4 AFFECTED ENVIRONMENT

This chapter of the EA describes the existing environmental conditions within the geographic area that could potentially be affected by the Proposed Action. A description of the Study Area is provided first, followed by descriptions of each environmental impact category.[72] Section 4.2 presents those environmental impact categories that the Proposed Action could have potential to affect. Section 4.3 lists those categories that the Proposed Action would not have potential to affect. Since neither the No Action Alternative nor the Proposed Action would involve construction or land-disturbing activities, the potential environmental consequences are limited, and several impact categories would have no potential effects.

The description of the Affected Environment provides the context to assess the environmental impacts of the Proposed Action, which are presented in Chapter 5 *"Environmental Consequences."* Section 4.4 presents relevant past, present, or reasonably foreseeable future actions that are not part of the Proposed Action to allow for assessment of potential cumulative effects in conjunction with implementation of the Proposed Action. The cumulative effects analysis itself is presented in Chapter 5.

4.1 Environmental Assessment Study Area

A "study area" is the geographic area within which environmental impacts could potentially occur as a result of implementation of a Proposed Action. The altitude ceiling for environmental consideration regarding "air traffic airspace actions" is generally 10,000 feet (ft.) above ground level (AGL).[73] However, analysis between 10,000 ft. and 18,000 ft. AGL may be considered when the proposed changes are over a National Park or Wildlife Refuge.[74] Using methodology described further below, the FAA developed two study areas for this EA (see Figure 14):

1. A **Primary Study Area (PSA)**, consisting of the area within a 50 nautical mile (NM) radius of a point midway between IAH and HOU was identified to evaluate potential impacts of changes in aircraft routings that are proposed to occur below 10,000 ft. AGL[75]

2. A **Supplemental Study Area (SSA)**, which includes the PSA, consisting of the area within an 85 NM radius of a point midway between IAH and HOU was identified to evaluate potential effects of changes in aircraft routing up to 18,000 ft. AGL over National Parks and Wildlife Refuges

Both study areas are large enough to allow evaluation of the potential effects of the Proposed Action on all environmental impact categories.

[72] FAA Order 1050.1E, Chg. 1, App. A (and related guidance memoranda) identifies and defines the Environmental Impact Categories.
[73] Ibid., sec. 14.5e.
[74] FAA Order JO 7400.2J, "Procedures for Handling Airspace Matters," February 9, 2012, sec. 32-2-1.b.
[75] The following coordinates were used to represent the mid-point between IAH and HOU: Latitude 29.815485 N, Longitude 95.310150 W.

Figure 14 Primary and Supplemental Study Areas

The geographic area for each impact category can vary, sometimes coinciding with the study area but more often constituting a smaller area within the study area. The relevant geographic area can, and often does, differ from one impact category to another (e.g., Compatible Land Use area can be different from Air Quality area). The effects on some environmental impact categories are highly localized and confined, whereas others cover a broader geographic area. Given the vast size and geographical diversity of the Study Area, focusing on specific geographic areas for each environmental impact category allows a more complete analysis of the potential effects of the Proposed Action.

4.1.1 Data Acquisition

To determine the study area boundaries for this EA, the FAA considered the geographic areas where new or revised aircraft routings under the Proposed Action would differ from the No Action Alternative. The FAA evaluated the existing flight paths in the southeast Texas region as a basis to determine where Proposed Action changes are likely to occur. Initially, the FAA collected radar data for arrival and departure operations from airports in the southeast Texas region during 2010-2011, focusing on aircraft traffic controlled by the ZHU ARTCC and the I90 TRACON. The ZHU ARTCC is

located at IAH and controls airspace in southern Texas, Louisiana, southern Mississippi, southwestern Alabama, and areas in the Gulf of Mexico. The I90 TRACON provides approach control for airports within the Houston Metroplex. This analysis gathered representative radar data, specific to the region, from the National Offload Program (NOP) for thirty-six (36) 24-hour periods between October 3, 2010 and September 26, 2011, providing an accurate representation of overall annual conditions.

4.1.2 Methodology to Determine the Study Area

The FAA analyzed the collected radar data for approaching and departing Houston Metroplex jet aircraft operating under Instrument Flight Rules (IFR).[76] A review of radar data showed that approximately 95 percent of Houston Metroplex jet aircraft operations below 10,000 ft. AGL occur within 50 nm of a point midway between IAH and HOU. This became the PSA. Development of the SSA applied the same methodology as was used for the PSA. Approximately 95 percent of IFR Houston Metroplex jet aircraft operations below 18,000 ft. AGL occur within 85 nm of a point midway between IAH and HOU.

4.1.3 Setting and Location

The PSA encompasses approximately 7,850 square nautical miles (NM^2) and 19 counties in part or whole (all within Texas). The SSA, including the PSA, encompasses approximately 22,700 NM^2, spanning 16 additional counties and two Louisiana parishes, in part or whole. Table 12 lists all counties in the PSA and SSA.

Table 12 Study Area Counties and Parishes

Primary Study Area (PSA)	Supplemental Study Area (SSA)[1]
Austin	Angelina
Brazoria	Brazos
Chambers	Burleson
Colorado	Fayette
Fort Bend	Houston
Galveston	Jackson
Grimes	Jasper
Hardin	Lavaca
Harris	Lee
Jefferson	Leon
Liberty	Madison
Matagorda	Newton
Montgomery	Orange
Polk	Robertson
San Jacinto	Trinity
Walker	Tyler

[76] Instrument Flight Rules (IFR): Rules governing the procedures for conducting instrument flight. Also a term used by pilots and controllers to indicate type of flight plan. For further information, please see Appendix D. (FAA, *Pilot-Controller Glossary,* July 26, 2012)

Primary Study Area (PSA)	Supplemental Study Area (SSA)[1]
Waller	Calcasieu (Louisiana)
Washington	Cameron (Louisiana)
Wharton	
Note: 1. SSA also includes all counties in the PSA	

4.1.4 Airport Facilities

There are 411 public and private airports and heliports in the PSA and SSA.[77] This EA focuses on those airports with existing, published aircraft procedures that the Proposed Action may potentially affect, including the Houston OAPM Airports (see Section 1.1), as depicted in Figure 15.[78] Five of the 15 satellite airports warranted noise analysis in this EA. The remaining satellite airports were determined to have too few operations to warrant noise analysis.[79] Table 13 identifies the airports subject to detailed noise modeling in this EA, referred to throughout this EA as "Analyzed Airports."

[77] FAA, Forms 5010, "Airport Master Records": http://www.faa.gov/airports/airport_safety/airportdata_5010/ (current as of May 31, 2012).
[78] Houston OAPM Design and Implementation (D&I) Team, "Optimization of Airspace and Procedures in the Metroplex (OAPM) Design Submission, Executive Summary, Houston Metroplex" (see Appendix F).
[79] Harris Miller Miller and Hanson Inc., "Recommended Satellite Airports for Noise Analysis," *Memorandum to Roger McGrath, Environmental & Airspace Specialist, FAA, ATO Central Service Center*, July 31, 2012 (see Appendix G.2, *Noise Modeling Technical Report*).

