aerospace ground equipment since 1950; contained three 1,000 gallon ASTs (two gasoline and one JP-4); staining and dead vegetation beneath drums of waste fuel and oil.	Final Record of Decision	No Further Action

Site ID [Former IDs]	Site Name	Site Description	Current Status	Next Phase
OU-26 CERCLA	Aircraft Fabrication Shop (Building 745)	Used for maintenance of aircraft skin and hydraulics; PD-680 and hydraulic fluid wastes generated; contained two fuel oil USTs, one apparently leaked.	Remedial Action	Long Term Monitoring
OU-28 CERCLA	Propulsion Maintenance Facility (Building 750)	Used for jet engine teardown, rebuilding, inspection, and repair since the 1950s; contained waste oil AST, electroplating waste solution USTs, and OWS; lead contamination in the soil.	Remedial Action	Long Term Monitoring
OU-29 CERCLA	Avionics/Aerospace Ground Equipment Maintenance Facility (Building 760)	Used as Avionics Aerospace Ground Equipment shop, Tactical Electronic Warfare System shop, and various other testing shops; contained OWS and diesel fuel UST.	Remedial Action	Long Term Monitoring
OU-30 [AOC-1] CERCLA	Former Contractor Storage Area (Building 767)	Former parking lot used for storage of drums containing fuel oil and hydraulic fluid, ASTs, machinery, and various demolition debris.	Feasibility Study	Proposed Plan/ Record of Decision
OU-31 [AOC-5] CERCLA	Nondestructive Inspection Laboratory (Building 755)	Used for aircraft part x-ray inspection and inspection of engine oil; wastes generated include oil, dye penetrant, emulsifier, and photo development and fixers. Stains and stressed vegetation noted.	Feasibility Study	Proposed Plan/ Record of Decision
SS-15A [SP-15] Petroleum	Flight Apron	Consists of fuel hydrant system headers and valve boxes under apron. Fuel spilled during connection/disconnection of refueling hoses from valve boxes.	Remedial Action	Long-Term Monitoring
SS-15B [SS-15, SS-10] Petroleum	Flightline Pumphouses	Unknown quantity of JP-4 leaked from underground pipeline in 1982 near Pumphouse 9. Two JP-4 leaks detected in 1988 near Pumphouses 5 and 8. In 1989, 1,500 gallons of JP-4 unrecovered from Pumphouse 7.	Remedial Action	Long-Term Operations/ Monitoring
SS-20 Petroleum	Buildings 711 and 766	Buildings 711 and 766 of SS-20 include areas around the location of the former OWSs. JP-4 contaminated.	Remedial Action	Long-Term Operations/ Monitoring
SS-20 Petroleum	Buildings 990 and 996	Diesel contamination found at Buildings 990 and 996.	Remedial Action Complete	Closeout

Site ID [Former IDs]	Site Name	Site Description	Current Status	Next Phase
SS-20 Petroleum	Miscellaneous Fuel Sites (Buildings 760, 798, 935)	Contaminated by diesel, JP-4, and gasoline.	No Further Action	Closeout
FT-09 Closed	Fire Protection Training Area 1	Disposed of solvents, waste oils, contaminated soils, and burned fuel.	No Further Action Accepted, FDEP Letter on 7 Oct 94	
SS-20 [H-1] Closed	Hardfill Storage Area	Concrete, asphalt, excavated earth, and other construction debris disposed of here between 1945 and the mid-1950s.	No Further Action Accepted, FDEP Letter on 7 Oct 94	
SS-21 Closed	Hardfill Storage Area 2	Concrete, asphalt, excavated earth, and other construction debris disposed of here.	No Further Action Accepted, FDEP Letter on 7 Oct 94	
SS-24 [DPDO-1, SWMU-37] Closed	DRMO Battery Storage Area (Building 606)	Used to store spent lead acid batteries; other materials included various waste chemicals and used oils; battery liquid spilled on paved surface in 1987.	No Further Action Accepted, FDEP Letter 19 Sep 94	

Source: **WPI 1997**, **Engineering-Science 1997b**, **Bartol 1998**.
AOC Area of Concern
AST above-ground storage tank
CERCLA Comprehensive Environmental Response, Compensation and Liability Act
DRMO Defense Reutilization and Marketing Office
FDEP Florida Department of Environmental Protection
OU operable unit
OWS oil/water separator
RI/BRA Remedial Investigation/Baseline Risk Assessment
SWMU Solid Waste Management Unit
UST underground storage tank

Of highest environmental concern at the IRP sites was the fuel contamination beneath the SS-15B flightline pumphouses (**Bartol 1998**). During 1997, liquid fuel product was removed from beneath the pumphouses in preparation for a bioventing remedial action. The removal of the liquid fuel product there and beneath Buildings 711 and 766 (SS-20) completed the removal of all known liquid fuel contamination on the former base (**WPI 1998**).

All of the IRP sites on the former base are near final closure (either remedial action or no further action) with the exception of OU-11 (Military Canal). Decisions on OU-9 are also awaiting decisions on OU-11.

The Air Force Base Conversion Agency has spent $32 million on environmental restoration projects at former Homestead AFB (**Bartol 1998**). Due to these efforts, 1,997 acres (98.6 percent) of the 2,026 acres are environmentally suitable for transfer. Investigation continues at the sites on the remaining 29 acres (**AFBCA 1997**).

Homestead ARS

The IRP sites in the cantonment have been divided into 14 CERCLA sites and 7 petroleum sites. A summary of all these sites with their description and current status is shown in **Table 3.7-6**. As can be seen in the table, all sites in the cantonment have completed investigations with the exception of OU-12 (Entomology Shop), OU-15 (Waste Storage), and AOC-3 (Weapons Storage Area). These sites had not been thoroughly investigated in the past (**Mitchell 1998**). Of the sites where investigation is complete, five require no further action and eight require long-term monitoring. Remedial action is pending at OU-19 and SS-20. As noted above, decisions concerning OUs 9 and 11, portions of which are within the cantonment, are pending.

3.7.4.2 Projected Baseline Environment

The investigation and remediation of all IRP sites is proceeding, and all remedial actions that have been determined are anticipated to be in place on the disposal property by June 2000. OUs 9 and 11 are approaching a decision, but the timetable for further actions, if any, has not been established.

By 2000, all remedial actions should be in place (with the exception of Military Canal). Any sites with long-term monitoring requirements (OU-6, OU-16, SS-15A, SS-15B, and SS-20; Buildings 990 and 996) will be transferred to the Air Force Reserve Command (**Mitchell 1998**). AFRC anticipates that remediation will be in place for all sites in the cantonment by 2002 (**Mitchell 1998**). Groundwater monitoring will continue on a quarterly or semiannual basis at the wells around these sites, as specified in the records of decision and remedial action plans. Easements on disposal property will allow Air Force personnel access to the property around IRP sites.

Long-term groundwater monitoring could continue in 2005. By 2005, all sites would have had a 5 year review to determine whether continued monitoring is necessary. Based on the review, monitoring frequency and the parameter list may be increased or decreased.

By 2015, all remediations should be complete. The long-term monitoring plans scheduled monitoring for 15 years with 5 year review periods. Microorganisms should have degraded all contaminants by then. Based on the monitoring results, however, the long-term monitoring could be extended.

Table 3.7-6. IRP Site Summary on Homestead ARS

Site ID [Former IDs]	Site Name	Site Description	Current Status
OU-1 [FPTA-2, FT-5] CERCLA	Fire Protection Training Area No. 2	Fire training activities were conducted at this site between 1955 and 1972; materials burned at the site include JP-4, AVGAS, MOGAS, and liquid waste.	Record of Decision/ Long-Term Monitoring
OU-2 [P-3, OT-11] CERCLA	Residual Pesticide Disposal Area	Waste pesticides were disposed of in an open area between 1977 and 1982; no contaminants were detected exceeded federal or state guidelines.	Record of Decision/ Long-Term Monitoring
OU-4 [SP-2, SS-8] CERCLA	Oil Leakage Behind Motor Pool	Located in the western portion of the base; leakage from two 500 gallon ASTs storing waste oils was reported in the 1980s.	Record of Decision/No Further Action

Site ID [Former IDs]	Site Name	Site Description	Current Status
OU-5 [SP-1, WP-1] CERCLA	Electroplating Waste Disposal Area	A small electroplating shop was operated by Miami-Dade County between 1946 and 1953 on this site; plating solutions were disposed of on the ground.	Record of Decision/No Further Action
OU-7 [P-2, SS-7] CERCLA	Entomology Storage Area	Located in the western portion of the base near Building 207; entomology chemicals have been stored at the site since the 1960s.	Record of Decision/ Long-Term Monitoring
OU-9 [SD-27] CERCLA	Boundary Canal	Located along the perimeter of the base; Boundary Canal was constructed in 1942 to drain surface water, act as a groundwater barrier, and lower the water table.	Decision pending
OU-11 [D-1, D-2, LF-19, WP-23] CERCLA	Former Wastewater Treatment Plant/Ash Disposal Area/Outfall Canal	Sewage treatment plant and incinerator operated here; domestic and industrial wastewaters treated from the 1950s to 1983; treated water discharged to Outfall (Military) Canal.	Draft Feasibility Study
OU-12 [OT-25, P-1] CERCLA	Entomology Shop	The site was used as a storage area for pesticides, water treatment chemicals, and small equipment from the mid-1940s to the mid-1980s.	Expanded Site Investigation
OU-13 [L-1, H-3, SS-22] CERCLA	Landfill	The site was originally an open dump with landfilling activities occurring between the early 1940s and 1950; oils and fuel were assumed to be burned at the site.	Decision Document/No Further Action
OU-15 [SS-30] CERCLA	Waste Storage	Building 153 was used to store hazardous materials such as battery electrolytes, paint thinners, hydraulic fluids, and motor oils; evidence of chemical releases on the ground behind the building was identified in the mid-1970s.	Expanded Site Investigation
OU-19 [SS-33] CERCLA	Aerospace Ground Equipment Facility/OWS	Located at Building 208; the facility has been used for maintenance and repairs of aerospace ground equipment since 1950; an OWS, waste oil UST, and six ASTs were removed in 1994.	Expanded Site Investigation/ Remedial Investigation/ Decision Document
OU-25 [OT-21] CERCLA	Drum Storage	Located near Building 814; the site has been used to secure aircraft for engine testing since Hurricane Andrew in 1992; the area was used to stage and consolidate pesticides, herbicides, paints, thinners, waste, and lube oils, and contaminated soils.	Expanded Site Investigation/ Long-Term Monitoring
OU-27 [OT-23] CERCLA	Jet Engine Test Cell	Located at Building 268; the site was used for jet engine testing between the 1970s and the 1980s; several years later the facility was used for corrosion control activities until 1992.	Proposed Plan/ No Further Action/Deci-sion Document

Site ID [Former IDs]	Site Name	Site Description	Current Status
AOC-3 [NA] CERCLA	Weapons Storage Area	The site has been used for munitions storage, munitions painting, and maintenance of munitions trailers since 1950; a spill of mineral spirits occurred in 1988.	Expanded Site Investigation
OUs 1,2,25,27 CERCLA	Cross-Reference Sampling	These four operable units were used for cross-reference sampling.	Expanded Site Investigation/ Long-Term Monitoring
OU-8 [FTPA-3, FT-4] Petroleum	Fire Protection Training Area No. 3	The site has been used for fire training activities since 1972; JP-4, AVGAS, MOGAS, and liquid wastes have been burned at the site.	Expanded Site Investigation/ Long-Term Monitoring
SS-2A [SP-4] Petroleum	Leak at POL Bulk Storage Tank Farm	The site contains six JP-4 ASTs; in 1958 an unknown quantity of JP-4 leaked from an underground pipeline.	Long-Term Monitoring—Monitoring Only Plan
SS-2B [SP-4] Petroleum	Leak at POL Bulk Storage Tank Farm	The site contains six JP-4 ASTs; in 1958 an unknown quantity of JP-4 leaked from an underground pipeline.	No Further Action
SS-15C Petroleum	Flightline Fuel Lines	This site contains the fuel lines located along the flightline.	Long-Term Monitoring—Monitoring Only Plan
SS-20 [H-1] Petroleum	Hardfill Storage Area	Located in the southwestern corner of the base; concrete, asphalt, excavated earth, and other construction debris were disposed of on this site between 1945 and the mid-1950s.	Closure Assessment Report Pending
NORTS Petroleum	Buildings 176/177, 249, 289, 350, and 361	These are the buildings sampled under the Notice of Required Testing and Sampling.	Site Investigation
Hydrant Station Petroleum	New Fuel Storage Area	This site contains the fuel hydrant station at the new fuel storage area.	Awaiting DERM approval

Source: **Mitchell 1998**.
AST above-ground storage tank
AVGAS aviation fuel
CERCLA Comprehensive Environmental Response, Compensation and Liability Act
DERM Department of Environmental Resources Management (Miami-Dade County)
MOGAS motor vehicle fuel
NORTS Notice of Required Testing and Sampling
OU operable unit
OWS oil/water separator
POL petroleum/oils/lubricants
UST underground storage tank

3.8 AIR QUALITY

3.8.1 Introduction

This section presents air quality conditions in the vicinity of former Homestead AFB compared to federal and state air quality standards, provides current and baseline air emissions inventories, and addresses areas of special concern.

3.8.1.1 Resource Definition

Air quality in a given location is generally described by the concentration of pollutants in the atmosphere expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). Air quality is determined by the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. Meteorological conditions have a significant impact on the pollutant concentrations because they control the dispersion or mixing of pollutants in the atmosphere through the influences of wind speed, wind direction, atmospheric stability, and other variables.

Air emissions considered in the evaluation of air quality include pollutants regulated under the Clean Air Act (see Section 3.8.1.2) and unregulated pollutants, including volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs).

VOCs are composed of a large group of diverse organic molecules. These molecules are gases or liquids at ambient conditions and tend to vaporize readily. Thus they are present in the atmosphere in the vapor state. VOCs include benzene, commonly found in gasoline, and xylenes, commonly found in paints. VOCs contribute to the formation of ozone, a pollutant regulated under the Clean Air Act.

PAHs are a class of relatively large organic molecules that are generally toxic and carcinogenic. These compounds can form in a combustion chamber of an automobile or aircraft engine through incomplete combustion, but usually comprise a very small portion of aircraft engine exhaust.

Automobile and aircraft engines also emit unburned hydrocarbons. These are fuels that have passed through the combustion chambers of an engine but have not been completely burned. Other terms sometimes used to describe unburned hydrocarbons include “oily gunk” and “soot.” Unburned hydrocarbons can be deposited on windows, cars, and other surfaces.

Fuel venting emissions are defined by FAA as “raw fuel, exclusive of hydrocarbons in the exhaust emissions, discharged from aircraft gas turbine engines during all normal ground and flight operations.” FAA Advisory Circular 34-1, “Fuel Venting and Exhaust Emissions Requirements from Turbine Engine Powered Aircraft” (July 27, 2000), prohibits the discharge of fuel venting emissions into the atmosphere from all new and in-use gas turbine engines manufactured after January 1, 1975.

Air emissions inventories identify sources of regulated pollutants from both stationary sources (e.g., industrial plants, gasoline stations) and mobile sources (e.g., motor vehicles, aircraft, construction equipment).

Areas of special concern include certain national parks, wilderness areas, and other areas afforded additional protection from air quality impacts.

3.8.1.2 Applicable Laws and Regulations

Clean Air Act (42 U.S.C. 7401–7671q). The Clean Air Act (CAA) provides the authority to USEPA to establish nationwide air quality standards to protect public health and welfare, with an adequate margin of safety. These federal standards, known as the National Ambient Air Quality Standards (NAAQS) (40 CFR 50), were developed for six "criteria" pollutants: ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter less than 10 micrometers in diameter (PM_{10}), sulfur dioxide (SO_2), and lead (Pb). The standards are defined in terms of concentration (e.g., ppm) determined over various periods of time (averaging periods). Short-term standards (1 hour, 8 hour, or 24 hour) were established for pollutants with acute health effects, while long-term standards (annual) were established for pollutants with chronic health effects. These standards are shown in **Table 3.8-1**. The CAA Amendments of 1990 established a framework to achieve attainment and maintenance of the health-protective NAAQS. Title I of the amendments sets provisions for the attainment and maintenance of the NAAQS.

Table 3.8-1. Federal, State, and Local Ambient Air Quality Standards

Air Pollutant	Averaging Time	Federal Standards[a]		Florida Standards[a]	Miami-Dade Standards[a]
		Primary[b]	Secondary[b]		
CO	8 hour 1 hour	9 ppm 35 ppm	— —	9 ppm 35 ppm	9 ppm 35 ppm
NO_2	AAM 24 hour	0.053 ppm —	0.053 ppm —	0.053 ppm —	0.053 ppm —
SO_2	AAM 24 hour 3 hour	0.03 ppm 0.14 ppm —	— — 0.5 ppm	0.02 ppm 0.10 ppm 0.5 ppm	0.01 ppm 0.042 ppm 0.13 ppm
PM_{10}[c]	AAM 24 hr	50 µg/m^3 150 µg/m^3	50 µg/m^3 150 µg/m^3	50 µg/m^3 150 µg/m^3	50 µg/m^3 150 µg/m^3
O_3[d]	1 hour 8 hour	0.12 ppm 0.08 ppm	0.12 ppm —	0.12 ppm 0.08 ppm	0.12 ppm 0.08 ppm
Pb and Pb Compounds	Calendar Quarter	1.5 µg/m^3	1.5 µg/m^3	1.5 µg/m^3	1.5 µg/m^3

Source: 40 CFR Part 50; Florida Title 62, Chapter 62-204.240.

Notes:
[a] Federal, state, and county standards, other than ozone and those based on an annual/quarterly arithmetic mean, are not to be exceeded more than once per year.
[b] Primary standards are the levels of air quality required to protect the public health, including an adequate margin of safety. Secondary standards are the levels of air quality required to protect the public welfare.
[c] USEPA has revised the form of the 24 hour PM_{10} standard from one expected exceedance to a 99th percentile form, averaged over 3 years.
[d] USEPA is phasing out the 1 hour primary ozone standard with a new 8 hour standard to protect against longer exposure periods. The new standard is defined as a "concentration-based" form, specifically the 3 year average of the annual fourth highest daily maximum 8 hour ozone concentration.

AAM annual arithmetic mean
µg/m^3 micrograms per cubic meter
ppm parts per million

USEPA has classified all areas of the United States as in attainment (meeting NAAQS), in nonattainment (not meeting NAAQS), or unclassified (insufficient ambient air monitoring data to determine attainment status) for each individual criteria pollutant. For regulatory purposes, unclassified areas are treated in a

similar manner to attainment areas. Areas that have been designated as nonattainment for ozone are categorized (ranging from extreme to marginal) based upon the severity of the air pollution.

Individual states are required to establish a USEPA-approved State Implementation Plan (SIP). A SIP is a plan for maintaining existing air quality in attainment areas and programmatically eliminating or reducing the severity and number of NAAQS violations in nonattainment areas. The underlying goal is to bring state air quality conditions into compliance with NAAQS.

Two NAAQS were newly promulgated by USEPA in 1997: a new 8 hour O_3 standard (which may eventually replace the existing 1 hour standard) and a new standard for $PM_{2.5}$, a previously unregulated, smaller size of particulate matter. Both of these standards have been remanded to USEPA by District Court for additional information and justification. In addition, USEPA has made a change in the form of the PM_{10} standard (which is not expected to affect attainment status in Florida). USEPA has stated that it plans to implement both of the new standards over an extended period of time.

For the new 8 hour ozone standard, USEPA planned to designate areas as attainment or nonattainment between 1999 and 2000, but the timing is now uncertain. Under the CAA, states are required to revise and update their SIPs as needed within 3 years after USEPA revises NAAQS. If Miami-Dade County were to be redesignated as nonattainment for ozone, Florida would be required to revise and submit its SIP to USEPA for approval.

For the new $PM_{2.5}$ standard, USEPA currently plans to make initial designations of "unclassifiable" due to a lack of data. From a regulatory perspective, an unclassifiable area is treated the same as an attainment area. Redesignations from unclassifiable to attainment or nonattainment would occur after 3 years of quality-assured monitoring data become available.

Under CAA, state and local agencies may establish air quality standards and regulations of their own, provided they are at least as stringent as the NAAQS. The Division of Air Resources Management of the FDEP is responsible for regulating air quality sources in Florida. Miami-Dade County DERM is responsible for administering the program in Miami-Dade County. As shown in Table 3.8-1, both the State of Florida and Miami-Dade County have adopted the federal NAAQS, except SO_2. Both agencies have promulgated more stringent standards for this pollutant.

The principal method of maintaining or improving ambient air quality is by controlling emissions from the sources. SIPs establish regulations to control stationary and mobile emission sources. In attainment areas, Prevention of Significant Deterioration (PSD) (*40 CFR 51.166*) regulations apply; in nonattainment areas, New Source Review (NSR) (*40 CFR 51.160–164*) regulations apply.

PSD regulations provide additional air quality protection from stationary source emissions in areas that are currently in attainment by setting a maximum incremental increase in the ambient concentrations of certain criteria pollutants (SO_2, NO_2, and PM_{10}). PSD regulations apply only to new construction for permanent sources.

Certain national parks and wilderness areas established before August 1977 were designated as PSD Class I areas. All other attainment areas in the United States have been designated as PSD Class II areas. Class I increments are very restrictive, allowing only minor increases in pollutants, while Class II increments allow moderate increases in pollutants. (There is a third category, Class III increments, but to date no area has been designated as Class III.) Everglades NP is designated as a Class I area, and Biscayne NP is designated as a Class II area. The PSD Class I and Class II increments are presented in **Table 3.8-2**.

Table 3.8-2. Federal and State PSD Increments for Areas in Attainment of the NAAQS

Pollutant	Averaging Time	PSD Increment ($\mu g/m^3$)	
		Class I	Class II
NO_2	Annual arithmetic mean	2.5	25
SO_2	Annual arithmetic mean 24 hour maximum 3 hour maximum	2 5 25	20 91 512
PM_{10}	Annual arithmetic mean 24 hour maximum	4 8	17 30

Source: Florida Title 62, Chapter 62-212.400.
$\mu g/m^3$ micrograms per cubic meter
PSD Prevention of Significant Deterioration

PSD and NSR regulations apply to stationary sources. The majority of emissions associated with the civil reuse of Homestead AFB are expected to be from mobile sources. Visibility is singled out in the PSD regulations for protection and enhancement in accordance with the national goal of preventing any future impairment and remedying any existing impairment of visibility in Class I areas caused by industrial air pollution. A visibility impact analysis focuses on major new stationary sources or major modifications of existing stationary sources that have the potential to impair visibility in any Class I area. Because the majority of emissions associated with reuse of former Homestead AFB are expected to be from mobile sources, PSD and NSR regulations will have limited applicability.

General Conformity Rule (40 CFR Part 51, Subpart W). Under the CAA's General Conformity Rule, federal agencies contemplating an action must determine whether the action will conform to the applicable SIP. SIPs include plans for eliminating or reducing the severity and number of NAAQS violations in nonattainment areas, and the Florida SIP references the federal procedures for general conformity determinations. Federal agencies must ensure their actions do not:

- Cause or contribute to any new violation of NAAQS;
- Increase the frequency or severity of any existing violation; or
- Delay timely attainment of any standard, interim emission reduction, or milestone.

The General Conformity Rule only applies to nonattainment areas and maintenance areas. Former Homestead AFB is in an ozone maintenance area. The General Conformity Rule applies to all federal actions in nonattainment and maintenance areas except those covered by the Transportation Conformity Rule (see below), exempted from the regulation (including base realignment and closure property disposal actions), or found to be presumed to conform. The General Conformity Rule provides the procedures to be used in evaluating general conformity actions. Most FAA actions at airports are general conformity actions.

A conformity evaluation is conducted in three steps: applicability determination, conformity analysis, and conformity determination. The applicability determination establishes whether the General Conformity Rule applies to an action, compares the project's estimated net direct and indirect emissions with conformity threshold levels (emissions greater than 100 tons/year of nitrogen oxide [NO_x] or VOCs in ozone maintenance areas), and determines the regional significance of the project in the context of the General Conformity Rule (emissions greater than 10 percent of the regional emissions inventory for NO_x

and VOCs). The results of the conformity analysis provide the input for making a conformity determination if one is required. The determination requires certain documentation to be provided to USEPA, the State of Florida, and Miami-Dade County, as well as notification to the general public.

Transportation Conformity Rule (40 CFR Part 51, Subpart T). The Transportation Conformity Rule applies to federal actions related to highway or transit projects in nonattainment or maintenance areas which are proposed to receive funding and approval through the Federal-Aid Highway program, require Federal Highway Administration approval, or are "regionally significant." A project is of regional significance when it serves regional transportation needs and would normally be included in the modeling of a metropolitan planning organization.

3.8.1.3 Region of Influence

Federal regulations (40 CFR 81) define air quality control regions (AQCR) which were originally designated based on population and topographic criteria closely approximating each air basin. Air quality impacts from a given project are generally expected to be confined to the air basin or AQCR. Former Homestead AFB is located in the Southeast Florida Intrastate AQCR (AQCR #50), which consists of the following eight counties: Broward, Miami-Dade, Indian River, Martin, Monroe, Okeechobee, Palm Beach, and St. Lucie. In this SEIS, the ROI (**Figure 3.8-1**) for air quality includes all of Miami-Dade County and those parts of Everglades and Biscayne NPs that would be overflown at altitudes less than 3,000 feet by aircraft arriving at or departing from former Homestead AFB.

3.8.2 Regional Air Quality

This section presents air quality conditions in the ROI and compares them to the federal, state, and local air quality standards.

3.8.2.1 Existing Environment

Regional Climate

A brief summary of the regional climate is presented because of the influence of meteorology on air quality. The area surrounding former Homestead AFB is classified as having a subtropical maritime climate. The climate is dominated by the region's proximity to the warm waters of the Atlantic Ocean and the Gulf of Mexico. These water bodies are a major source of water vapor, particularly when the water is warm during the summer, resulting in high precipitation and high relative humidity. The proximity of the ocean also provides a stabilizing and moderating influence on temperatures in the region.

There are essentially two seasons in the region: a summer wet season from May through October, in which approximately 75 percent of the annual precipitation falls, and a winter dry season from November through April. Total annual rainfall is approximately 56 inches, with average monthly totals of 7.0 inches during the summer and 2.3 inches during the winter. Measurable precipitation with thunderstorms occurs about one out of every two days in the summer.

On an annual basis, prevailing winds in the area are primarily from the east and southeast, as shown on the wind rose for the area (**Figure 3.8-2**). A wind rose is a figure that depicts wind speeds and wind direction frequencies by compass direction. Although the prevailing winds are primarily easterly on an annual basis (wind directions are traditionally given as the direction from which the wind is blowing), they vary significantly throughout the year. Between December and February, the prevailing winds are from the northwest; between March and August, winds are predominantly from the southeast; and between September and November, prevailing winds are easterly.

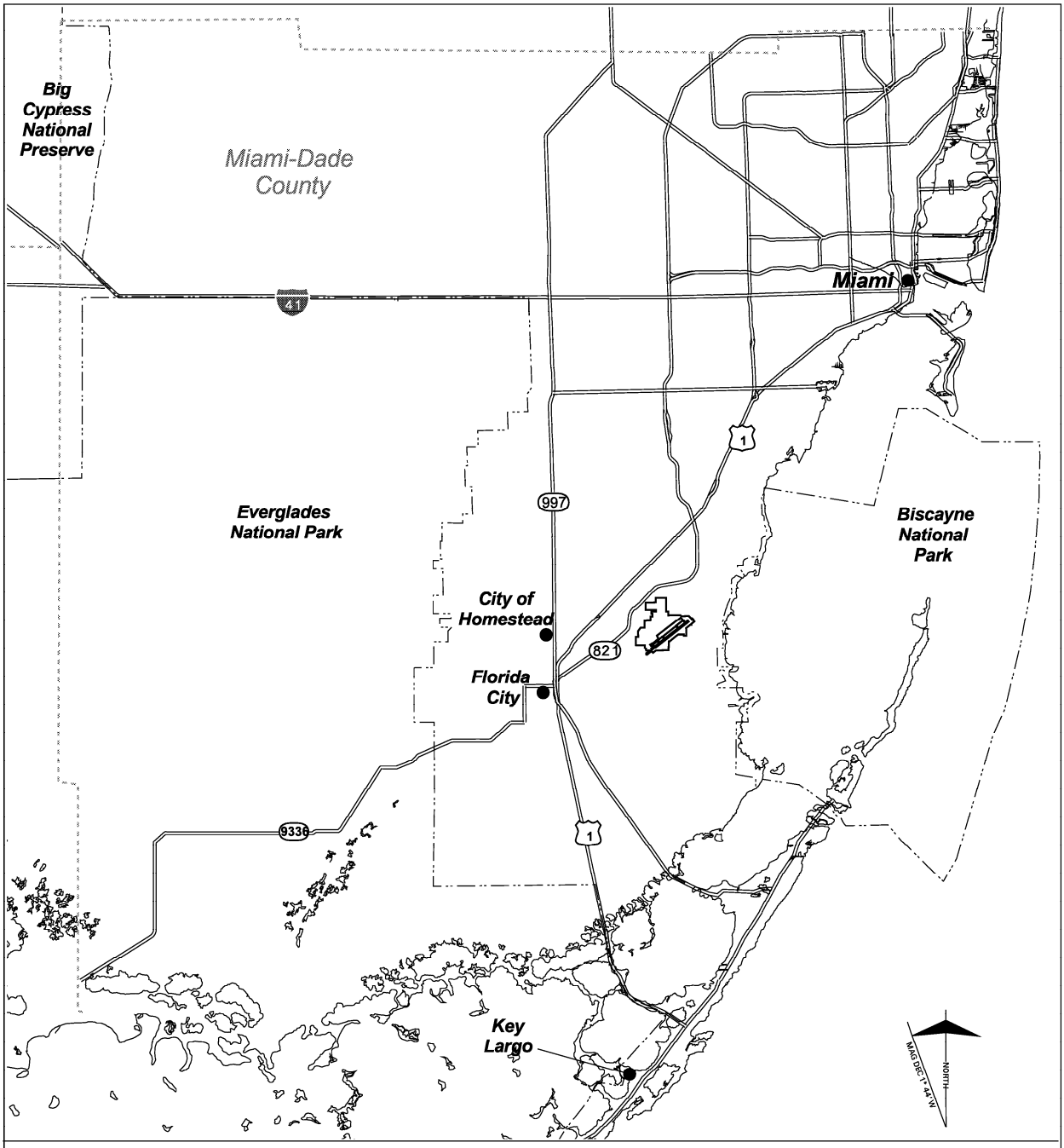
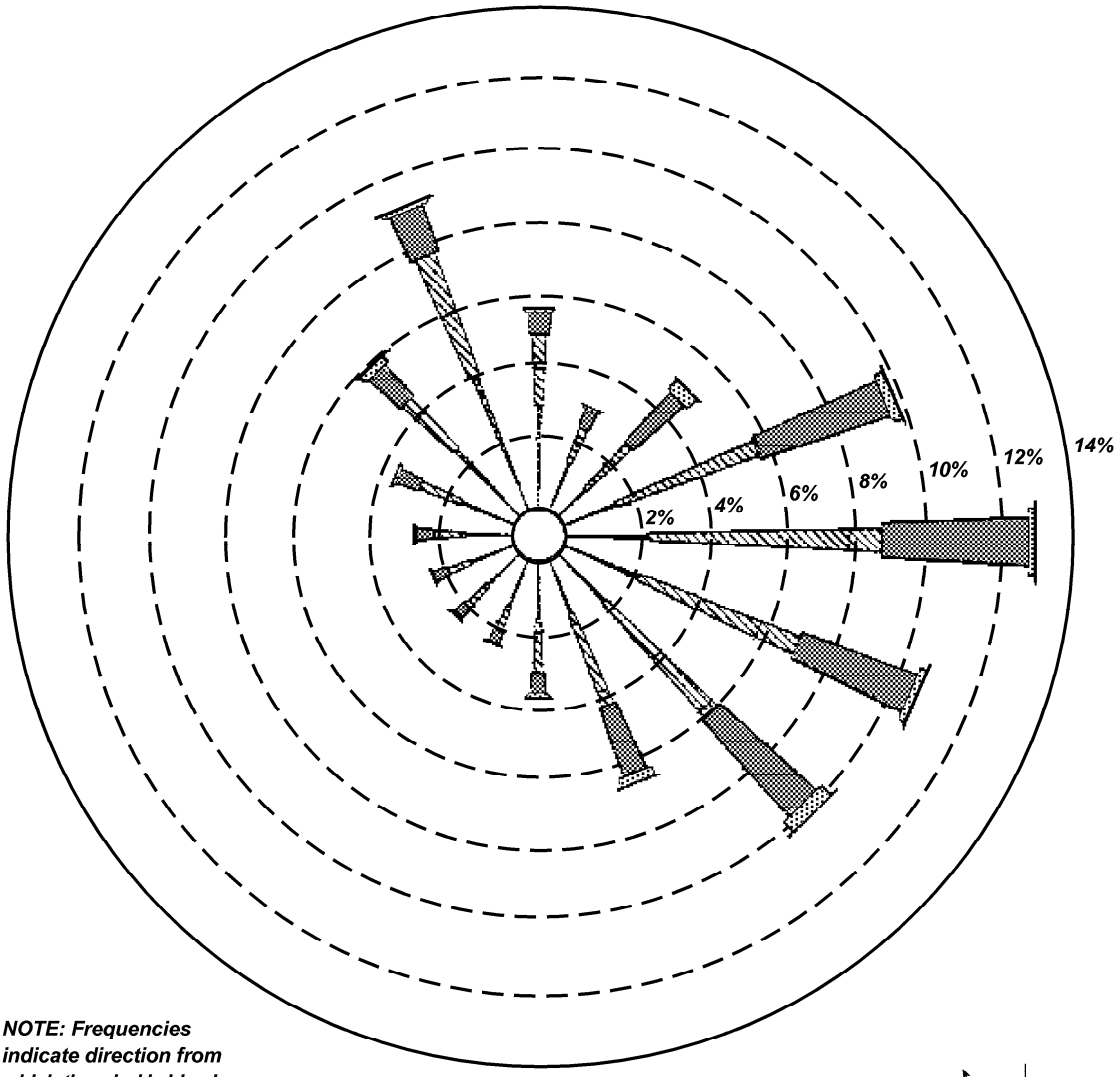


Figure 3.8-1
Region of Influence for Air Quality



Source: USAF 1994a

Figure 3.8-2
Wind Rose for
Former Homestead AFB Area

Temperatures in the region are warm, but are moderated by the maritime influence of the Atlantic Ocean and Gulf of Mexico. Summer temperatures at Homestead AFB averaged 78 to 83ºF, and winter temperatures average 67 to 75ºF (**USAF 1990a**). Extreme temperatures are rare in the area; in over 50 years of record at the National Weather Service station at Miami International Airport, the temperature has ranged from 30 to 98ºF.

Attainment Status

In general, air quality conditions in Miami-Dade County are good, and the county is currently designated as in attainment for all NAAQS (CO, NO_2, SO_2, PM_{10}, O_3, and lead). Miami-Dade County was reclassified in 1995 from an ozone nonattainment area to an ozone maintenance area.

As part of that reclassification process, Florida and Miami-Dade County developed an air quality maintenance plan that has become part of Florida's SIP. The maintenance plan includes individual emission "budgets" for ozone precursors (VOC and NO_x). Compliance with the ozone maintenance plan is determined on a county-by-county basis in southeastern Florida. USEPA will be classifying areas with respect to the new ozone and $PM_{2.5}$ NAAQS as monitoring data are collected and evaluated.

Air Quality Measurements

Miami-Dade County DERM operated a total of 19 monitors at 15 sites in 1991. The locations of the monitors are presented in **Figure 3.8-3**. As the figure shows, the monitors are sited at various locations to obtain representative air quality measurements in Miami-Dade County. The data collected between 1988 and 1991 are summarized in **Table 3.8-3**. The table shows that official exceedances of NAAQS were recorded for only one pollutant (ozone) during two of the four years (1988 and 1990). Further, the data show that Miami-Dade County was in compliance with all of the NAAQS during this period, including ozone[1]. Between 1989 and 1991, only one exceedance of the ozone standard was measured.

Recent air quality data (1995–1997) are summarized in **Table 3.8-4**. Miami-Dade County was in attainment for all NAAQS between 1995 and 1997. There were no exceedances of the ozone standard in those years.

There is also an air quality monitoring site in Everglades NP, which is shown on Figure 3.8-3. It does not collect the same type of data as the DERM sites. Certain information on ozone exposure was collected at the site between 1988 and 1991. The site primarily collects data on acid deposition. Data collected at the site on atmospheric deposition of nitrates are discussed in Section 3.8.4.

3.8.2.2 Projected Baseline Environment

Ambient air quality is expected to decline with the population growth forecast for the future. Air emissions, discussed in the following section, provide the most realistic projections of expected air quality through 2015.

[1] The ozone standard is met when there are no more than three exceedances of the ozone standard at a specific site over a consecutive 3 year period.

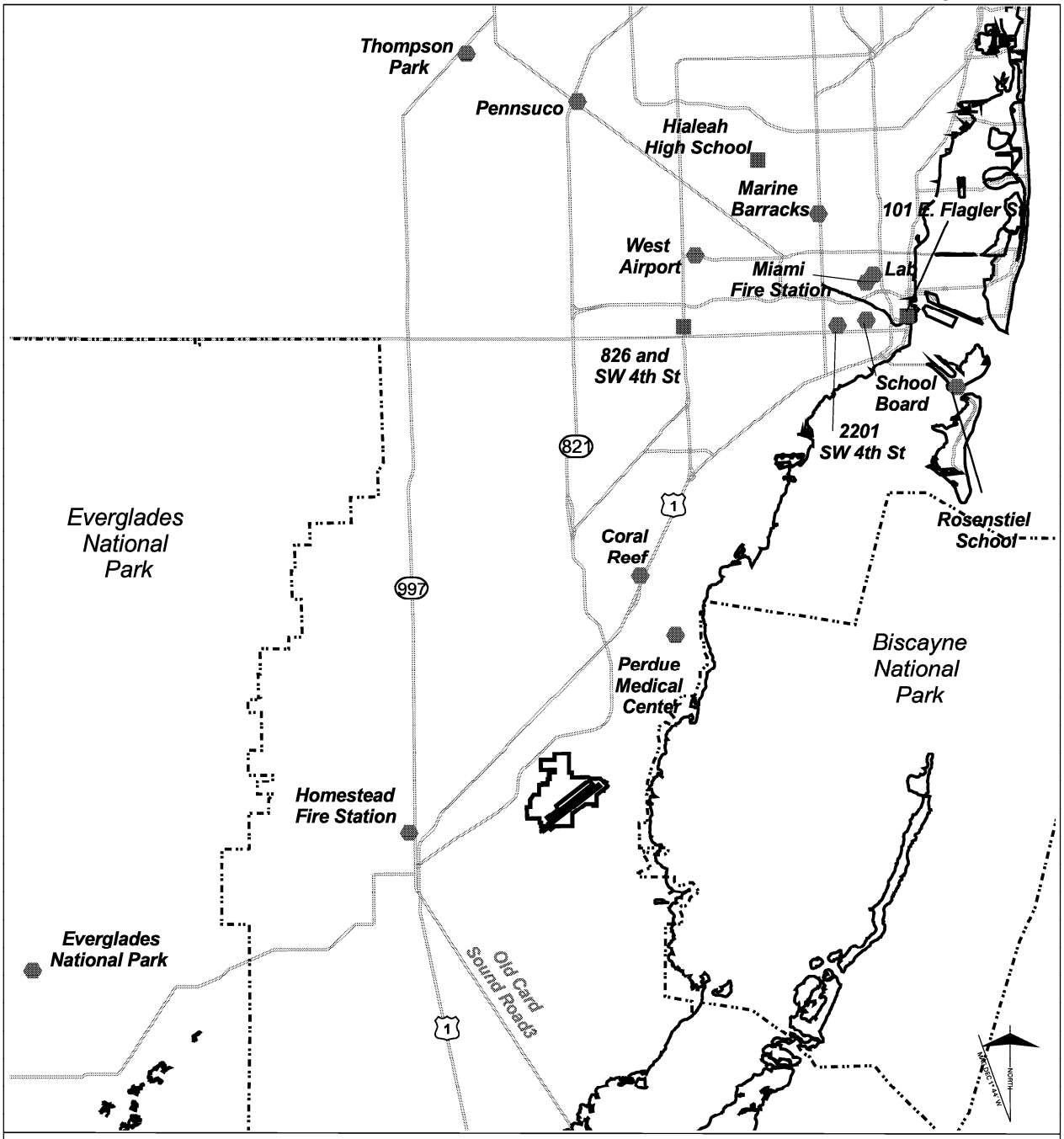


Figure 3.8-3
Ambient Air Quality Monitoring Network

Table 3.8-3. Ambient Air Quality in Miami-Dade County, 1988–1991

Pollutant	NAAQS	Florida Standards	Miami-Dade Standards	1988	1989	1990	1991
SO_2 Average annual reading	0.003 ppm[a] (80 µg/m^3)	0.02 ppm[a] (60 µg/m^3)	0.007 ppm[a] (25 µg/m^3)	0.0003 ppm	—[b]	0.00033 ppm	0.00089 ppm
CO Maximum 8 hour average	9 ppm[c] (10,000 µg/m^3)	9 ppm[c] (10,000 µg/m^3)	9 ppm[c] (10,000 µg/m^3)	9.0 ppm[d]	9.4 ppm[d]	9.3 ppm[d]	8.8 ppm
O_3 Number of days exceeding standard[g]	0.12 ppm (235 µg/m^3)	0.12 ppm (235 µg/m^3)	0.12 ppm (235 µg/m^3)	2	0	1	0
NO_2 Average annual reading	0.053 ppm[e] (100 µg/m^3)	0.053 ppm[a] (100 µg/m^3)	0.053 ppm[a] (100 µg/m^3)	0.0167 ppm	0.0178 ppm	0.0161 ppm	0.0150 ppm
Pb Maximum concentration Highest quarterly average	1.5 µg/m^3 [e]	1.5 µg/m^3 [e]	1.5 µg/m^3 [e]	0.1 µg/m^3	0.1 µg/m^3	0.00 µg/m^3	0.09 µg/m^3 0.00 µg/m^3
PM_{10} Annual arithmetic mean Maximum daily reading	50 µg/m^3 [a] 150 µg/m^3 [f]	50 µg/m^3 [a] 150 µg/m^3 [f]	50 µg/m^3 [a] 150 µg/m^3 [f]	32.1 µg/m^3 66 µg/m^3	30.3 µg/m^3 49 µg/m^3	30.6 µg/m^3 58 µg/m^3	29 µg/m^3 65 µg/m^3

Source: **USAF 1994a**.

Notes:
[a] Annual arithmetic average.
[b] Monitoring site not operational pending Florida Department of Environmental Protection decision.
[c] 8 hour arithmetic mean.
[d] Although 9.0 ppm is the official exceedance value, until a value equals or exceeds 9.5 ppm, it is not considered an official exceedance.
[e] Quarterly arithmetic mean.
[f] 24 hour arithmetic average.
[g] Number of days with exceedances greater than 0.124 ppm.

µg/m^3 micrograms per cubic meter
NAAQS National Ambient Air Quality Standards
ppm parts per million

Table 3.8-4. Ambient Air Quality in Miami-Dade County, 1995–1997

Pollutant	NAAQS	Florida Standards	Miami-Dade Standards	1995	1996	1997
SO_2						
Average annual reading	0.003 ppm[a] (80 µg/m^3)	0.02 ppm[a] (60 µg/m^3)	0.007 ppm[a] (25 µg/m^3)	0.0016 ppm	0.00099 ppm	0.00107 ppm
CO						
Maximum 8 hour average	9 ppm[b] (10,000 µg/m^3)	9 ppm[b] (10,000 µg/m^3)	9 ppm[b] (10,000 µg/m^3)	7.0 ppm	8.7 ppm	4.4 ppm
O_3						
Maximum annual reading	0.12 ppm (235 µg/m^3)	0.12 ppm (235 µg/m^3)	0.12 ppm (235 µg/m^3)	0.111 ppm	0.123 ppm	0.117 ppm
Number of days exceeding standard[c]				0	0	0
NO_2						
Average annual reading	0.053 ppm[d] (100 µg/m^3)	0.053 ppm[a] (100 µg/m^3)	0.053 ppm[a] 100 µg/m^3)	0.015 ppm	0.016 ppm	0.016 ppm
Pb						
Highest quarterly average	1.5 µg/m^3 [d]	1.5 µg/m^3 [d]	1.5 µg/m^3 [d]	0.0 µg/m^3	0.0 µg/m^3	[e]
PM_{10}						
Annual arithmetic mean	50 µg/m^3 [a]	50 µg/m^3 [a]	50 µg/m^3 [a]	29.1 µg/m^3	28.4 µg/m^3	26.2 µg/m^3
Maximum daily reading	150 µg/m^3 [f]	150 µg/m^3 [f]	150 µg/m^3 [f]	86 µg/m^3	88 µg/m^3	71 µg/m^3

Source: **Dade County 1996, 1997, 1998.**

Notes:
[a] Annual arithmetic average.
[b] 8 hour arithmetic mean.
[c] Number of days with exceedances greater than 0.124 ppm.
[d] Quarterly arithmetic mean.
[e] Lead monitoring sites were closed on October 31, 1996.
[f] 24 hour arithmetic average.

µg/m^3 micrograms per cubic meter
NAAQS National Ambient Air Quality Standards
ppm parts per million

3.8.3 Air Emissions

Available data on air emissions are generally limited to criteria pollutants that have NAAQS. This section focuses on those pollutants. NPS has expressed concern about the generation of polycyclic aromatic hydrocarbons, and these compounds are also discussed in this section.

3.8.3.1 Existing Environment

Criteria Pollutants

FDEP developed a 1990 emissions inventory for Miami-Dade County as part of the air quality maintenance plan for Southeast Florida in the Florida SIP (**Table 3.8-5**). This emissions inventory is closest in time to the 1988 emissions inventory for Homestead AFB (**Table 3.8-6**). The air quality focus in Miami-Dade County has largely been on ozone (since the county was classified as nonattainment for ozone until 1995); therefore, the emissions inventory presented in Table 3.8-5 is only available for VOCs and NO_x emissions.

Table 3.8-5. Air Emissions Inventory for Miami-Dade County, 1990

Emissions Source	VOC (tons/year)	NO_x (tons/year)
Stationary Point	5,198	17,250
Stationary Area	57,889	2,179
Non-Road Mobile	23,758	17,491
Biogenic[1]	56,535	0
On-Road Mobile	57,159	42,961
Total Emissions	**200,539**	**79,881**

Source: Florida Title 62, Chapter 62-204.
Note: [1] Biogenic emissions are emissions from natural sources.

Table 3.8-5 shows that there are three source groups that contribute most of the VOC emissions in Miami-Dade County in nearly equal amounts: stationary area sources, on-road mobile sources, and biogenic sources. The majority of the NO_x emissions are due to on-road mobile sources.

Table 3.8-6. Air Emissions Inventory for Homestead AFB, 1988

Emissions Source	VOC (tons/year)	NO_x (tons/year)	CO (tons/year)	SO_2 (tons/year)	PM_{10} (tons/year)
Stationary Sources	150	58	29	4	7
Mobile sources	332	580	1,489	58	55
Total Emissions	**482**	**638**	**1,518**	**62**	**62**

Source: **USAF 1994a**.

A comparison of the emissions from Homestead AFB (1988) and Miami-Dade County (1990) shows that Homestead AFB contributed less than 1 percent of the VOC and NO_x emissions in Miami-Dade County in the late 1980s and early 1990s. This inventory shows that the overall level of air emissions from

Homestead AFB were low, and that mobile sources contributed most of the VOC, NO_x, and CO emissions.

FDEP has also calculated the 1997 emissions inventory for Miami-Dade County in the Florida SIP. This emissions inventory again focused on VOC and NO_x emissions. The 1997 emissions inventory for Miami-Dade County, derived from the Florida SIP, is presented in **Table 3.8-7**.

Table 3.8-7. Air Emissions Inventory and Emission Budgets for Miami-Dade County, 1997

Emissions Source	VOC (tons/year)	NO_x (tons/year)
Stationary Point	4,077	11,669
Stationary Area	40,515	2,292
Non-Road Mobile	25,543	18,575
Biogenic	56,535	0
On-Road Mobile	32,445	39,059
Total Emissions	**159,115**	**71,595**
***On-Road Mobile Emissions Budget*[1]**	***54,301***	***40,814***

Source: Florida Title 62, Chapter 62-204.
Note: [1] Applies to on-road mobile emissions only.

Two elements have been added to the 1997 emissions inventory in Table 3.8-7: "Motor Vehicles Emissions Budget" and "Total with Motor Vehicles Emissions Budget." The motor vehicles emissions budget is the emissions cap on VOC and NO_x emissions in Miami-Dade County, set at 95 percent of the 1990 VOC and NO_x on-road mobile emissions in the county. This emissions budget was developed as part of the redesignation of Miami-Dade County to an ozone maintenance area. The approach taken to ensure that Miami-Dade County would continue to meet the ozone NAAQS was to limit future VOC and NO_x emissions to the 1990 level (when there were no ozone violations), with a further 5 percent reduction as a safety factor.

The reason that emission budgets were assigned to motor vehicle emissions was twofold. First, motor vehicles contribute a significant part of the VOC and NO_x emissions in Miami-Dade County (more than 50 percent for NO_x, as shown in Table 3.8-7). Second, they are the source with the greatest potential for future emissions growth, due to increased population, increased number of vehicles, and increased vehicle miles traveled. Table 3.8-7 also provides a budget for total emissions, but the control emphasis is on the motor vehicles emission budget.

The 1997 on-road mobile VOC emissions dropped by 43 percent from the 1990 level and were well below the motor vehicle emissions budget for VOCs shown in Table 3.8-7. However, the 1997 on-road mobile NO_x emissions decreased from 1990 levels by only 9 percent, and because of the 5 percent safety factor, were only slightly below the corresponding NO_x motor vehicles emissions budget.

The basic problem in reducing the total emissions from motor vehicles is that the reduction in emissions per mile from cleaner-running individual vehicles is at least partly offset by an increase in total vehicle miles traveled in the area. Motor vehicle emission control systems have made significant gains during the 1990s in controlling VOC emissions but have made less progress in controlling NO_x emissions.

A 1997 air emissions inventory developed for Homestead ARS (**AFRC 1998a**) is summarized in **Table 3.8-8.** The mobile sources emissions for this inventory are based on an analysis of aircraft operation plus other mobile emissions determined by the ratio of aircraft emissions to other mobile sources emissions derived from 1988 emission inventory at Homestead AFB.

Table 3.8-8. Air Emissions Inventory for Homestead ARS, 1997

Emissions Source	VOC (tons/year)	NO_x (tons/year)	CO (tons/year)	SO_2 (tons/year)	PM_{10} (tons/year)
Stationary Sources	4	11	11	4	4
Mobile Sources	47	135	358	7	4
Total Emissions	**51**	**146**	**369**	**11**	**8**

Source: **AFRC 1998a**.

Air emissions from stationary sources at Homestead ARS decreased between 1988 and 1997 due to the closure of Homestead AFB and reduction in military aircraft operations. Homestead ARS contributed an extremely small part of the air emissions in Miami-Dade County during 1997.

Polycyclic Aromatic Hydrocarbons

PAHs are organic compounds that are contained in certain petroleum products and are generated by the combustion of petroleum products. They occur in airborne emissions as very small particles from mobile sources (aircraft, automobiles, and trucks) and industrial processes that use petroleum products as fuels. Even though they are toxic to biota at very low concentrations, there is little quantitative information about their generation rates by vehicles and their dispersal, especially in atmospheric environments.

It is reasonable to assume that operations at former Homestead AFB over a number of years has contributed to the deposition of PAHs on nearby soils and in drainage canals. While the source of these materials may include base operations, the relative contribution of various sources of PAHs to concentrations in soils and sediments is not known.

3.8.3.2 Projected Baseline Environment

FDEP has projected emissions rates for 2000, 2005, and 2015 (motor vehicles only). These emissions projections are presented in **Table 3.8-9**. Table 3.8-9 shows that the projected mobile source emissions of VOCs in 2000, 2005, and 2015 are well below the emissions budget (approximately 28,000 tons/year compared to a budget of 54,000 tons/year). However, projected mobile source emissions of NO_x are relatively close to the emissions budget. This is particularly true in 2015, when the estimated emissions are projected to be less than 3,000 tons/year below the mobile source emissions budget.

These emissions are based on vehicle miles traveled, and it appears that the increases in vehicle miles traveled are more consistent with Miami-Dade County's high population growth forecasts than with the moderate growth forecasts used for estimating projected baselines in this SEIS. Therefore, the projected baseline increases in emissions are probably overstated.

Table 3.8-9. Projected Air Emissions Inventory and Emissions Budget for Miami-Dade County

Emissions Source	2000 (tons/year)		2005 (tons/year)		2015 (tons/year)	
	VOCs	NO_x	VOCs	NO_x	VOCs	NO_x
Stationary Point	2,953	11,673	3,135	11,680	NA	NA
Stationary Area	40,851	2,347	39,121	2,427	NA	NA
Non-Road Mobile	26,630	19,341	28,419	20,630	NA	NA
Biogenic	56,535	0	56,535	0	NA	NA
On-Road Mobile	28,127	39,654	27,280	37,712	30,021	37,588
Total Emissions	**155,096**	**73,015**	**154,490**	**72,449**	**NA**	**NA**
***On-Road Mobile Emissions Budget*[1]**	***54,301***	***40,814***	***54,301***	***40,814***	***54,301***	***40,814***

Source: Florida Title 62, Chapter 62-204; Florida Department of Environmental Protection.
Note: [1] Applies to on-road mobile emissions only.
NA not available

Conversations with FDEP staff (**McElveen 1998**, **Offord 1998**) indicate that there are two areas in which future NO_x emissions from mobile sources may be reduced. These areas include USEPA-mandated NO_x controls on the heavy-duty diesel engines used on trucks, scheduled for implementation in 2004, and low-sulfur gasoline, which reduces the contamination of catalytic converters in motor vehicles and allows them to control NO_x emissions more efficiently. FDEP is currently evaluating these options and their effect on future projections of NO_x emissions from mobile sources.

3.8.4 Areas of Special Concern

3.8.4.1 Existing Environment

There are two areas which have special air quality concerns near former Homestead AFB: Everglades NP, a Class I area, and Biscayne NP, a Class II area.

Everglades National Park

The nearest Class I area to former Homestead AFB is Everglades NP, the eastern boundary of which is about 10 miles west of the former base. Everglades NP was designated a Class I area in the 1977 CAA Amendments. The CAA provides additional air quality protection for Class I areas such as Everglades NP from major new stationary emission sources, as well as from existing stationary sources undergoing major modifications. One of these provisions is the Class I increments that allow only minor increases of pollutants in Class I areas from stationary sources. In addition, the CAA charges federal land managers (i.e., NPS) of Class I areas with an affirmative responsibility to protect air quality related values (AQRV) of these areas and to evaluate whether stationary sources from a proposed major emitting facility will have an adverse impact on such values. According to NPS, AQRVs are "values including visibility, flora, fauna, cultural and historical resources, odor, soil, water, and virtually all resources dependent upon and affected by air quality" (**NPS 1996a**). The NPS Organic Act requires NPS to protect resources at all NPS areas, regardless of AQRV status.

NPS has conducted an AQRV analysis for Everglades NP (**NPS 1993**). The principal AQRV concerns listed by NPS were visibility and two sensitive plant species. Two "integral vistas" (scenic views) were identified in the park (along the Main Park Road and at the Shark Valley Tower).

NPS monitors a number of air quality parameters in Everglades NP, including visibility, acid deposition, and ozone, and has defined the 90th percentile site-specific standard visual range and average ozone concentrations on a seasonal basis for the park for use in conducting a visibility analysis (**Table 3.8-10**). Those values are used to protect the most sensitive visual resources (those days with the best visibility).

Table 3.8-10. Seasonal Ozone Concentrations and Standard Visual Range for Everglades NP

Season	Ozone Concentration (ppm)	90th Percentile Standard Visual Range (km)
Winter	0.045	43
Spring	0.061	47
Summer	0.040	59
Fall	0.047	63

Source: **Florida Administration Commission 1998**.
km kilometers
ppm parts per million

NPS has preliminarily identified two plants in the park reported to be sensitive to specific air pollutants: South Florida Slash Pine (sensitive to SO_2) and Carolina Ash (sensitive to O_3). In addition to the direct effects on AQRVs, NPS is concerned about potential indirect effects on plants and animals due to pollution, such as habitat alteration and changes in food supply.

NPS operates a National Atmospheric Deposition Program acid deposition monitoring station at Everglades NP, one of five stations in the state of Florida. The annual average measured atmospheric deposition rate of nitrates at Everglades NP over the 1994–1998 period was 7.08 kilograms/hectare (**NADP 1998**).

Biscayne National Park

Regulatory protection of AQRVs is less for Class II areas such as Biscayne NP, which is located about 1.5 miles east of former Homestead AFB. However, NPS has identified nitrogen loading into Biscayne Bay from all sources (surface water, groundwater, and air) as an ecological concern for the park. The measurements collected by the National Atmospheric Deposition Program in Everglades NP provide an estimate of current levels of nitrate deposition rates in the area. Although there may be localized variations in deposition, these data are the best information available and are assumed to be generally representative of nitrogen deposition rates in Biscayne NP.

3.8.4.2 Projected Baseline Environment

The limit on increased air emissions in Miami-Dade County imposed by the air emissions budget (part of the ozone air maintenance plan) means that the projected baseline air quality in these areas of special concern is not expected to change significantly from current conditions.

3.9 EARTH RESOURCES

This section describes earth resources, including geology and soils.

3.9.1 Introduction

3.9.1.1 Resource Definition

Geologic resources include mineral deposits, significant landforms, tectonic features, and paleontologic remains, all of which can have scientific, historical, economic, and recreational value. Geology refers to the natural physiographic and geologic features that characterize, and are unique to, the geologic setting of southern Florida, with an emphasis on the top 200 feet of the earth's surface. Soils are the unconsolidated material and organic material at the ground surface in which plants grow.

3.9.1.2 Applicable Laws and Regulations

The following are summaries of federal and state laws and regulations that apply to earth resources.

Federal Agriculture Improvement and Reform Act of 1996 (P.L. 104-494). This act includes the Farmland Protection Program, which provides funds in some locations to purchase development rights to keep productive farmland in use. It includes the Everglades program to purchase land as a means of improving the Everglades. It also includes the Environmental Quality Incentives Program, the Conservation of Private Grazing Land Initiative, Conservation Reserve Program, Wetlands Reserve Program, and the Wildlife Habitat Incentives Program, all of which deal with conservation and erosion control.

Farmland Protection Policy Act (7 U.S.C. 73). Under this act, federal agencies are required to identify effects of federal programs on conversion of farmland to nonagricultural uses.

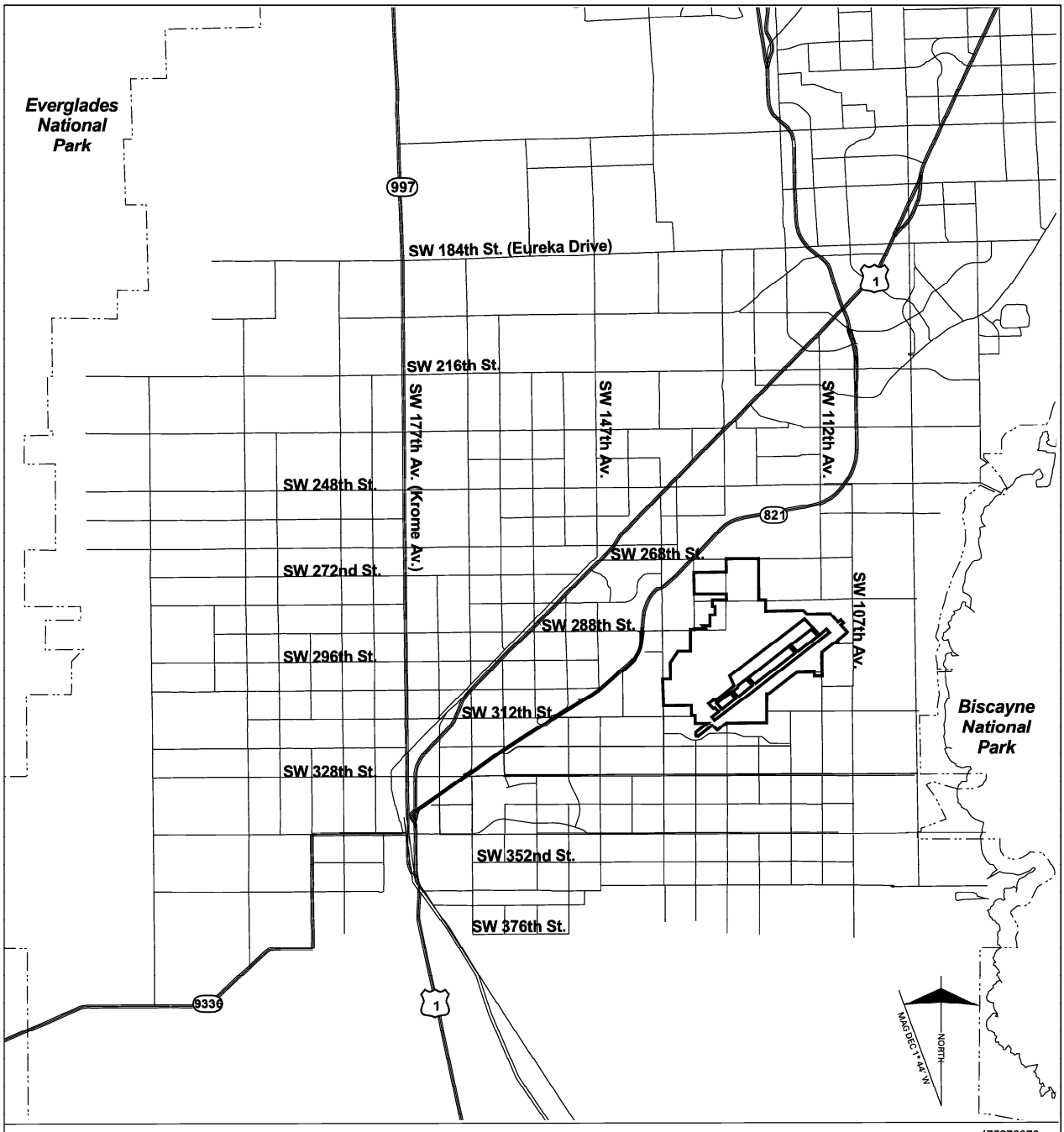
Soil Conservation Act (16 U.S.C. 3b). This act defines the policy of Congress to permanently provide for the control and prevention of soil erosion, thus preserving natural resources.

Mineral Lands and Mining (30 U.S.C.). This statute provides criteria for regulation and protection of mineral resources.

Part IV of Chapter 40E-1, Florida Administrative Code (FAC) covers Environmental Resource Permits as part of the Rules of the South Florida Water Management District. This regulation governs activities that have the potential to be detrimental to drainage, flood control, water conservation, erosion control, soil conservation, or fish and wildlife habitat preservation. It requires that people conducting earth disturbing activities implement measures for erosion and pollution control by using best management practices, and that all activities be conducted in a manner which does not cause violations of state water quality standards.

3.9.1.3 Region of Influence

The ROI for earth resources (**Figure 3.9-1**) includes former Homestead AFB and the surrounding lands that may be affected by the disposal and subsequent reuse of former Homestead AFB property, including secondary development. The ROI for geology and soils encompasses south Miami-Dade County, from Eureka Drive south to SW 376th Street, west to SW 177th Avenue, and east to Biscayne National Park.



LEGEND

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

2 0 2
Scale in Miles

Source: SAIC

Figure 3.9-1
Region of Influence
for Earth Resources

3.9.2 Geology

3.9.2.1 Existing Environment

The ROI is located in the southern extension of the Atlantic Coastal Ridge (Miami Ridge) physiographic province. The Miami Ridge is bounded to the west by the Everglades Trough physiographic province and to the south and east by the Southern Slope physiographic province. The Silver Bluff Scarp, a wave-cut cliff directly east of the former base, has formed along the southeast edge of the ridge during periods of higher sea levels (**USDA 1996**).

Cycles of sediment deposition and erosion occurred in Florida in response to sea-level changes throughout the Cenozoic era (the last 65 million years). Florida's Cenozoic-aged sediments were deposited in two major periods: the Paleogene and Neogene. During these two periods, carbonate sediments, mostly made up of whole or broken shells, formed in southern Florida. Up to 11,800 feet of carbonate rock underlies much of southern Florida. These deposits include very little siliciclastic sediment (quartz sands, silts, and clays). Rock-forming sediments of southern Florida are dominated by limestone and dolostone (**Florida Geological Survey 1998**).

Stratigraphy

Figure 3.9-2 displays the stratigraphic units described in this section and is generally representative of the area. The lowest relevant rock formation is the Hawthorn Group, of Miocene age, that attains a thickness of more than 900 feet. This group consists of interbedded sand, silt, clay, dolostone, and limestone. The Tamiami Formation, of late Miocene to early Pliocene age, forms the top of this group. It consists of sand and clay and forms the base of the Biscayne (shallow) Aquifer. The upper part of the group acts as a confining unit for the Floridan (deep) Aquifer (**USDA 1996**).

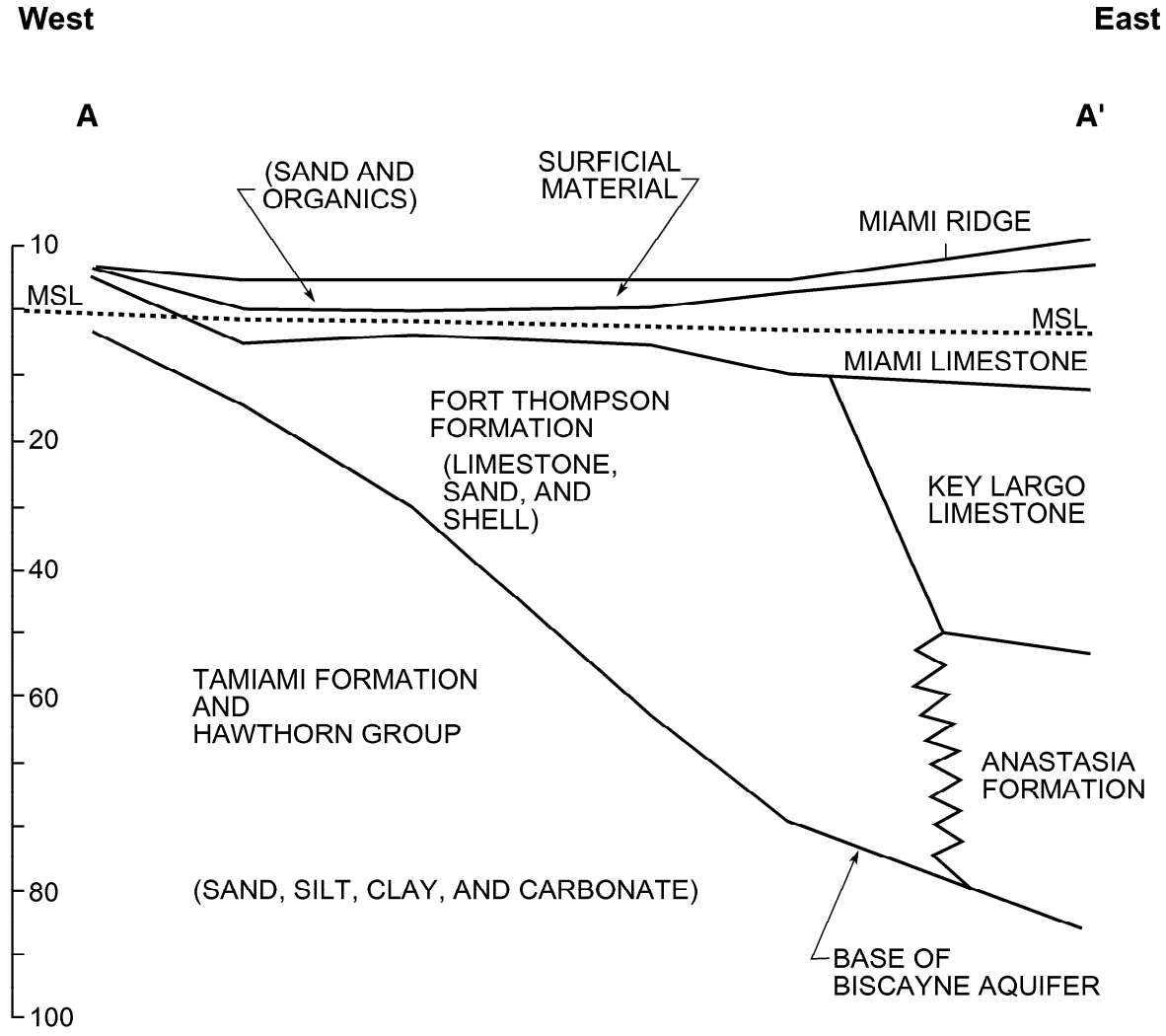
The Fort Thompson Formation, of Pleistocene age and approximately 40 to 70 feet thick, consists of interbedded limestone, sand, and shells. The Fort Thompson Formation is one of the most productive water units within the Biscayne Aquifer. To the east of the Fort Thompson Formation, along the Atlantic Coast, is the Anastasia Formation, also of Pleistocene age. This formation consists of a sandy, shelly limestone up to 120 feet thick and also forms a major part of the Biscayne Aquifer along the coastal areas (**USDA 1996**).

The Key Largo Limestone merges laterally with the Anastasia Formation. It consists of hard limestone and is derived from coral, algae, and shells, with a thickness as great as 60 feet. The Key Largo Limestone is exposed throughout the upper keys, but generally is below the surface in the vicinity of former Homestead AFB (**USDA 1996**).

Miami Limestone is the surface formation in south Miami-Dade County, generally overlain by a thin layer of soil. It is a soft, light cream to dark gray, oolitic limestone, generally less than 40 feet thick. It is of Pleistocene age and has become very porous and permeable through dissolution by recharging groundwater. The Miami Limestone is also considered a part of the Biscayne Aquifer (**USDA 1996**).

Mineral Resources

According to a recent map available from the Florida Geological Survey (**USGS 1998**), crushed stone is the primary geologic resource of economic value in the ROI. The major source is Miami limestone.



LEGEND

Formation Boundary

Mean Sea Level (MSL)

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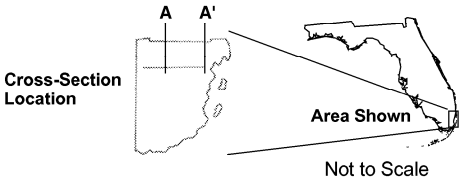


Source: USDA 1996

Figure 3.9-2
Cross Sectional Area,
South Miami-Dade County Stratigraphy

Significant Landforms

The Miami Ridge is the most significant landform in south Miami-Dade County. The ridge runs in a north-south direction parallel to the Atlantic coast. It is the highest structure in the area, with elevations of up to 10 feet above MSL.

Karst landforms are a common feature of Florida's landscape. They appear as sinkholes, caves, disappearing streams, springs, and underground drainage systems. However, based on the hydrogeologic setting of the area in and around former Homestead AFB, the potential for karst landforms is minimal. Only a few sinkholes are present in the area, and when they are present, they are generally shallow, wide, and develop slowly (**Florida Geological Survey 1998**).

Tectonic Features

The potential for seismic activity in the ROI is negligible. Based on studies published in the Florida Geological Survey (**Lane 1991**), former Homestead AFB is in an area with no reasonable expectation for seismic activity.

Paleontological Resources

The potential for paleontological resources is limited in the area around the former base. Fossil shells and shell fragments are an abundant feature associated with the limestone formations, but no significant paleontological findings have occurred in the ROI (**Rupert 1989**).

3.9.2.2 Projected Baseline Environment

Geological resources in the ROI will remain the same during the analysis periods for this SEIS.

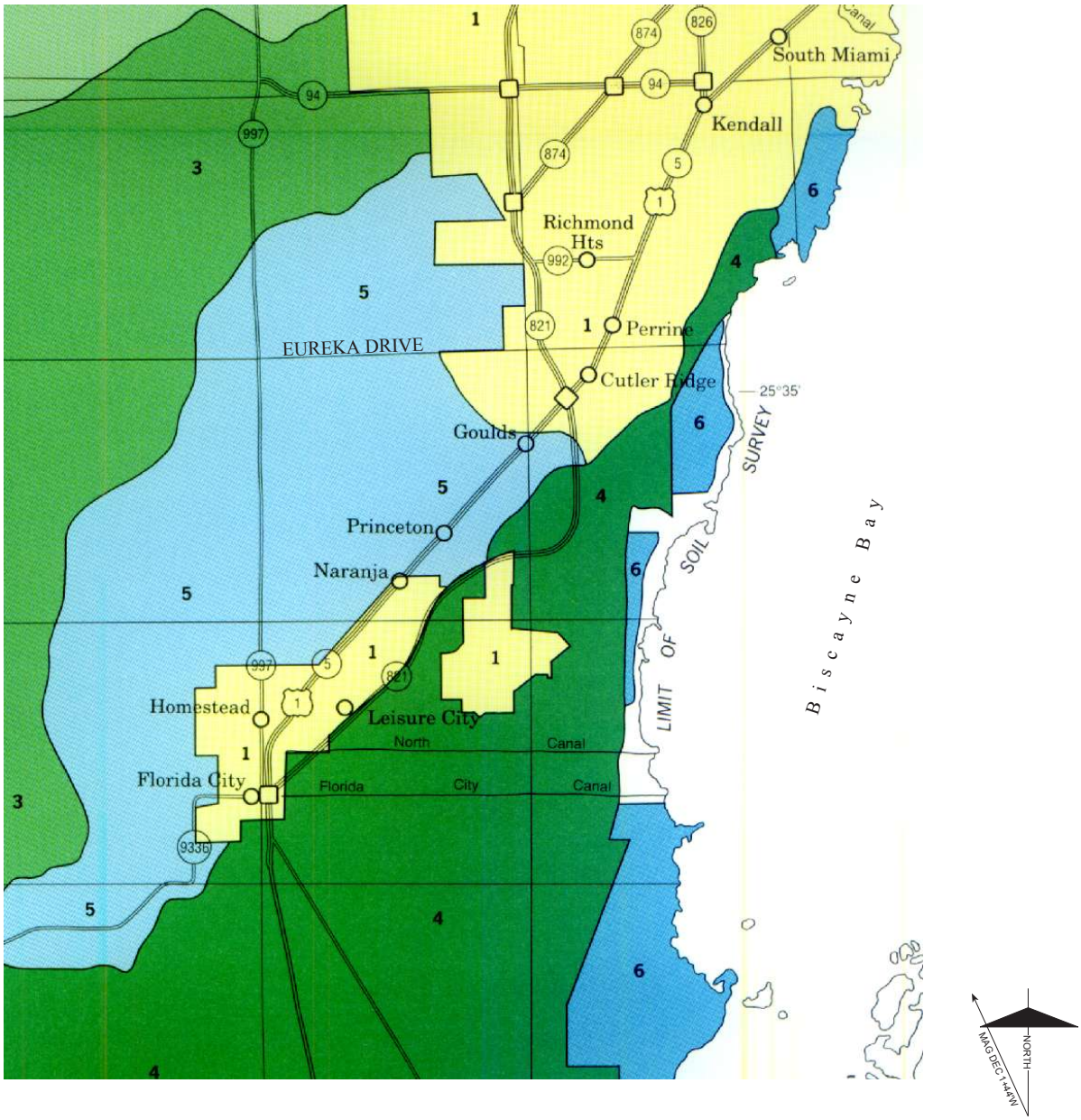
3.9.3 Soils

3.9.3.1 Existing Environment

The characteristics and distribution of soil types in the ROI affect the location of important land uses such as agriculture and urban development. There are five general soil associations in the ROI, each having distinctive patterns of soils, topography, and drainage, named for the dominant soils in the area. These soil associations, shown in **Figure 3.9-3**, can be used to compare the suitability of soils for different land uses.

Within the general soil associations, twenty-two different soil mapping units occur. **Table 3.9-1** summarizes some of the important characteristics of these soil mapping units existing within the general soil associations. **Figure 3.9-4** illustrates the detailed soil mapping units on and near former Homestead AFB.

The soil association for developed areas is Urban Land-Udorthents Association. This consists of soils that have been disturbed by construction and areas covered by streets, sidewalks, and structures that prevent classification of the underlying soils. It includes topography that ranges from nearly level to very steep, moderately well-drained to well-drained soils, often with stony fill material that is eight inches to over 80 inches thick above limestone bedrock. Soil mapping units, other than Udorthents and Urban land, that occur within this association include drained Biscayne gravelly marl and Biscayne marl, Krome very gravelly loam, and Cardsound-Rock outcrop complex (**USDA 1996**).



LEGEND

- 1 Urban Land–Udorthents Association
- 3 Rock Outcrop–Biscayne–Chekika Association
- 4 Perrine–Biscayne–Pennsuco Association
- 5 Krome Association
- 6 Perrine–Terra Ceia–Pennsuco Association

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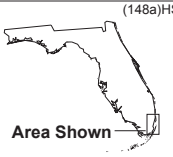


0 2 4
Scale in Miles

Source: USDA 1996

Figure 3.9-3
General Soil Map of the ROI

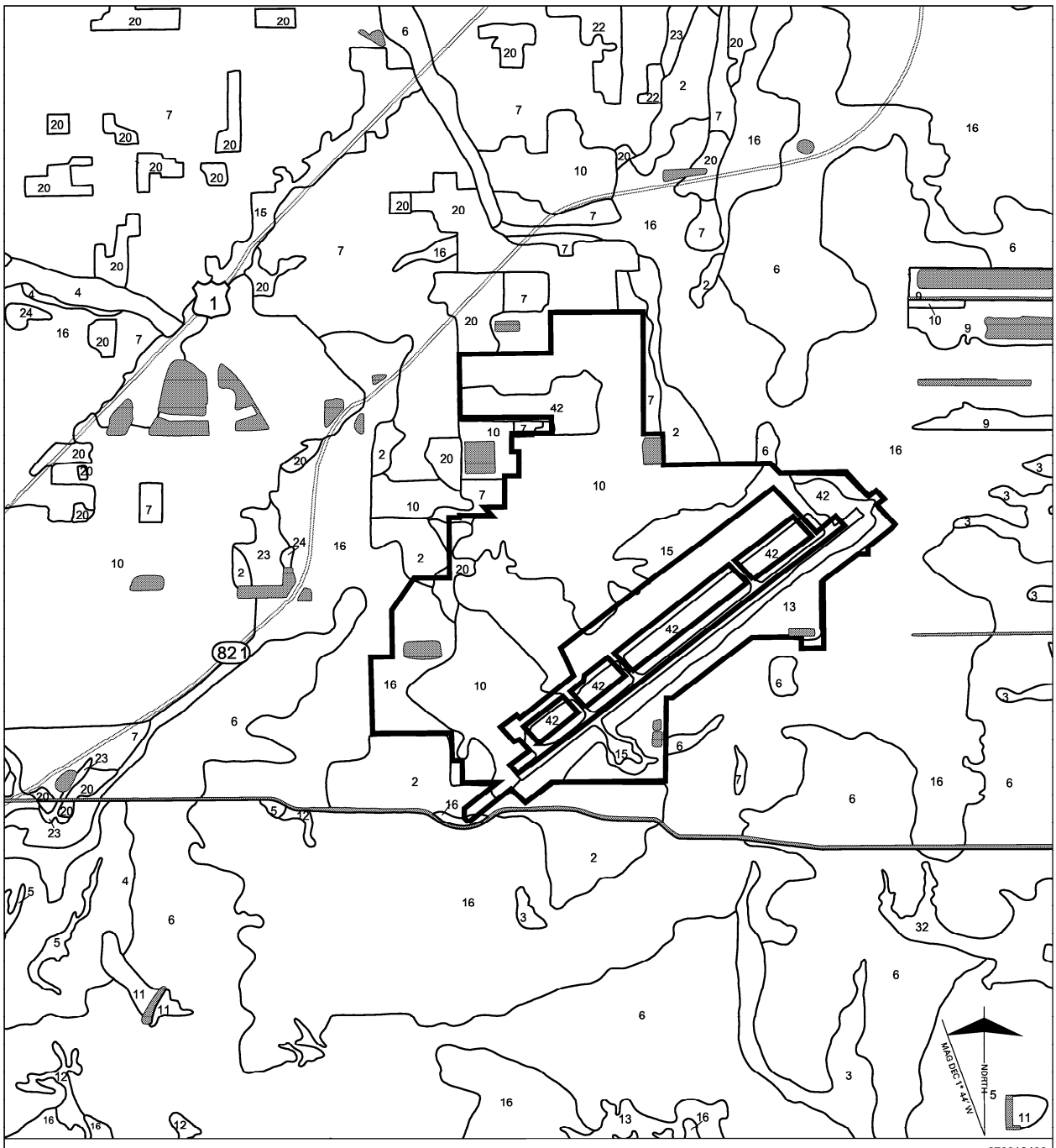
Table 3.9-1. Characteristics of Soils in the ROI

Soil Map Symbol[1]	Soil Mapping Unit	Permeability[2]	Depth to Apparent High Water Table (feet)[3]	Available Water Capacity[4]	Wind Erosion Potential[5]	Water Erosion Potential[6]	Land Capability Class[7]	Building Site Suitability[8]
2	Biscayne gravelly marl, drained	Moderate	0–1	Moderate to high	Very low	Moderate	3	Severe
3	Lauderhill muck, depressional	Rapid	+2–0	High	Very high	NA	7	Severe
4	Pennsuco marl, drained	Moderately slow	0–1	High	Moderate	Moderate	3	Severe
5	Pennsuco marl	Moderately slow	0–1	High	Moderate	Moderate	3	Severe
6	Perrine marl, drained	Moderately slow	1	High	Moderate	Moderate	3	Severe
7	Krome very gravelly loam	Moderate	4–5	Moderate	Very low	Low	5	Severe
9	Udorthents–Water complex	Moderate	NA	NA	NA	NA	NA	NA
10	Udorthents, limestone substratum–Urban land complex	Moderate	NA	NA	NA	NA	NA	NA
11	Udorthents, marl substratum–Urban land complex	Moderately slow	NA	NA	NA	NA	NA	NA
12	Perrine marl	Moderately slow	+1–1	High	Moderate	Moderate	7	Severe
13	Biscayne marl	Moderate	0–1	High	Moderate	Moderate	7	Severe
15	Urban land	NA	NA	NA	NA	NA	NA	NA
16	Biscayne marl, drained	Moderate	0–1	High	Moderate	Moderate	3	Severe
20	Cardsound-Rock outcrop complex	Moderately slow	5–6	High	Moderate	Moderate	4	Severe
22	Opalocka-Rock outcrop complex	Very Rapid	5–6	Very low	Extremely high	Low	6	Severe
23	Chekika very gravelly loam	Moderate	1–3	Moderate	Moderate	Low	3	Severe
24	Matecumbe muck	Rapid	1.5–3	High	Low	NA	7	Severe
25	Biscayne-Rock outcrop complex	Moderate	0–1	High	Moderate	Moderate	4	Severe
26	Perrine marl, tidal	Moderately slow	0–1	High	Moderate	Moderate	8	Severe
31	Pennsuco marl, tidal	Moderately slow	0–0.5	High	Moderate	Moderate	7	Severe
32	Terra Ceia muck, tidal	Rapid	0–0.5	High	Very high	NA	8	Severe
42	Udorthents, limestone substratum, 0 to 5 percent slopes	Rapid	NA	NA	NA	NA	NA	NA

Source: **USDA 1996**.

Notes:
[1] Soil Map Symbol refers to the number and soil type classification on Figure 3.9-4 and in the soil survey of Miami-Dade County Area, Florida.
[2] Rate of flow of water through saturated soil.
[3] Measured in feet from the surface to the seasonal highest level of a saturated zone in the soil in most years.
[4] Capacity of soils to hold water.
[5] Susceptibility of soils to wind erosion.
[6] Susceptibility of soils to water erosion.
[7] An indicator of the suitability of soils for use as cropland, with 1 being the most suitable and 8 having the most limitations. Classes 1 through 5 can be used for crop production with increasing limitations to overcome.
[8] Indicates the limitations of the soil as a site for buildings, sanitary facilities, and roads.

NA Data not available or not applicable



LEGEND

Soil Types
2 Biscayne gravelly marl, drained
3 Lauderhill muck, depressional
4 Pennsuco marl, drained
5 Pennsuco marl
6 Perrine marl, drained
7 Krome very gravelly loam
9 Udorthents-water complex
10 Udorthents, limestone substratum-urban land complex
11 Udorthents, marl substratum-urban land complex
12 Perrine marl
13 Biscayne marl
15 Urban land
16 Biscayne marl, drained
20 Cardsound silty clay loam-rock outcrop complex
22 Opalocka sand-rock outcrop complex
23 Chekika very gravelly loam
32 Terra Ceia muck, tidal
42 Udorthents, limestone substratum, 2 to 5 % slopes

Former Homestead AFB
Water
U.S. Highway
State Highway

0.5 0 0.5
Scale in Miles

Derived from:
SFWMD n.d.

Figure 3.9-4
Soils Distribution in the
Vicinity of Former Homestead AFB

North of the former base is the Krome Association, consisting of nearly level and gently sloping, moderately well-drained loamy soils. These soils are gravelly and very shallow, only 3 to 9 inches thick over limestone bedrock. There are solution cavities in the rock underlying this association, which consists of drained Biscayne gravelly marl, drained Biscayne marl, Biscayne marl-Rock outcrop complex, Cardsound-Rock outcrop complex, Chekika very gravelly loam, Krome very gravelly loam, Matecumbe muck, Opalocka sand-Rock outcrop complex, drained Pennsuco marl, drained Perrine marl, Udorthents, limestone substratum-Urban land complex, and Urban land. The majority of agricultural land in the ROI occurs in this association. Most of the vegetables and fruit trees are grown on Krome and Chekika soils. Potatoes, sweet corn and malanga are grown on Biscayne, Perrine, and Pennsuco soils (**USDA 1996**).

The Perrine-Biscayne-Pennsuco Association is located in an area primarily south of Route 821, on the low coastal plains south and southeast of former Homestead AFB. It consists of soils that are nearly level, poorly drained marls, which formed from unconsolidated fine-grained particles of calcium carbonate deposited in marine or fresh water. The soil depth ranges from very shallow to deep. There are several hydric soils within this association. Soil mapping units within this association include Biscayne marl, drained and undrained, Cardsound-Rock outcrop complex, depressional Lauderhill muck, Matecumbe muck, drained and undrained Pennsuco marl, drained and undrained Perrine marl, tidal Terra Ceia muck, and limestone substratum-Urban land complex Udorthents (**USDA 1996**). The agricultural land adjacent to former base occurs in this association.

In the mangrove swamps in the southeastern part of the ROI is the Perrine-Terra Ceia-Pennsuco Association. The soils are nearly level and poorly to very poorly drained. They are either marl that is 40 to 80 inches deep over limestone or organic material that is over 50 inches thick. Many of these soils are inundated by salt water during high tide, and most are hydric (**USDA 1996**). The soil mapping units within this association include depressional Lauderhill muck, Matecumbe muck, Pennsuco marl, tidal Pennsuco marl, tidal Perrine marl, and tidal Terra Ceia muck (**USDA 1996**).

Permeability as shown in Table 3.9-1 is a measure of the rate water moves through saturated soil and is an indicator of soil drainage and the potential for movement of soluble chemicals through the soil profile. Available water capacity is an estimate of how much water a soil can hold and release for plants. Depth to apparent high water table is the depth in feet to the seasonal highest level of a saturated zone in the soil in most years. Water and wind erosion potential ratings indicate how susceptible bare soil is to erosion caused by wind and surface water. Land capability class is an indicator, in a general way, of the suitability of soils for use as cropland. The ratings range from 1 to 8, with 1 identifying soils with few limitations that restrict agricultural use, 2 indicating moderate limitations, 3 indicating severe limitations that reduce the choices of crops, 4 identifying the most severe limitations for crops and also the need for additional management, and 5 indicating limitations that are impractical to overcome in most cases. Land capability classes 6 through 8 are unsuitable for cultivation. The ratings for building site suitability provide guidance on how difficult it is to overcome limitations for construction of buildings, utilities, and roads.

The Urban land soil mapping unit is used to describe areas that have been covered by pavements and structures. They also include lawns, vacant lots, and parks where the native soil has been replaced or disturbed. The natural soil types in these areas cannot be identified. Typically these lands are level, moderately permeable, and consist of fill material up to 55 inches thick. The fill material generally improves the suitability of these areas as building sites (**USDA 1996**).

Soils at former Homestead AFB consist primarily of Urban land with small amounts of Biscayne marls located on the south and east portions of the base. Much of the natural soil types have been altered or covered by fill for buildings, streets, parking lots, and the runway. Figure 3.9-4 displays soil type classifications on the former base. **Table 3.9-2** summarizes the distribution of the predominant soil type classifications.

Table 3.9-2. Distribution of Soil Mapping Units on Former Homestead AFB

Soil Map Symbol[1]	Soil Mapping Unit	Percentage of Land Surface[2]
2	Biscayne gravelly marl, drained	0.82
7	Krome very gravelly loam	0.14
10	Udorthents, limestone substratum, Urban land complex	39.45
13	Biscayne marl	7.91
15	Urban land	24.27
16	Biscayne marl, drained	7.97
20	Cardsound-Rock outcrop complex	1.17
42	Udorthents, limestone substratum, 0 to 5 percent slopes	17.25
99	Water	1.02

Source: **USDA 1996**.
Notes: [1] Soil map symbol and soil mapping unit refer to the information on Figure 3.9-4.
[2] Percentage of land surface is based on all acres on former Homestead AFB, including areas covered by water.

There are no areas of prime farmland or additional farmland of statewide or local importance in Miami-Dade County. All agricultural land in the ROI is identified as unique farmland (**Coffin 1999**), defined as areas with a special combination of soil quality, location, growing season, and moisture supply needed to produce sustained high quality and high value crops such as citrus, avocado, mangos, papayas, strawberries, vegetables, and sugar cane. (**Florida Cooperative Extension Service 1982**). Unique farmlands have local value for agricultural production. Loss of these soils to uses that permanently preclude crop production, such as construction of buildings, would reduce the region's value for agriculture.

3.9.3.2 Projected Baseline Environment

Population growth and development will affect soil resources in the ROI. Some of the soils now used for agriculture, mainly in the Krome Association and some in the Perrine-Biscayne-Pennsuco Association, are expected to be converted to non-agricultural uses such as roads, buildings, and parks. Krome Association soils are suitable both for agriculture and urban development. It is estimated that about 4,000 acres of the soils suitable for agriculture in the ROI could be converted to urban uses between 1995 and 2015, and it is likely that the majority of the conversion will occur within the Krome Association.

3.10 WATER RESOURCES

This section describes water resources, including surface water quantity and quality and groundwater quantity and quality.

3.10.1 Introduction

3.10.1.1 Resource Definition

Water resources comprise the water on or beneath the ground surface, including marine bays, rivers, canals, lakes, ponds, and wetlands, and water percolating, standing, or flowing beneath the ground surface.

3.10.1.2 Applicable Laws and Regulations

Following is a summary of major laws and regulations that apply to the use and management of surface water and groundwater:

Clean Water Act (CWA) (33 U.S.C. 1251 et seq.). This statute specifies permitting requirements for discharges of wastewater and stormwater to waters of the United States under the National Pollutant Discharge Elimination System (delegated to the State of Florida), and for the protection of ambient water quality. It also specifies permitting requirements for dredging and filling wetlands (Section 404), a program administered by the USACE with USEPA oversight.

Safe Drinking Water Act (42 U.S.C. 300f et seq.). This act sets forth a classification system for groundwater used for potable water supply and specifies requirements for the quality of groundwater that can be used for water supply. The implementation of the Safe Drinking Water Act is delegated to the State of Florida. The Biscayne Aquifer, which lies beneath former Homestead AFB, is the principal aquifer in southeastern Florida and is the primary source of drinking water for Miami-Dade County. This aquifer is classified as a sole-source aquifer by USEPA pursuant to Section 1425 of the Safe Drinking Water Act (44 FR 58797). Under this act, federally financially assisted projects over designated sole source aquifers are subject to USEPA review to ensure that such projects do not contaminate the aquifer so as to create a significant hazard to public health.

State of Florida Water Resource Implementation Rule (Florida Statute 373.036). This statute sets forth goals, objectives, and guidance for the development and review of programs, rules, and plans relating to water resources, based on statutory policies and directives.

Florida Statute 62-302.700(9), This Statute establishes the "Outstanding Florida Waters" program to designate waters that are of exceptional recreational or ecological significance in which water quality should be maintained and protected under all circumstances, other than temporary degradation and the lowering allowed under Section 316 of the federal Clean Water Act. Waters within Biscayne NP and Everglades NP are classified as Outstanding Florida Waters under Chapter 62-302.700(9).

Florida Administrative Code (FAC), Chapter 62-520.410. This regulation defines classes of aquifers designated for potable water use and sets standards for water quality. The Biscayne Aquifer is a Class G-1 aquifer for potable water use, with a total dissolved solids (TDS) content of less than 3,000 milligrams per liter (mg/L) under Chapter 62-520.410, FAC. However, the aquifer is designated by FDEP as a Class G-2 aquifer (i.e., for potable water use with TDS content of less than 10,000 mg/L) under Chapter 62-520.410, FAC.

3.10.1.3 Region of Influence

The ROI for water resources (**Figure 3.10-1**) is primarily composed of the area most likely affected by development associated with activities on the former base. This area encompasses the land and water resources from Eureka Drive south to SW 376th Street and from the nearshore Biscayne Bay west to the eastern boundary of Everglades NP. In addition, water areas that could be subject to atmospheric deposition from aircraft operations are examined. This includes Biscayne NP and Everglades NP and the area between them (not shown on Figure 3.10-1).

3.10.2 Surface Water

3.10.2.1 Existing Environment

The following sections describe existing surface water network and flows and water quality in the area potentially affected by development on former Homestead AFB and vicinity. FDEP has classified all water bodies within the ROI as Class III Surface Waters designated for recreation and maintenance of a healthy, well-balanced fish and wildlife population (Chapter 62-302.400, FAC).

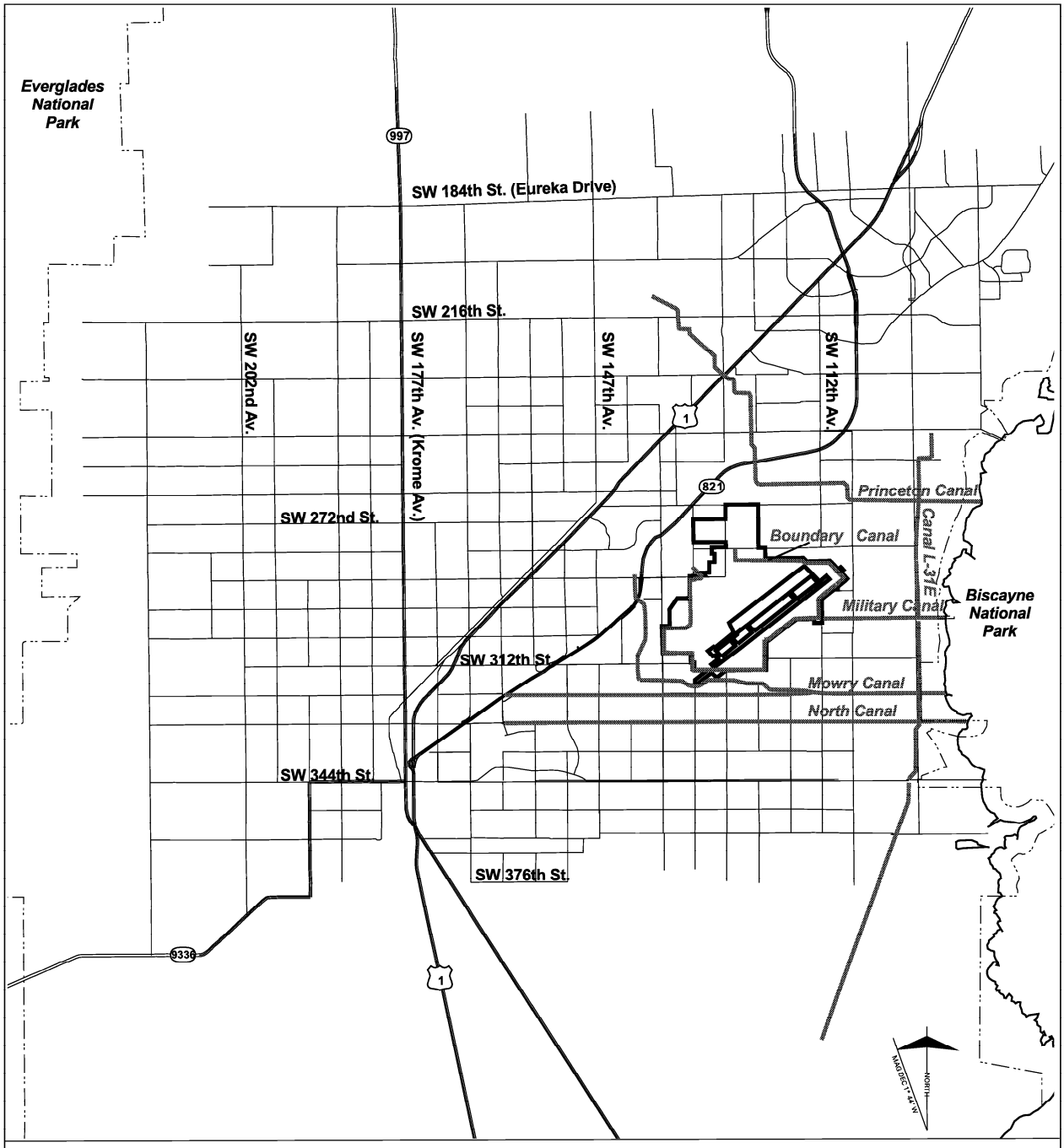
Surface Water Network and Flows

Historically, much of the surface water that flowed from the area around former Homestead AFB to Biscayne Bay was in poorly defined, small channels or overland sheet flow. Since about the 1950s, when canals were dug over most of southern Florida to promote drainage, the majority of the surface water features in the ROI are human-made. Now, much of the water that flows "to tide" (i.e., to the ocean or the bay) does so in human-made canals. With the exception of a few small sinkholes, essentially all of the lakes and ponds in the ROI are also human-made. They were created for limestone mines or borrow pits.

In general, surface water flows from areas around former Homestead AFB to either Princeton Canal or Mowry Canal and is discharged to Biscayne Bay through salinity control structures within a few hundred yards of the bay. Water flowing from the former base (with the exception of the former golf course) is collected in a series of canals, stored in a reservoir, and ultimately carried by Military Canal (also called Outfall Canal) to the bay (**Figure 3.10-2**). The following paragraphs describe the canal system that drains the ROI.

Military Canal. Military Canal runs approximately 2 miles eastward from former Homestead AFB to Biscayne Bay. The majority of its flow is derived from stormwater runoff from the former base, but some surface water drains from agricultural and unused land along the canal. There is also exchange of water in the canal with groundwater, and the extent and direction of the exchange depends on the relative heads of water in the surface and groundwater systems. The estimated average annual discharge from Military Canal to Biscayne Bay, using the Surface Water Management Model (SWMM), is 4,560 acre-feet. This represents about 1.1 percent of the freshwater input to southern Biscayne Bay (**Alleman 1995**).

Figure 3.10-2 shows the general surface drainage from former Homestead AFB. Stormwater on the base is collected by a system of 24 miles of canals, swales, ditches, and pipes. Runoff from former Homestead AFB is drained via a series of canals to Boundary Canal, which almost surrounds the former base. A 4 foot levee along the outside bank of Boundary Canal prevents most runoff from outside the property from entering the canal, but an unknown amount of runoff enters the cantonment from SW 288th Street. Flightline Canal and other drainage canals discharge water to Boundary Canal. Flightline Canal drains the runway and flows into the southwest segment of Boundary Canal. The Boundary Canal system



LEGEND

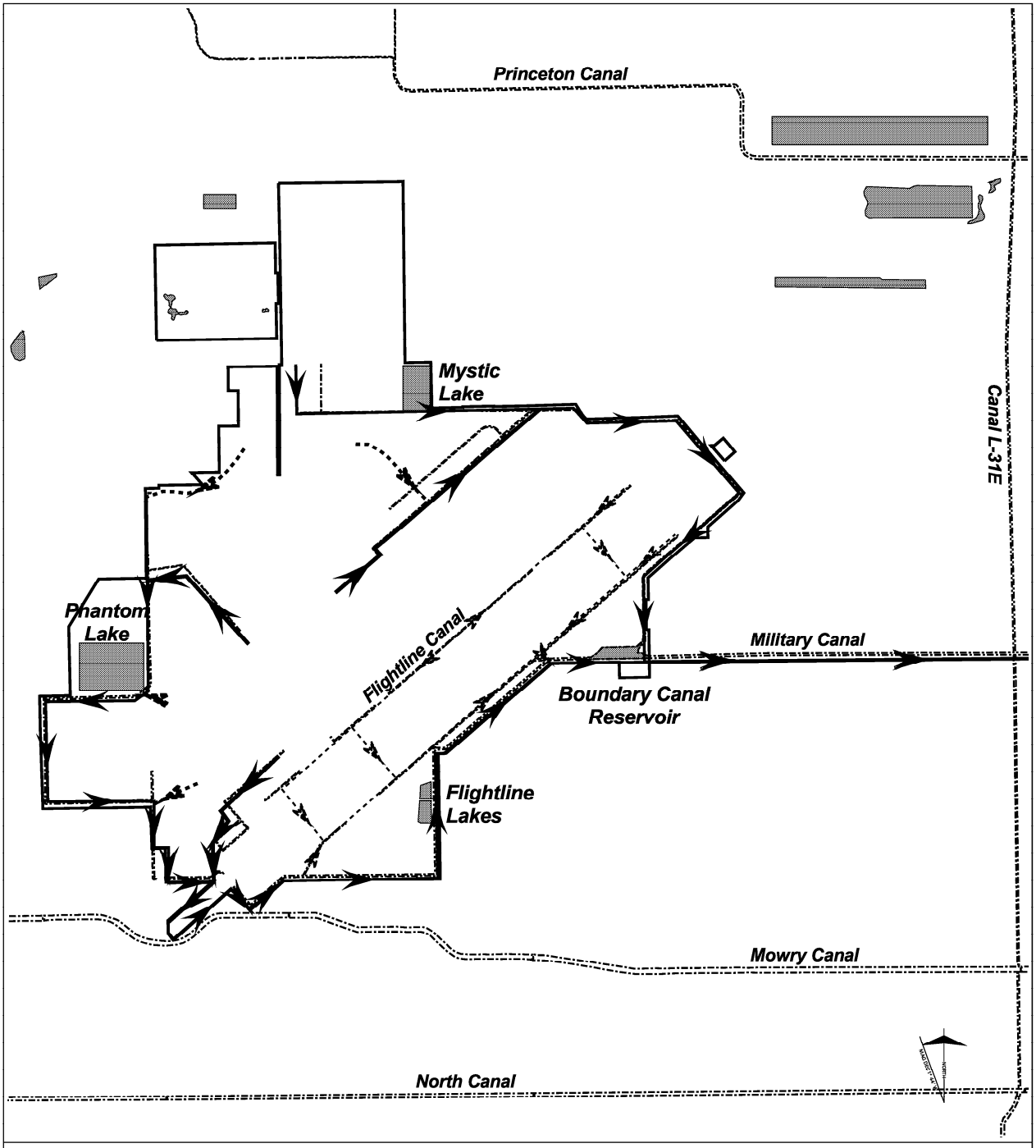
- Former Homestead AFB
- Major Canal
- National Park Boundary
- Street
- Major Road
- U.S. Highway
- State Highway

2 0 2

Scale in Miles

Source: SAIC

Figure 3.10-1
Region of Influence
for Water Resources



Source: PBS&J 1998a

Figure 3.10-2
Former Homestead AFB
Drainage Patterns

collects approximately 85 percent of the runoff from the former base and delivers the water to the reservoir on the eastern edge of the installation. The remaining site runoff is generated in part of the former base housing area and is discharged to Mystic Lake, an impoundment on the northeastern boundary of the former base.

Discharge from the reservoir receiving water from Boundary Canal is controlled by a pumping station at the east end of the reservoir. Three pumps, each with a maximum capacity of 100,000 gallons per minute (gpm), pump collected stormwater into Military Canal. The ultimate capacity of discharge is 300,000 gpm (668 cubic feet per second [cfs]). The pump station has space for a fourth pump, but discharge from former Homestead AFB is limited to 668 cfs by SFWMD permit (**PBS&J 1998a**).

The pumps operate at maximum discharge when reservoir elevation is 4.1 feet according to the 1927 National Geodetic Vertical Datum (NGVD). An interim discharge at 3 feet NGVD is currently allowed under an agreement between the Air Force Reserve Command and Miami-Dade County. This discharge is required to keep water elevations in Flightline Canal at acceptable operational levels. The pumps are operated until the water level in Flightline Canal is lowered to 2.5 feet NGVD. Without the pumps operation, flooding would occur along the flightline.

Surface water elevation and flow from Military Canal to Biscayne Bay is controlled by automated gate structure S20-G, operated by SFWMD. S20-G is a gated spillway 1.5 miles east of the former base that maintains adequate upstream water control stages in the canal, regulates discharges to tidewater, and prevents salinity intrusion during periods of high flood tides. Gates are opened when the water level in Military Canal is more than 0.3 feet above the tide elevation in Biscayne Bay. The highest surface water elevation of record behind S20-G was 3.05 feet.

According to revised 1987 maps developed by the Federal Emergency Management Agency (FEMA), the eastern end of former Homestead AFB would be flooded during the 100 year flood (**USAF 1994a**). The flood boundary runs north-south and extends through the middle of the runway. Most of the area west of this line would form part of an island, bounded on the west and south by the former base boundary and on the north by Princeton Canal. During this severe flooding, stormwater from the former base would be discharged directly into the surrounding flood waters. Runoff for the 10 year, 25 year, and 100 year floods were estimated using the Natural Resource Conservation Service curve number method. Peak flows for the 10 year, 24 hour storm range from 520 cfs to 710 cfs.

Runoff hydrographs were calculated for both 24 hour and 72 hour storms for each storm return period (10 year, 25 year, and 100 year). The precipitation magnitudes for each case, based on Natural Resources Conservation Service Type III storms, are shown in **Table 3.10-1**.

Table 3.10-1. Estimates of Former Homestead AFB Storms

Storm Return Period (years)	24 hour (inches)	72 hour (inches)
10	7.5	10.2
25	9.0	12.2
100	11.0	14.9

Source: **PBS&J 1998a**.

Table 3.10-2 shows the peak flows for former Homestead AFB. The storm return period (10, 25, and 100 years) and duration (24 and 72 hours) were selected based on a study performed by Post, Buckley, Schuh & Jernigan, Inc. (**PBS&J 1998a**). The criteria were developed in accordance with the SFWMD Permit Information Manual (Volume IV) and in close coordination with the Miami-Dade County Aviation Department and DERM.

Table 3.10-2. Estimates of Former Homestead AFB Peak Flows

Storm Return Period (years)	24 hour (cfs)	72 hour (cfs)
10	710	810
25	880	970
100	1,100	1,200

Source: **PBS&J 1998a**.
cfs cubic feet per second

Mowry Canal. Mowry Canal is located approximately 1,000 feet south of former Homestead AFB. This canal is approximately 14 miles long and begins at canal L-31N, located approximately 10 miles west of the former base. Before discharging into Biscayne Bay via Control Structure S-20F, this canal flows east parallel to and approximately 7,000 feet south of Military Canal. The average monthly flow from S-20F, based on measurements from 1980 to 1989 by SFWMD, varies from 4,028 acre-feet in May to 20,861 acre-feet in August (**Alleman et al. 1995**), with an estimated average annual discharge of 155,250 acre-feet, about 38 percent of the total freshwater input to southern Biscayne Bay.

Princeton Canal. Princeton Canal is located approximately 3,000 feet north of former Homestead AFB. The drainage basin for this canal is approximately 25.4 square miles (**Alleman et al. 1995**) and begins at canal L-31N. Before discharging into Biscayne Bay via Control Structure S-21A, this canal flows east parallel to and approximately 11,000 feet north of Military Canal. The average monthly flow from S-21A, based on measurements from 1980 to 1989 by SFWMD, varies from 1,673 acre-feet in May to 9,163 acre-feet in August (**Alleman et al. 1995**), with an estimated average annual discharge of 76,170 acre-feet, about 19 percent of the total freshwater input to southern Biscayne Bay.

Canal L-31E. L-31E is a north-south canal located between Princeton and Mowry Canals, 0.5 to 1 mile from Biscayne Bay. It was created to provide fill material for the levee that protects inland areas against storm surges. L-31E is hydraulically connected to Princeton and Mowry Canals. L-31E also has a culvert connection to Military Canal, but the culverts were intentionally blocked some time in the past to prevent surface water from L-31E mixing with Military Canal surface water. L-31E drains a sizable fraction of the area east of former Homestead AFB through a series of mosquito ditches and natural channels. Stormwater generated between Princeton and Mowry canals is collected in L-31E and discharged to Biscayne Bay via Princeton or Mowry Canal.

Lakes and Ponds. Other surface water features on the former base include seven lakes and ponds (see Figure 3.10-2). These lakes and ponds, like the Boundary Canal system, were excavated from limestone. Mystic Lake comprises approximately 9.8 acres on the northeastern boundary of the site and receives approximately 15 percent of the stormwater from the former base. Phantom Lake (14.5 acres) lies on the western site boundary. The North and South Flightline Lakes (7.7 and 8.0 acres, respectively) are located near the southern boundary of the former base and are remnant borrow pits. Two ponds on the western end of the former golf course cover 2.1 acres. None of these lakes and ponds on former Homestead AFB

have any apparent surface water connections to the Boundary Canal system. Two large ponds lie northeast of former Homestead AFB. These ponds were created by limestone mining. The ponds are not connected to other surface water features, and water balance is maintained primarily through percolation to groundwater and evaporation.

Biscayne Bay. Biscayne Bay is a large, semi-enclosed marine embayment that borders the east coast of south Florida from North Miami to Key Largo. Its eastern extent is defined by a series of keys between three and 10 miles offshore. The bay is generally shallow, with most areas having depths of 10 feet or less.

Historically, Biscayne Bay was fed by a number of small streams, overland sheet flow, and groundwater inputs that created a nearshore, low-salinity area. With the channelization of south Florida, however, groundwater inputs were reduced and the widely dispersed and more or less continuous surface water flow was replaced by periodic slugs of freshwater from the canals. The result was an increase in nearshore salinity, causing the area near the shore to be more marine in character.

Water Quality

The water quality of the canals in the ROI is generally within Florida water quality standards, although concentrations of several parameters are occasionally elevated. Few data are available to assess water quality in the lakes and ponds in the ROI. The following descriptions focus on the surface water quality and sediment quality of Military Canal and its tributaries, Mowry Canal, Princeton Canal, and Biscayne Bay.

The major issues associated with water (or sediment) quality in the ROI's canal systems are discharges of nutrients and toxics to the bay. The discharge of surges of freshwater whenever canal salinity control structures are opened is also of concern.

When present in excess, nutrients (nitrogen and phosphorus compounds) can stimulate plant growth to nuisance levels. In addition, un-ionized ammonia, a nitrogen compound, is toxic to animals. At the pHs and temperatures in the vicinity of the base, un-ionized ammonia would range from 1.8 percent of total ammonia at pH 7.5 and 25°C to 20.3 percent of total ammonia at pH 8.5 and 30°C. Most conditions are near the lower end of the range. The SWIM Plan for Biscayne Bay indicates that phosphorus is the limiting nutrient for the bay, and discharges of phosphorus could stimulate plant growth to nuisance levels if not carefully controlled. Because ammonia can also be toxic to animals, however, discharges of both nitrogen and phosphorus compounds should be limited to minimize adverse effects. Limited information on the biota of Biscayne Bay indicates that excess nutrients are stimulating the growth of epiphytes (attached plants) on seagrasses, reducing the viability of the seagrasses in the bay.

USEPA's water quality criteria (and Florida water quality standards) implicitly acknowledge the harm that is caused by a variety of toxic compounds when they are present at sufficiently high concentrations. Toxic compounds can be divided into two major groups: organics and metals. Organics include compounds that are designed to be toxic (e.g., pesticides), as well as compounds that have been generated by human activity and generally dispersed into the environment (e.g., polyaromatic hydrocarbons) or widely used and not carefully controlled (e.g., polychlorinated biphenyls).

Metals such as cadmium, lead, mercury, chromium, and others are widely used in industrial operations and were often purposefully disposed of in aquatic environments in the past. Once in the environment, they often remain for long periods of time (decades or more) and can cause toxic effects long into the future. While the release of significant quantities of metals is not now permitted under the National

Pollutant Discharge Elimination System, such was not the case prior to the mid-1970s when these compounds were of less concern.

The following paragraphs describe measured concentrations of some general indicators of water quality (e.g., pH, dissolved oxygen, total dissolved solids), nutrients, and toxics in Military Canal and its tributaries, Mowry Canal, Princeton Canal, and Biscayne Bay. In general, there are more data on nutrients than on toxics, and because of the expense of measuring organic compounds, there are more data on metals than organics. The measured concentrations are compared to applicable Florida and Miami-Dade County freshwater standards.

Military Canal. There are several sources of data on Military Canal; DERM, the Air Force, and USEPA have all monitored the canal at times. The results of the monitoring activities differ but show similar patterns.

DERM monitored water quality monthly at a number of stations in the canals of Miami-Dade County over a number of years. One monitoring station, MI03, is at the mouth of Military Canal, at the west side of the SW 107th Avenue bridge. Water quality data for this station are presented in **Table 3.10-3**.

The physical/chemical parameters measured at this station indicate that, between 1989 and 1997, the water at that location was essentially fresh water. All parameters except dissolved oxygen complied with applicable state and county standards. The minimum concentration of dissolved oxygen did not meet either Florida or Miami-Dade County water quality standards. The Florida standard for ammonia is for un-ionized ammonia only, while the measured results are for total ammonia. Un-ionized ammonia is less than 5 percent of total ammonia under common pH and temperature conditions. Five percent of the measured levels fall below the Florida standard.

A small number of surface water samples from Military Canal analyzed by the Air Force between 1993 and 1996 indicated all constituents except beryllium and cadmium complied with Florida water quality standards over this period (**Table 3.10-4**). Out of six samples, beryllium was detected twice, once slightly above the standard, and the other almost twice the standard.

The concentrations of various parameters in the sediments of Military Canal have been studied on a number of occasions. The results of the 1989 and 1990 sediment samples collected by DERM are summarized in **Table 3.10-5**.

The Air Force sampled Military Canal sediments as part of the remedial investigation of OU-11 between 1993 and 1996. The results of these analyses are presented in **Table 3.10-6**.

In late 1997, USEPA sampled sediments from 93 sampling stations along Military Canal. In an initial summary of results, USEPA identified nine compounds of potential concern. These compounds and their mean concentrations throughout the canal system are presented in **Table 3.10-7**.

There is concern that toxic chemicals are being transported from Military Canal to Biscayne Bay. Based on USEPA data, Military Canal sediments are toxic to standard freshwater test organisms in various locations, and a NOAA study (**NOAA 1998b**) also indicated that there is some toxicity in Biscayne Bay sediments just outside of the Military Canal control structure.

Table 3.10-3. Water Quality of Military Canal, DERM Station MI03, 1989–1997

	Units	Number of Samples	Number of Non-detects	Maximum	Median[1]	Mean[1]	Florida Standard	Miami-Dade Standard	Notes
Dissolved Oxygen	mg/L	93	0	1.9	6.7	6.6	5	4	2, 3, 4
Salinity	ppt	74	0	1.0	0.3	0.3	ns	ns	5
Temperature	°C	93	0	32.6	26.8	26.5	nar	3°	6, 7, 8
Hardness	mg/L as $CaCO_3$	4	0	206	203	198	ns	ns	5
Nitrogen	mg/L					0.709	nar	nar	8
Nitrates and Nitrites	mg/L	90	0	1.900	0.580	0.655	nar	nar	8
Ammonia	mg/L	86	7	0.230	0.040	0.054	0.02	0.5	9
Total Phosphorus	mg/L	86	0	0.100	0.010	0.012	nar	nar	8
Cadmium	µg/L	44	40	0.90	0.02	0.23	1.94	nar	8, 10
Copper	µg/L	45	36	6.58	0.60	1.39	21.2	400	10
Lead	µg/L	45	38	1.79	0.10	0.33	7.58	950	10
Zinc	µg/L	40	28	14.40	4.60	6.11	189	1,000	10

Source: DERM; statistical analysis, SAIC.

Notes:
[1] Median and mean are calculated with detected values only. Nondetects have been eliminated, so actual medians and means would be lower than the values presented here.
[2] Dissolved oxygen lists minimum value in Maximum column.
[3] Florida criterion is not less than 5 mg/L, with normal daily and seasonal levels above this level to be maintained.
[4] County criterion is 5 ppm during at least 10 hours per 24-hour period, never less than 4, unless naturally caused.
[5] ns = no standard.
[6] The Florida thermal criterion varies with the situation and generally does not apply to canal discharges.
[7] Miami-Dade criterion: 3° above ambient.
[8] nar = narrative standard only, no numeric criterion. This generally requires concentrations that cause no adverse environmental effect.
[9] Measurements are for total ammonia. Florida standard is for un-ionized ammonia only. Un-ionized ammonia is less than 5 percent of total ammonia at pH 7.9 at 27°C.
[10] Florida criteria are calcium carbonate dependent.

µg/L micrograms per liter
mg/L milligrams per liter
ppt parts per thousand

When examining the nature of the contaminants in Military Canal, at least two of the compounds must have been deposited in canal sediments at least 20 years ago. DDT and PCB-1254 were both banned in the early 1970s, and no new sources of contamination for these compounds have been identified. Yet concentrations of DDE (a degradation product of DDT) and PCB-1254 in Military Canal remain at elevated levels, even after several major storms, including Hurricane Andrew. This suggests that the sediments are not easily transported out of Military Canal to Biscayne Bay. Nevertheless, elevated concentrations of some metals in the water column of Military Canal, probably caused by resuspension of sediments during high flows or wind-induced mixing, suggest that some transport of contaminants probably occurs over extended periods of time.

Table 3.10-4. Air Force Measurements of Military Canal Surface Water Quality, 1993–1996

Parameter	Units	Minimum Concentration	Maximum Concentration	Florida Standard
Organics				
Benzene	µg/L	<10	1 J	71.28 annual avg.
Chloroform	µg/L	<10	1.1 J	470.8 annual avg.
Ethylbenzene	µg/L	<10	3	605
Toluene	µg/L	<10	8	475
Xylenes (Total)	µg/L	<10	18	370
2-methylnaphthalene	µg/L	<10	1 J	30
Naphthalene	µg/L	<10	2 J	26
Heptachlor	µg/L	<0.05	0.016 J	0.0038
Metals				
Aluminum	µg/L	<22.0	29.1	ns
Antimony	µg/L	<22.2	25.6	4,300
Arsenic	µg/L	<3.2	1.6	50
Barium	µg/L	8.6	12.0	ns
Beryllium	µg/L	<0.20	0.24	0.13
Cadmium	µg/L	<2.7	3.5	1.94
Calcium	µg/L	57,500	230,000	ns
Copper	µg/L	<2.2	3.1	21.2
Iron	µg/L	<7.8	9.2	1,000
Lead	µg/L	<0.9	1.7	7.58
Magnesium	µg/L	3,970	664,000	ns
Manganese	µg/L	<0.4	5.6	ns
Nickel	µg/L	<5.7	10.7	281
Potassium	µg/L	7,610	196,000	ns
Selenium	µg/L	<2.0	0.4	5.0
Sodium	µg/L	19,800	5,160,000	ns
Vanadium	µg/L	<3.8	6.0	ns
Zinc	µg/L	6.0	9.4	189

Source: **Montgomery Watson 1997**.
< less than detection limit
J estimated concentration
µg/L micrograms per liter
ns no standard

Boundary Canal. In general, Boundary Canal has higher maximum concentrations of pollutants than Military Canal (**Table 3.10-8**). All measurements for beryllium and mercury exceeded their respective criteria. The maximum concentration of total ammonia exceeded Florida standard for un-ionized ammonia, if 5 percent of total ammonia is assumed to be un-ionized. All other parameters complied with both state and county water quality standards.

Table 3.10-5. DERM Measurements of Military Canal Sediment Quality, 1989–1990

Parameter	Units	Concentration[1]
Organics		
BHC-Alpha	µg/kg	11.1
Endosulfan I	µg/kg	4.9
Heptachlor	µg/kg	3.4
DDD	µg/kg	25.7
DDE	µg/kg	34.0
DDT	µg/kg	53.5
Kelthane	µg/kg	24.7
Lindane	µg/kg	1.4
Perthane	µg/kg	241
Trifluralin	µg/kg	11.4
Metals		
Aluminum	mg/kg	3,079
Cadmium	mg/kg	13.5
Copper	mg/kg	78.6
Lead	mg/kg	82.3
Zinc	mg/kg	304.2

Source: **Woodward-Clyde 1995**.
Note: [1] Concentration of organics represents maximum detected values.
µg/kg micrograms per kilogram
mg/kg milligrams per kilogram

Mowry Canal. Surface water data for Mowry Canal are summarized for 1991 through 1997 in **Table 3.10-9**. In general, concentrations of nutrients were higher than those in Military Canal, but metals were lower. All parameters complied with both state and county water quality criteria. Measured concentrations of total ammonia did not exceed Florida standard for un-ionized ammonia, assumed to be 5 percent of total ammonia under common conditions.

Princeton Canal. Surface water data for Princeton Canal for 1991 through 1997 are summarized in **Table 3.10-10**. In general, concentrations of nutrients were higher than those in Military Canal, but metals were lower. All parameters complied with both state and county water quality criteria. Measured concentrations of total ammonia did not exceed Florida standard for un-ionized ammonia, assumed to be 5 percent of total ammonia under common conditions.

Biscayne Bay. DERM has taken water quality samples at a number of stations in Biscayne Bay since 1988. Five stations in the bay were routinely sampled between 1988 and 1996. Data for these stations are summarized in **Table 3.10-11**. Freshwater water quality standards do not apply to Biscayne Bay.

The salinity data indicate that the bay is essentially seawater (salinity of seawater is approximately 35 parts per thousand). The stations most influenced by freshwater inputs from canals have slightly lower average salinities. Station BB41, approximately 3.5 miles off the mouth of Mowry Canal and 3.7 miles off the mouth of Military Canal, has the lowest salinity.

Table 3.10-6. Air Force Measurements of Military Canal Sediment Quality, 1993–1996

Parameter	Units	Concentration	
		Minimum	Maximum
Organics			
Acetone	µg/kg	180	9,700
4,4-DDE	µg/kg	<0.1J	20J
4,4-DDT	µg/kg	<21	21
Metals			
Aluminum	mg/kg	1,460	4,960
Antimony	mg/kg	<14.8	26.6
Arsenic	mg/kg	2.8	7.5
Barium	mg/kg	8.2	27.8
Beryllium	mg/kg	0.08	0.30
Cadmium	mg/kg	0.94	2.50
Chromium	mg/kg	10.5	18.3
Cobalt	mg/kg	<1.1	1.9
Copper	mg/kg	32.9J	66.3J
Cyanide[1]	mg/kg	4.7J	4.7J
Iron	mg/kg	2,140	5,640
Lead	mg/kg	17.1	38.8
Mercury	mg/kg	0.43	0.73
Magnesium	mg/kg	1,440	13,900
Manganese	mg/kg	16.7	65.1
Nickel	mg/kg	<2.3	4.3
Potassium	mg/kg	392	2,770
Selenium	mg/kg	15	3.9
Silver	mg/kg	<2.3	11.3
Vanadium	mg/kg	7.6	24.1
Zinc	mg/kg	45.7	188

Source: **Montgomery Watson 1997**.
Note: [1] Only one sample analyzed.
< less than detection limit
J estimated concentration
µg/kg micrograms per kilogram
mg/kg milligrams per kilogram

Total phosphorus and ammonia concentrations were similar for all stations measured, but nitrate plus nitrite varied by a factor of four. High nitrate plus nitrite concentrations reflect the input of nutrient-rich canal water. BB41 had the highest average concentration of nitrate plus nitrite. Dissolved oxygen concentrations also tended to be higher at stations with higher nutrient concentrations, probably because the higher nutrient waters lead to more plant growth, which causes a higher range in oxygen concentration over a 24 hour period. Because the samples reported were taken during the day when the plants are photosynthesizing, higher oxygen concentrations were observed.

Table 3.10-7. USEPA Measurements of Military Canal Sediment Quality, 1997

Parameter	Units	Mean Concentration
Organics		
P,P-DDE	µg/kg	118.51
Chlordane	µg/kg	18.07
Dibenzo(a,h)anthracene	µg/kg	98.66
PCB-1254	µg/kg	219.61
Metals		
Arsenic	mg/kg	8.18
Cadmium	mg/kg	3.6
Copper	mg/kg	91.46
Mercury	mg/kg	1.32
Silver	mg/kg	23.99

Source: **USEPA 1999**.
µg/kg micrograms per kilogram
mg/kg milligrams per kilogram

NOAA sampled the sediments of Biscayne Bay at 226 stations in 1995 and 1996 and tested their toxicity by four tests: (1) percent survival of marine amphipods in 10 day tests of bulk sediments (amphipod), (2) changes in bioluminescence of a marine bacterium in organic extracts (Microtox), (3) fertilization success of sea urchins in 1 hour tests of sediment porewater (fertilization), and (4) embryological development of sea urchin eggs in 48 hour porewater tests (development).

Three stations were sampled below the salinity control structures in each of three canals in the ROI: Princeton Canal, Military Canal, and Mowry Canal (**NOAA 1998b**). The results are summarized in **Table 3.10-12**. None of the canals had sediments that were toxic to amphipods, but all other tests showed some toxicity for all of the canals. The Microtox tests indicated that Princeton Canal had the most toxic sediments and Mowry Canal the least. The development tests indicated that Military Canal had the most toxic sediments, while Princeton and Mowry Canals had lower toxicities. In fertilization tests, Mowry Canal had the most toxic sediments and Princeton Canal the least. Chemical concentration data are also available for these stations, but they are not included here because toxicity and resulting biological effects are the principal concerns.

Nutrient and Toxicant Loads. The Draft SEIS included estimated concentrations of metal, organic, and nutrient loadings from former Homestead AFB in Military Canal, based on soil concentrations. Data from actual measurements of Military Canal water and sediment samples indicate that soil concentrations are not appropriate surrogates. Therefore, it is not possible to estimate loads for metals and organic chemicals that have not been measured during sampling.

Loads to Biscayne Bay from the three major canals in the ROI (**Table 3.10-13**) were estimated by multiplying mean concentrations at the canal mouths, times the average annual flow from each canal. Flows for Mowry and Princeton canals were obtained from the Biscayne Bay SWIM Plan. Flows for Military Canal were calculated using the SWMM model. Concentrations were obtained from DERM data on bay-wide canal monitoring.

Table 3.10-8. Boundary Canal Water Quality

Parameter	Units	Concentration		
		Minimum	Maximum	Florida Standard
Physical/Chemical				
TDS	mg/L	230	7,000	ns
TSS	mg/L	<5	38	ns
Nutrients				
Total Phosphorus (P)	mg/L	<0.05	0.29	nar
Total Ammonia (N)	mg/L	<0.05	0.78	0.02[1]
Nitrite + Nitrate (N)	mg/L	<0.10	4.11	nar
TKN	mg/L	<0.5	1.5	ns
Organics				
Chloroform	µg/L	<5	2	470.8[2]
Endosulfan II	µg/L	<0.1	0.03	0.056
Metals				
Aluminum	µg/L	22.4	108.0	ns
Antimony	µg/L	23.8	33.6	4,300
Arsenic	µg/L	0.6	6.0	50
Beryllium	µg/L	0.20	0.39	0.13[2]
Cadmium	µg/L	<2.7	3.4	1.94[3]
Chromium	µg/L	<4.1	4.5	362
Copper	µg/L	2.2	18.1	21.2
Iron	µg/L	8.1	120.0	1,000
Lead	µg/L	1.1	6.4	7.58
Mercury	µg/L	0.08	0.09	0.012
Nickel	µg/L	5.9	7.9	281
Selenium	µg/L	0.4	0.8	ns
Vanadium	µg/L	4.4	7.1	ns
Zinc	µg/L	5.1	40.9	189

Source: **Woodward-Clyde 1995**.

Notes:
[1] Applies to un-ionized ammonia only, which is less than 5 percent of total ammonia at pH 7.9 at 27°C.
[2] Annual average.
[3] Hardness dependent. Hardness taken from Table 3.10-3.

< less than detection limit
µg/L micrograms per liter
mg/L milligrams per liter
nar narrative criterion only, no numeric criterion.
ns no standard
TDS total dissolved solids
TKN total Kjeldahl nitrogen
TSS total suspended solids

Table 3.10-9. Water Quality of Mowry Canal, DERM Station MW04, 1991–1997

	Units	Number of Samples	Number of Non-detects	Maximum[1]	Median[1]	Mean[1]	Florida Standard	Miami-Dade Standard	Notes
Dissolved Oxygen	mg/L	78	0	0.6	6.5	6.6	5	4	2, 3, 4
Salinity	ppt	74	0	0.9	0.4	0.3	ns	ns	5
Temperature	°C	78	0	30.3	26.0	26.0	nar	3°	6, 7, 8
Hardness	mg/L as $CaCO_3$	4	0	316	293	280	ns	ns	5
Nitrogen	mg/L					2.162	nar	nar	8
Nitrates and Nitrites	mg/L	71	0	4.640	2.080	2.123	nar	nar	8
Ammonia	mg/L	58	8	0.150	0.030	0.040	0.02	0.5	9
Total Phosphorus	mg/L	51	0	0.040	0.004	0.006	nar	nar	8
Cadmium	µg/L	34	31	0.10	0.10	0.07	1.94	nar	8, 10
Copper	µg/L	36	33	2.10	0.54	1.00	21.2	400	10
Lead	µg/L	36	33	2.30	0.14	0.86	7.58	950	10
Zinc	µg/L	31	23	6.20	4.00	4.70	189	1,000	10

Source: DERM; statistical analysis, SAIC.

Notes:
[1] Median and mean are calculated with detected values only. Nondetects have been eliminated, so actual medians and means would be lower than the values presented here.
[2] Dissolved oxygen lists minimum value in Maximum column.
[3] Florida criterion is not less than 5 mg/L, with normal daily and seasonal levels above this level to be maintained.
[4] County criterion is 5 ppm during at least 10 hours per 24-hour period, never less than 4, unless naturally caused.
[5] ns = no standard.
[6] The Florida thermal criterion varies with the situation and generally does not apply to canal discharges.
[7] Miami-Dade criterion: 3° above ambient.
[8] nar = narrative standard only, no numeric criterion. This generally requires concentrations that cause no adverse environmental effect.
[9] Measurements are for total ammonia. Florida standard is for un-ionized ammonia only. Un-ionized ammonia is less than 5 percent of total ammonia at pH 7.9 at 27°C.
[10] Florida criteria are calcium carbonate dependent.

µg/L micrograms per liter
mg/L milligrams per liter
ppt parts per thousand

There are also atmospheric sources of pollutants entering Biscayne Bay and the Everglades. Nitrogen is added from the deposition of water-soluble and particulate nitrogen compounds which are generated, at least in part, from emissions from stationary and mobile sources. Polycyclic aromatic hydrocarbons from petroleum products and the combustion of petroleum products by vehicles, aircraft, and other equipment are also deposited as very small particles. There are no measurements of either nitrogen or PAH deposition in Biscayne Bay, but there are data for nitrogen deposition in Everglades NP. The measured annual nitrogen deposition rate over 1994–1998 was 7.08 kilogram/hectare, which is equivalent to 6.30 pounds per acre (see Section 3.8.4.1).

Table 3.10-10. Water Quality of Princeton Canal, DERM Station PR03, 1991–1997

	Units	Number of Samples	Number of Non-detects	Maxi-mum[1]	Median[1]	Mean[1]	Florida Standard	Miami-Dade Standard	Notes
Dissolved Oxygen	mg/L	78	0	2.3	5.9	5.9	5	4	2, 3, 4
Salinity	ppt	74	0	0.7	0.3	0.3	ns	ns	5
Temperature	°C	78	0	29.9	26.0	25.8	nar	3°	6, 7, 8
Hardness	mg/L as $CaCO_3$	3	0	307	298	298	ns	ns	5
Nitrogen	mg/L					3.933	nar	nar	8
Nitrates and Nitrites	mg/L	72	0	4.860	4.060	3.873	nar	nar	8
Ammonia	mg/L	65	6	0.320	0.040	0.060	0.02	0.5	9
Total Phosphorus	mg/L	48	3	0.030	0.003	0.006	nar	nar	8
Cadmium	µg/L	35	34	0.10	0.10	0.10	1.94	nar	8, 10
Copper	µg/L	36	34	2.40	1.52	1.52	21.2	400	10
Lead	µg/L	36	35	0.04	0.04	0.04	7.58	950	10
Zinc	µg/L	31	23	8.90	6.05	6.31	189	1,000	10

Source: DERM; statistical analysis, SAIC.

Notes:
[1] Median and mean are calculated with detected values only. Nondetects have been eliminated, so actual medians and means would be lower than the values presented here.
[2] Dissolved oxygen lists minimum value in Maximum column.
[3] Florida criterion is not less than 5 mg/L, with normal daily and seasonal levels above this level to be maintained.
[4] County criterion is 5 ppm during at least 10 hours per 24-hour period, never less than 4, unless naturally caused.
[5] ns = no standard.
[6] The Florida thermal criterion varies with the situation and generally does not apply to canal discharges.
[7] Miami-Dade criterion: 3° above ambient.
[8] nar = narrative standard only, no numeric criterion. This generally requires concentrations that cause no adverse environmental effect.
[9] Measurements are for total ammonia. Florida standard is for un-ionized ammonia only. Un-ionized ammonia is less than 5 percent of total ammonia at pH 7.9 at 27°C.
[10] Florida criteria are calcium carbonate dependent.

µg/L micrograms per liter
mg/L milligrams per liter
ppt parts per thousand

3.10.2.2 Projected Baseline Environment

Although there will be growth in south Miami-Dade County over the next 15 years, it is not clear how and where that growth will occur. Future changes in surface water flows and loads were estimated based on land use changes estimated to occur in the projected baseline (see Section 2.1.3). The estimated acreage changes in residential, commercial, and industrial land uses in the ROI were multiplied by an assumed percent imperviousness (between 40 and 79 percent) for each land use category to obtain total new acres of impervious surface. The area of impervious surface was multiplied by average annual rainfall to obtain total increased runoff. The increased runoff was then multiplied by the weighted average concentration of pollutants in Princeton and Mowry Canals to obtain total increased loadings. The results of these calculations (**Table 3.10-14**) indicate that both flows and loads in the ROI would be expected to increase by about 8 percent by 2015 with moderate growth.

Table 3.10-11. Biscayne Bay Water Quality, 1988–1996

Station	Salinity (ppt)	Dissolved Oxygen (mg/L)	Total Phosphorus (mg/L)	Nitrate + Nitrite (mg/L)	Ammonia (mg/L)
BB36	34.8	6.12	0.0028	0.0146	0.065
BB37	35.3	5.94	ND	ND	ND
BB38	35.4	5.99	0.0030	0.0085	0.057
BB41	33.3	6.33	0.0031	0.0333	0.062
BB42	35.5	6.05	ND	ND	ND
Mean[1]	34.8	6.09	0.0029	0.0188	0.061

Source: DERM; statistical analysis, SAIC.
Note: [1] Mean is average of station means, not individual observations.
mg/L milligrams per liter
ND no data
ppt parts per thousand

Table 3.10-12. Sediment Toxicity at the Mouths of Three Canals Discharging to Biscayne Bay, 1995–1996

Location	Amphipod[1]	Microtox[2]	Development[3]	Fertilization[4]
Princeton Canal				
Landward station	Non-toxic	Highly toxic	Slightly toxic	Non-toxic
Intermed. station	Non-toxic	Moderately toxic	Non-toxic	Non-toxic
Seaward station	Non-toxic	Highly toxic	Slightly toxic	Slightly toxic
Military Canal				
Landward station	Non-toxic	Non-toxic	Moderately toxic	Moderately toxic
Intermed. station	Non-toxic	Non-toxic	Moderately toxic	Slightly toxic
Seaward station	Non-toxic	Moderately toxic	Slightly toxic	Slightly toxic
Mowry Canal				
Landward station	Non-toxic	Non-toxic	Non-toxic	Moderately toxic
Intermed. station	Non-toxic	Slightly toxic	Slightly toxic	Moderately toxic
Seaward station	Non-toxic	Slightly toxic	Slightly toxic	Highly toxic

Source: **NOAA 1998b**.
Notes: [1] Amphipod (crustacean) survival test.
[2] Bacterial bioluminescence test.
[3] Sea urchin embryological development test.
[4] Sea urchin egg fertilization test.

3.10.3 Groundwater

Groundwater in southeastern Florida is contained in two distinct aquifers: the Biscayne Aquifer, which is the surficial, unconfined aquifer system, and the lower, confined Floridan Aquifer. This section describes each of these aquifers and addresses groundwater quality.

Table 3.10-13. Total Estimated Flows and Loads from Military, Mowry, and Princeton Canals to Biscayne Bay, 1989–1997

	Units	Military	Mowry	Princeton	Total
Flows	acre-feet/year	5,133	155,250	76,170	236,553
Nitrogen	pounds/year	9,905	913,130	814,950	1,737,985
Phosphorus	pounds/year	174	2,484	1,188	3,846
Cadmium	pounds/year	3	29	21	53
Copper	pounds/year	19	424	315	758
Lead	pounds/year	5	362	8	375
Zinc	pounds/year	85	1,985	1,308	3,378

Source: SAIC.
Note: Loads in this table are calculated on detected values only, so loads of cadmium, copper, lead, and zinc are probably overestimated because the majority of samples for these elements were nondetects.

Table 3.10-14. Total Projected Baseline Surface Water Flows and Loads from Military, Mowry, and Princeton Canals

	Units	2000	2005	2015
Flow	acre-feet/year	241,251	245,945	255,338
Nitrogen	pounds/year	1,773,068	1,808,121	1,878,257
Phosphorus	pounds/year	3,920	3,995	4,144
Cadmium	pounds/year	54	55	57
Copper	pounds/year	773	788	818
Lead	pounds/year	382	390	405
Zinc	pounds/year	3,445	3,512	3,645

Source: SAIC.
Note: Loads in this table are estimated based on detected baseline values only. Loads of cadmium, copper, lead, and zinc are probably overestimated because the majority of samples for these elements were nondetects. Projected increases in surface water flows were based on the assumption that all rainfall falling on newly impervious surface would be discharged to Biscayne Bay. This is a conservative assumption that would also result in high estimates of chemical loads.

3.10.3.1 Existing Environment

Aquifers

Biscayne Aquifer. The Biscayne Aquifer (a sole-source aquifer, see Section 3.10.1.2) in the area of former Homestead AFB is composed mainly of highly permeable limestone and sandstone. The thickness of the aquifer at the former base ranges from approximately 80 to 120 feet (**Fish and Stewart 1991**) and is bounded to the east by saline water derived from the intrusion of seawater into aquifer formations. The groundwater table, the phreatic surface of the unconfined Biscayne Aquifer, is close to the land surface. Because of its shallow, unconfined condition, the aquifer is influenced by rainfall, channel flows, and ponded surface water in the area.

In the Homestead area, the Biscayne Aquifer is composed of the following stratigraphic units in ascending order: permeable limestone of the Tamiami Formation, the Fort Thompson Formation, and Miami Oolite (**Geraghty & Miller 1992**) (see Section 3.9). Due to the interfingering of aquifer materials, some permeable units (aquifers or small sections of aquifers) may exhibit confined characteristics. In general, the Biscayne Aquifer has hydraulically interconnected groundwater flow at all depths, and flows are closely related to the water table depth (**Sonntag 1987**).

The Biscayne Aquifer is characterized by interconnected zones of cavernous limestone and has reported transmissivities ranging from approximately 4 to 8 million gallons per day per foot (mgd/foot) (**Montgomery Watson 1997**). The transmissivity of the aquifer at the base has been estimated to range from 2.2 to 8 mgd/foot, and the permeability has been found to be greater than 1,000 feet per day (**Fish and Stewart 1991**). The average transmissivity has been estimated to be 5 mgd/foot, the average permeability has been estimated to be 8,640 feet per day, and the average flow velocity is estimated at 2.6 feet per day or 950 feet per year (**USAF 1994a**).

The general direction of groundwater flow within the Biscayne Aquifer is to the east toward Biscayne Bay, except in localized areas where it is influenced by canals or production well pumpage (**Figure 3.10-3**). The hydraulic gradient, calculated from the average configuration of the water table in Miami-Dade County in September between 1974 and 1982, was 0.3 feet per mile. The water table is generally within 1 to 5 feet of the land surface, but may occur at or near land surface during the wet season (summer). The seasonal variation in water level ranges from 0.5 to 1.0 foot. The extremely flat regional hydraulic gradient counteracts the very high transmissivity of the Biscayne Aquifer and results in slow net movement of groundwater.

Fluctuations in groundwater levels and local variations in the direction of groundwater flow are due to several factors: (1) differences in infiltration potential, (2) runoff from paved areas, (3) water-level drawdown near pumping wells, and (4) drainage effects of canals and water-level control structures.

Recharge to the Biscayne Aquifer is derived from rainfall, irrigation runoff, surface water imported by canals, urban runoff, and groundwater inflow. Due to the high permeability of the aquifer, surface runoff is slight, except over impervious areas. Recharge by rainfall is greatest during the wet season, from May through October, and recharge by canal seepage is greatest during the dry season, from November through April. Annual recharge to the aquifer is estimated to be as much as 38 inches per year, or 63 percent of total rainfall (**USAF 1994a**).

Infiltration is considered to be rapid through surfaces of Oolite outcrop and areas with a thin soil layer. Infiltration rates are accelerated by fractures within the Oolite, as well as by naturally occurring solution channels. Rain water percolates through the relatively thin vadose zone to locally recharge the unconfined aquifer. Discharge from the Biscayne Aquifer is mainly by evapotranspiration; groundwater flow to canals or Biscayne Bay; and municipal, industrial, domestic, and agricultural withdrawals.

The unconfined Biscayne Aquifer is influenced by the surface water bodies in the ROI. Available data indicate that the groundwater levels in the Biscayne Aquifer remain higher than the canal surface water levels during the dry (low rain) period, and it is likely that the Biscayne Aquifer discharges groundwater to the canals during those times. During storms, water levels in the canals rise with a rise in the groundwater table (i.e., there are rises in water levels in Military Canal without pumpage from the reservoir). The rise in the groundwater table is caused by vertical recharge from rainfall and lateral recharge from canals. Canal water levels return to pre-storm conditions within hours of rainfall.

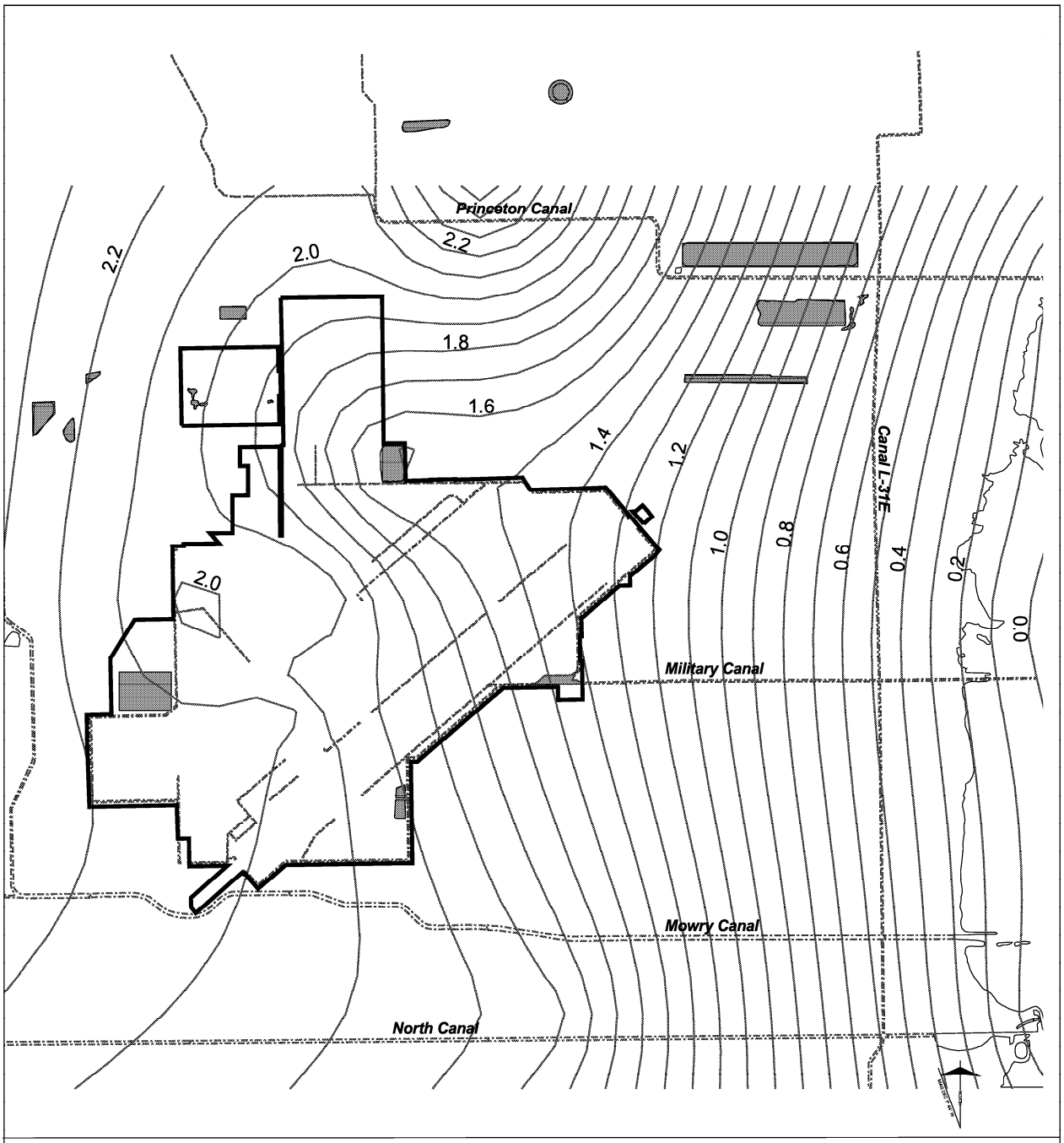


Figure 3.10-3
Observed Hydraulic Heads in the
Former Homestead AFB Area

The existing flow pattern in the aquifer in the former Homestead AFB area was determined by simulation using MODFLOW (**McDonald and Harbaugh 1988**). The simulated steady state groundwater levels in the aquifer are illustrated in **Figure 3.10-4**. The calibrated groundwater levels represent an approximate average condition.

Groundwater flow lines were determined using the three-dimensional particle tracking model MODPATH (**Geraghty & Miller 1997**). Results are shown in **Figure 3.10-5**. The groundwater level contours and flow lines indicate that Biscayne Aquifer groundwater flows generally toward Biscayne Bay from former Homestead AFB, but there are also flows to Mystic Lake and Pine Lake from nearby areas. These lakes are local groundwater discharge areas.

Groundwater flux to Biscayne Bay from Biscayne Aquifer in the former Homestead AFB area was obtained directly from the MODFLOW outputs. The outflow to Biscayne Bay between Princeton and Mowry canals was estimated to be 7,174 acre-feet per year.

The direction and rate of groundwater flow from former Homestead AFB was determined using MODPATH. Fluid particles were placed at selected locations to simulate the flow lines by tracking the movement of the particles. The overall average seepage velocity in the former Homestead AFB area is estimated to be 310 feet per year.

Floridan Aquifer. Underlying the low-permeability clayey marls, clays, and dense limestones of the Pliocene-age Tamiami Formation, and similar low-permeability sediments of the Hawthorn Group, are the formations that constitute the Floridan Aquifer. The Floridan Aquifer is made up of limestones and dolomites. This extensive system is present in all of Florida and parts of adjacent states. It is under artesian pressure, and water levels in deep wells rise above land surface.

Within the area of former Homestead AFB, the top of the Floridan Aquifer system is located approximately 950 to 1,000 feet below mean sea level and is approximately 2,800 feet thick (**USAF 1994a**). The upper part of the system contains confined water with heads of 30 to 50 feet above mean sea level (**Fish and Stewart 1991**). Groundwater within the Floridan Aquifer system usually contains dissolved chloride, sulfate, and TDS at concentrations that exceed primary drinking water standards. In view of the poor chemical quality of water and the depth of the aquifer system, the Floridan Aquifer is of limited usefulness as a source of potable water supply in the ROI.

Groundwater Quality

Groundwater from the Biscayne Aquifer is generally calcium bicarbonate-rich and typically classified as "hard." Reported hardness levels (as $CaCO_3$) range from 230 to 370 mg/L in the area of the former base (**Sonntag 1987**). Dissolved iron concentrations are naturally high in the Biscayne Aquifer and commonly exceed the Florida Secondary Drinking Water Regulations standard (**Sonntag 1987**). Otherwise, water in the Biscayne Aquifer west of the sea water intrusion front appears to comply with Florida standards. Data on toxics is limited to metals; little data are available on concentrations of toxic organics. USGS and DERM routinely monitor the water quality of wells throughout Miami-Dade County. Recent data are summarized in **Table 3.10-15**.

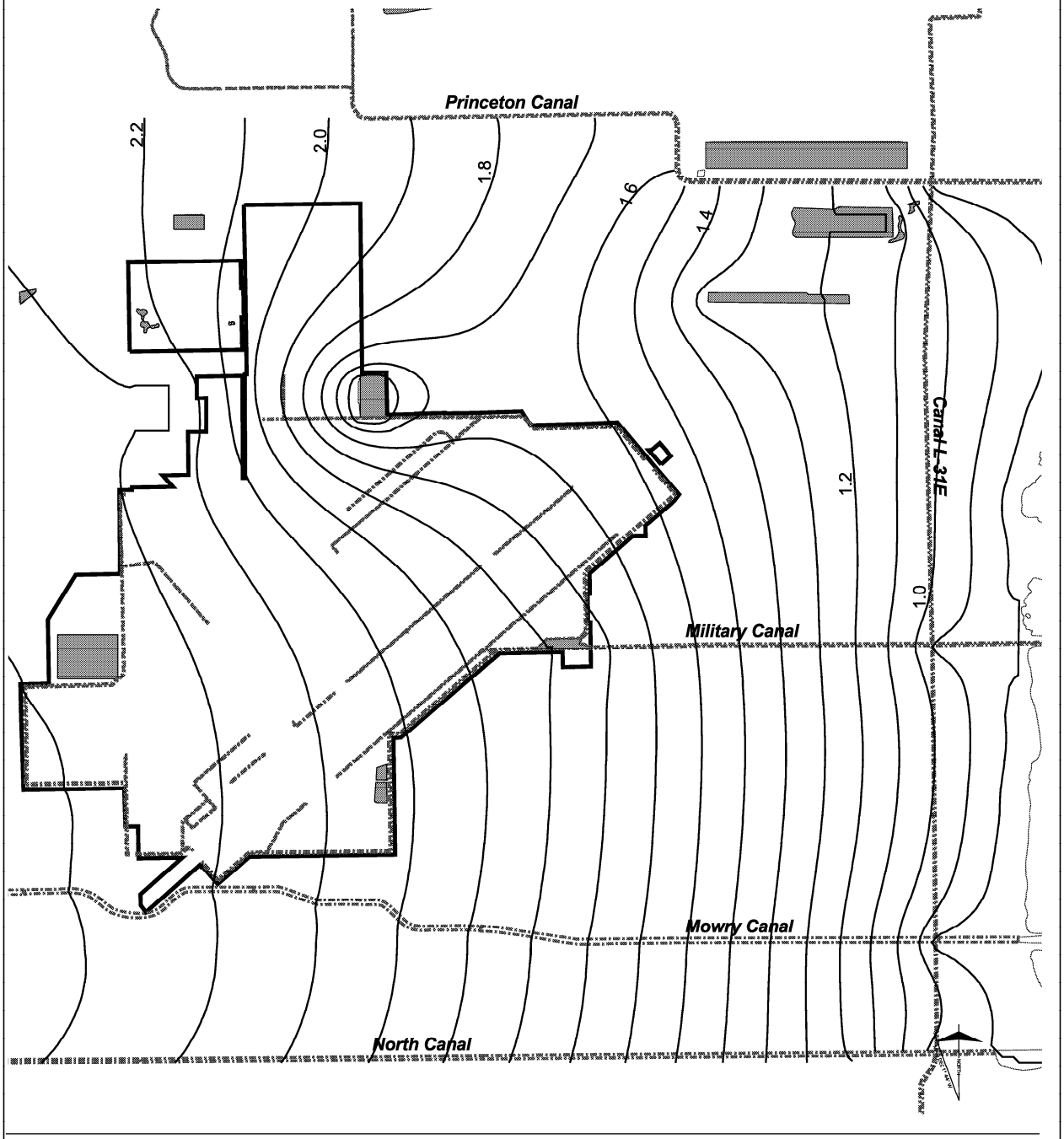
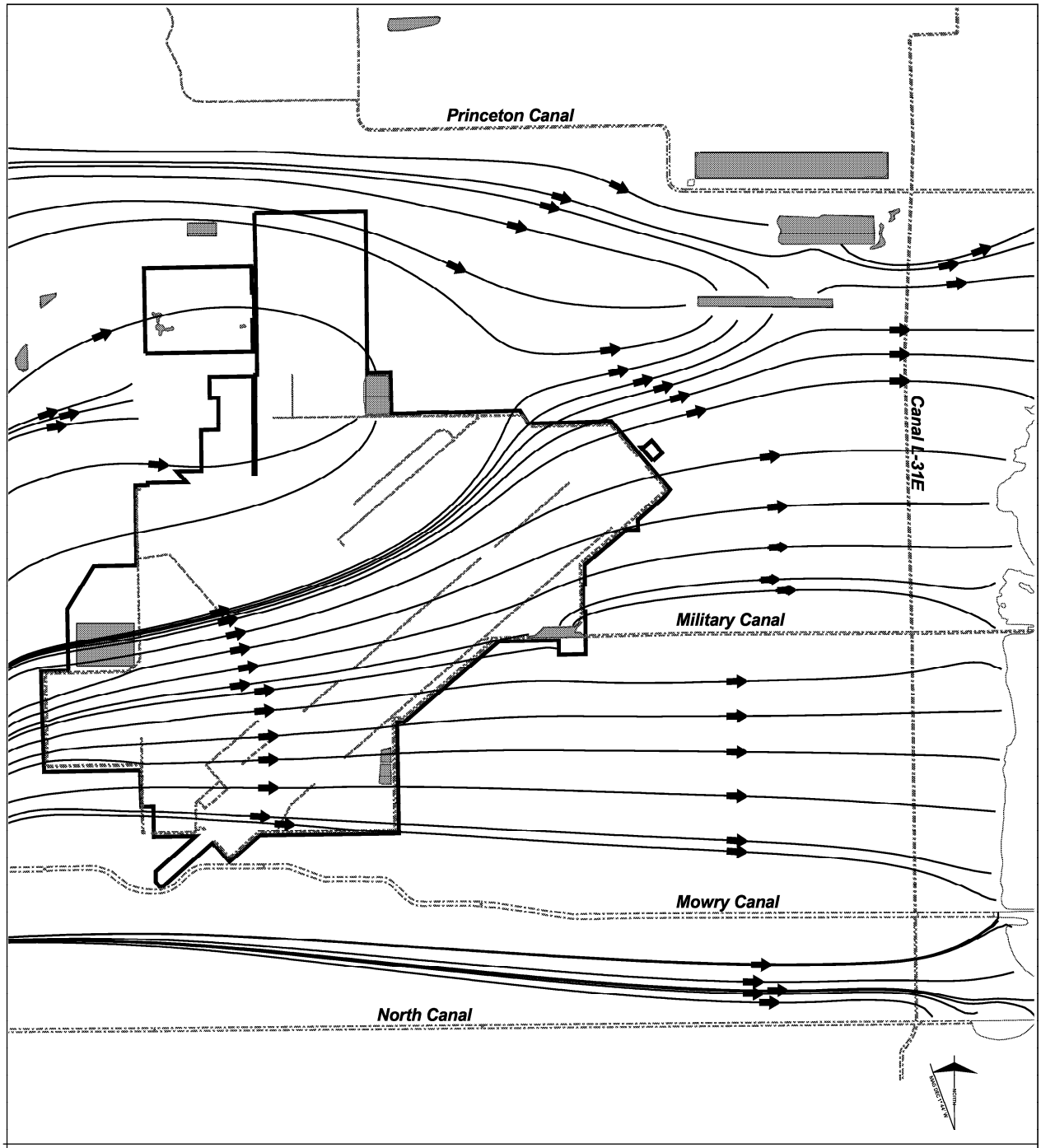


Figure 3.10-4
Simulated Ambient Hydraulic Heads
In the Biscayne Aquifer



-777650705

LEGEND

- Former Homestead AFB
- Surface Water
- Flow Line
- Canal

0.5 0 0.5

Scale in Miles

Source: SAIC

Figures 3.10-5
MODPATH Flow Lines
in Biscayne Aquifer

Table 3.10-15. Groundwater Quality of the Biscayne Aquifer in Miami-Dade County

Parameter	Units	Concentration			
		Minimum	Maximum	Mean	FDEP Class I Criterion
Water Quality Parameters					
Alkalinity (as $CaCO_3$)	mg/L	157	624	263	none
Chloride	mg/L	13	110	42	none
Fluoride	mg/L	0.1	0.5	0.2	2
Hardness (as $CaCO_3$)	mg/L	150	370	249	none
Sulfate	µg/L	0.1	45	14.6	250,000
TDS	µg/L	196	478	333	500,000
Metals					
Arsenic	µg/L	<1	2	1.2	50
Barium	µg/L	<100	100	100	2,000
Cadmium	µg/L	<1	3	1.0	5
Calcium	µg/L	55,000	140,000	90,000	none
Chromium[1]	µg/L	<10	10	—	100
Iron	µg/L	<10	1,900	560	300
Lead	µg/L	<1	6	1.9	15
Mercury	µg/L	<0.1	0.3	0.1	2.0
Magnesium	µg/L	1,700	19,000	5,600	none
Manganese	µg/L	<10	30	9.7	50
Potassium	µg/L	200	6,500	2,400	none
Sodium	µg/L	7,400	77,000	26,600	160
Zinc	µg/L	4	30	7.5	5,000

Source: **Woodward-Clyde 1995**.
Note: [1] All detected observations had the same value.
< less than the detection limit
FDEP Florida Department of Environmental Protection
µg/L micrograms per liter
mg/L milligrams per liter
TDS total dissolved solids

Saline groundwater is found in an area paralleling the coast that transects the base (**USAF 1994a**). This saltwater front is defined by water containing 1,000 mg/L chloride. The saltwater front near southeastern Miami-Dade County apparently moved landward in the early 1970s in response to groundwater pumping. Data obtained from multiple wells at the inland edge of the zone of diffusion indicated that the chloride concentrations increased from less than 200 mg/L at a depth of 80 feet below MSL to greater than 4,000 mg/L at a depth of 95 feet below MSL. Data collected from USGS monitoring wells located at former Homestead AFB showed a significant increase in chloride levels over time (**Montgomery Watson 1997**).

As part of the remedial investigation of OU-11 (Military Canal) (**Montgomery Watson 1997**), the Air Force analyzed organics and metals in the soils and groundwater adjacent to Military Canal (Base Sewage Treatment Plant Sludge/Incinerator Ash Disposal Area), just below the stormwater collection

reservoir at its head. The results are shown in **Table 3.10-16**. With the exception of aluminum, iron, manganese, and arsenic, all parameters were below FDEP standards for remediation. The maximum concentrations of aluminum, iron, manganese, and arsenic were above FDEP Guidance Concentrations. While aluminum, iron, and manganese generally do not cause toxic effects even in high concentrations, arsenic is toxic to many species. The elevated arsenic appears to be isolated to a single well (in the former base ash disposal area). Arsenic concentrations from five other wells in the same area ranged from less than 3.2 μg/L to 12.7 μg/L, all below the FDEP groundwater Guidance Concentration.

The organics results shown in Table 3.10-16 are surprising because compounds such as DDD and phthalates are not normally found in groundwater; they typically sorb to particles and do not leach. Since the wells from which these samples were taken are at least 5 feet deep, and elevated concentrations at this level could only occur by leaching, the data suggest that the samples may have been contaminated by the surface soils through which the wells were sunk. The surface soils in this area have detectable concentrations of DDD and phthalates, and this could explain the observed results. If surface soils contaminated the groundwater samples, this could also have affected the metals results.

The dissolved inorganic constituent loads to Biscayne Bay via groundwater were estimated using the modeled groundwater flow combined with the average groundwater quality of the Biscayne Aquifer in Miami-Dade County (**Woodward-Clyde 1995**). These estimates are crude and are included only to provide a context for the potential magnitude of inputs of pollutants to Biscayne Bay from groundwater sources in general. These estimates may not be representative of inputs in the Homestead area, although the groundwater flows on which they are based are for the area between Princeton and Mowry Canals. The results are presented in **Table 3.10-17**.

Only one study was found that documented the concentration of nitrogen in groundwater discharging to Biscayne Bay (**Meeder et al. 1997**). It reports the results of samples taken from 31 wells drilled in Biscayne Bay in May 1996. The wells were located along five transects between Coconut Grove and Mowry Canal at distances of 50, 200, 400, and 800 meters offshore. Samples were taken from all wells in June 1996 and from wells between Military and Mowry Canals in September 1996 and January, May, and June 1997. Dissolved inorganic nitrogen concentrations in nearshore shallow groundwater ranged from 0.48 milligrams per liter to 0.93 milligrams per liter, with a mean concentration of 0.74 milligrams per liter. Ammonia concentrations were found to be about 92 percent of total dissolved inorganic nitrogen, with a mean nearshore concentration of 0.68 milligrams per liter (range of 0.52 to 0.75 milligrams per liter). The concentrations decreased with distance from shore. Mean dissolved inorganic nitrogen concentrations ranged from 0.74 milligrams per liter in groundwater 50 meters from the shoreline to 0.47 milligrams per liter at 800 meters offshore.

Water Use

The potable water supply system for former Homestead AFB includes wells, a water treatment plant, water storage tanks, and a distribution network. The base had two wellfields, one on base and one off base. The on-base wellfield is no longer in use, and the wells have been abandoned and properly closed. Three off-base wells, located approximately 1.5 miles west of the former base, currently provide water supply to the cantonment and the remainder of the former base. The off-base wells have a permitted pumping rate of 3.9 mgd. The water system is currently operated by Miami-Dade WASD under contract to AFBCA. There are no waste disposal wells on the former base.

Table 3.10-16. Summary of Groundwater Quality Near the Origin of Military Canal

Parameter	Units	Concentration Range	FDEP Criteria Class I Criterion
Organics			
1,2-Dichloroethane	µg/L	<1.0–2.0J	700
Styrene	µg/L	<1.0–7.0J	100
Tetrachloroethene	µg/L	<1.0–3.0	5
Toluene	µg/L	<1.0–2.0	1,000
Trichloroethene	µg/L	<1.0–1.0	5
Xylene, Total	µg/L	<2.0–9.0	10,000
Di-n-butylphthalate	µg/L	0.08J–0.2J	none
Bis(2-ethylhexyl)phthalate	µg/L	0.1J–0.3J	6
p,p-DDD	µg/L	0.041J–0.056J	0.1
Metals			
Aluminum	µg/L	37.4–6,400	200
Antimony	µg/L	nd	6
Arsenic	µg/L	<3.2–63.3	50
Barium	µg/L	5.3–83.0	2,000
Beryllium	µg/L	<0.09–0.16	4
Cadmium	µg/L	nd	5
Calcium	µg/L	85,200–2,200,000	none
Cyanide	µg/L	nd	200
Chromium	µg/L	<0.92–49.00	100
Copper	µg/L	<1.8–30.0	1,000
Iron	µg/L	<1.8–2,900.0	300
Lead	µg/L	<1.3–12.0	15
Magnesium	mg/L	3.15–10.30	none
Manganese	µg/L	0.82–52.00	50
Nickel	µg/L	<1.6–5.7	100
Potassium	µg/L	916–48,600	none
Selenium	µg/L	<3.4–3.8	50
Sodium	mg/L	12.5–59.0	160
Vanadium	µg/L	<1.1–26.0	49
Zinc	µg/L	1.8–65.0	5,000

Source: **Montgomery Watson 1997**.
< less than detection limit
FDEP Florida Department of Environmental Protection
J estimated concentration
µg/L micrograms per liter
mg/L milligrams per liter
nd not detected

Table 3.10-17. Rough Estimates of Dissolved Inorganic Constituent Loads Entering Biscayne Bay via Groundwater Between Mowry and Princeton Canals

Parameter	Concentration (µg/L)	Estimated Load (lbs/year)
Water Quality Parameters		
Alkalinity (as $CaCO_3$)	263,000	5,120,610
Chloride	42,000	817,740
Fluoride	200	3,894
Hardness (as $CaCO_3$)	249,000	4,848,030
Sulfate	14,600	284,262
TDS	333,000	6,483,510
Metals		
Arsenic	1.2	23.4
Barium	100	1,947
Cadmium	1.0	19.5
Calcium	90,000	1,752,300
Iron	560	10,032
Lead	1.9	37.0
Mercury	0.1	1.9
Magnesium	5,600	109,032
Manganese	9.7	188.9
Potassium	2,400	46,728
Sodium	26,600	517,902
Zinc	7.5	146.0

Sources: **Woodward-Clyde 1995**; modeled by SAIC.
lbs pounds
µg/L micrograms per liter
TDS total dissolved solids

3.10.3.2 Projected Baseline Environment

A 7 percent increase in runoff flow by 2015 was projected in connection with projected baseline growth and development in the vicinity of the former base (see Section 3.10.2.2). Given the relationship between surface and groundwater systems, a comparable percent reduction of recharge to the groundwater system could be expected. With the reduction in groundwater recharge, there would be a reduction in both the total volume of groundwater discharged to Biscayne Bay and in the rate of movement of groundwater towards the bay. The complexity of the groundwater system, however, precludes estimation of the magnitude of these changes over such a broad area.

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3.11 BIOLOGICAL RESOURCES

3.11.1 Introduction

This section presents information on the biological resources that occur or potentially occur in, around, and near former Homestead AFB. It describes the three major biological community types that occur in the ROI: estuarine and marine communities, wetland and freshwater communities, and upland and disturbed communities. The section also addresses species of special concern including species designated as threatened and endangered under the Endangered Species Act and other species of concern in south Florida. Scientific names of species discussed in this section are presented in Appendix G.

3.11.1.1 Resource Definition

The estuarine and marine biological community includes the mangrove swamps along the shoreline of Biscayne Bay, seagrass beds in nearshore areas of the bay, the coral reefs east of the Florida Keys, and the open waters of Biscayne Bay.

Freshwater aquatic communities are found in canals, ponds, lakes, and reservoirs. Wetlands are areas that are distinguished by the presence of water, unique soil type, and hydrophytic vegetation.

Upland communities include dry prairie, pineland, and tropical hardwood hammock. Disturbed communities include agriculture lands, grassland, shrub and brushland, exotic plants, and barren and urbanized areas.

Biological resources described in this SEIS include plants and animals that could be affected by the disposal and reuse of former Homestead AFB property.

3.11.1.2 Applicable Laws and Regulations

A variety of laws and regulations apply to biota in southern Florida. Federal laws, regulations, and executive orders generally provide protection to very rare species or species whose range extends over large areas. The most important laws, regulations, and executive orders are summarized below.

Endangered Species Act of 1973 (16 U.S.C. 1531–1544, as amended). The Endangered Species act established measures for the conservation of federally listed plant and animal species listed as threatened or endangered, including the protection of critical habitat necessary for their continued existence. Section 7 of the Act requires federal agencies to consult with the Secretary of the Interior (delegated to the U.S. Fish and Wildlife Service for non-marine species) prior to carrying out any action that might affect a threatened or endangered species.

Migratory Bird Treaty Act (16 U.S.C. 701–715s). This act established protections for migratory birds and their parts (including eggs, nests, and feathers) from hunting, capture, or sale by non-federal entities.

Bald Eagle Protection Act (16 U.S.C. 668–668C). This act protects bald and golden eagles by prohibiting the take, possession, or transportation of these species, dead or alive. The act extends protection to eagle nests and eggs.

Fish and Wildlife Conservation Act (16 U.S.C. 2901–2911). This act authorizes funding for grants aimed at developing and implementing comprehensive state nongame fish and wildlife management plans.

Fish and Wildlife Coordination Act (16 U.S.C. 601–666c). This act provides for conservation and management of fish and wildlife when a proposed action will affect a water body by encouraging cooperation between the U.S. Fish and Wildlife Service and other federal, state, public, and private agencies in developing stocking programs, conducting inventories of wild populations, conserving habitat, and providing public shooting and fishing areas.

Marine Mammal Protection Act (16 U.S.C. 1361–1421h). This act established protection for marine mammals by implementing a moratorium on the take of marine mammals, establishing a program for monitoring for the health and size of populations, and forming a commission to oversee the conservation of marine mammal species.

Federal Water Pollution Control Act (Clean Water Act; 33 U.S.C. 1251–1387). This act established procedures and programs for the restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters, thus protecting habitat conditions in aquatic and wetland ecosystems.

North American Wetlands Conservation Act (16 U.S.C. 4401–4412). This act supports the management and preservation of waterfowl by funding the implementation of the North American Waterfowl Management Plan and the Tripartite Agreement on wetlands between Canada, United States, and Mexico.

Executive Order 11990, Protection of Wetlands. This executive order established a policy of no net loss of wetland for any federal action that may affect wetlands and to avoid activities in wetlands whenever there is a practicable alternative.

Executive Order 11988, Floodplain Management. This executive order requires federal agencies to avoid, when possible, adversely affecting floodplains with their actions and to avoid supporting floodplain development whenever there is a practicable alternative.

Executive Order 13112, Invasive Species. This executive order requires federal agencies to identify actions that affect the status of invasive species; use relevant programs and authorities to prevent the introduction of invasive species; detect and control populations of such species; provide for restoration of native species and habitat conditions; and not authorize, fund, or carry out actions that are likely to promote the introduction or spread of invasive species.

3.11.1.3 Region of Influence

The ROI for biological resources (**Figure 3.11-1**) includes the area most likely to be affected by construction (Miami-Dade County south of Eureka Drive), areas affected by stormwater runoff from former Homestead AFB (nearshore Biscayne Bay within Biscayne NP), and areas that could be affected by elevated noise levels from aircraft overflights (Biscayne NP, Crocodile Lake NWR, and eastern Everglades NP). Biota in the western part of Everglades NP and Florida Bay are not expected to be measurably affected by reuse of former Homestead AFB.

3.11.2 Biological Communities

A variety of community types occur in the vicinity of former Homestead AFB. The habitats that comprise biological community types are often close to each other geographically, providing a diversity of habitats in relatively small areas. The diversity of habitats provides for a rich flora and fauna. This section contains a brief description of the major biological communities in the ROI. Each major biological

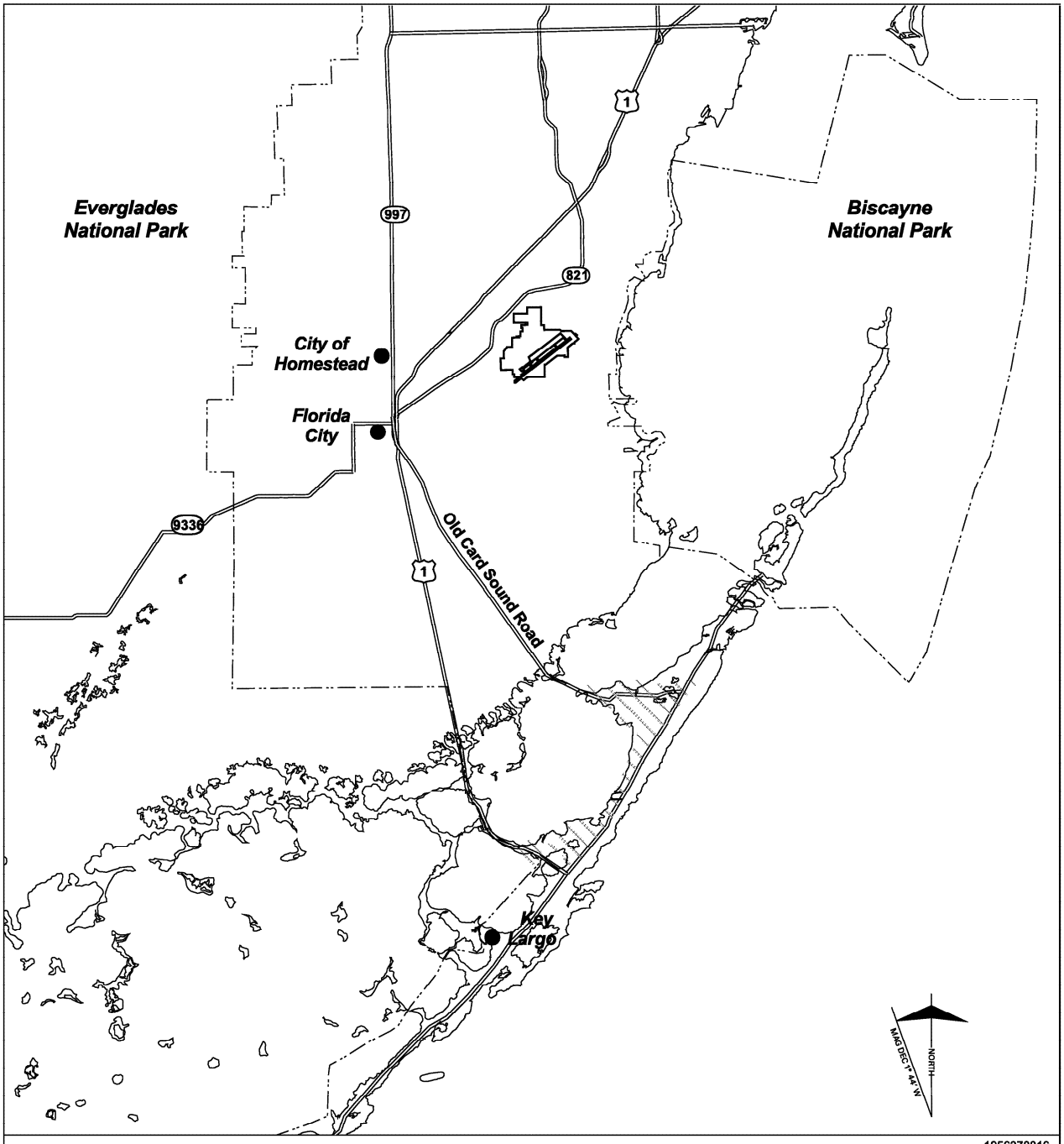


Figure 3.11-1
Region of Influence
for Biological Resources

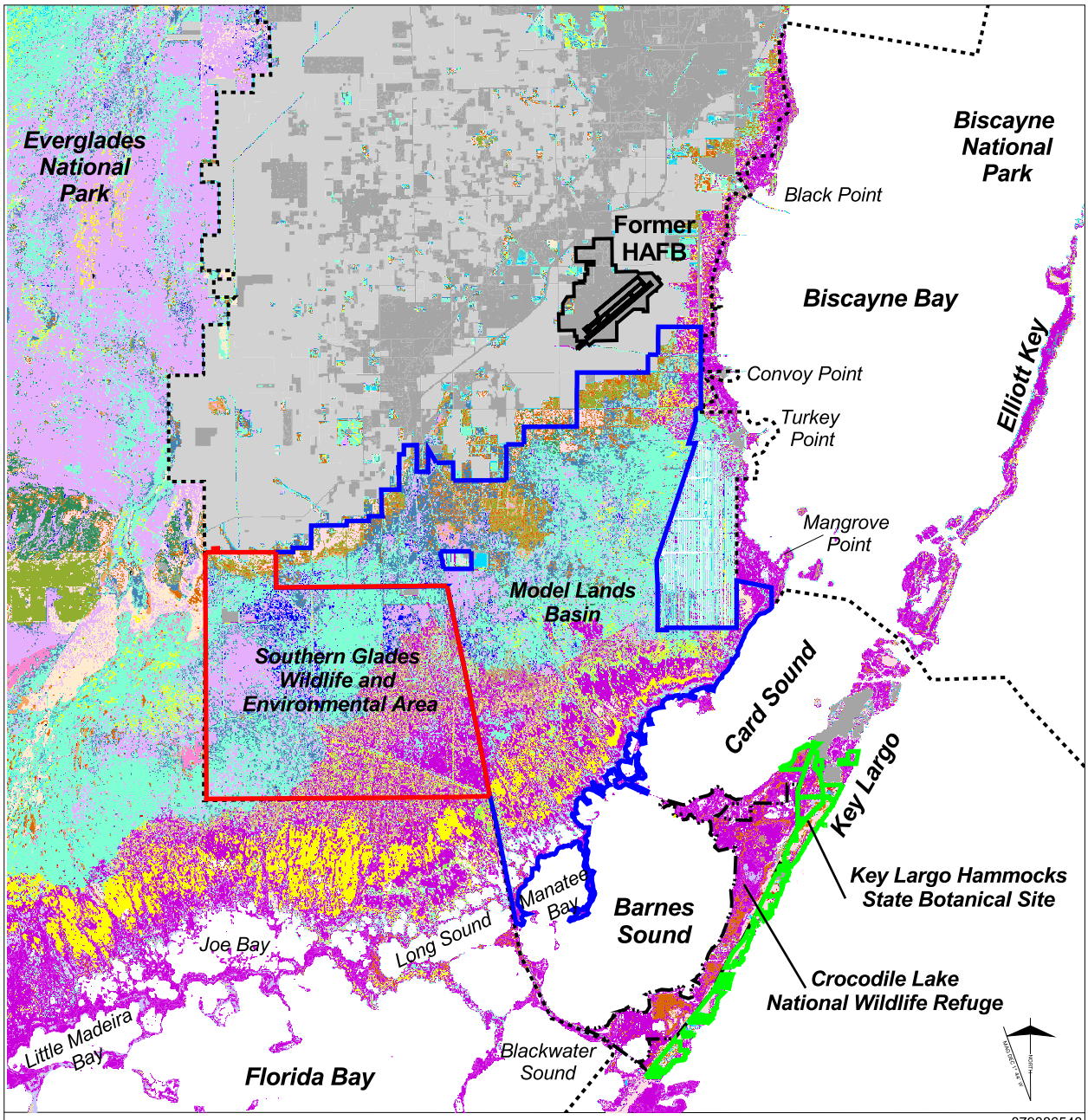
community type is further divided into a series of habitats. **Figure 3.11-2** shows land-cover types in the ROI in 1995. Land-cover types are generally equivalent to habitat types and are used to describe wildlife habitat and associated plant and animal species. The approximate acreage associated with each land-cover type shown in Figure 3.11-2 is presented in **Table 3.11-1**.

Table 3.11-1. Approximate Acreage of Land-Cover Types in the ROI

Land-Cover Types	Acres	Percent of ROI
Mangrove Swamp	56,900	14.4
Grass, Forb, and Cattail Emergent Marsh	8,400	2.1
Sawgrass Marsh	69,300	17.5
Muhly Grass Marsh	60,700	15.4
Salt Marsh, Saltwort/Glasswort, Spikerush, Sand Cordgrass Types	28,350	7.2
Dwarf Cypress Prairie and Cypress Forest	3,600	0.9
Hardwood Swamp	9,300	2.4
Scrub Swamp	17,200	4.4
Open Water[1]	1,500	0.4
Dry Prairies	3,100	0.8
Pineland	5,600	1.4
Tropical Hardwood Hammock	6,800	1.7
Agriculture	73,500	18.6
Exotic Plant Communities	6,400	1.6
Barren and Urban	44,600	11.3
Total ROI	**395,250**	**100.0**[2]

Source: SAIC.
Note: [1] Includes freshwater bodies.
[2] Does not sum due to rounding.

The ROI contains a number of important biological areas, including Everglades and Biscayne NPs. Two other areas south and southwest of former Homestead AFB are the Model Lands Basin and the SFWMD Southern Glades Wildlife and Environmental Area. The Model Lands Basin includes the Southeast Wetlands and the Coastal Wetlands and Hammocks, and the majority of this area is undisturbed freshwater and estuarine wetlands. The dominant freshwater wetlands are wet prairie interspersed with tree islands. Red, white, and black mangroves are the dominant estuarine species. The Southern Glades Wildlife and Environmental Area is southwest of former Homestead AFB and is dominated by wet prairie wetlands with tree islands (hammocks) and thickets. Sawgrass and muhly grass wetlands are common, with some areas dominated by cypress and others by tropical hardwood hammocks (**Florida Game and Fresh Water Fish Commission 1998b**).



LEGEND

- Agriculture
- Urban
- Brasilian Pepper Shrubland
- Melaleuca Forest Compositional Group
- Cattail Marsh Compositional Group
- Cypress Forest Compositional Group
- Dry Prairie & Graminoid Dry Prairie Ecological Complex
- Dwarf Cypress Prairie
- Flooded Cold-Deciduous Shrubland Ecological Complex
- Forb Emergent Marsh & Water Lilly or Floating Leaved Vegetation
- Graminoid Emergent Marsh Group
- Mangroves/Buttonwood
- Mesic-Hydric Pine Forest Group
- Muhly Grass Marsh
- Open Water
- Salt Marsh Ecological Complex
- Saltwort/Glasswort Ecological Complex
- Sand Cordgrass Grassland
- Sawgrass Marsh
- Semi-Deciduous Tropical/Subtropical Swamp Forest & Swamp Forest Compositional Group
- South Florida Slash Pine Forest
- Spikerush Marsh & Black-Needle Rush Marsh
- Tropical Hardwood Hammock

Derived From:
University of Florida 2000, SFWMD 1999b, FDEP 1998a, Miami-Dade County 2000b

Figure 3.11-2
Land Cover Types Within the ROI, 1995

3.11.2.1 Existing Environment

Estuarine and Marine Communities

There are four types of estuarine and marine communities in the ROI: mangrove swamps, seagrass beds, reefs, and open water. The distribution of these communities and the species that comprise them are described in the following sections.

Mangrove Swamps. Mangrove swamps form the majority of the transition between the land of south Miami-Dade County and the waters of Biscayne Bay (see Figure 3.11-2). Mangroves are salt-tolerant, woody trees that inhabit intertidal zones with varying salinity regimes in coastal warm tropical regions.

The four major species in south Florida are red, white, and black mangroves and buttonwood[1]. Mangrove forests found along the Biscayne Bay shoreline consist of tall red and black mangroves (1.5 meters tall or greater) extending 200 meters inland. Directly behind these tall mangroves are dwarf (less than 1.5 meters tall) red mangroves. The dwarf mangroves end abruptly near the human-made canals adjacent to south Miami-Dade County's agricultural and suburban areas (**Smith et al. 1994**).

Only a few stands of mangrove forests are present in the north bay: near the Oleta River State Recreation Area, at Bird Key, along the western shore of Virginia Key, and on Key Biscayne. Mangroves in the south bay are located along Matheson Hammock Park and extend southward to the mainland shoreline adjacent to Barnes Sound (**Sewell 1996**).

The tall red and black mangroves along the western shore of Biscayne Bay were damaged from Matheson Hammock in the north to Mangrove Point in the south by Hurricane Andrew in 1992 (**Smith et al. 1994**). Dwarf mangroves adjacent to these areas were partly defoliated from Northern Black Point to south of Mangrove Point. The shorter red mangroves were apparently unaffected by the hurricane. Presently, areas of regrowth are observed within the mangrove swamps. Abundant new growth regions have become established, although stands are not yet mature.

Coastal mangroves provide habitat and protection for numerous animals. Crustaceans such as amphipods, mysids, copepods, and shrimp feed on decayed mangrove leaves. Juvenile spiny lobsters, crabs, and snails commonly live on the mangrove prop roots (emergent mangrove tree roots). Prop roots often function as nursery habitats and protective refuges for many invertebrate and fish species (**Alleman et al. 1995**).

Sport fish surveys along Rickenbacker Causeway near Miami indicate that the Spanish mackerel is a dependent mangrove species. Young Spanish mackerel use the mangrove environment prior to migrating into the bay, where they spawn offshore as adults (**Alleman et al. 1995**).

Mangrove areas also support fish species that are critical links in the Biscayne Bay food web. Live-bearing (Poeciliidae) and egg-laying (Cyprintodontidae) topminnows regularly inhabit mangrove and estuarine habitats. Egg-laying topminnows include two species of mosquito fish and a mollie; live-bearing topminnows comprise six killifish species. Numerous gobies, blennies, eels, and wormfish also inhabit mangrove areas. In addition, the barracuda, smalltooth sawfish (Pristiformes), and various flatfish species (Bothidae and Cynglossidae) also frequently inhabit mangroves (**Alleman et al. 1995**).

[1] Scientific names of all species are presented in Appendix G.

The American crocodile is a federally and state listed endangered species and is found in sheltered areas such as mangrove creeks, the salt water portion of canals, and coastal ponds. The American crocodile has nested in recent years only along the coast from Florida Bay to Turkey Point and north Key Largo. About half of the nesting sites are in Biscayne Bay, Card Sound, and Barnes Sound. One-third of these nests occur in the cooling canals at the Turkey Point Nuclear Power Plant. An increase in the number of nests has recently been recorded in these areas. In 1987, a total of 29 nests were counted. By 1992, 32 nests were found, with 12 located at Turkey Point (**Alleman et al. 1995**). Another breeding population occurs in Crocodile Lake NWR. In recent years, the range of this species has expanded north of Turkey Point. It has been observed along the western shoreline of Biscayne Bay north of Turkey Point and nests at Chapman Field Park (**Denton and Godley 1999**, **Mazzotti 1999b**, **Mazzotti and Cherkiss 1998**). Crocodiles have recently been observed as far north as Matheson Hammock County Park.

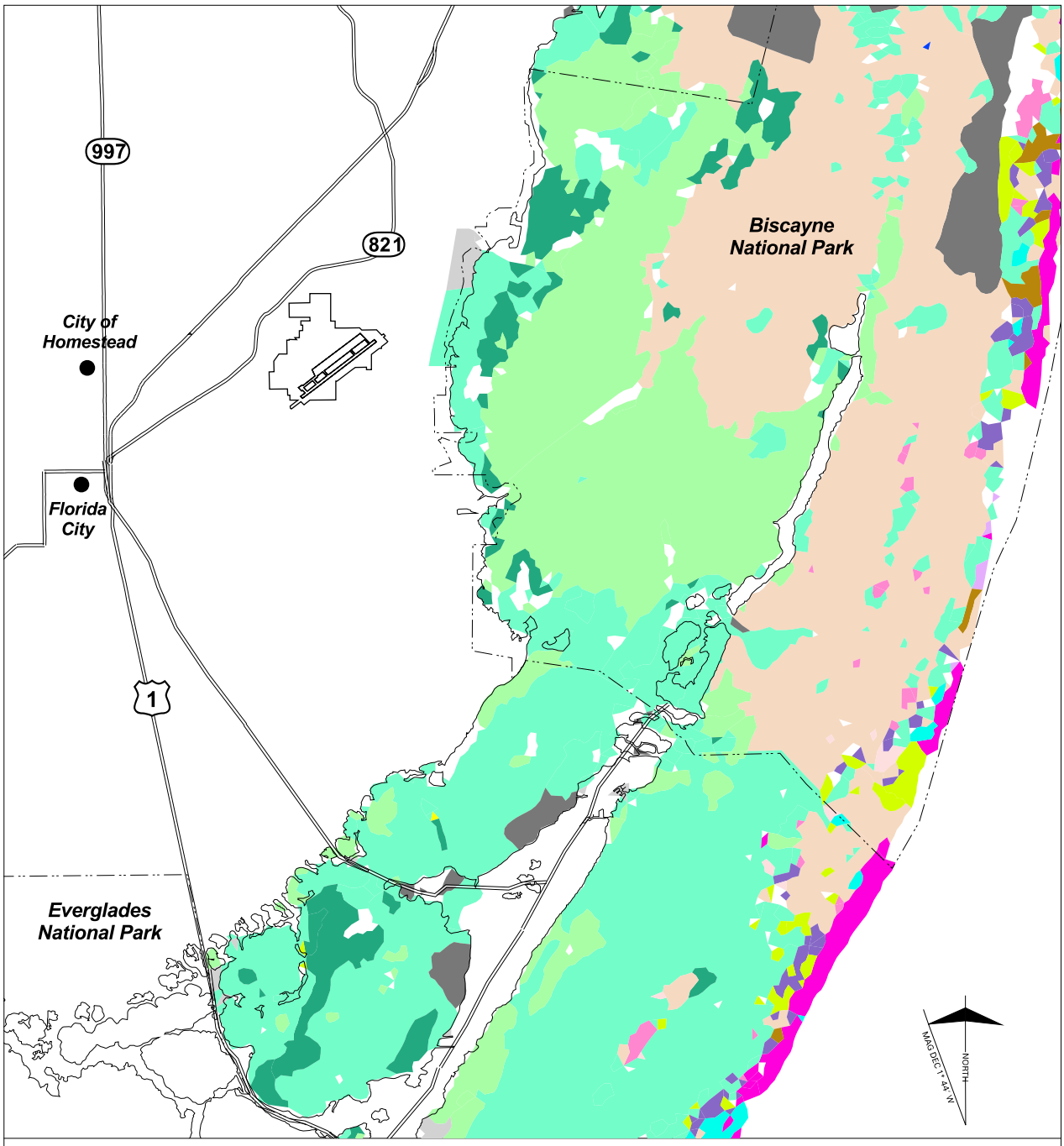
Seagrass Beds. Seagrass beds occupy extensive areas of the nearshore Biscayne Bay (**Figure 3.11-3**). Seagrass beds cover approximately 370 square kilometers of Biscayne NP aquatic habitat (**Ault et al. 1997**) and comprise the dominant vegetation in the area closest to shore that is most influenced by groundwater inflow. In nearshore areas within approximately 400 meters of the shoreline, seagrasses are extensively covered by epiphytes.

Seagrass species commonly occurring in Biscayne Bay include turtle grass, manatee grass, shoal grass, and species of *Halophila* (**Serafy et al. 1997**, **Alleman et al. 1995**). In addition to being a main source of primary productivity, seagrasses provide essential habitat and shelter for a variety of benthic species. Seagrasses require high light intensities and depend on water clarity and shallow depths for their survival (**Alleman et al. 1995**).

A large number (over 850) of invertebrate species inhabit the seagrass beds of Biscayne Bay. These species are commonly trawled by fisherman. Commercially harvested species include stone crabs, blue crab, penaeid shrimp, and the spiny lobster. There are also eight species of blue crabs (*Portunidae*) in more saline waters of the eastern bay, and five species of the blue crab genus (*Callinectes*) that inhabit estuarine regions within the western half of Biscayne Bay (**Alleman et al. 1995**). The Florida spiny lobster depends on seagrass beds for food.

In addition to the many commercially harvested invertebrate species inhabiting the seagrass beds, there is a diverse assemblage of other benthic invertebrate species that are part of the seagrass community. Benthic organisms—clams, worms, bryozoans, and sponges—are bottom dwellers that live in, upon, or attach to the sea floor. These animals are important components of the Biscayne Bay food web. In general, greater numbers and higher diversities of benthic organisms are associated with seagrasses, especially turtle and manatee grass beds (**Alleman et al. 1995**).

Numerous commercially and recreationally important fish in Biscayne Bay are dependent on seagrass beds. Seagrass-dependent species include bonefish, ladyfish, pompano, permit, red drum, spotted seatrout, silver perch, hogfish, and Nassau, red, and black grouper (**Alleman et al. 1995**). Other seagrass bed inhabitants include blennies (Clinidae), conchfish, cowfish and trunkfish (*Lactophrys* spp.), eels (Congridae, Ophidiidae, and Muraenidae), gobies (Gobiidae), jawfish (Opisthognathidae), parrotfish (Scaridae), pearlfish, puffers (Tetraodontidae), sea horses and pipefish (Syngnathidae), toadfish, and wrasses (Labridae). Several species of venomous scorpionfish also inhabit the bay, and a variety of shark species can be found traveling through seagrasses, including lemon, blacknose, sharpnose, and bonnethead. Many common fish species, including grunts (Pomadasyadae) and snappers (Lutjanidae), forage for food in seagrass beds (**Alleman et al. 1995**).



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LEGEND

South Florida Benthic Habitat
- Aggregated Patch Reefs
- Individual Patch Reef and Halo
- Reef Containing Drowned/Shallow Spur and Groove
- Back Reef
- Remnant Reef
- Coral Patches in Bare Sand
- Soft Coral, Sponges, Algae
- Dense Patches of Seagrass (>50%)
- Moderate to Dense Seagrass, Continuous Beds
- Hardbottom with Perceptible Seagrass
- Dominantly Sand or Mud with Small Scattered Seagrass Patches (<50%)
- Reef Rubble
- Carbonate Sand
- Bottom Unknown; Dredged/ Excavated
- Unmappable/ Unknown Bottom

- Former Homestead AFB
- Major Road
- U.S. Highway
- State Highway

3 0 3
Scale in Miles

Derived from: FMRI 1997

Figure 3.11-3
Seagrass and Reef Habitats in the ROI

The West Indian manatee is a federally listed endangered species inhabiting both fresh and salt water parts of shallow coastal waters, canals, and rivers of Florida, including Biscayne Bay. The manatee, or sea cow, is a large, herbivorous aquatic mammal that inhabits the warm subtropical waters of Biscayne Bay. Manatees are often observed swimming, feeding, or resting in seagrass areas and near freshwater canal mouths.

Reef. The northern portion of the Florida reef tract lies within Biscayne NP. This tract extends approximately 360 kilometers from Miami south and west to the Dry Tortugas. The Biscayne NP reef complex forms an outer discontinuous barrier reef approximately 7 kilometers offshore of the Florida Keys (Figure 3.11-3) (**Bohnsack et al. 1992**).

Studies performed by Ault et al. (**Ault et al. 1997**) report reef area plants consisting of red and calcareous algae. No other reports identify the species of red, brown, and green algae and other plants that inhabit reef areas in Biscayne NP.

The reef/hard bottom community covers 11 to 13 percent of Biscayne NP, with the greatest coverage in central south bay at depths of 1 to 3 meters (**Alleman et al. 1995**, **Ault et al. 1997**). Reef/hard bottom habitats are inhabited by a diverse assortment of soft and hard corals, anemones, sponges, and other invertebrates (i.e., shrimps, crabs, tubeworms, brittle stars, and sea urchins). Sponges commonly found on hard bottoms include the loggerhead sponge and basket sponge. Sheepswool, yellow, grass, and glove sponges are commonly found in central and south bay. The finger coral, star coral, fire coral, and starlet coral are hard corals also found in hard bottom communities (**Alleman et al. 1995**).

Reef fish are not typical inhabitants of the bay, although some species are known to occur in reef and hard bottom areas. Trawl surveys found several reef fish species in the hard bottom communities of the bay, along with sponges, alcyonarians, and shallow water corals (**Alleman et al. 1995**). Visual censusing of ten study reefs located on the eastern side of the barrier islands identified fish populations in Biscayne NP. Abundant fish in this area were wrasses (Carangidae and Labridae), damselfish (Pomacanthidae), grunts (Haemulidae), parrotfish (Scaridae), and surgeonfish (Acanthuridae). Other fish observed were snapper, gobies, angelfish, butterflyfish, and two species of sea bass (*Epinephelus cruentatus* and *Serranus tigrinus*) (**Bohnsack et al. 1992**).

Open Water. A variety of flora and fauna spend the majority or all of their lives in open water. These species may be free-floating (planktonic) or active swimmers (pelagic).

Planktonic organisms are organisms that float in the water and have poor or no ability to move themselves, drifting with currents. Phytoplankton (plant plankton) are important food producers, converting sunlight to biomass through photosynthesis.

Brand (**1988**) found low chlorophyll concentrations (signifying small populations of phytoplankton) in the open waters of southern Biscayne Bay, with five to ten times higher chlorophyll concentrations in the northern bay. Chlorophyll concentrations were higher near canal mouths than in the open water (**Brand et al. 1991**).

Brand found that the dominant phytoplankton of the bay were small coccoid cells, comprising approximately 80 percent of the north bay phytoplankton and 90 percent of the south bay phytoplankton. The remaining 10 to 20 percent of north bay phytoplankton were composed of centric diatoms. Centric diatoms constitute 1 percent or less of the south bay phytoplankton community. Pennate diatoms and dinoflagellates comprised less than 1 percent of the overall phytoplankton community (**Brand 1988**).

Zooplankton (animal plankton) are the most abundant animals in the marine environment (**Tilmant et al. 1994**). Zooplankton are secondary consumers that graze on phytoplankton, other zooplankton, bacteria, and organic matter. The most common form of zooplankton are copepods, small shrimp-like organisms that generally comprise 95 percent of all zooplankton. Copepods serve as food for larger predators such as shrimp, fish, and baleen whales.

In Biscayne Bay, Brand calculated zooplankton biomass to be two to five times higher in the north bay than in the south bay, with the highest zooplankton biomass in Dumfoundling Bay. North bay zooplankton are composed primarily of various life stages of copepods (nauplii, copepodites, adults). Card Sound had a somewhat higher biomass for all developmental stages. Copepods were most abundant in the fall and winter months (**Brand 1988**).

Shrimp larval stages were most abundant in seagrass beds north of the Julia Tuttle Causeway. As observed for copepods, shrimp larvae were more abundant in the north than in the south bay. Seasonally, shrimp larvae were most abundant in the fall, and juvenile shrimp densities were greatest in winter. Other incidental zooplankton collected during Brand's survey included ostracods and amphipods, larval and juvenile stages of crabs, mollusks (bivalves and other shellfish), juvenile barnacles, and larval fish. Fish eggs and larvae were most abundant in the north bay during the spring and summer seasons.

Biscayne Bay provides a suitable environment for a highly diverse fish community, estimated to consist of at least 512 species. The bay serves as a transition area where tropical and temperate species intermix. Tropical species are most abundant during summer months, while more temperate species are prevalent in winter months. Oceanic fishes are not normal inhabitants of the bay, but occasional strays from deeper ocean water and the Florida Current, such as dolphins, sailfish, and other deep sea fish, have been observed. In addition, fish important to the food chain, such as silversides (Atherinidae), sardines and herrings (Clupeidae), and anchovies (Engraulidae), live in open waters of Biscayne Bay. These species often serve as prey for larger predatory species such as needlefish (Belonidae) and barracuda (Sphyraenidae) (**Alleman et al. 1995**).

Several species of sea turtles are observed in Biscayne Bay, including the federally and state listed endangered or threatened Atlantic green turtle, Atlantic hawksbill turtle, Atlantic ridley turtle, and loggerhead turtle. The diamondback terrapin and the mangrove saltmarsh terrapin have also been observed. The loggerhead turtle occurs regularly in Biscayne Bay and has nested on the outer beaches of some of the keys in Biscayne NP at least since 1995 (see Appendix G for more details). The Atlantic hawksbill turtle is commonly observed in waters overlying bay seagrass beds and it nested along the outer keys of Biscayne Bay in 1981 and 1990. The green turtle is frequently seen foraging in the bay but are not known to have nested in Biscayne NP (**Moulding and Lockwood 1997**). The diamondback terrapin has often been observed nesting on the outer keys and foraging throughout Biscayne Bay, Card Sound, and Barnes Sound. The mangrove saltmarsh terrapin is closely related to the diamondback terrapin. Primarily found in the lower keys, the mangrove terrapin is incidentally found in Barnes Sound.

Surveys from 1990 through 2000 indicate there is a resident population of bottlenose dolphin, which is protected under the Marine Mammal Protection Act, in Biscayne Bay (**Contillo et al. 1997**). A total of 136 individuals were observed between 1990 and 1997, and 120 (88 percent) were sighted more than once. Distribution data indicate that dolphins tend to occur in more open and deeper waters along the central and eastern sides of the bay. Fewer records exist on this species along the western shoreline of south Biscayne Bay (Black Point south to Card Sound), and it has not been observed in the canals that discharge to the bay.

Wetland and Freshwater Aquatic Communities

Wetlands generally occupy a transition zone between aquatic and upland communities and typically have well-developed hydrophytic vegetation, reliable hydrology, and hydric soils. Wetlands are usually shallow. Wetlands east of former Homestead AFB are further designated as areas suitable and not suitable for fill (**Metro-Dade County 1994b**). Freshwater aquatic communities exist in canals, ponds, lakes, and reservoirs. Aquatic habitats generally lack extensive vegetation because of water depth or movement.

The primary data sources used for describing the distribution of wetland and aquatic communities in the ROI include a Florida land-cover map developed from 1994 and 1995 satellite imagery and a number of local studies (**Geraghty & Miller 1993**, **PBS&J 1996c**, **Florida Game and Fresh Water Fish Commission 1998a**).

Land-cover types identified in Figure 3.11-2 provide the basis for the discussion of plants and animals associated with wetland and aquatic communities in the ROI. Local studies provide detailed information on presence, absence, abundance, and other attributes of plant and animal species that is not available from land-cover maps.

The development of the drainage and levee system on and around former Homestead AFB resulted in a reduction of freshwater sheetflow into Biscayne Bay, establishing isolated wetland basins and a shift from freshwater to marine/brackish wetland plant communities between the former base and Biscayne Bay (**Metro-Dade County 1994b**). The changes in wetland hydrology enhanced the invasion of wetlands by exotic species, noticeably Brazilian pepper. Other development and associated clearing and filling also altered the natural distribution and types of wetlands in the ROI. Even without development and other human-induced alterations, wetland and aquatic communities are in constant change due to succession, fire, floods, hurricanes, and sea-level fluctuations.

The satellite imagery used to develop land-cover types shown in Figure 3.11-2 was taken in 1995, so the type and distribution of wetland and aquatic communities represent conditions in the ROI after Hurricane Andrew. As depicted in Figure 3.11-2, most wetland communities occurred west, south, and east of former Homestead AFB. The fresh water marsh and wet prairie community dominated wetland areas west and south of the former base, while the mangrove swamp community occupies the coastal fringe to the east. Smaller, isolated areas of these and other wetland communities are also found within the disturbed communities immediately surrounding former Homestead AFB.

Some of the physical damage to vegetation from Hurricane Andrew (e.g., defoliation and limb breakage) has been, and will continue to be, naturally repaired (**Metro-Dade County 1994b**), but more extensive damage may have led to long-term changes in plant species composition in some areas (**Ogden 1992**, **Loope et al. 1994**, **Roman et al. 1994**). For example, a change in the types of wetland communities within the ROI might have occurred as a result of openings in the canopy and dispersal of exotics (**Ogden 1992**, **Loope et al. 1994**). The spread of exotics within ROI wetland communities is an ongoing concern.

The ROI is within the Everglades Province of the Savannah Division Ecoregion (**Bailey 1980**). Historically, this area likely exhibited a mosaic of communities typical of the south Florida rockland and freshwater marsh ecosystems described in Abrahamson and Hartnett (**Abrahamson and Hartnett 1990**).

National Wetland Inventory (NWI) data are also included in the description of wetland communities when appropriate. NWI acreage is summarized in **Table 3.11-2**. Except on the former base, no formal wetlands delineations have been conducted in the general vicinity.

Table 3.11-2. Approximate National Wetland Inventory Acreage in the ROI

Wetland Type	Acres	Percent of Total Wetlands
Estuarine	208,475	68.1
Riverine	488	0.2
Lacustrine	407	0.1
Palustrine		
Unconsolidated Bottom	636	0.2
Aquatic Bed	3	<0.1
Unconsolidated Shore	19	<0.1
Emergent Wetland	64,175	21.0
Scrub-Shrub Wetland	6,980	2.3
Forested Wetland	11,393	3.7
Open Water	166	<0.1
Emergent/Scrub-Shrub	13,588	4.4
Total Palustrine	*96,960*	*31.6*
Total Wetlands	**306,330**	**100.00**

Source: **USFWS 1991a, 1991b, 1991c, 1991d, 1991e, 1991f, 1991g, 1991h**.

Coastal Salt Marsh. Within the ROI, the coastal salt marsh communities primarily occur south and southeast of former Homestead AFB as a transition zone between the fresh water marsh and wet prairie or mangrove swamp communities. Coastal salt marsh occurs in brackish waters along protected estuarine shorelines where wave energy is low. Comprising approximately 28,350 acres within the ROI, the coastal salt marsh community is dominated by non-woody vegetation, including smooth cordgrass in the lower elevations (e.g., low marsh) and black needlerush in the less frequently inundated areas. Smooth cordgrass and black needlerush are considered indicators of this community. Glasswort, saltwort, saltgrass, sea oxeye daisy, marsh elder, and saltbush occur in the higher elevation (e.g., high marsh) and upper edge of the marsh (**Cox et al. 1994**). The density of this vegetation and the low topographic relief of this community are important attributes for the function of shoreline stabilization.

Tides and salinity drive the composition of the coastal salt marsh community and result in productivity among the highest of any ecosystem. This productivity forms the basis for both marine and terrestrial food webs. The grazing food web within the leaves and stems of marsh vegetation is dominated by herbivorous insects, which in turn supports a predatory food web consisting of spiders, parasitic wasps, and other invertebrates. Below the leaves and stems of marsh vegetation, at the sediment-water interface, exists an array of fauna, including polychaetes, mollusks, and crustaceans (**Montague and Wiegert 1990**). In tidal creeks, shrimp and a variety of fish, including mullet, function as both prey and predator in the food web of this community.

In addition to invertebrates, the coastal salt marsh community serves as nursery habitat for numerous fish and is also the home of salt marsh snakes, amphibians, mammals, and a variety of birds. The fringe of the high marsh is frequented by mammals such as raccoons and marsh rabbits (**Montague and Wiegert**

1990). Common birds of this community include clapper rails, marsh wrens, seaside and sharp-tailed sparrows, herons, egrets, ibises, and northern harriers. Red-breasted mergansers, oystercatchers, terns, and other shorebirds occupy the network of tidal creeks dissecting this community (**Kale and Maehr 1990**).

Fresh Water Marsh and Wet Prairie. The fresh water marsh and wet prairie community occupies part of the Everglades south and west of former Homestead AFB. Freshwater marshes generally occur in topographical depressions, and wet prairies typically occur in shallow, periodically inundated areas. Comprising approximately 138,400 acres within the ROI, this community is dominated by sawgrass and muhly grass marsh, as well as grass, forb, and cattail emergent marsh. Other plant species include pickerel weed, maidencane, arrowhead, fire flag, spike rush, bulrush, white water lily, water shield, and sedges (**Cox et al. 1994**). Saw grass marsh is the predominant association in the Everglades and is typically categorized as dense or sparse. Periphyton, an algal mat growing on the land surface, is a common feature of sparse sawgrass marsh (**Kushlan 1990**).

Prior to development, the wetland community of former Homestead AFB was likely a wet prairie (**FDEP 1996**). The historical development of facilities and infrastructure combined with natural forces, has altered wetland and aquatic communities within former Homestead AFB (**Figure 3.11-4**). Current wetland and aquatic communities in this area are human-made (e.g., canals, borrow pits) or altered in some way (e.g., fill, drainage, invasion by exotic species) (**PBS&J 1997a**). Recent field surveys of former Homestead AFB described species and features of current wetland and aquatic communities (**PBS&J 1997a**, **SEA 1997**, **Geraghty & Miller 1993**, **Hilsenbeck 1993**).

Freshwater marsh is the most extensive (198 acres) wetland type within former Homestead AFB (**PBS&J 1997c**). A recent field survey of these wetlands revealed sawgrass marsh, spikerush-beakrush flats, and cattail marsh. Species reported by this survey include torpedo grass, foxtail, maidencane, smartweed, duck potato, and arrowhead (**PBS&J 1997a**).

Species that occur along the fringes of emergent wetlands on former Homestead AFB are grouped in a mixed wetlands hardwood association that includes Brazilian pepper/Australian pine thickets, Carolina willow, and saltbush. Understory plant species include castor bean, morning glory, sawgrass, sedges, and rushes (**PBS&J 1997a**). This association covers approximately 21 acres of former Homestead AFB (**PBS&J 1997c**).

The fresh water marsh and wet prairie community provides foraging and nesting habitat for a variety of wildlife, including many wading birds. Wading birds within the ROI that rely on wetland include the wood stork, white ibis, little blue heron, tricolored heron, snowy egret, great egret, reddish egret, and roseate spoonbill. Cox et al. (**Cox et al. 1994**) identified the importance of Everglades NP and other wetland systems to these wading birds.

Other animal species of the fresh water marsh and wet prairie include invertebrates, fish, amphibians, reptiles, and mammals. Important small invertebrate species in the food chain of this community include dragonflies, mayflies, fly larvae, mosquitoes, water bugs and beetles, and various gnats and fly species. Important macroinvertebrates include prawns, crayfish, and snails. Common fish species of the Everglades include the mosquitofish, other live-bearing fish, and killifish. A variety of frogs, newts, water snakes, and turtles occupy the fresh water marsh and wet prairie community. The American alligator serves a dominant role in many fresh water marshes as a predator and by the “gator holes” that it creates (**Kushlan 1990**).

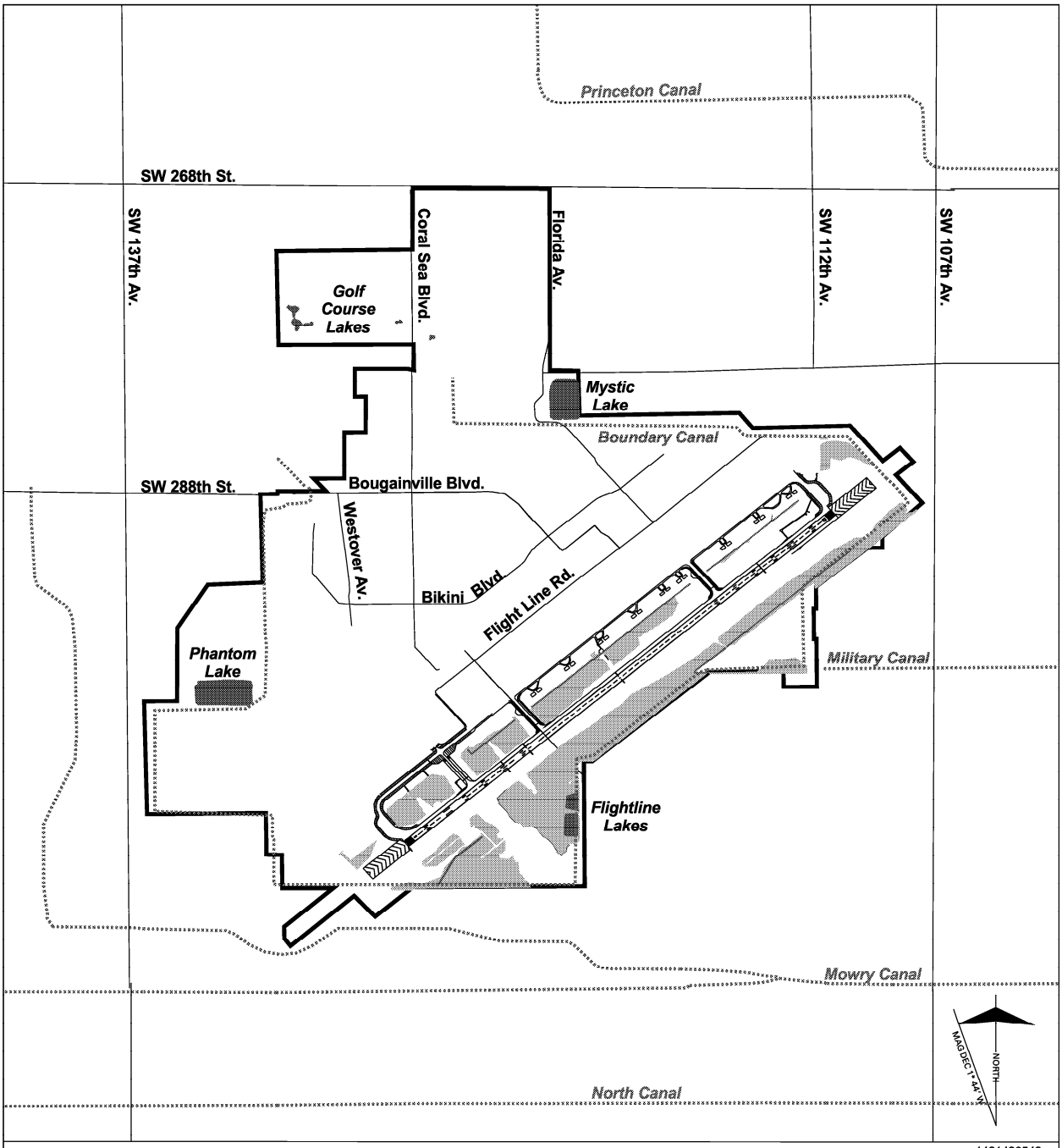


Figure 3.11-4
Wetlands and Surface Water
on Former Homestead AFB

Although wildlife typically use a variety of habitats, many of the wildlife species observed on former Homestead AFB are associated with wetlands for at least part of their life cycle. Plant and animal species observed or recorded on or in the vicinity of the former Homestead AFB by others are included in the appendix.

Raccoon and marsh rabbit are the two most abundant mammal species observed on Homestead ARS (**SEA 1997**). Other mammals observed in the cantonment area include striped skunk, bobcat, opossum, gray fox, gray squirrel, feral dogs and cats, moles, and miscellaneous rodents (**SEA 1996**).

Numerous reptiles and amphibians may also be observed on Homestead ARS. These species include the rough grass snake, corn snake, rat snake, checkered garter snake, Florida slider, Florida soft shell turtle, snapping turtle, American alligator, Florida chorus frog, marine toad, tree frogs, and salamanders (**SEA 1997**). In addition, exotic species such as the Cuban tree frog, giant toad, brown ande, green iguana, basilisk lizard, and spectacled caiman occur on and outside the former base (**SEA 1996**, **Denton and Godley 1999**, **Mazzotti 1999b**).

Birds are the most diverse and abundant wildlife group found on Homestead ARS, with over 70 species observed in the cantonment area. Selected birds that have been reported to occur in this area include the common grackle, mourning dove, loggerhead shrike, common nighthawk, red-bellied woodpecker, red-tailed hawk, American kestrel, burrowing owl, turkey vulture, osprey, barred owl, bald eagle, black-crowned night-heron, anhinga, and great egret (**SEA 1997**). The cattle egret is the most common exotic bird species recorded in wetland habitat on the former base (**Peterla 1999a**).

Freshwater Swamps. Due to the relatively small acreage of individual forest swamp communities (e.g., cypress, hardwood, and scrub) within the ROI, these three communities are discussed together.

As the name implies, cypress is the dominant species in cypress swamps. Bald and pond cypress dominate this community, with the former more common in flowing-water swamps and the latter more typical of still-water swamps (**Ewel 1990**). Cypress is adapted to the fluctuating water levels characteristic of this community. Hardwood swamps provide mast, an important food item for wildlife. Other important features of hardwood swamps include tree cavities, edible foliage, and cover.

A variety of animals use swamp communities within the ROI. Leeches, worms, insects, mites, spiders, crustaceans, and mollusks comprise the base of the swamp food web. The diversity of fish populations is typically greater in swamps associated with rivers and lakes than in isolated swamps because of the connections of swamps to other communities in the former and the periodic drawdowns of the latter. The periodic drawdowns and resulting wet-dry cycles of many still-water swamps provide suitable habitat for several species of frogs. The American alligator and a variety of snake and salamander species also live in swamp communities. Shrews, mice, and raccoons comprise some of the more common swamp mammals. The black bear and Florida panther are restricted to swamps in parts of their range due to loss of suitable upland habitat (**Ewel 1990**).

A variety of birds, including several rare and endangered species, occupy swamp habitat (see Section 3.11.3). Bird species found in cypress and mixed hardwood swamps include the wood stork, short-tailed hawk, bald eagle, and osprey (**Ewel 1990**). Federally listed species (wood stork and bald eagle) and state sensitive species (osprey) are described in greater detail in Section 3.11.3 and Appendix G. Other birds typical of swamp communities include wood duck, swallowtail kite, Mississippi kite, red-shouldered hawk, woodcock, barred owl, chimney swift, hairy woodpecker, pileated woodpecker, Acadian flycatcher, Carolina wren, white-eyed vireo, red-eyed vireo, parula warbler,

prothonotary warbler, hooded warbler, Swainson's warbler, cardinal, and towhee (**Florida Natural Areas Inventory 1990**).

Open Water. Approximately 1,500 acres of open fresh water occur within the ROI. This community type includes inland freshwater lakes, reservoirs, creeks, canals, and rivers, and the cooling canals at Turkey Point. Marine open water in Biscayne and Florida Bays is not included in this community (Figure 3.11-2).

The aquatic community on former Homestead AFB consists of approximately 50 acres of streams and waterways and 30 acres of small surface water reservoirs (**PBS&J 1997c**). Water in the canals in the cantonment area is clear and non-tidal (**SEA 1996**). Canals on former Homestead AFB range from 2 to 40 feet wide and from 4 to more than 10 feet deep (**PBS&J 1997a**). The sides of the canals are nearly vertical and generally support sparse aquatic vegetation; however, parsley fern, a Florida sensitive species, was observed along the walls of the western Boundary Canal (**PBS&J 1997a**, **SEA 1997**). Filamentous algae and coontail comprise the vegetation on the bottoms of these canals (**PBS&J 1997a**).

Eight borrow pits (lakes) comprise the surface water bodies on former Homestead AFB. These lakes were generally excavated from upland or historical wetlands to provide sources of fill. They range from 10 to 20 feet deep. Plant species associated with these lakes include cattail, torpedo grass, spikerush, Australian pine, saltbush, and poisonwood (**PBS&J 1997a**).

The canals and lakes on former Homestead AFB provide habitat for a variety of native and exotic freshwater and saltwater fish (**SEA 1997**). Mystic Lake was formerly managed for recreational fishing (**PBS&J 1997a**). The presence of largemouth bass, warmouth, bluegill, striped mullet, Florida gar, tarpon, common snook, gizzard shad, walking catfish, sailfin catfish, oscar, midas cichlid, and spotted tilapia is documented in canals on the former base (**SEA 1996**).

The spectacled caiman, native to Mexico and Central and South America, is the most widespread of the New World crocodilians, extremely adaptable in terms of habitat requirements, and common in human-made habitats. The spectacled caiman was reported in the Miami area in the 1950s and 1960s and in the Everglades in 1976 (**Wilson and Porras 1983**).

The spectacled caiman was confirmed in canals on Homestead AFB in 1974 (**Ellis 1980**). Surveys in 1985 found 25 non-hatchlings and 7 hatchlings, and an estimated 30 non-hatchlings were observed in 1998 (16 caiman and 14 unidentified crocodilians assumed to be caiman) (**Mazzotti 1999b**). Presently, there may be up to 70 non-hatchling caiman residing on former Homestead AFB, 40 in canals and 30 in the runway area.

Systematic surveys for caiman outside former Homestead AFB have not been conducted, but caiman are reportedly common in the shallow ditches on the tree farms east of the former base and may occupy most available habitat west of Canal L-31E from Black Point south to Palm Drive (**Hardwick 1999**, **Wasilewski 1999b**).

Upland and Disturbed Communities

Upland communities include dry prairie, pineland, and tropical hardwood hammock. None of the upland communities found on former Homestead AFB are natural or unaltered (**Hilsenbeck 1993**). Uplands outside of former Homestead AFB include both disturbed and natural communities. Disturbed communities include grassland and agriculture, shrub and brushland, exotic plant, and barren and urban.

These communities, particularly exotic plant communities, may include both wetland and upland areas as a result of natural or anthropogenic disturbance.

Upland communities tend to be the first areas developed in south Miami-Dade County because of the stable foundation offered by the Atlantic Coastal Ridge, the decreased flood risk provided by higher elevations, and restrictions on development in wetlands. As a result, many of the upland areas around the former base are already developed, leaving grassland and wetland communities primarily to the west, east, and south of the former base (**NPS 1997**).

Natural upland communities in south Florida are endangered because lower flood risks and solid limestone foundations make such sites ideal for development (**NPS 1997**, **Florida Natural Areas Inventory 1990**, **Cox et al. 1994**). The ROI contains three types of natural upland communities, covering a total of 15,500 acres: dry prairie, pineland, and tropical hardwood hammock. None of these communities, with the exception of small remnant pinelands, occur on former Homestead AFB (see Table 3.11-1). The remaining natural upland communities in south Miami-Dade County generally occur in undeveloped or protected areas east, south, and west of former Homestead AFB.

The ROI contains four types of disturbed communities: miscellaneous grasslands and agriculture, exotic plant, and urban (see Table 3.11-1). Each of these community types occurs both on former Homestead AFB and in the surrounding area, but detailed data are limited to former Homestead AFB. Detailed information on species composition and distribution is not available for most of the ROI.

The fauna of disturbed communities in general is not well documented, but former Homestead AFB is home, either permanently or temporarily, to numerous birds, amphibians, and reptiles. A field survey by Geraghty & Miller (**1993**) recorded 37 species of birds, six reptile species, six amphibian species, and one species of mammal. Birds observed on the former base are common to urban or agricultural settings. Common birds include the northern mockingbird, mourning dove, common grackle, and northern cardinal. A raccoon was the only mammal observed on the former base during the Geraghty & Miller survey. Other species found on the former base include the American alligator, bald eagle, least bittern, barred owl, black-necked stilt, burrowing owl, feral dog, and bobcat (**PBS&J 1996c**). The house sparrow and European starling are the most common introduced bird species in upland areas on former Homestead AFB. Other introduced species include the canary-winged parakeet, monk parakeet, hill myna bird, and Eurasian collared dove (**Denton and Godley 1999**, **Mazzotti 1999b**).

Dry Prairie. Dry prairie is endemic to Florida and is confined to a few regions of the state. Most representatives of this community have been converted to farm fields or citrus groves, and remaining remnants are disappearing rapidly (**Florida Natural Areas Inventory 1990**). The ROI contains approximately 3,100 acres of dry prairie, none of which occur on the former base (see Table 3.11-1). Dry prairies occur southeast of former Homestead AFB near the Turkey Point Nuclear Power Plant (see Figure 3.11-2).

Dry prairies are native grasslands and shrub-lands occurring on very flat terrain interspersed with scattered cypress domes and strands, bayheads, isolated freshwater marshes, and hardwood hammocks. Palmetto prairies, former pine flatwoods where the overstory trees have been thinned or removed, are included in this category (**Cox et al. 1994**). Dry prairie groundcover is dense and composed of wiregrass, saw palmetto, and other grasses, herbs, and low shrubs (**Florida Natural Areas Inventory 1990**). Other common herbaceous species include broomsedge, runner oak, milkwort, goldenrod, Indian grass, love grass, blazing star, rabbit tobacco, pine lily, marsh pink, musky mint, pawpaw, dwarf wax myrtle, fetterbush, staggerbush, tar flower, gallberry, blueberry, carpet grasses, and various bluestems (**Cox et al. 1994**, **Florida Natural Areas Inventory 1990**). Typical fauna include crested caracara, bobwhite,

sandhill crane, burrowing owl, loggerhead shrike, meadowlark, grasshopper sparrow, least shrew, cotton rat, harvest mouse, spotted skunk, and bobcat (**Florida Natural Areas Inventory 1990**). The crested caracara and burrowing owl are two species for which this community type provides primary habitat (**Florida Natural Areas Inventory 1990**, **Abrahamson and Hartnett 1990**).

Pineland. The pineland community in the ROI includes approximately 5,600 acres of both south Florida pine flatwoods and south Florida pine rocklands (see Table 3.11-1). Pine flatwoods occur on flat, sandy terrain and have an overstory of longleaf pine on well-drained sites, pond pine on poorly drained sites, and slash pine on sites with intermediate drainage. Pine rockland communities are restricted to outcrops of Miami limestone in Miami-Dade County and the Florida Keys. Development has greatly reduced the extent of this important community and remaining areas are in poor condition because of improper management, geographic isolation, or natural disturbance (**Cox et al. 1994**).

Pinelands are home to a variety of tropical and subtropical plants and animals endemic to south Florida (**Snyder et al. 1990**). Understory and groundcover species in both flatwood and rockland communities include saw palmetto, gallberry, wax myrtle, and a variety of grasses and herbs (**Cox et al. 1994**). Typical pineland animals include the southeastern five-lined skink, ringneck snake, pygmy rattlesnake, red-shouldered hawk, Carolina wren, eastern bluebird, pine warbler, opossum, marsh rabbit, cotton rat, cotton mouse, raccoon, and bobcat (**Florida Natural Areas Inventory 1990**). Rare fauna recorded in pine rocklands include the Florida evening bat, mastiff bat, Florida burrowing owl, gopher tortoise, eastern indigo snake, rim rock crowned snake, and Florida atala butterfly (**Cox et al. 1994**).

State and federal sensitive plant species have been observed at 26 locations on former Homestead AFB, and most of these areas are remnant pine rocklands (**Hilsenbeck 1993**, **PBS&J 1998b**). Many of the expected pine rockland understory species are missing because they were regularly mowed and maintained, and urban grasses and weeds have colonized these sites (**Geraghty & Miller 1993**). Most populations of listed plant species are irregularly scattered over these pine rockland habitats and are found around the bases of living or dead pine trees or around the edges of limestone outcrops (**PBS&J 1998b**). The Hilsenbeck et al. (**Hilsenbeck 1993**) ecological inventory recorded numerous state-listed plants in pine rockland areas. Two other field surveys (**PBS&J 1998b**) recorded additional species (see Section 3.11.3 for a list of sensitive plant species on former Homestead AFB and Appendix G for a description of these species).

Tropical Hardwood Hammock. This rare community type is characterized as hardwood forest on upland sites in regions where limestone is near the surface or exposed. Tropical hardwood hammocks occur on high ground that rarely floods. This community also requires high humidity levels. Humidity is maintained by a high water table that saturates the porous limestone (**Florida Natural Areas Inventory 1990**). The ROI contains approximately 6,800 acres of tropical hardwood hammock (see Figure 3.11-2) occurring south and southeast of former Homestead AFB.

Tropical hardwood hammocks have very high species diversity. More than 150 species of trees and shrubs are native to this community, and fewer than a quarter of these species occur north of Florida. These species tend to be at the northern limit of their range and are more commonly found in the Neotropics (**Snyder et al. 1990**). Typical plant species include live oak, gumbo-limbo, wild tamarind, pigeon plum, false mastic, poisonwood, mahogany, inkwood, marlberry, lancewood, strangler fig, wild coffee, bustic, black ironwood, paradise tree, satin leaf, redbay, cabbage palm, laurel oak, tallowwood, prickly ash, hackberry, guiana-plum, shortleaf fig, cat's claw, soapberry, sea grape, coffee colubrina, soldierwood, geiger tree, wild pine, Spanish moss, coonties, greenbrier, and fox grape. Typical fauna include the tree snail, Schaus swallowtail, white-crowned pigeon, wood rat, and cotton mouse (**Florida Natural Areas Inventory 1990**).

Miscellaneous Grasslands and Agriculture. This community consists of predominantly low-growing grasses and forbs on intensively managed sites such as improved pastures, lawns, golf courses, road shoulders, cemeteries, and agricultural fields. This is an early successional community encompassing all vegetated sites between bare ground and the shrub and brush stage (**Cox et al. 1994**), as well as actual agricultural lands.

The northern and central portions of former Homestead AFB contained extensively managed ornamental landscapes, including residential lawns, associated plantings, and the 18 hole golf course. While these areas contained a few scattered native slash pine (**Hilsenbeck 1993**), more common arboreal components were weeping fig, silk tree, bischofia, native mahogany, and black olive (**PBS&J 1997a**, **Hilsenbeck 1993**, **PBS&J 1996c**). Ground cover was primarily Bermuda grass, St. Augustine grass, and three-hole grass (**PBS&J 1997a**, **Hilsenbeck 1993**). These areas have not been managed since base realignment and have now grown up in a variety of native and exotic grasses.

Former Homestead AFB is home to an extensive grassland of native and exotic grasses and forbs. This grassland, which is maintained by mowing, is found adjacent to the runway and approach areas on the west, south, and east portions of the base. Hydric species are replacing mesic species on the deeper marls of grassland areas receiving significant amounts of drainage (e.g., southeast of the runway). Adjacent to drainage canals, a 1 meter wide strip of natural vegetation occurs on both sides of the canal. During their ecological survey, Hilsenbeck et al. discovered several rare or endangered vascular plant species living in these strips: locustberry, Porter's spurge, silver palm, Florida white-top sedge, Florida pinewood privet, Krug's holly, small-leaved melanthera, Florida five-petaled leaf flower, Bahama brake fern, and tetrazygia (**Hilsenbeck 1993**).

Exotic Plant Communities. This disturbed community includes sites dominated by exotic (non-native) plants that were either planted or have escaped and invaded native plant communities. Exotic plant species are expanding rapidly in south Florida's wetlands and uplands. Non-native species typically invade disturbed sites, displacing native vegetation, disrupting natural ecosystem functions, and reducing available habitat for endemic plant and animal species (**Schmitz et al. 1997**). The ROI currently contains approximately 6,400 acres of exotic plant communities (see Table 3.11-1).

Problematic exotic species in south Florida include air potato, Australian pine, Brazilian pepper, Burma reed, and melaleuca. Brazilian pepper is the most widespread exotic upland plant species. This species forms monospecific stands, impeding colonization by native species and reducing wildlife habitat. Australian pine, another widespread exotic, colonizes disturbed beach plant communities, preventing reestablishment of native species. Australian pine also displaces understory communities by producing dense litter that smothers most herbaceous vegetation. Burma reed is well established in most Miami-Dade County pine rockland communities. Melaleuca also invades disturbed sites, particularly wetlands with shortened hydroperiods, forming dense, monospecific stands in areas previously devoid of forests. The air potato vine colonizes tropical hardwood hammocks where canopy disturbance has increased ground light levels. This species covers mature trees and shades out understory vegetation (**Schmitz et al. 1997**).

Former Homestead AFB contains several exotic plant communities, the most extensive of which is a non-native forest in the western easement area (**Hilsenbeck 1993**). This forest is dominated by Australian pine, with a mixed understory of Brazilian pepper and the occasional slash pine or native hardwood. Groundcover is composed of brake fern, spurge, and bushy beardgrass (**Hilsenbeck 1993**, **PBS&J 1996c**). The western easement area is the most biologically diverse area on Homestead ARS and has the potential to provide a stable habitat for several listed vascular plant species. A similar Australian pine forest, without the rich diversity of native species, is located near the grenade range (**Hilsenbeck 1993**).

Urban. This community type includes unvegetated areas such as roads, beaches, active strip mines, tilled agricultural sites, and land cleared on sandy soils. Unvegetated sites in urban areas are also included in this category (**Cox et al. 1994**). Barren or urban land comprises about 44,600 acres of the ROI (see Table 3.11-1).

3.11.2.2 Projected Baseline Environment

Estuarine and Marine Communities

Future population growth and associated development could affect estuarine and marine communities by increasing stormwater runoff, resulting in potentially higher nutrient and toxicant loads in Biscayne Bay. The development would probably lead to shorter hydroperiod, but higher volume flows from the canals draining the area and further reduce groundwater inputs, resulting in higher long-term average salinities in the nearshore environment. Higher salinities would reduce the value of the nearshore environment as nursery areas and could reduce the vitality of trees in the mangrove fringe along the bay shore.

Higher nutrient inputs would increase productivity in surface waters, possibly leading to parts of the system being more influenced by phytoplankton than by seagrasses. Higher levels of toxicant inputs could reduce species diversity in the vicinity of canal mouths. The areal extent and magnitude of such changes cannot be quantified because of the lack of detailed information on the flora and fauna of the marine and estuarine ecosystem and limited understanding of the relative importance of the many factors influencing the distribution of flora and fauna.

Wetland and Freshwater Communities

It is assumed that existing areas of jurisdictional wetlands and other waters of the United States in the ROI will not be developed between now and 2015 because of the protections in place that either prohibit or require mitigation for loss of wetlands. Future development is assumed to concentrate in areas of vacant and agricultural lands. As a result, impacts associated with filling of wetlands and other waters of the United States are not expected to be extensive. The majority of wetlands are located east, west, and south of former Homestead AFB. Most of these wetlands are protected by land use designation or ownership (e.g., national park, EEL).

Changes in hydrology and neighboring land use could result in indirect changes to wetlands. Changes in hydrology resulting from development and management of stormwater runoff (loss of overland sheet flow returning to Biscayne Bay) could lower the water table. Developed areas contain more impervious surface than agricultural or vacant land. As a result, stormwater runoff in urban areas tends to be shorter in duration and greater in volume than a similar event in a rural area, with less recharge to local aquifers. Development can also interfere with overland sheetflow, the runoff regime historically responsible for maintenance of coastal wetlands.

Even subtle changes in wetland hydrology could increase invasion of exotic plant species and result in long-term changes in species composition. Changes in hydrology could reduce the distribution and extent of fresh water wetlands in the ROI by 2015. Encroachment on wetlands could also result in invasion of exotic plant species and changes in wetland functionality.

Upland and Disturbed Communities

Future commercial, residential and urban development in the vicinity of former Homestead AFB is assumed to be concentrated on vacant and agricultural uplands. Between 1995 and 2015, an estimated

4,000 acres of agricultural land and 4,500 acres of vacant land are assumed to be developed within the ROI. Vacant land can occur in any of the cover types, but future development is most likely to be concentrated on land currently classified as shrub and brushland, exotic plant communities, or barren and urban. Some natural upland communities exist within the area of potential future development, but it is not possible to determine exactly where specific development will occur. Some of the natural upland communities will probably be lost, but it is not possible to calculate the acreage lost.

The potential future impacts of this projected development on upland and disturbed communities could extend beyond direct acreage losses. Urbanization will likely change hydrologic regimes, increase habitat fragmentation, exacerbate loss of biodiversity, and enhance exotic species invasion. Habitat fragmentation would be expected to reduce the size of habitats and cause habitat patches to become increasingly isolated from each other. When patch size falls below the minimum area needed to support a viable population of a particular species, that species will disappear from the patch. As isolated patches become increasingly distant, individual animals will not be able to move across patches to reproduce with other members of the species, genetic variability will be lost, and the presence of the species across all the patches could be jeopardized. Habitat fragmentation is also accompanied by proportional increases in edge environments. Edge environments in and near urban areas are associated with increased mortality and decreased reproduction resulting from changes in habitat, encounters with humans and domesticated animals, and vehicle collisions (**Cox et al. 1994**).

Invasive exotic species will continue to displace native vegetation, disrupt natural ecosystems, and reduce habitat for endemic species. SFWMD, other government agencies, and private landowners are currently involved in eradication efforts against melaleuca, Brazilian pepper, and Australian pine (**Ferriter et al. 1997**). These efforts will continue, but continued disturbance and development of south Florida environments will encourage the spread of invasive exotic species.

3.11.3 Threatened, Endangered, and Special-Status Species

This section provides a summary of the status of species of special concern. More detailed information appears in Appendix G. This section addresses federally listed threatened and endangered species; state listed threatened, endangered, and sensitive species; and other species of concern that occur or have the potential to occur in the ROI. The determination of species to include in this section was based on discussions with biologists from the U.S. Fish and Wildlife Service, Florida Game and Fresh Water Fish Commission, and Biscayne and Everglades NPs. Additional information regarding species to include was derived from pertinent literature.

Much of the information regarding species of concern was derived from the existing literature and from discussions with experts as referenced in Appendix G. In addition, sensitive species surveys were conducted for this SEIS, including surveys for sensitive plants, the American crocodile, eastern indigo snake, wood stork, other sensitive species of wading birds, rim rock crowned snake, southwestern American kestrel, burrowing owl, and breeding birds such as the mangrove cuckoo, Cuban yellow warbler, and Florida prairie warbler (**Denton and Godley 1999**, **Mazzotti 1999b**). The methods, areas surveyed, and results of these surveys appear in Appendix G.

3.11.3.1 Existing Environment

Federally Listed Species

A total of 18 federally listed threatened or endangered species occur or have the potential to occur in the ROI (**Table 3.11-3**) (**USFWS 1998b**). All federally listed species are also listed by the State of Florida (**Florida Game and Fresh Water Fish Commission 1997**). Federally listed species include two plants, one invertebrate, five reptiles, six birds, and four mammals. **Figure 3.11-5** shows critical habitat for federally listed species in the ROI.

Table 3.11-3. Federally Listed Threatened and Endangered Species Potentially in the ROI

Common Name	Scientific Name	Status		Areas of Occurrence
		Federal	State	
Plants				
Small's milkpea	*Galactia smallii*	E	E	Endemic to pine rocklands in Miami-Dade County. Observed in three areas on disposal land but not on Homestead ARS or along Military Canal; potential in other locations in Homestead area.
Deltoid spurge	*Chamaesyce deltoidea*	E	E	Endemic to pine rocklands in Miami-Dade County. Not recorded at remnant pine rocklands on former Homestead AFB, but known from pine rocklands in the Homestead area.
Invertebrates				
Schaus swallowtail butterfly	*Heraclides aristodemus ponceanus*	E	E	Occurs in tropical hardwood hammocks on the keys of Biscayne NP and north Key Largo, with an introduced population in the Deering Estate County Park. Appropriate habitat lacking on former Homestead AFB and between the former base and Biscayne Bay.
Reptiles				
American crocodile	*Crocodylus acutus*	E	E	Occurs in coastal areas of Dade, Monroe, Collier, and Lee counties in south Florida. Recently observed in east end of Military Canal and mangrove swamps along Biscayne Bay shoreline, Crocodile Sanctuary in northern Florida Bay at Little Madeira and Joe Bays. Does not occur on disposal land or Homestead ARS.
Eastern indigo snake	*Drymarchon corais couperi*	T	T	Occurs throughout Florida and in parts of Georgia. Recently observed near Military Canal and Florida City. Potential habitat along nearby canals, mangrove swamps, freshwater wetlands, and vacant land with marginal habitat on disposal land and Homestead ARS.
Green Sea Turtle	*Chelonia mydas mydas*	E	E	Occurs worldwide and nests and feeds in most Florida coastal waters. Known to feed on aquatic vegetation in Biscayne Bay and the reefs outside the bay. Not known to nest at Biscayne NP.
Hawksbill Sea Turtle	*Eretmochelys imbricata*	E		Occurs worldwide including Florida coastal waters, as well as other Gulf coast and Atlantic coast states. Known to have nested on Soldier key in Biscayne NP in 1981 and 1990. No nesting recorded from 1990 through 1998.
Loggerhead Sea Turtle	*Caretta caretta*	T	T	Occurs worldwide and nests in coastal areas from Louisiana to Virginia. Most common sea turtle to nest at Biscayne NP. Nests on keys near eastern boundary of the park. Has nested successfully from at least 1995 through 1998 at Biscayne NP.

Common Name	Scientific Name	Status		Areas of Occurrence
		Federal	State	
Birds				
Bald eagle	*Haliaeetus leucocephalus*	T	T	Nests throughout most of North America including most of Florida. Nests in the keys of Biscayne NP. Forages along mangrove swamps and occasionally occurs on disposal land and Homestead ARS.
Cape Sable seaside sparrow	*Ammodramus maritimus mirabilis*	E	E	Currently exists in three populations in the Shark River slough areas in the Everglades; potential habitat generally lacking outside of the Everglades.
Piping plover	*Charadrius melodus*	T	T	Winters along the Gulf of Mexico and the Atlantic coast. Very rare wintering species in Miami-Dade County. Very infrequent on the beaches of the Biscayne NP keys. Not expected in the Homestead area due the lack of suitable habitat.
Roseate tern	*Sterna dougallii*	T	T	The Caribbean population nests in the Florida Keys and Dry Tortugas. A marine bird that may forage along the mangrove swamps; is very rare in Biscayne NP. Suitable habitat lacking in Homestead area and it is not expected to occur on disposal land or Homestead ARS.
Snail kite	*Rostrhamus sociabilis plumbeus*	E	E	Current distribution in Florida is the central and southern portions of the state from Kissimmee Chain-of-Lakes south to the Everglades. Nesting sites and migratory corridors west of Homestead. Occasional transient birds could be observed in Homestead area.
Wood stork	*Mycteria americana*	E	E	Nests throughout most of Florida, as well as parts of Georgia and South Carolina. Most winter in south Florida. Forages and roosts in small numbers along mangrove swamps and in wetlands between mangrove swamps and Homestead ARS mostly during the winter. Very infrequent on disposal land and Homestead ARS. Nests in the Everglades west and north of Homestead.
Mammals				
Florida panther	*Felis concolor coryi*	E	E	Only known remaining populations are centered in Big Cypress Swamp and Everglades region. Center of population in Collier and Hendry counties. Also known from land to the south of former Homestead AFB. No appropriate habitat on disposal land or Homestead ARS.
West Indian manatee	*Trichechus manatus*	E	E	Present distribution includes the coasts and rivers of Florida and Georgia. Reported from shoreline of mangrove swamps and portions of Military Canal, but unlikely in canals on disposal land or Homestead ARS.
Key Largo cotton mouse	*Peromyscus gossypinus allapaticola*	E	E	Known from early successional to mature tropical hardwood hammocks in north Key Largo. Historic range only on Key Largo.
Key Largo woodrat	*Neotoma floridana smalli*	E	E	Known from mature tropical hardwood hammocks in north Key Largo. Historic range only on Key Largo.

Source: **Florida Game and Fresh Water Fish Commission 1997**; **USFWS 1998b**; **PBS&J 1998b**; **Mazzotti 1999b**; **Denton and Godley 1999**; **Moler 1999**; **BNP 1995**, **1998**; **Mansfield 1996**; **Moulding and Lockwood 1997**; **Lockwood et al. 1999**; **DOI 1997**; **Howitt 1996**; **Lockwood 1999b**; **Ferro 1999a**.

E endangered

T threatened

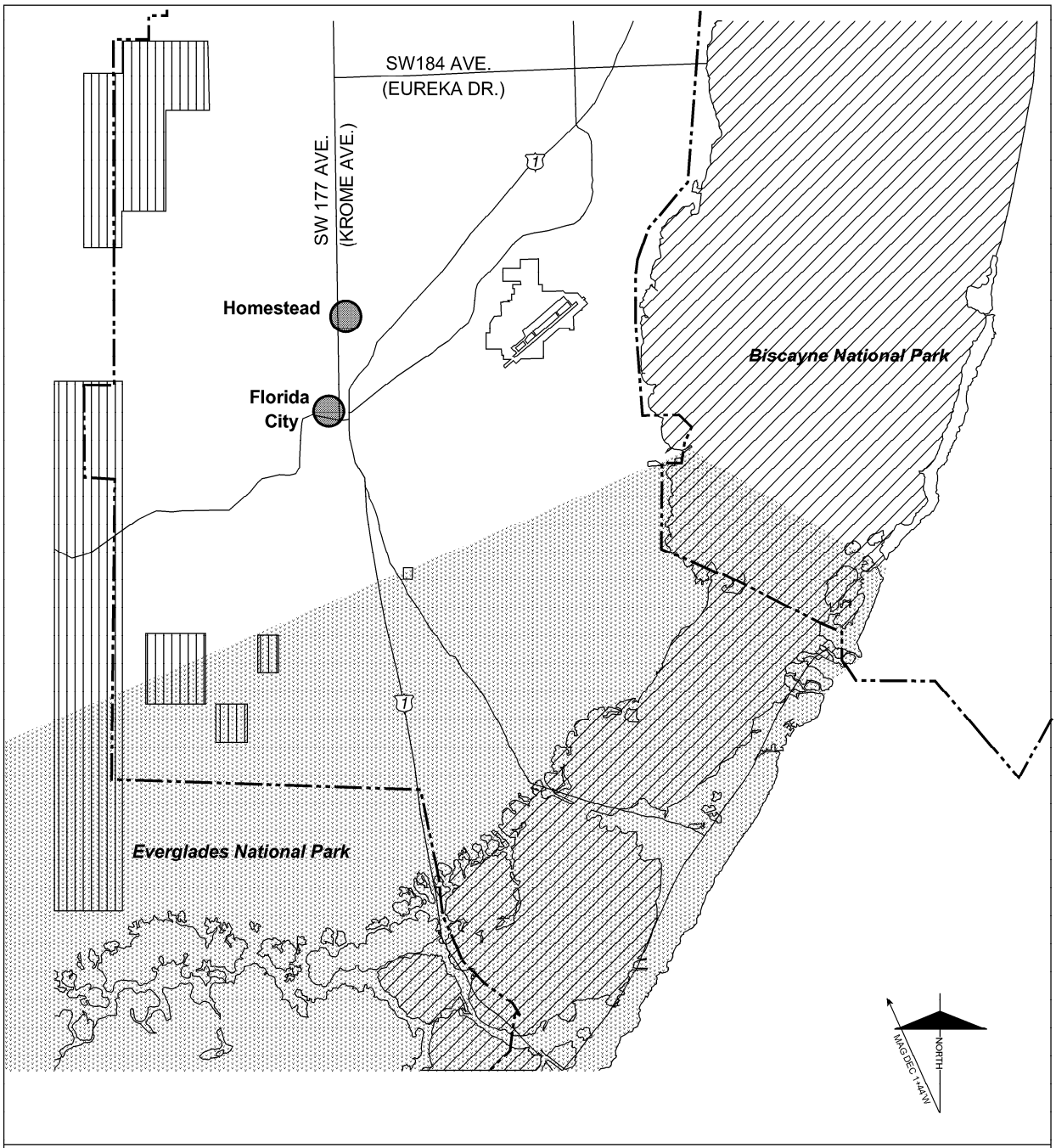


Figure 3.11-5
Federally Designated Critical Habitat
in the Area of Former Homestead AFB

State Listed Species

A total of 29 species that occur or have the potential to occur in the ROI are listed as threatened or endangered by the State of Florida but not listed by the federal government (**Rodgers et al. 1996**, **Florida Game and Fresh Water Fish Commission 1997**). The state-listed threatened and endangered species include 24 plants, one reptile, and four birds (**Table 3.11-4**). **Figure 3.11-6** shows the 12 areas where sensitive plant species were observed on the disposal property. **Table 3.11-5** lists plants that were observed during the 1992–93 and 1997 surveys of disposal property at former Homestead AFB, and during 1992–93 and 1996–97 surveys of Homestead ARS.

State Species of Special Concern

State species of special concern include four plants and 29 birds (**Table 3.11-6**). More details regarding these species appear in Appendix G.

Neotropical Migrants

In Florida, neotropical migrant birds receive special attention from state and local government agencies. DeGraaf and Rappole (**1995**) define neotropical migrants as Western Hemisphere birds that breed north of and winter south of the Tropic of Cancer. Of the 361 species of neotropical migrants identified by DeGraaf and Rappole, 27 have been recorded on selected breeding bird survey routes within the ROI. **Table 3.11-7** identifies the population trends for neotropical migrants recorded from 1966 through 1996 on breeding bird survey routes within the ROI. The breeding bird survey is a highly standardized roadside survey consisting of randomly distributed routes of 50 three-minute stops (**Robbins et al. 1989**). Surveys begin one-half hour before local sunrise, and at each stop all birds heard or seen within one-quarter mile are identified. The breeding bird surveys are the primary method by which USFWS monitors songbirds and other nongame species (**Robbins et al. 1989**).

Trend analysis of breeding bird survey data (Table 3.11-7) reveals that selected populations of forest-dwelling neotropical migrants have declined, especially during the 1980s (**Price et al. 1995**). Some of these population declines are likely due to alterations in tropical winter habitat (e.g., deforestation) (**DeGraaf and Rappole 1995**), but may also be due to, or exacerbated by, alterations in breeding habitat (e.g., forest fragmentation) within the United States.

Hunter et al. (**Hunter et al. 1993**) identify important habitats for neotropical migrants in the southeast United States, including the mangrove swamps and tropical hardwood communities characteristic of the ROI (see Figure 3.11-2). Using breeding bird survey data, Audubon Christmas Bird Count data, and other criteria, the U.S. Fish and Wildlife Service (**USFWS 1995**) identified migratory nongame birds of management concern in the United States. Of the species of neotropical migrants listed in Table 3.11-7, only the yellow-billed cuckoo has been designated a species of management concern.

Land bird species observed at Biscayne NP have been recorded sporadically from 1973 through 1998 (**BNP 1998**). A total of 87 species of neotropical migrant land birds have been recorded, including 28 species of warblers, 8 species of flycatchers, and 6 species of vireos (**Table 3.11-8**). The relative abundance of these species was determined based on the number of observations. Thirty-nine species (45 percent of the total) were rarely observed (10 or fewer times) and 29 species (33 percent) were uncommon (11 to 100 observations). Common (12 species) and abundant (7 species) species comprised the remaining species. Common and abundant species included the belted kingfisher, white-eyed vireo, black-whiskered vireo, blue-gray gnatcatcher, black-throated blue warbler, prairie warbler, American redstart, and ovenbird. Some of the common to abundant species are sensitive species in Florida (black-whiskered vireo, American redstart, prairie warbler) and are also of conservation concern range-wide (black-throated warbler and prairie warblers) (**Meuhter 1998**).

Table 3.11-4. State Threatened and Endangered Species Known or Potentially Occurring in the Homestead Area

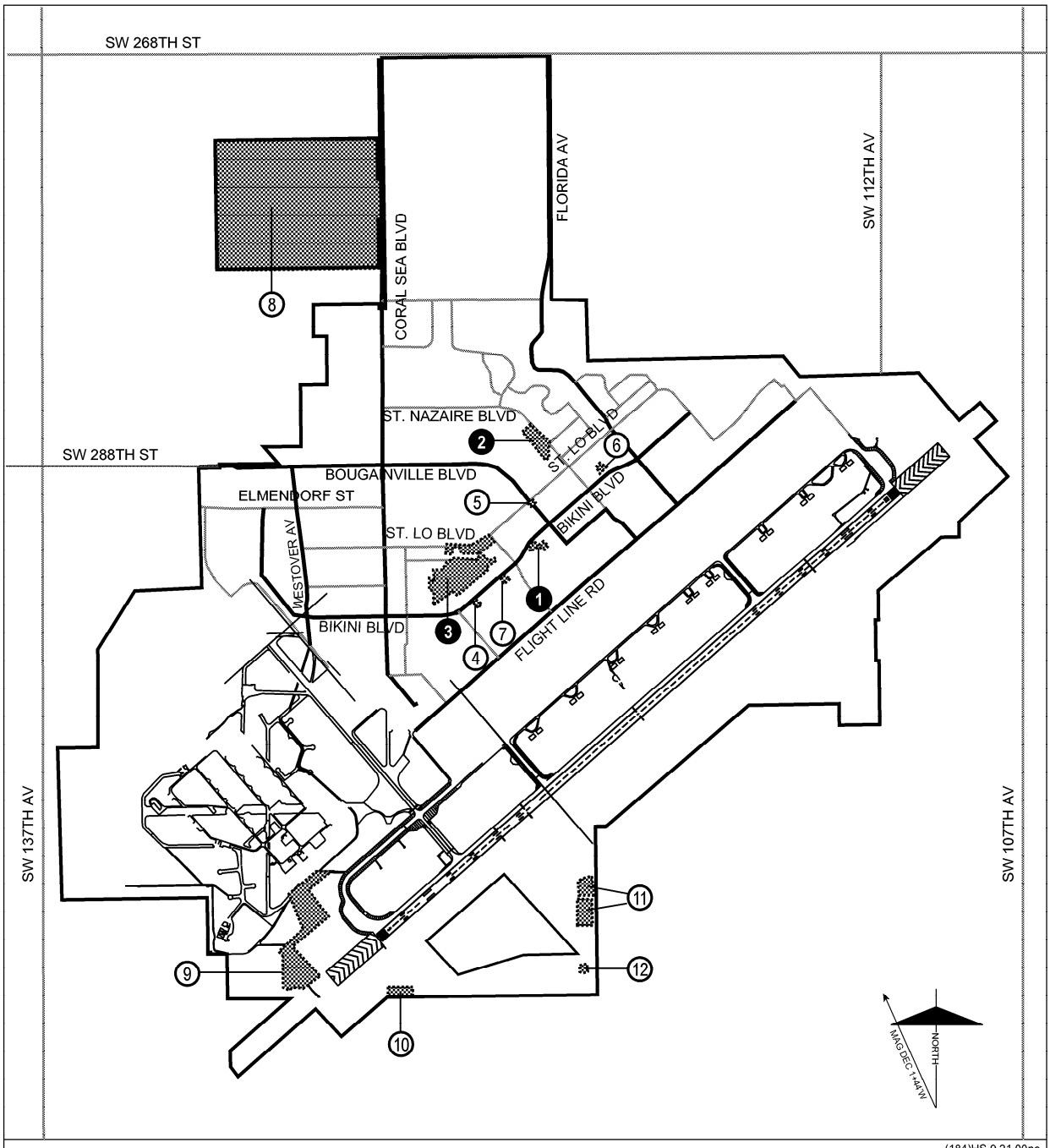
Common Name	Scientific Name	State Status	Areas of Occurrence
Plants			
Bahama brake	*Pteris bahamensis*	E	Occurs in south Florida and fairly widespread on disposal land and Homestead ARS; potentially in other areas.
Bahama sachsia	*Sachsia polycephala*	E	Occurs in south Florida and a few plants observed on disposal land and Homestead ARS; potentially in other areas.
Blodgett's wild mercury	*Argythamnia blodgettii*	E	Endemic to pine rocklands in Miami-Dade County and the Florida Keys. Four plants along Military Canal. Not observed on disposal land or Homestead ARS.
Carter's small-flowered flax	*Linum carteri*	E	Occurs in south Florida. Found only on disposal land; potentially in other areas.
Christmas berry	*Crossopetalum ilicifolium*	E	Occurs in south Florida and fairly widespread on disposal land and Homestead ARS; potentially in other areas.
Florida lantana	*Lantana depressa*	E	Occurs in south Florida and scattered plants on disposal land and Homestead ARS; potentially in other areas.
Giant wild pine	*Tillandsia utriculata*	E	Occurs in south Florida. One plant from one location on disposal land; potentially in other areas.
Krug's holly	*Ilex krugiana*	E	Occurs in south Florida and found in moderate to high density on Homestead ARS; potentially in other areas.
Locustberry	*Byrsonima lucida*	E	Occurs in south Florida and fairly widespread on disposal land and Homestead ARS; potentially in other areas.
One-nerved ernodea	*Ernodea cokeri*	E	Occurs in south Florida. Observed in two areas only on disposal land; potentially in other areas.
Pineland jacquemontia	*Jacquemontia curtissii*	E	Occurs in south Florida and fairly widespread on disposal land and Homestead ARS; potentially in other areas.
Pineland noseburn	*Tragia saxicola*	E	Occurs in south Florida. Small number of individuals from one area in disposal land; potentially in other areas.
Pink pine orchid	*Bletia purpurea*	T	Occurs in south Florida. Known only from disposal land; potentially in other areas.
Porter's spurge	*Chamaesyce porteriana*	E	Occurs in south Florida and fairly widespread on disposal land and Homestead ARS; potentially in other areas.
Rockland painted-leaf	*Poinsettia pinetorum*	E	Occurs in south Florida. Very few individual on disposal land and Homestead ARS; potentially on other areas.
Royal palm	*Roystonea elata*	E	Occurs in south Florida. One plant on disposal land; may have been from cultivated stock.
Sand flax	*Linum arenicola*	E	Occurs in south Florida. Found only on disposal land; potentially in other areas.
Sea lavender	*Tournefortia gnaphalodes*	E	A seashore shrub that occurs from the Florida Keys north to Brevard County. Two plants at eastern tip of Military Canal. Not observed on disposal land or Homestead ARS.
Silver palm	*Coccothrinax argentata*	E	Occurs in south Florida. Scattered plants on disposal land and Homestead ARS; potentially in other areas.
Small-leaved melanthera	*Melanthera parvifolia*	E	Occurs in south Florida and fairly widespread on disposal land and Homestead ARS; potentially in other areas.

Common Name	Scientific Name	State Status	Areas of Occurrence
Tetrazygia	*Tetrazygia bicolor*	T	Occurs in south Florida and in fairly larger numbers on disposal land and Homestead ARS; potentially in other areas.
Wedgelet fern	*Sphenomeris clavata*	E	Occurs in south Florida. Known only from Homestead ARS; potentially in other areas.
West Indian mahogany	*Swietenia mahogani*	E	Occurs in south Florida. Observed in low numbers on disposal land and Homestead ARS; potentially in other areas.
Wild potato morning-glory	*Ipomoea microdactyla*	E	Occurs in south Florida. Found at low densities on disposal land; potentially in other areas.
Reptiles			
Rim rock crowned snake	*Tantilla oolitica*	T	Found in eastern Miami-Dade and Monroe counties. Not recorded from disposal land, or Homestead ARS, during species-specific surveys.
Birds			
Arctic peregrine falcon	*Falco peregrinus tundrius*	E	Winters in south Florida. Forages along western shore of Biscayne Bay and possibly other locations.
Least tern	*Sterna antillarum*	T	Breeding range along the Gulf and Atlantic coasts including most of Florida's coastline. Forages along the western shoreline of Biscayne Bay and elsewhere in Biscayne NP. Nearest known nesting site is on the keys of Biscayne NP. Occasional birds observed on disposal land and Homestead ARS.
Southeastern American kestrel	*Falco sparverius paulus*	T	Breeding range includes central and northern Florida, as well as adjacent states. Unconfirmed reports from disposal land and Homestead ARS; but not observed during southeastern American kestrel surveys during the summer of 1998. Unlikely anywhere in Homestead area as it may have been extirpated from Miami-Dade County.
White-crowned pigeon	*Columba leucocephala*	T	Found in mangrove swamps and tropical hardwood hammocks of Miami-Dade and Monroe counties. Nests and roosts on keys of Biscayne NP and not recorded from mangrove swamps along western shoreline. Potentially rare transient on disposal land and Homestead ARS.

Source: **Florida Game and Fresh Water Fish Commission 1997**, **Denton and Godley 1999**, **Argonne National Laboratory 1997**, **Howitt 1996**, **BNP 1998**, **Hilsenbeck 1993**, **PBS&J 1998b**.
E endangered
T threatened

Wintering Water Birds and Raptors

Wintering water birds, raptors, and other species have been tallied at Biscayne NP during 13 Christmas Bird Counts from 1979 through 1997 (**BNP 1998**) and at Everglades NP during 19 Christmas Bird Counts from 1978 through 1998 (**Cornell Laboratory of Ornithology 2000**). A total of 81 species of water birds and raptors were recorded at Biscayne NP with observations of over 27,000 individuals (**Table 3.11-9**). Fourteen species were abundant (500+ records), ten species were common (101 to 500 records), and the remaining species were rare (10 or fewer records) or uncommon (11 to 100 records). Two species (bald eagle and wood stork) are federally listed. The brown pelican, tricolor heron, little blue heron, reddish egret, great white heron, great egret, white ibis, roseate spoonbill, osprey, and Wilson's plover are state sensitive species.



LEGEND

- Former Homestead AFB Boundary
- Sites Containing Sensitive Plants
- (#) Site Number
- Sites with Small's milkpea
- (#) Site Number

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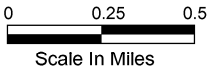

Derived from: PBS&J 1998b

Figure 3.11-6
Locations Where Sensitive Plant Species Were Observed on Former Homestead AFB

Table 3.11-5. Federal and State Listed Plant Species and Species of Special Concern Observed on Former Homestead AFB

Species	Surveys			
	Disposal Property		Homestead ARS	
	1992/93	1997	1992/93	1996/97
Bahama break	✓	✓	✓	✓
Bahama sachsia	✓	—	✓	—
Blodgett's ironweed	✓	—	✓	✓
Carter's small flowered flax	✓	—	—	—
Christmas berry	✓	✓	✓	✓
Florida five-petaled leaf flower	✓	✓	✓	✓
Florida lantana	—	✓	✓	✓
Florida pinewood privet	—	—	✓	✓
Florida white-topped sedge	✓	✓	✓	✓
Giant wild pine	—	✓	—	—
Krug's holly	—	—	✓	✓
Locustberry	✓	✓	✓	✓
One-nerved ernodea	—	✓	—	—
Pineland jacquemontia	✓	✓	✓	✓
Pineland noseburn	—	—	✓	—
Pink pine orchid	—	✓	—	—
Porter's spurge	✓	✓	✓	✓
Rockland painted-leaf	—	✓	✓	✓
Royal palm	—	✓	—	—
Sand flax	—	✓	—	—
Silver palm	✓	✓	✓	✓
Small-leaved melanthera	✓	✓	✓	✓
Small's milkpea	—	✓	—	—
Tetrazygia	—	✓	✓	✓
Wedgelet fern	—	—	✓	✓
West Indian mahogany	—	✓	—	✓
Wild-potato morning-glory	✓	✓	—	—

Source: **Argonne National Laboratory 1997**, **Hilsenbeck 1993**, **PBS&J 1998b**.

A total of 121 species of water birds and raptors totaling over 616,000 individuals were tallied during the 19 Christmas Bird Counts at Everglades NP (**Table 3.11-10**). The most abundant groups were shorebirds, with almost 250,000 observations (41 percent of total), and wading birds, with about 105,000 observations (17 percent). Twenty-one species were abundant, 35 were common, 18 were uncommon, and 47 were rare. The bald eagle and wood stork are federally listed species. State sensitive species recorded at Biscayne NP were also seen at Everglades NP.

Table 3.11-6. State Rare Species and Species of Special Concern Known to Occur in the Homestead Area

Common Name	Scientific Name	Areas of Occurrence
Plants		
Blodgett's ironweed	*Vernonia blodgettii*	Found in south Florida. Occurs in small numbers on Homestead ARS and disposal property; potentially in other areas.
Florida five-petaled leaf flower	*Phyllanthus pentaphyllus floridanus*	Found in south Florida. Fairly widespread on disposal land and Homestead ARS; potentially in other areas.
Florida pinewood privet	*Forestiera segregata var. pinetorum*	Found in south Florida. Known from Homestead ARS; potentially in other areas.
Florida white-topped sedge	*Dichromena floridensis*	Found in south Florida. Fairly widespread on disposal land and Homestead ARS; potentially in other areas.
Birds		
American oystercatcher	*Haematopus palliatus*	Major breeding habitat north of Miami. Occurs sporadically at Biscayne NP. Not expected to occur on disposal land or Homestead ARS.
American redstart	*Setophaga ruticilla*	Breeding range includes much of the eastern United States and Canada; it winters in and migrates through south Florida. Very common migrant and rare winter resident on Biscayne NP. Common to uncommon on disposal land and Homestead ARS.
Antillean nighthawk	*Chordeiles gundlachii*	Nests in the Florida Keys and the outer keys of Biscayne NP. Observed on disposal land and nearby areas during 1998 avian surveys.
Black-crowned night heron	*Nycticorax nycticorax*	Widespread in North America and breeds throughout Florida. Likely nests in wetlands on disposal land and Homestead ARS.
Black-whiskered vireo	*Vireo altiloquus*	Nests in Florida Keys and along east and west coastlines up to central Florida. Nests on mangrove islands in Biscayne NP but not detected along mangrove swamps along western shoreline of Biscayne NP. Not reported from, and low potential to occur on, disposal land and Homestead ARS.
Brown pelican	*Pelecanus occidentalis*	Breeds at various locations along the eastern and western coastlines of Florida. Found in most coastal areas during non-breeding season. Common along mangrove swamps and salt water section of Military Canal especially in winter. Occasional transient elsewhere in Homestead area.
Burrowing owl	*Speotyto cunicularia*	Occurs in peninsular Florida south to the Florida Keys. Nesting recorded on disposal land and Homestead ARS; currently nests at three locations near edge of the runway in the area of the control tower. May nest elsewhere in Homestead area.

Common Name	Scientific Name	Areas of Occurrence
Caspian tern	*Sterna caspia*	Breeds in a few locations along eastern and western coastline of central Florida. Occurs in most coastal areas during non-breeding season. Occasionally observed at Biscayne NP. Not reported, and unlikely to occur, on disposal land and Homestead ARS.
Cooper's hawk	*Accipiter cooperii*	Breeding range includes much of North America including northern two-thirds of Florida. Wintering and migrating species in south Florida. Rarely reported from Biscayne NP. Rare migrant or wintering species on disposal land and Homestead ARS.
Cuban yellow warbler	*Dendroica petechia gundlachi*	Breeds in mangroves in extreme southern Florida. Nests on mangrove islands and in small numbers along the mangrove swamps along the western shoreline of Biscayne NP. Not reported, and unlikely to nest, on disposal land and Homestead ARS.
Florida prairie warbler	*Dendroica discolor paludicola*	Breeds in mangroves along the eastern and western coastlines of central Florida south to the Florida Keys. Nests in mangroves on the keys and along the western shoreline of Biscayne NP and along Military Canal. Not reported, and unlikely to nest, on disposal land and Homestead ARS.
Glossy ibis	*Plegadis falcinellus*	Nests primarily at inland locations in central Florida with small numbers nesting in south Florida. Found throughout the state in non-breeding season. Occasionally observed in Biscayne NP and in wetlands between Biscayne NP and former Homestead AFB. Occasional birds observed on the disposal land and Homestead ARS.
Great egret	*Casmerodius albus*	Current breeding range includes much of North America including all of Florida. Common on Biscayne NP and in wetlands between Biscayne NP and former Homestead AFB. Uncommon all year on disposal land and Homestead ARS.
Great white heron	*Ardea herodias occidentalis*	Nests mostly in coastal islands in Florida Bay. Occurs in central and south Florida during non-breeding season. Occurs sporadically at Biscayne NP and along canals and wetlands between Biscayne NP and former Homestead AFB. Not reported, but could occur, on disposal land and Homestead ARS.
Least bittern	*Ixobrychus exilis*	Occurs over much of the eastern United States. Occurs in wetlands at disposal land and Homestead ARS.

Common Name	Scientific Name	Areas of Occurrence
Little blue heron	*Egretta caerulea*	Widely distributed nesting species in Florida and elsewhere along the Atlantic coast and in Gulf coast states. Forages on disposal land and Homestead ARS and along Military Canal and mangrove swamps. Roosts in small numbers along mangrove swamps along western shoreline of Biscayne Bay during the winter. Closest rookery on keys of Biscayne NP.
Louisiana waterthrush	*Seiurus motacilla*	Breeds throughout much of the eastern United States including northern Florida. Occasional wintering and migrating species in south Florida. Very rarely reported from Biscayne NP. Not reported from, and low potential to occur on, disposal land and Homestead ARS.
Mangrove cuckoo	*Coccyzus minor*	Generally restricted to wooded habitat along the coasts of Miami-Dade and Monroe counties. Detected at four locations during 1998 breeding season east of former Homestead AFB including along Military Canal. Not reported from, and low potential to occur on, disposal land and Homestead ARS.
Osprey	*Pandion haliaetus*	Nests throughout much of North America including most of Florida. Known to nest on the keys at Biscayne NP. Forages but not known to nest along western shoreline of Biscayne Bay. Occasionally seen on disposal land and Homestead ARS.
Reddish egret	*Egretta rufescens*	Nests exclusively on islands along the eastern and western coastline from central Florida south to the Florida Keys. May forage along Military Canal and the western shoreline of Biscayne Bay but was not recorded during any surveys in the area. Not observed in the disposal land or Homestead ARS. Closest rookery on keys of Biscayne NP.
Roseate spoonbill	*Ajaia ajaja*	Nests in wooded coastal islands mostly in Florida Bay and Everglades NP. Rare foraging species in Biscayne NP and not recorded from the disposal land or Homestead ARS. Only one individual recorded during 1998 wading bird surveys. Nests in the Everglades west of Homestead.
Royal tern	*Sterna maxima*	Breeds along the Atlantic and Gulf coasts including coastal colonies in central Florida. Occurs in south Florida during non-breeding season. Commonly observed at Biscayne NP. Not reported, and unlikely to occur, on disposal land and Homestead ARS.
Sandwich tern	*Sterna sandvicensis*	Nests in a few locations along the western coastline of central Florida; occurs throughout Florida during non-breeding season. Commonly observed at Biscayne NP. Not reported, and unlikely to occur, on disposal land and Homestead ARS.

Common Name	Scientific Name	Areas of Occurrence
Snowy egret	*Egretta thula*	Widely distributed in Florida; also occurs along the Atlantic coast north of Florida and lower Mississippi Valley. Forages on disposal land, Homestead ARS, along Military Canal, and in mangrove swamps. Roosts in small numbers along western shoreline of Biscayne NP in winter. Closest rookery on keys of Biscayne NP.
Tricolored heron	*Egretta tricolor*	Breeding range includes most of the Atlantic and Gulf coasts, as well as most of coastal and inland Florida. Forages on disposal land, Homestead ARS, along Military Canal, and in freshwater and wetlands and in mangrove swamps along western shoreline of Biscayne NP. Closest rookery on keys of Biscayne NP.
White ibis	*Eudocimus albus*	Breeding range includes Atlantic seaboard to Virginia, the Gulf coast and central and south Florida. Common in Biscayne NP and in wetlands between Biscayne NP and former Homestead AFB. Forages generally in small numbers on disposal land and Homestead ARS.
Wilson's plover	*Charadrius wilsonia*	Occurs along much of the Atlantic and Gulf coasts. Nests in various locations in coastal Florida including Florida Bay and the Florida Keys. Occasionally observed on Biscayne NP. Not reported, but could occur on rare occasions, on disposal land and Homestead ARS.
Worm-eating warbler	*Helmitheros vermivorus*	Nests throughout much of the eastern United States. Wintering and migrating species in south Florida. Occasional individuals observed at Biscayne NP during migration. Not reported, and low potential to occur, on disposal land and Homestead ARS.
Yellow-crowned night heron	*Nyctanassa violacea*	Nests in eastern United States, including Florida. Likely nesting in wetlands on the disposal land and Homestead ARS.

Source: **Florida Game and Fresh Water Fish Commission 1997, Rodgers et al. 1996, Denton and Godley 1999, Hilsenbeck 1993, PBS&J 1998b, Argonne National Laboratory 1997, BNP 1998, Howitt 1996.**

3.11.3.2 Projected Baseline Environment

Over the next 15 years, most development in south Miami-Dade County is generally assumed to occur west and north of former Homestead AFB in areas designated for development. Some growth could be expected to spill out of urbanized areas onto unprotected vacant and agricultural lands outside the Urban Development Boundary. Critical habitat and occurrence of federal and state species of concern are generally east, south, and southwest of the former base. Undeveloped and agricultural lands support species such as the eastern indigo snake and federally and state listed wading birds. Agricultural lands are marginal habitat for the eastern indigo snake, and wading birds use fields and associated drainage ditches for foraging. The development of these lands could reduce habitat availability for some species of concern.

Table 3.11-7. National Breeding Bird Survey Trend Analyses of Neotropical Migratory Bird Species in the ROI

Species Common Name[1]	Trends (% change per year)	
	1966–1979	1980–1996
Barn Swallow	4.2	–1.6
Brown-headed Cowbird	0.7	-.05
Chuck-will's-widow	–1.0	–0.8
Common Nighthawk	0.1	–3.0
Common Yellowthroat	0.7	–0.6
Eastern Kingbird	–1.2	–0.9
Great Crested Flycatcher	0.6	0.3
Pine Warbler	-5.2	-0.9
Prairie Warbler	–5.2	–0.9
Purple Martin	3.1	–2.0
White-eyed Vireo	0.2	0.2
Yellow-billed Cuckoo[2]	3.2	–3.1
Yellow Warbler	–0.1	0.9

Source: **Sauer et al. 1997**, **USFWS 1995**, **DeGraaf and Rappole 1995**.
Notes: [1] Only neotropical migratory bird species with trend analysis data available on the Breeding Bird Surveys Internet site and with more than 100 survey routes are included (**Sauer et al. 1997**).
[2] U.S. Fish and Wildlife Service Region 4 species of management concern (**USFWS 1995**).

Development in critical habitat and other important habitats, such as freshwater wetlands and mangrove swamps, is unlikely because of the governmental restrictions on development in wetlands. Reductions in the area of these habitats might occur, however, with increases in stormwater runoff that is discharged through canals to Biscayne Bay. Increased surface water flows could lower the water table, reducing the extent of wetlands east of the former base.

Population growth in the immediate vicinity of habitat areas will mean greater exposure to human activity, which could reduce the attractiveness of the areas east of the base for species of concern.

Table 3.11-8. Neotropical Migrant Land Birds Observed at Biscayne National Park, 1973–1998

Species	Relative Abundance[1]			
	Rare	Uncommon	Common	Abundant
Osprey		✓		
Sharp-shinned hawk		✓		
Copper's hawk	✓			
Broad-winged hawk		✓		
American kestrel		✓		
Merlin			✓	
Peregrine falcon		✓		
Yellow-billed cuckoo		✓		
Mangrove cuckoo		✓		
Burrowing owl	✓			
Common nighthawk	✓			
Chuck-wills-widow		✓		
Whip-poor-will	✓			
Chimney swift	✓			
Ruby-throated hummingbird	✓			
Rufous hummingbird	✓			
Belted kingfisher			✓	
Yellow-bellied sapsucker		✓		
Eastern wood pewee	✓			
Least flycatcher	✓			
Eastern phoebe		✓		
Great crested flycatcher			✓	
Western kingbird	✓			
Eastern kingbird	✓			
Scissor-tailed flycatcher	✓			
Gray kingbird		✓		
Bell's vireo	✓			
White-eyed vireo				✓
Solitary vireo		✓		
Yellow-throated vireo	✓			
Red-eyed vireo		✓		
Black-whiskered vireo			✓	
Cedar waxwing		✓		
Veery	✓			
Gray-cheeked thrush	✓			
Swainson's thrush	✓			
American robin		✓		
Gray catbird			✓	
House wren		✓		
Blue-gray gnatcatcher				✓
Tree swallow				✓
Purple martin	✓			
Northern rough-winged swallow	✓			
Bank swallow		✓		
Barn swallow				✓
Ruby-crowned kinglet	✓			
Tennessee warbler	✓			

Species	Relative Abundance[1]			
	Rare	Uncommon	Common	Abundant
Orange-crowned warbler		✓		
Nashville warbler	✓			
Northern parula			✓	
Yellow warbler		✓		
Magnolia warbler		✓		
Cape May warbler		✓		
Black-throated blue warbler			✓	
Black-throated gray warbler	✓			
Black-throated green warbler	✓			
Yellow-throated warbler		✓		
Pine warbler	✓			
Prairie warbler				✓
Palm warbler				✓
Blackpoll warbler			✓	
Black-and-white warbler			✓	
American redstart			✓	
Prothonotary warbler	✓			
Worm-eating warbler		✓		
Swainson's warbler	✓			
Ovenbird			✓	
Northern waterthrush		✓		
Louisiana waterthrush	✓			
Connecticut warbler	✓			
Common yellow-throat				✓
Yellow-breasted chat	✓			
Hooded warbler	✓			
Canada warbler	✓			
Savannah sparrow		✓		
Grasshopper sparrow		✓		
Dickcissel	✓			
Summer tanager	✓			
Scarlet tanager	✓			
Rose-breasted grosbeak	✓			
Blue grosbeak	✓			
Indigo bunting		✓		
Painted bunting		✓		
Northern oriole	✓			
Red-winged blackbird			✓	
Brown-headed cowbird	✓			
Bobolink		✓		
Total	**39**	**29**	**12**	**7**
Percent	45	33	14	8

Source: **BNP 1998**, **Finch 1991**.
Notes: [1] Rare = 10 or fewer records, uncommon = 11 to 100 records, common = 101 to 500 records, abundant = 500+ records.

Table 3.11-9. Water Birds and Birds of Prey Observed During Christmas Bird Counts at Biscayne National Park, 1979–1997

Species	Relative Abundance[1]			
	Rare	Uncommon	Common	Abundant
Common loon		✓		
Pied-billed grebe		✓		
Horned grebe	✓			
Audubon's shearwater		✓		
Magnificent frigatebird			✓	
Northern gannet			✓	
Brown booby		✓		
Anhinga	✓			
Double-crested cormorant				✓
Brown pelican				✓
White pelican		✓		
Blue-winged teal		✓		
Northern pintail	✓			
Mottled duck	✓			
Black scoter		✓		
Fulvous whistling duck		✓		
Red-breasted merganser				✓
Tricolor heron			✓	
Little blue heron			✓	
Reddish egret	✓			
Great white heron		✓		
Great blue heron			✓	
Great egret		✓		
Snowy egret		✓		
Cattle egret		✓		
Green heron		✓		
Yellow-crowned night heron		✓		
Black crowned night heron	✓			
Wood stork	✓			
Glossy ibis	✓			
White ibis				✓
Roseate spoonbill	✓			
Black vulture	✓			
Turkey vulture				✓
Osprey		✓		
Bald eagle	✓			
Northern harrier		✓		
Sharp-shinned hawk		✓		
Cooper's hawk	✓			
Red-shouldered hawk		✓		
Broad-winged hawk		✓		
Red-tailed hawk	✓			
American kestrel		✓		

Species	Relative Abundance[1]			
	Rare	Uncommon	Common	Abundant
Merlin	✓			
Peregrine falcon	✓			
Clapper rail	✓			
Common gallinule	✓			
American coot		✓		
Whimbrel		✓		
Greater yellowlegs	✓			
Spotted sandpiper		✓		
Willet			✓	
Ruddy turnstone				✓
Red phalarope	✓			
Short-billed dowitcher				✓
Red knot		✓		
Sanderling				✓
Western sandpiper			✓	
Least sandpiper				✓
Purple sandpiper	✓			
Dunlin			✓	
American oystercatcher	✓			
Gray plover				✓
Semipalmated plover				✓
Wilson's plover	✓			
Killdeer		✓		
Ring-billed gull				✓
Lesser black-backed gull	✓			
Great black-backed gull	✓			
Herring gull			✓	
Bonaparte's gull		✓		
Franklin's gull	✓			
Laughing gull				✓
Caspian tern	✓			
Royal tern				✓
Sandwich tern		✓		
Common tern	✓			
Forster's tern		✓		
Jager sp.	✓			
Pomarine jager		✓		
Black skimmer			✓	
Total Species	**28**	**29**	**10**	**14**
Percent	35	36	12	17

Source: **BNP 1998**.
Notes: [1] Rare = 10 or fewer records, uncommon = 11 to 100 records, common = 101 to 500 records, abundant = 500+ records.

Table 3.11-10. Water Birds and Birds of Prey Observed During Christmas Bird Counts at Everglades National Park, 1978–1998

Species	Relative Abundance[1]			
	Rare	Uncommon	Common	Abundant
Red-throated loon	✓			
Common loon	✓			
Pied-billed grebe			✓	
Horned grebe		✓		
American white pelican				✓
Brown pelican			✓	
Great cormorant	✓			
Double-crested cormorant				✓
Anhinga			✓	
Magnificent frigatebird	✓			
American bittern	✓			
Least bittern	✓			
Great blue heron			✓	
Great white heron			✓	
Great egret				✓
Snowy egret				✓
Little blue heron				✓
Tricolor heron				✓
Reddish egret			✓	
Cattle egret			✓	
Green heron		✓		
Black-crowned night heron		✓		
Yellow-crowned night heron		✓		
White ibis				✓
Scarlet ibis	✓			
Glossy ibis		✓		
Roseate spoonbill			✓	
Wood stork			✓	
Greater flamingo		✓		
Fulvous whistling duck	✓			
Snow goose	✓			
Brant	✓			
Wood duck	✓			
Green-winged teal			✓	
American black duck	✓			
Mottled duck		✓		
Mallard	✓			
Northern pintail				✓
Blue-winged teal				✓
Northern shoveler			✓	
Gadwall	✓			
American widgeon				✓
Canvasback	✓			

Species	Relative Abundance[1]			
	Rare	Uncommon	Common	Abundant
Redhead	✓			
Ring-necked duck			✓	
Greater scaup	✓			
Lesser scaup			✓	
Black scoter	✓			
Surf scoter	✓			
Oldsquaw	✓			
Hooded merganser	✓			
Red-breasted merganser			✓	
Ruddy duck		✓		
Black vulture			✓	
Turkey vulture			✓	
Osprey			✓	
Bald eagle		✓		
Northern harrier		✓		
Sharp-shinned hawk	✓			
Coopers hawk	✓			
Red-shouldered hawk			✓	
Broad-winged hawk	✓			
Short-tailed hawk		✓		
Swainson's hawk	✓			
Red-tailed hawk	✓			
American kestrel		✓		
Merlin	✓			
Peregrine falcon	✓			
Yellow rail	✓			
Clapper rail	✓			
King rail	✓			
Virginia rail	✓			
Sora	✓			
Purple gallinule	✓			
Common moorhen			✓	
American coot				✓
Limpkin	✓			
Black-bellied plover				✓
Snowy plover	✓			
Wilson's plover		✓		
Semipalmated plover			✓	
Piping plover	✓			
Killdeer			✓	
Black-necked stilt		✓		
American avocet			✓	
Greater yellowlegs			✓	
Lesser yellowlegs			✓	
Solitary sandpiper	✓			

Species	Relative Abundance[1]			
	Rare	Uncommon	Common	Abundant
Willet				✓
Spotted sandpiper			✓	
Whimbrel			✓	
Long-billed curlew	✓			
Marbled godwit			✓	
Ruddy turnstone			✓	
Red knot			✓	
Sanderling			✓	
Semipalmated sandpiper			✓	
Western sandpiper				✓
Least sandpiper				✓
Pectoral sandpiper	✓			
Dunlin				✓
Stilt sandpiper		✓		
Peep species				✓
Short-billed dowitcher				✓
Long-billed dowitcher	✓			
Sandpiper species				✓
Common snipe	✓			
Laughing gull				✓
Bonaparte's gull	✓			
Ring-billed gull			✓	
Herring gull		✓		
Lesser black-backed gull	✓			
Greater black-backed gull	✓			
Gull-billed tern		✓		
Caspian tern			✓	
Royal tern			✓	
Sandwich tern		✓		
Roseate tern	✓			
Common tern	✓			
Forster's tern			✓	
Black skimmer				✓
Total Species	**47**	**18**	**35**	**21**
Percent	39	15	29	17

Source: **Cornell Laboratory of Ornithology 2000**.

Notes [1] Rare = 100 or fewer records, uncommon = 101 to 500 records, common = 501 to 5,000 records, and abundant = 5,001+ records.

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3.12 CULTURAL RESOURCES

3.12.1 Introduction

Cultural resources described in this section include archaeological and architectural resources and traditional cultural resources.

3.12.1.1 Resource Definition

Cultural resources are districts, landscapes, sites, buildings, structures, or objects considered to be important to a culture, subculture, or community for scientific, traditional, religious or any other reason. Cultural resources listed on or eligible for nomination to the National Register of Historic Places (National Register) are afforded special consideration and protection.

Archaeological resources are locations where human activity has measurably altered the earth (e.g., hearths, foundations) or left deposits of physical remains (e.g., arrowheads, bottles). Federal laws and regulations may use the term "prehistoric" to refer to archaeological resources associated with Native Americans, particularly before contact with Euroamericans. This term also means cultural resources that predate the beginning of written records. In southern Florida, prehistoric archaeological resources range from isolated artifacts (e.g., shark tooth knives, conch-shell hammers, stone tools) to shell middens and mounds. The term "historic" includes any cultural resource that postdates Euroamerican contact with Native Americans. Historic archaeological resources in southern Florida include shipwrecks, cemeteries, trails, collapsed buildings, and a variety of other features.

Architectural resources are standing buildings, facilities, and other structures of historical, aesthetic, or scientific importance, including public buildings, churches, stores, theaters, residences, and architectural features such as fountains and entrance gates. On former Homestead AFB and in the surrounding area, all known surviving architectural resources are historic in age.

A historic landscape is a geographic area that includes related cultural and natural features. Historic landscapes are generally 50 years or more in age and can include agricultural landscapes, industrial landscapes, and traditional landscapes. Historic vernacular landscapes are those modified by human activity to reflect traditions, customs, or values in the everyday lives of people. More than one historic landscape can be defined for an area, representing changes in how people used the land.

Traditional cultural resources are resources associated with cultural practices and beliefs of a living community that are rooted in its history and are important in maintaining the continuing cultural identity of the community. Certain categories of traditional cultural resources, such as ancestral settlements or historic buildings, may be protected through their eligibility for the National Register. In this document, if a traditional cultural resource has been determined to be eligible for nomination to the National Register, it is called a traditional cultural property.

Archaeological or architectural resources usually must be at least 50 years old before they are afforded protection under federal law. However, certain structures or objects associated with more recent, exceptionally important historic events (e.g., the Cold War) also may be considered eligible for nomination to the National Register. Cultural resources are usually afforded protection in the context of existing knowledge about the region, culture, property type, object, or other set of characteristics represented by the resource.

3.12.1.2 Applicable Laws and Regulations

Following is a summary of laws and regulations related to the identification and preservation of cultural resources.

National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. Section 470), amended 1976, 1980, 1992. The NHPA established the National Register and outlined procedures for management of cultural resources on federal property. Section 110 requires action on the part of a federal agency to preserve historic properties owned or controlled by the agency, and Section 106 requires that federal agencies take into account the effects of any undertaking on historic properties. Procedures for meeting the requirement of the NHPA are codified in 36 CFR Section 800 (1999).

Archaeological and Historic Preservation Act of 1974 (16 U.S.C. Section 469). This act provides for the "preservation of historical and archaeological data threatened by dam construction or alterations of terrain."

Archaeological Resources Protection Act of 1979 (16 U.S.C. Section 470aa-47011). This act ensures the protection and preservation of archaeological sites on federal or Native American lands.

Executive Order 11593. This executive order directs land-holding federal agencies to identify and nominate historic properties to the National Register and requires that these agencies avoid damage to historic properties that might be eligible for the National Register.

Native American Graves Protection and Repatriation Act (25 U.S.C. Section 3001–3013). This act requires consultation with American Indian tribes prior to intentional excavation, or removal after inadvertent discovery, of human remains or certain objects of cultural importance on federal or Indian lands.

American Indian Religious Freedom Act (42 U.S.C. Section 1996). This act states that it is the policy of the United States to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise their traditional religions including, but not limited to, access to sites, use and possession of sacred objects, and the freedom to worship through ceremonial and traditional rites.

Executive Order 13007, Indian Sacred Sites. This executive order directs agencies responsible for managing federal lands to "(1) accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and (2) avoid adversely affecting the physical integrity of such sacred sites. Where appropriate, agencies shall maintain the confidentiality of sacred sites." The executive order also requires that reasonable notice be given for proposed actions or policies potentially restricting access to or adversely affecting sacred sites.

Executive Order 13084, Consultation and Coordination with Indian Tribal Governments. This executive order directs federal agencies to be guided by principles of tribal sovereignty and to provide a process for tribal input when formulating policies that significantly affect Indian tribal governments. It further orders agencies to review and streamline the waiver process for statutory and regulatory requirements for Indian tribal governments; and to cooperate with tribal governments in developing regulations that relate to tribal self-government, trust resources, and treaty or other rights. The executive order is designed to improve the internal management of the agency and does not create any right that is enforceable at law.

Memorandum for the Heads of Executive Departments and Agencies Regarding Government-to-Government Relations with Native American Tribal Governments. This document directs each executive

department and agency in the federal government to operate within a government-to-government relationship with federally recognized tribal governments; consult with tribal governments prior to taking actions affecting such governments; and assess the impact of plans, projects, programs, and activities on tribal trust resources and assure that tribal rights are considered during the consideration of such plans, projects, and programs.

Federal Aviation Administration Order 5050.4A, Airport Environmental Handbook (October 8, 1985). This order prescribes procedures for airport operators, sponsors, and others who are complying with federal laws, acts, and regulations invoked by proposed airport undertakings or actions. Section 47.e.(8) specifically addresses the requirements of NHPA and the Archaeological and Historic Preservation Act in the case of impacts to "historic, architectural, archaeological, and cultural resources."

Air Force Instruction 32-7065, Cultural Resources Management. This instruction implements Air Force Policy Directive 32-70 and sets guidelines for protecting and managing cultural resources on Air Force property in the United States and its territories and possessions.

Metropolitan Dade County Historic Preservation Ordinance (Ord. No. 81-13, Sections 1, 2-17-81). This ordinance designates historic properties, provides financial incentives for owners of historic properties, and generally promotes the preservation and appreciation of historic properties.

Florida Historic Resources Act (Florida Statutes, Annotated, Chapter 267, Sections .011 to .172). This statute addresses the identification, documentation, and preservation of cultural resources on state land.

3.12.1.3 Region of Influence

The ROI for cultural resources (**Figure 3.12-1**) was developed based on information generated by the Socioeconomics (Section 3.1), Noise (Section 3.5), and Land Use (Section 3.6) sections. It is defined as the area that could potentially be affected by actions directly associated with the Proposed Action and alternatives, the Area of Potential Effect (APE) as defined in 36 CFR 800. The APE includes areas subject to direct on-the-ground impacts from the development of former base property, areas affected by aircraft noise generally at levels of DNL 65 dB and higher, and areas that could be affected by secondary development. The ROI for development-related, ground-disturbing impacts (from both on-site and secondary development) is defined by Eureka Drive on the north, Biscayne National Park on the east, SW 376th Street/Ingram Highway on the south, and the eastern boundary of Everglades NP on the west. In addition, some information is provided on cultural resources in Biscayne and Everglades National Parks identified by the National Park Service.

3.12.2 Cultural Setting and Cultural History

The following sections summarize the history of southern Florida from prehistoric times through the Cold War.

3.12.2.1 Early Native American History

Paleoindian Stage (13000 B.C. to 8000 B.C.)

The climate of Florida 15,000 to 10,000 years ago was markedly drier than that of modern times. For this reason, the location of fresh water was of particular importance. Animals clustered around water sources, and people settled nearby to take advantage of both water and food. The people hunted large mammals and giant turtles, as well as smaller mammals such as deer and rabbits (**Milanich 1994**). At least by the

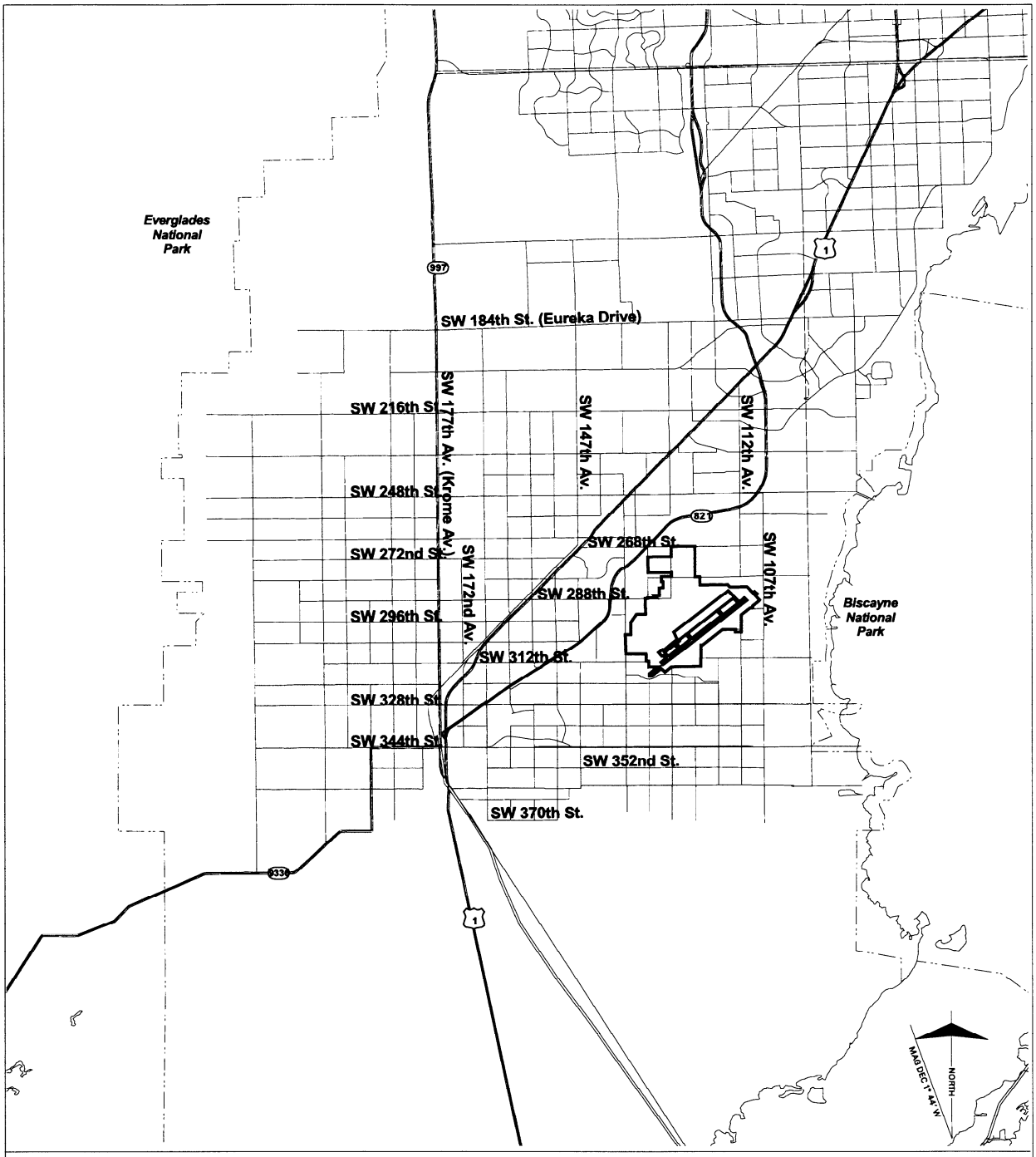

Figure 3.12-1
Region of Influence
for Cultural Resources

end of this period, people had expanded their source of livelihood to include fish and a wide variety of other animals (**Bense 1994**). There is at least one known Paleoindian site near Homestead ARS (**Milanich 1994**).

Archaic Stage (8000 B.C. to 1000 B.C.)

As the climate gradually became wetter about 8000 B.C., people expanded their settlement territory to coastal areas and along rivers (**Milanich 1994**). They were able to stay in one place longer and perform tasks that required more time. Canoes first appeared in Florida during the Archaic stage, and archaeological sites have a greater variety of tools. Other important changes included mound construction, development of large settlements, cultivation of plants, and long-distance trade (**Bense 1994**). Archaeologists are able to identify Archaic cultures from basketry, pottery, and tools made from stone, bone, wood, and shell (**Milanich 1994**). Two well- known sites in southern Florida that date to the Archaic stage are outside the ROI.

Glades (500 B.C. to A.D. 1500)

The Glades culture of southern Florida is differentiated from contemporary Native American cultures found in northern Florida by the relatively heavy reliance on water resources and less reliance on agriculture, including corn (**Milanich 1994**). Pottery tempered with sand and elaborately carved ceremonial artifacts also characterize this period. Toward the end of this period, the bow and arrow became more common. People lived along the coast and on hammocks rising from the surrounding marsh and sawgrass prairies. They may have moved seasonally among a series of established settlements. By the end of this period, some of the more socially complex societies were collapsing, resulting in reorganizations and population movements (**Bense 1994**). Several Glades sites are located near former Homestead AFB in southern Florida.

3.12.2.2 Recent American Indian History and Early Euroamerican History

European Stage (A.D. 1500 to 1821)

Written records during the 16th century fill in information that can be inferred from archaeological evidence. In 1513, Ponce de Leon made the first recorded landing in southern Florida, although he was probably preceded by shipwrecked sailors and possibly by slavers (**Bense 1994**). Ponce de Leon's first exploration and settlement (in 1521) in south Florida were followed in quick succession by a series of Spanish and then French explorers such as Cordoba (1517), Narvaez (1528), and de Soto (1539), while others made forays into other parts of what is now the southeastern United States.

One of the first effects of the European occupation felt by Native Americans was disease introduced by the Europeans and African slaves who came to North America. By 1700 A.D., Native American populations in Florida may have been reduced by as much as 90 percent by outbreaks of smallpox, mumps, measles, influenza, and pneumonia. Creeks from Alabama and Georgia immigrated to northern Florida, filling the population void, providing a labor source for the Spanish. Many Creeks eventually moved further south and linking up with escaped African slaves, became known as Seminoles, a term derived from the Spanish word for runaways. Some Seminoles adopted a mobile life as they raised cattle to supply Europeans with hides. Others operated large plantations with large herds and some even owned slaves (**Bense 1994**).

The Spanish made the greatest impact on Florida during the 16th, 17th, and 18th centuries A.D. They built forts to protect their trading ships and missions, and to consolidate their land claims while converting the

Native Americans to Christianity. Spain briefly lost control of Florida to England in 1763, but won it back in 1781. By the early 19th century, Spain had relinquished Florida to the United States (**Bense 1994**).

Even before Florida became a territory of the United States in 1821, the U.S. Army entered Florida from Georgia, pursuing escaped slaves. The army defeated the Seminoles during what came to be called the First Seminole War (1817–1818 A.D.) (**Division of Historical Resources 1998d**).

3.12.2.3 Modern Euroamerican and Native American History

American Stage (A.D. 1821 to 1917)

In 1821, the United States formally acquired Florida from Spain. Soon after, the policy of Indian removal decimated all but the most tenacious Native American populations from the southeastern United States. In Florida, two more wars were fought with the Seminoles (**Division of Historical Resources 1998d**), culminating in the escape of only about 300 people into the Everglades (**de Golia 1993**). The Seminoles who escaped the wars continued to live in their secluded communities, raising crops and trading skins and aquatic resources for metal and cloth products (**de Golia 1993**).

In the early 1800s, European-Americans and African-Americans moved into the territory left by the Indians. They established settlements—large and small farms or plantations, hamlets and towns—wherever resources would support them. Both enslaved and free African-Americans lived within a culture distinctive from that of European-Americans.

Dade County was incorporated in 1836, and Florida became the 27th state in 1845 (**Division of Historical Resources 1998c**). The Civil War changed both the economic and social organization of the southeast, including southern Florida. Traditional plantations gave way to sharecropping and tenant farming, fishing, trapping (especially plume birds), and salvaging shipwrecks (**de Golia 1993**, **Landrum 1990**). Near former Homestead AFB, settlers established farms along the rocky pineland ridge to the north. The immediate vicinity was too marshy with few plant or animal resources (**USAF 1994a**). Reclamation efforts in the Everglades region introduced canals to drain swamps, followed by farming. In many cases, these efforts were short lived, as weather, fires, and pollution of the fresh-water aquifer with salt water rendered the work ineffective (**de Golia 1993**).

Modern Era (A.D. 1918 to Present)

The modern Seminoles divide roughly along linguistic lines. The Muskogee-speaking Seminole Indians live on the Big Cypress Reservation near Alligator Alley (Highway 75), across the northern Cypress National Preserve, near Lake Okeechobee on the Brighton Reservation, and on the Seminole Reservation near Hollywood. The Hichiti-speaking Miccosukees live on the Miccosukee Reservation near the Big Cypress Reservation and in several small villages along and near the Tamiami Trail (Highway 41) (**Seminole Tribe of Florida 1998**, **Division of Historical Resources 1998a**, **de Golia 1993**).

During the 1920s, the construction of roads in southern Florida, including the Tamiami Trail between Tampa and Miami, increased contact between developers and other business people and the rural population, including the Seminoles. Florida's boom went bust, however, even before the rest of the nation began to feel the effects of the Great Depression (**Division of Historical Resources 1998a**). Not until World War II did the state begin to recover.

Everglades NP was created in 1934, although the park's boundaries were not fixed until 1958 (**de Golia 1993**). Biscayne NP began as a National Monument in 1968 and was expanded and made into a national park in 1980 (**Landrum 1990**).

The facility that would become Homestead AFB consisted of an isolated airstrip operated by Pan American Ferries, Inc. In 1942, the newly designated Homestead Army Air Field began operations as a stop on the air route from the United States to the Caribbean and Africa (**Patterson et al. 1997**). During the rest of World War II, Homestead Army Air Field supported a number of missions, including training pilots to fly the C-54 *Skymaster* from Burma to China. In 1945, a hurricane devastated its infrastructure to such an extent that it was placed on inactive status.

Reactivated in 1953, the base came to have an important role in the Cold War strategy of Strategic Air Command and, later, Tactical Air Command. In 1992, Hurricane Andrew further damaged the architectural resources of the base, demolishing all but one of the remaining pre-1945 structures and severely damaging much of the rest of the base. The damage was so extensive the Air Force determined Homestead AFB could not fulfill its active duty mission, and its active units were reassigned and deployed to other bases (**Patterson et al. 1997**).

3.12.3 Archaeological, Architectural, and Historic Landscape Resources

3.12.3.1 Existing Environment

Archaeological Resources

Information on archaeological resources was obtained from the National Register, the Florida Division of Historic Resources, Biscayne National Park, and the Miami-Dade Office of Community and Economic Development, Historic Preservation Division.

A reconnaissance-level survey of former Homestead AFB was conducted by NPS in 1986 as part of an interagency technical assistance agreement between NPS and Homestead AFB (**Parsons Corporation et al. 1992**). The reconnaissance survey was of the entire base to determine the need for and scope of any additional investigations necessary to discover significant cultural resources. The survey consisted of windshield and pedestrian inspection and archival research. Drainage ditches that transect the base provided views of the topsoil overlying the basal Miami Oolite, indicating that the topsoil was no more than 4 inches deep.

Based on what is known of the ground conditions at former Homestead AFB, coupled with the construction history of the base, the report concluded that there is virtually no probability for the discovery of significant archaeological sites on the installation (**Parsons Corporation et al. 1992**). The Florida State Historic Preservation Office (SHPO) concurred with this conclusion (**Percy 1993**). However, further investigations indicated that former Homestead AFB may have included hammocks or other slightly higher topography (**Carr 1998**). Grading and filling during base construction could have disturbed archaeological sites, but also could have left some or part of such deposits undisturbed (**Carr 1998**). There is a slight possibility that future construction could encounter previously unidentified subsurface archaeological deposits. Cleanup activities following Hurricane Andrew did not discover any archaeological resources on the former base.

A survey of a 3,500 acre tract developed by HUD directly adjacent to Homestead ARS identified no archaeological sites (**Swindell 1975**).

At least four National Register-eligible archaeological resources are within areas outside of former Homestead AFB that could be affected by development related to reuse of the former base. (**Table 3.12-1**). Within Biscayne National Park, the Sweeting Homestead and the Offshore Reefs Archaeological District are listed on the National Register. Sands Key Archaeological District has been nominated to the National Register. In addition, another 57 National Register-eligible archaeological resources have been identified. (**NPS 1998b**).

Table 3.12-1. Cultural Resources in the ROI

Property Type	Preservation Status			Location			
	NR Listed	NR Eligible	Locally Important	Within 65 dB Contour	South Miami-Dade County	Biscayne NP	Everglades NP
Archaeological Site	2	61			4	58	1
Archaeological District	3	1				2	2
Architectural Site	13	16	61	1	88	1	
Architectural District	1	2	1		1	3	
Cultural Landscape		1				1	
Total	**19**	**81**	**62**	**2**	**93**	**65**	**3**

Source: **NPS 1998c, Florida Heritage Magazine 1998, Metro-Dade County n.d.a, NPS 1998b, Cordell 1997.**
NR National Register of Historic Places

The portion of Everglades National Park within Miami-Dade County includes two National Register archaeological districts: the Shark River Slough Archaeological District and the Lake Archaeological District. The historic Anhinga Trail is also on the National Register.

Architectural Resources

Two destructive hurricanes have eliminated most architectural resources on former Homestead AFB that could have been eligible for the National Register based on their age and architectural merit. In 1945, the damage was so extensive that the base was placed on inactive status. In 1992, Hurricane Andrew further damaged the architectural resources of the base, demolishing all but one of the remaining pre-1945 structures. Coupled with the fact that there was no construction on the base between 1945 and 1952, this leaves only one architectural resource more than 50 years old. However, there are numerous structures dating to the Cold War era.

Two architectural inventories have been completed on former Homestead AFB. The first concentrated on structures constructed prior to 1945; six were identified (**Parsons Corporation et al. 1992**). All but one of these pre-1945 architectural resources were destroyed by Hurricane Andrew. The surviving structure, Building 121, is a 1942 maintenance shop that has been determined not to be eligible for the National Register (**Percy 1993**).

The second inventory, part of an Air Combat Command nationwide study, examined Cold War cultural material at former Homestead AFB (**Patterson et al. 1997**). The inventory identified all architectural resources that could be considered eligible for the National Register, with construction dates up until 1989 when the Cold War ended with the destruction of the Berlin Wall. This study identified two buildings and one set of documentation that are important to understanding the Cold War.

The documentary collection consists of drawing details for Nike Hercules and Hawk Missiles and missile sites. Although the documentation is currently stored in a building on former Homestead AFB, it can be curated in any appropriate location. Air Combat Command recommended the documents be copied for use by Homestead ARS and the originals be sent to a permanent curatorial facility for stewardship and conservation (**Patterson et al. 1997**).

Building 931 was the USAF Conference Center, built in 1974. It was the site of many top-level Air Force meetings and work groups where numerous policy decisions were developed and announced. It is located in the portion of former Homestead AFB that has been conveyed to the Department of Labor. The 1997 Air Combat Command Cold War survey (**Patterson et al. 1997**) considered this building to have exceptional importance and to be eligible for the National Register (**Patterson et al. 1997**). However, records at the Air Force Base Conversion Agency show that Building 931 is not eligible, nor was it ever considered potentially eligible (**Mendoza 1999**). Therefore, the transfer documents had no stipulations in them with regard to historic properties or their eligibility (**Mendoza 1999**). Building 931 and the documentary collection are the only cultural resources within the DNL 65 dB contour for current military and government operations at Homestead ARS.

There are 89 identified historic architectural resources in the ROI of South Miami-Dade County, not including those in Biscayne NP. Thirteen of these are National Register properties, and 15 are National Register-eligible. They include public and private buildings, a gate, a pool, and other structures. Miami-Dade County has listed another two architectural structures and one historic district (**Metro-Dade County n.d.a**), the City of Homestead has listed another 17 structures (**Research Atlantica 1994**), and the Florida SHPO lists 42 as having local importance. A survey of the 3,500 acre tract directly adjacent to Homestead ARS that was developed by HUD located no architectural resources (**Swindell 1975**). However, a number of architectural resources have been identified by local preservation efforts (**Florida Heritage Magazine 1998**, **Metro-Dade County n.d.a**, **Metro-Dade County 1981**).

In addition, Biscayne National Park includes the Boca Chita National Register Historic District, with 10 structures, and the National Register-nominated Stiltsville Historic District. A multiple property nomination for Biscayne National Park cultural resources, to be submitted to the National Register, will encompass several historic themes and site types (**NPS 1998b**). The National Register-eligible Fowey Rocks Lighthouse, owned by the U.S. Coast Guard, is also within the national park boundaries.

Historic Landscape Resources

Biscayne National Park has completed the first phase of a Cultural Landscape Inventory. The proposed Biscayne National Park maritime cultural landscape will be based on elements of varied historic activities and remains on the keys, within the bay, and along the reef tract. A Biscayne National Park historic or cultural landscape could include Boca Chita, an ethnographic landscape encompassing the varied activities and remains on the keys, or a maritime historic landscape incorporating the submerged landscape (**NPS 1998b**).

3.12.3.2 Projected Baseline Environment

Development in the vicinity of former Homestead AFB could, but is unlikely to, result in the discovery of archaeological deposits. Any higher terrain, such as a hammock or tree island, would have the potential for archaeological resources (**Ricisak 1998**). Future surveys could also identify additional archaeological sites. Sites with undetermined National Register status could be evaluated as eligible or not eligible for the National Register, which could have implications for future development plans. Areas with known dense or important sites could be designated as districts or zones by Miami-Dade County.

Most cultural resources must be over 50 years old to be considered eligible for the National Register. This means that an architectural feature built between 1949 and 1950 could become eligible by the year 2000; if built between 1950 and 1955, it could be eligible by the year 2005; and if built between 1955 and 1965, it could be eligible by the year 2015. Architectural resources that will become 50 years old could be considered eligible for the National Register, although none have been identified at this time.

The Air Combat Command Cold War survey (**Patterson et al. 1997**) is the only architectural survey that has been performed on former Homestead AFB that identified cultural resources that could reach 50 years of age before 2015. That survey identified the only theme that could encompass future eligibility of buildings at the former base, and its results were discussed above. Based on the results of the Air Combat Command survey, base history, and the destruction wrought by the hurricane of 1945 and Hurricane Andrew, it is extremely unlikely that there are any additional architectural resources on the former base that could become eligible for listing on the National Register in the future.

3.12.4 Traditional Cultural Resources

Natural features, spiritual locations, and some structures may not be addressed in historic preservation legislation for the following reasons: (1) their historic use cannot be documented; (2) the resource does not have an integral relationship to traditional cultural practices and beliefs; (3) the present condition is such that the relationships no longer survive; (4) the resource's boundaries cannot be delineated; or (5) the resource does not meet the National Register eligibility criteria, including those related to integrity and age. However, even though a traditional cultural resource may not be considered significant according to National Register criteria, it may still have importance to a particular group, such as a Native American tribe or band. In that case, traditional cultural resources may be protected, or access to resources ensured, according to the provisions of the Native American Graves Protection and Repatriation Act, American Indian Religious Freedom Act, and Executive Order 13007.

3.12.4.1 Existing Environment

The State of Florida's Division of Historical Resources has identified at least three cultural communities that could potentially be associated with traditional cultural resources in Florida: modern Seminole Indian groups, African-American communities, and Cuban-American communities (**Cuban Heritage Trail Magazine 1998**, **Florida Heritage Magazine 1998**, **Division of Historical Resources 1998b**).

Traditional Seminole resources could potentially include archaeological resources; locations of important historic events; sacred areas; sources of raw material used to produce tools and sacred objects; traditional hunting, gathering, or meeting areas; native plants or animals; prominent topographic features; and other elements of the natural or built environment. Native Americans may consider these resources essential for the persistence of their traditional culture. No traditional Seminole resources have been reported within the ROI, and the Seminole and Miccosukee Tribes have not reported any traditional Native American cultural resources within the ROI.

Although the African-American and Cuban-American communities have identified culturally important locations, none of these have been designated traditional cultural resources. The Florida Department of State, Division of Historic Resources, has compiled locations and historic events important to Florida's African-American history in *Black Heritage Trail Sites* (**Florida Heritage Magazine 1998**). Among those that are in Miami-Dade County are the birthplaces or residences of people important to the African-American community; gathering places such as churches, community centers, neighborhoods, and parks; locations of services such as a hospital, cemetery, school or orphanage; and theaters and museums (**Florida Heritage Magazine 1998**).

The state has also identified locations and properties important to Cuban-American history, including several in Miami-Dade County (**Cuban Heritage Trail Magazine 1998**). These include museums, a factory, plazas, and churches.

No traditional cultural resources are located within former Homestead AFB, and none are known to be within the ROI.

3.12.4.2 Projected Baseline Environment

No traditional cultural resources have been identified in the ROI that could be affected by projected baseline population growth and development.

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3.13 MINORITY AND LOW-INCOME POPULATIONS

3.13.1 Introduction

This section identifies minority and low-income populations that have the potential to be affected by the disposal and reuse of former Homestead AFB property.

3.13.1.1 Resource Definition

Minority populations include all persons identified by the Census of Population and Housing to be of Hispanic origin, regardless of race, and all persons not of Hispanic origin other than White (i.e., non-Hispanic persons who are Black, American Indian, Eskimo or Aleut, Asian or Pacific Islander, or other race).

The federal government maintains a government-to-government relationship with Native American tribes, and Native American populations and reservation lands are addressed separately, in addition to being included in the discussion of minority populations.

Low-income populations include persons living below the poverty level ($12,674 for a family of four in 1989, adjusted based on household size) as reported in the 1990 Census of Population and Housing (**GeoLytics 1996**). The percentage of low-income persons is calculated as a percentage of all persons for whom the Bureau of the Census determines poverty status, which is generally a slightly lower number than the total population.

3.13.1.2 Applicable Laws and Regulations

Executive Order 12898, Environmental Justice. The objectives of this executive order include identification of disproportionately high and adverse health and environmental effects on minority populations and low-income populations that could be caused by a proposed federal action. Accompanying Executive Order 12898 was a Presidential Transmittal Memorandum that referenced existing federal statutes and regulations, including NEPA, to be used in conjunction with the executive order. The Council on Environmental Quality issued *Environmental Justice Guidance Under NEPA* in December 1997.

Air Force guidance for implementation of the executive order is contained in the Interim Guide for Environmental Justice Analysis with the Environmental Impact Analysis Process, dated November 1997 (**USAF 1997**). The USDOT guidance is contained in DOT Order 5610.2, *Department of Transportation Order To Address Environmental Justice in Minority Populations and Low-Income Populations*.

3.13.1.3 Region of Influence

The demographic profile of the region provides the context within which the environmental justice analysis was conducted. In order to determine whether or not environmental impacts would disproportionately affect minority or low-income populations, it is necessary to establish an appropriate basis of comparison. This basis is the "region of comparison," which consists of the geopolitical units that encompass the impact footprint of the proposed project. The environmental justice analysis, therefore, uses this region of comparison to define the ROI (**Figure 3.13-1**). Most environmental effects from the Proposed Action and alternatives would be expected to occur in southern Miami-Dade County, south of Eureka Drive, which is the ROI for the environmental justice analysis.

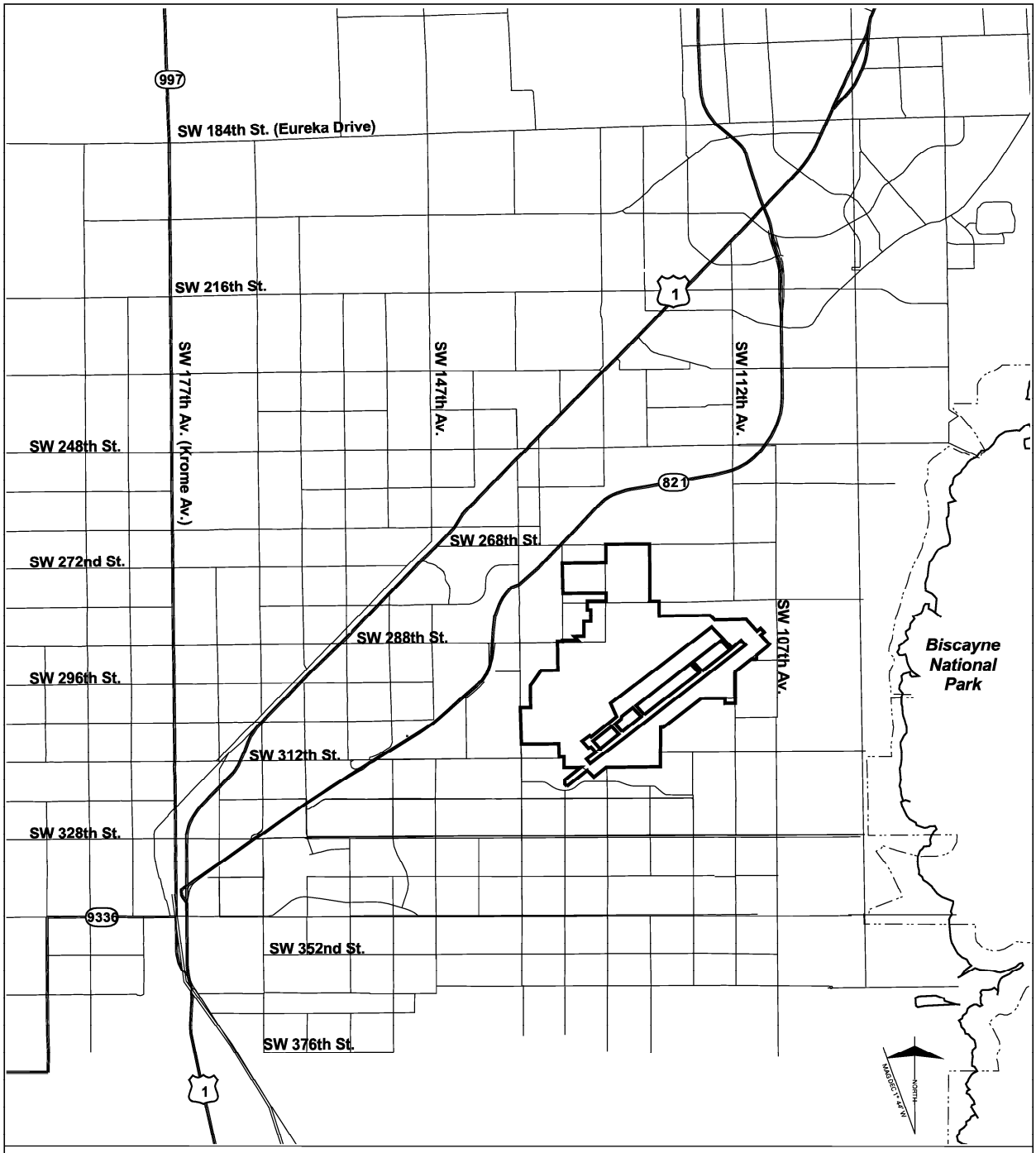


Figure 3.13-1
Region of Influence
for Environmental Justice Analysis

3.13.2 Existing Environment

Based upon the 1990 Census of Population and Housing, Miami-Dade County had a total population of 1,937,094, of which 1,349,031 (69.6 percent) were minority and 341,261 (17.9 percent) were low-income. Of the total population, 949,700 (49.0 percent) were persons of Hispanic origin. In addition, the Census reported persons not of Hispanic origin, of which 371,691 (19.2 percent were Black); 2,115 (0.1 percent) were American Indian, Eskimo, or Aleut; 23,163 (1.2 percent) were Asian or Pacific Islander; and 2,362 (0.1 percent) were of other races.

There are no Indian reservations located in the ROI. The Miccosukee Indian Reservation and portions of the Big Cypress Seminole Indian Reservation are located to the north in western Broward County.

There are no detailed current estimates (comparable to the 1990 Census) of minority populations or low-income populations for sub-county areas such as census tracts or block groups. Information from state and county government agencies and from the Miami-Dade County Public Schools suggests that the ethnic composition and the percentage of low-income population in the county have changed since the 1990 Census. Enrollment information provided by the Miami-Dade County Public Schools indicates that, between 1993 and 1997, the percentage of Hispanic students in the district increased from 48.0 percent to 51.4 percent, and in Region VI, which serves south Miami-Dade County, it increased from 40.1 percent to 48.9 percent (see Section 3.1.5 Public Education). In addition, Hurricane Andrew and the subsequent realignment of Homestead AFB to Homestead ARS have resulted in some reductions in economic activity in south Miami-Dade County. Housing assistance was made available after the hurricane, which resulted in housing becoming more affordable to persons with lower incomes, while military and civilian personnel receiving federal salaries and benefits left the area following realignment of the base.

Commercial vendors can also provide some current estimates of race and income status at the sub-county level, but these data are not compatible with current population estimates prepared by state and local agencies and it does not report Hispanic origin by race. Therefore, although the composition of the minority population and the low-income population in Miami-Dade County may have changed since 1990, the 1990 Census remains the only complete data source estimating minority populations.

To further assist in identifying minority and low-income populations in the ROI, contacts were made with local organizations representing migratory and seasonal farm workers, providers of housing for low-income persons, and organizations representing minority groups. The scoping process for the SEIS included sending public notification of scoping meetings in both English and Spanish to an extensive mailing list containing names of public and private organizations and individuals.

Migrant and seasonal farmworkers may be members of low-income populations and/or minority populations, and although this group is geographically dispersed/transient, individuals tend to experience common conditions of environmental exposure and effect. Migratory and seasonal workers in Miami-Dade County work primarily in farming row crops, fruit trees, and botanicals. The Coalition of Florida Farmworker Organizations represents migratory workers in the Homestead area.

Under the Federal Housing Act of 1937, as amended, and the Florida Housing Act, the City of Homestead Housing Authority operates housing programs with the goal of providing safe, decent, sanitary housing for low-income and indigent persons. The Homestead Housing Authority operates three housing projects under the U.S. Department of Agriculture Farmworker Housing program. One of these projects, the South Dade Center, is located at 13600 SW 312th Street in Homestead, southwest of the Homestead ARS runway. The project contains about 311 units. An estimated 2,400 persons reside in the

South Dade Center. Portions of this housing area are within the DNL 60 and 65 dB contours for existing military and government aircraft operations at Homestead ARS (see Figure 3.6-4).

3.13.3 Projected Baseline Environment

As noted above, the most recent detailed estimates of minority populations and low-income populations available for use in the environmental justice analysis are provided in the 1990 Census of Population. Although it appears that the percentage of minority populations and low-income populations in Miami-Dade County continues to increase, detailed demographic projections through 2015 are not available.

3.14 DEPARTMENT OF TRANSPORTATION ACT SECTION 4(f) LANDS

3.14.1 Introduction

This section summarizes publicly owned lands subject to the provisions of Section 4(f) of the Department of Transportation Act which may be affected by reuse of former Homestead AFB. Section 4(f) applies exclusively to approvals of transportation projects by the U.S. Department of Transportation, including any of its modal agencies such as the FAA. The FAA consults with the Department of the Interior on Section 4(f) determinations. Section 4(f) does not apply to approvals by other federal agencies such as the Air Force, nor to state or local approvals. It does not apply to projects that are not transportation projects, including reuse alternatives for former Homestead AFB that do not require USDOT or FAA approval.

3.14.1.1 Resource Definition

Publicly owned lands subject to the provisions of Section 4(f) include public parks, recreation areas, and wildlife and waterfowl refuges of national, state, or local significance. Land of historic sites of national, state, or local significance are also subject to Section 4(f), whether the land is publicly owned or privately owned. Any part of land subject to Section 4(f) is presumed to be significant unless the agency having jurisdiction makes a statement of insignificance relative to the entire land.

3.14.1.2 Applicable Laws and Regulations

Department of Transportation Act (49 U.S.C., Subtitle I, Section 303). This act, commonly known as DOT Section 4(f) or simply Section 4(f), mandates that special effort be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites in implementing transportation projects. The Secretary of Transportation may approve a transportation program or project requiring the use of lands protected under Section 4(f) only if (1) there is no prudent and feasible alternative to using that land, and (2) the program or project includes all possible planning to minimize harm to the affected land from the proposed use.

FAA Order 5050.4A, Airport Environmental Handbook. This order contains guidance on compliance with Section 4(f) of the DOT Act.

Airport Noise Compatibility Planning (14 CFR, Subchapter I, Part 150). This regulation contains compatible land use guidelines with respect to aircraft noise exposure that are relevant to most parks and recreation areas and to historic sites. These guidelines are supplemented for wildlife refuges and for national parks whose values and uses exceed common categories of park and recreational uses included in the guidelines.

Federal Highway Administration/Federal Transit Administration Constructive Use Guidance under 23 CFR 771.135. The FAA uses Federal Highway Administration/Federal Transit Administration guidance on constructive use to the extent relevant to FAA actions.

3.14.1.3 Region of Influence

The region of influence for Section 4(f) consideration is determined by the nature and extent of effects from any proposed transportation use associated with reuse of the disposal property at former Homestead AFB. The region of investigation (**Figure 3.14-1**) for characterizing the affected environment is defined as including south Miami-Dade County (south of Eureka Drive), Biscayne and Everglades NPs, Crocodile Lake NWR, Big Cypress National Preserve, Florida Keys National Marine Sanctuary, John Pennekamp Coral Reef State Park, Bill Baggs State Park, and Key Largo Hammocks State Botanical Site.

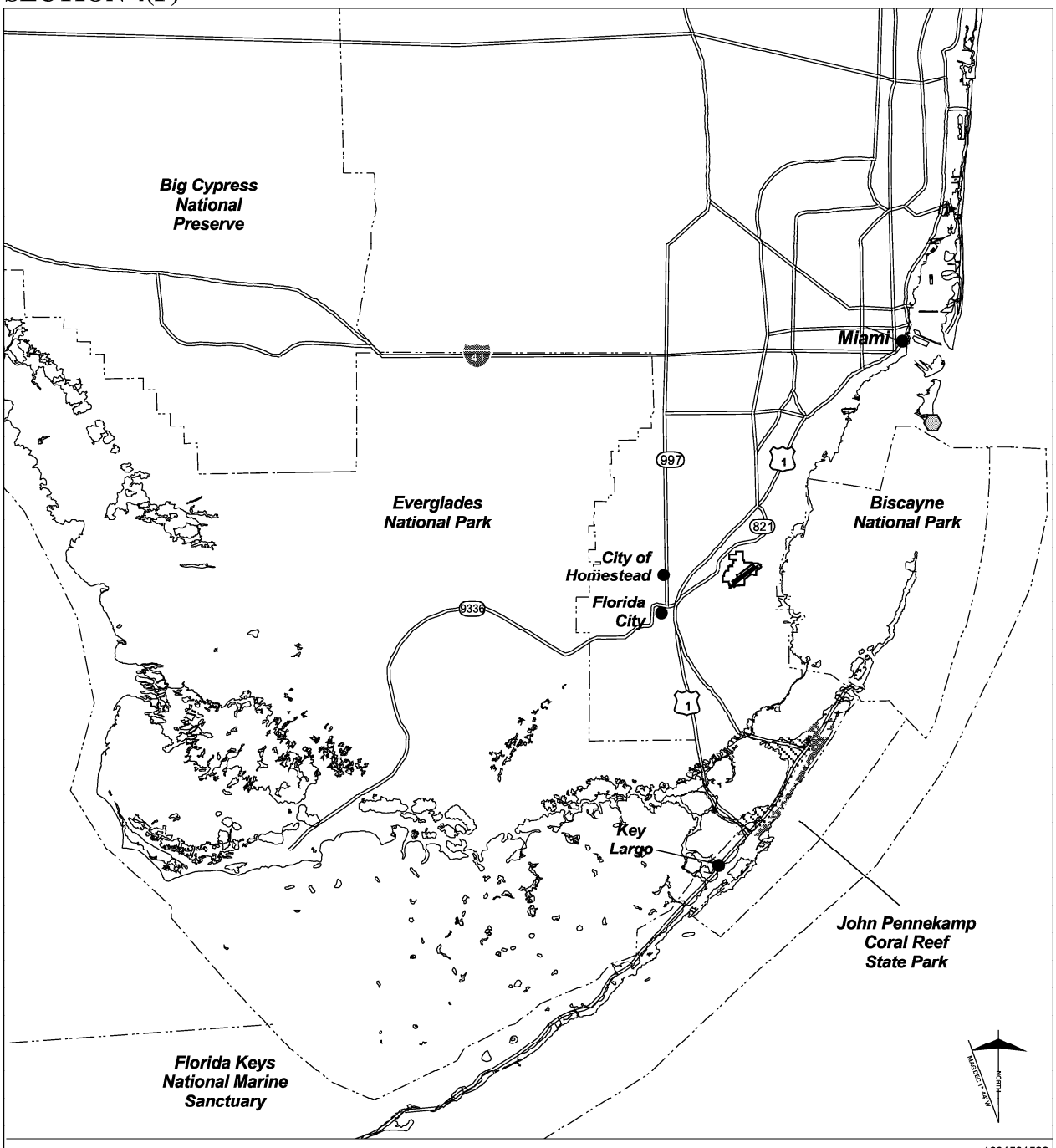


Figure 3.14-1
Region of Investigation for
DOT Act Section 4(f)

The area of focus for identifying and assessing impacts to public parks, recreation areas, refuges, and historic sites of local significance is comprised of the five Transportation Analysis Districts encompassing and surrounding former Homestead AFB.

3.14.2 Existing Environment

Section 3.6 of this SEIS provides detailed descriptions of the parks and refuges of national significance considered for the Section 4(f) analysis, including the two national parks, Crocodile Lakes NWR, Big Cypress National Preserve, and Florida Keys National Marine Sanctuary. John Pennekamp and Bill Baggs State Parks are also described in Section 3.6 as parks of state significance. That section discusses the values and management goals that each area's agency of jurisdiction has placed on the resources of the area. In addition to their recreation value, each of those areas contains and supports various important physical and biological resources identified for preservation in the agencies' management objectives. Physical resources include air quality, discussed in Section 3.8, and water resources, discussed in Section 3.10. The biological resources, including threatened, endangered, and other species of concern, are described in Section 3.11. These national and state parks and refuges are shown on Figure 3.14-1.

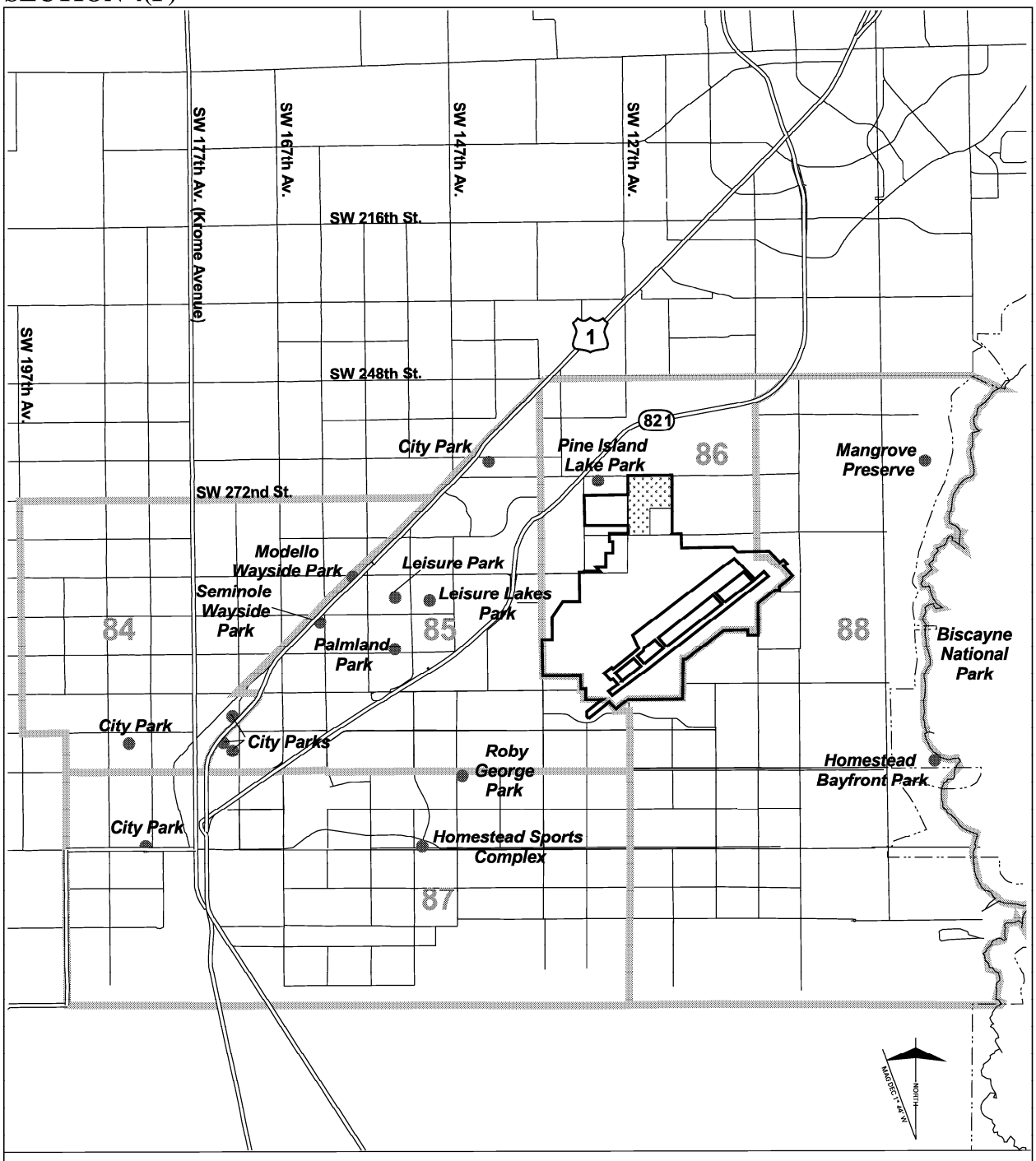
While nature is a principal value in the national parks, refuges, and preserves in the ROI, the local parks and recreation areas in the vicinity of former Homestead AFB can be generally characterized as urban or suburban parks for the use and enjoyment of nearby residents. **Figure 3.14-2** depicts local parks within the five TADs that include and surround the former base. There are no designated federal, state, or local wildlife or waterfowl refuges within the five TADs surrounding former Homestead AFB.

Historic resources are discussed in detail in Section 3.12. **Figure 3.14-3** shows the location of historic sites in the five TADs. The sites and their status relative to eligibility to the National Register or local register are listed in **Table 3.14-1**. Several of the sites are not independently eligible for listing on the National Register but are potential contributors to a National Register district.

In comments on the Draft SEIS, South Florida Water Management District submitted additional information on areas that it owns and manages in the vicinity of the region of influence for Homestead. These areas, described in Section 3.6, include the Southern Glades Wildlife and Environmental Area, Model Lands Basin, and Frog Pond/L31N Transition Lands. They were acquired for protection under the Save Our Rivers program because of their environmental sensitivity. They are not officially designated as public parks or wildlife refuges and do not specifically function as such. However, the Southern Glades and Model Lands Basin provide a wildlife corridor between the national parks and refuge, and the Southern Glades and Frog Pond/L31N Transition Lands allow various public recreational uses to the extent appropriate to the environmental sensitivity of the areas. While the applicability of DOT Section 4(f) to these SFWMD lands is uncertain, the FAA has included them within its 4(f) evaluation in Section 4.14.

3.14.3 Projected Baseline Environment

A portion of former Homestead AFB has been transferred to Miami-Dade County for a regional park (see Figure 3.14-2). The regional park is expected to be developed over the next 10 years and eventually provide a variety of recreational opportunities for residents in south Miami-Dade County, including playgrounds, picnic facilities, ball fields, and a stadium.



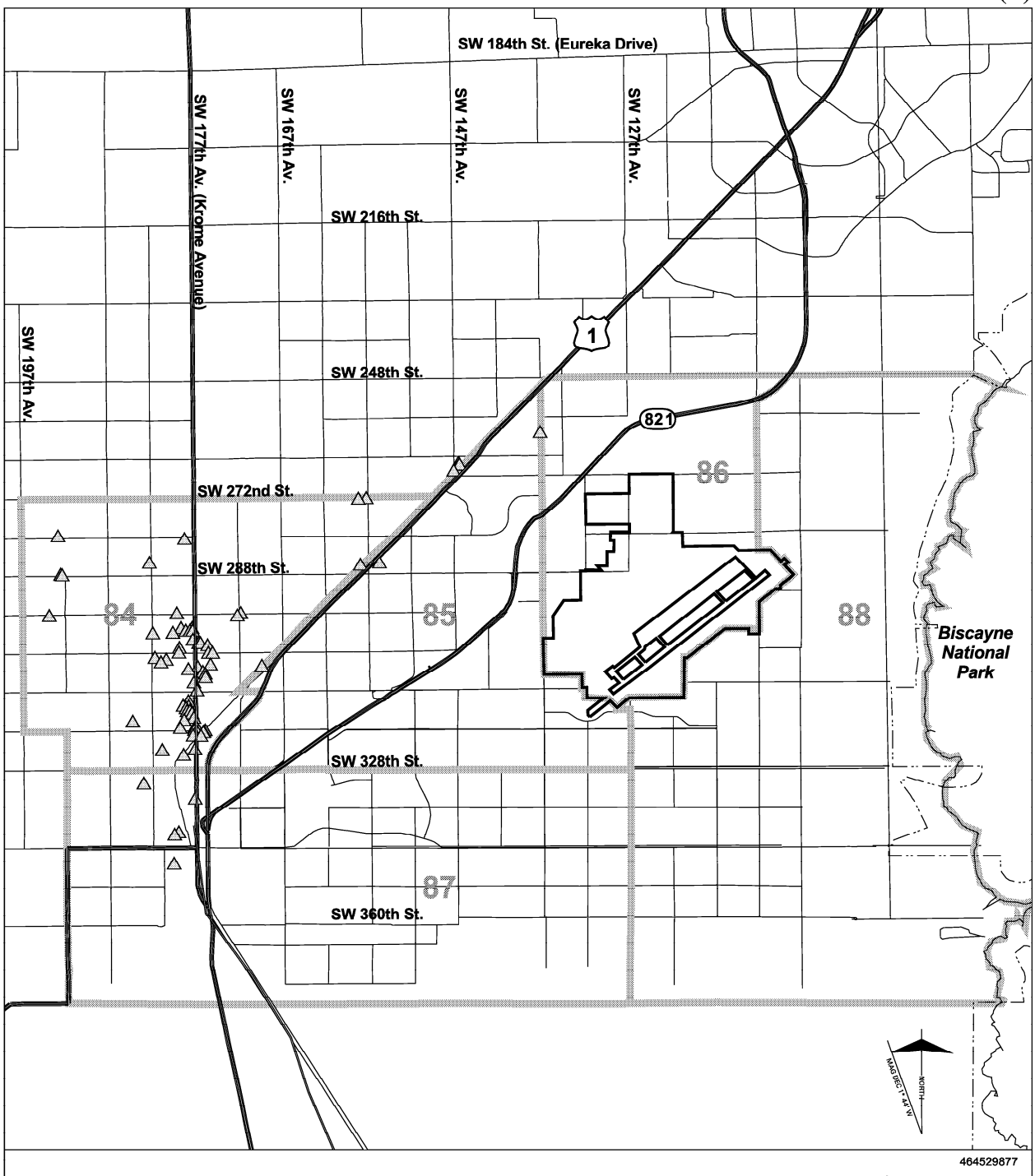
LEGEND

- Former Homestead AFB
- Park
- Homestead Regional Park
- 84 Transportation Analysis District
- Major Road
- Street
- U.S. Highway
- State Highway

1 0 1
Scale in Miles

Derived from:
Metro-Dade County 1992b

Figure 3.14-2
Parks in the Vicinity of
Former Homestead Air Force Base



LEGEND

- Former Homestead AFB
- Historic Site
- 84 Transportation Analysis District
- Major Road
- Street
- U.S. Highway
- State Highway

1 0 1
Scale in Miles

Derived from:
Florida Bureau of Historical Research n.d.,
Metro-Dade County 1992b

Figure 3.14-3
Historic Sites in the Vicinity of Former Homestead AFB

Table 3.14-1. Historic Sites in the Vicinity of Former Homestead AFB

Site Name	Year Built	Use	Status
107 Lucy Street	c1910	Private residence	Likely eligible for local register
1320 Old Dixie Highway	c1910	Private residence	Likely eligible for local register
15800 SW 272nd Street	c1940	Private residence	Eligible for local register
167 NW 16th Street	c1930	Private residence	Likely eligible for local register
17201 SW 296th Street	c1913	Private residence	Eligible for local register
1780 North Krome Avenue	1924	Private residence	Potential NR eligible
19201 SW 288th Street	c1939	Private residence	Eligible for local register
25900 SW 137th Avenue	c1930	Private residence	Eligible for local register
26549 SW 147th Avenue			Locally listed in Homestead
27200 SW 157th Avenue	c1929	Private residence	Eligible for local register
28800 SW 192nd Avenue	c1937	Private residence	Eligible for local register
327 SW 2nd Street	c1930	Private residence	Eligible for local register
680 NW 14th Street	c1936	Private residence	Eligible for local register
94 NW 5th Street	1914	Private residence	Likely eligible for local register
Acheson Residence	c1922	Private residence	Eligible for local register
Barnes, Anita House	1924	Private residence	Likely eligible for local register
Bird House	1937	Private residence	Eligible for local register
Blockhus, Carlyle House	c1920	Private residence	Likely eligible for local register
Bow, Lily Lawrence Library	1938	Library	NR eligible
Burton Chapel, First Presbyterian Church			Locally listed in Homestead
Burton, Joe House	1925	Private residence	Likely eligible for local register
Campbell, Doris L. & Vovis, Donna R. House	1925	Private residence	Likely eligible for local register
Campbell, Ruth House	1925	Private residence	Likely eligible for local register
Cano Residence	c1920	Private residence	Eligible for local register
Caribe Motel	c1920	Private residence	Eligible for local register
Caves, Albert & Carrie Belle Johnston Residence	c1923	Private residence	Eligible for local register
Champaigns	1912	Bank	Eligible for local register
Craven, Glynn E. House	c1930	Private residence	Likely eligible for local register
Dade Homestead Townhall	1917	City hall	NR eligible
Dandhasresdhi, Saner House	c1920	Private residence	Unknown
Davis, John and Dollie House	1930	Private residence	Likely eligible for local register
Deitz Residence	c1935	Private residence	Eligible for local register
Delk, Harris V. House	c1920	Private residence	Unknown
Faust, Thomas House	1926	Private residence	Potential NR eligible
First Baptist Church	1944	Religious temple	Eligible for local register
Florida Pioneer Museum	1904	Museum	Potential NR eligible
Frederick, John & Lois House	1924	Private residence	Likely eligible for local register
Fuchs Bakery	1913	Retail establishment	Potential NR eligible
Gadway, John F. House	c1930	Private residence	Likely eligible for local register
Hanson, Don House	1936	Private residence	Likely eligible for local register
Hausman, B. N. House	c1920	Private residence	Likely eligible for local register

Site Name	Year Built	Use	Status
Hillard, Dora House	c1920	Private residence	Likely eligible for local register
Institute of Food and Agricultural Sciences	c1931	Laboratory—research	Eligible for local register
Johnson, Robert B. House	1915	Private residence	Likely eligible for local register
Landmark Hotel, The	1913	Theater	Eligible for local register
Lee Residence	c1925	Private residence	Likely eligible for local register
Lichkai, Cheryl House	1930	Private residence	Likely eligible for local register
Lindeman/Johnson House	c1923	Private residence	NR eligible
Luther Chandler House			NR eligible
McMinn/Horne House	1920	Private residence	NR eligible
Moll, Melvin and Mildred House	1927	Private residence	Likely eligible for local register
Moody Residence			Locally listed in Homestead
Moody, William T. House	1925	Private residence	Likely contributor to NR district
Moore, Hal and Janice O. House	1906	Private residence	Likely eligible for local register
Morris, Victor B. House	c1930	Private residence	Likely eligible for local register
Naranja Store/Post Office			Locally listed in Homestead
Neva King Cooper Elementary School	1913	School	Potential NR eligible
Old Homestead City Hall	1917	City hall	Likely eligible for local register
Overton Residence	c1935	Private residence	Eligible for local register
Pavic, Iloma House	1926	Private residence	Likely eligible for local register
Peters, Russell House	1938	Private residence	Likely eligible for local register
Porvenir/Garcia House	1925	Private residence	Eligible for local register
Redd Residence	c1927	Private residence	Eligible for local register
Redland Hotel	1913	Hotel	Likely eligible for local register
Risberg, Robert and Andrea House	1926	Private residence	Likely eligible for local register
Rock Gate (Coral Castle)	1920	Commercial	Potential NR eligible
Rubens, Barbara House	c1930	Private residence	Likely eligible for local register
Seminole Theatre	1940	Theater	Potential NR eligible
Simmon's Bar	c1920	Commercial	Likely eligible for local register
Soto, Efrain House	c1920	Private residence	Likely eligible for local register
St. Paul Baptist Church	1942	Religious temple	Potential NR eligible
Super Transmissions	c1930	Commercial	Likely eligible for local register
U S Sand Blasting	1926	Terminal	Potential NR eligible
Victor House	c1921	Private residence	Eligible for local register
Whitney, Gerald T. House	1923	Private residence	Likely eligible for local register

c circa
NR National Register

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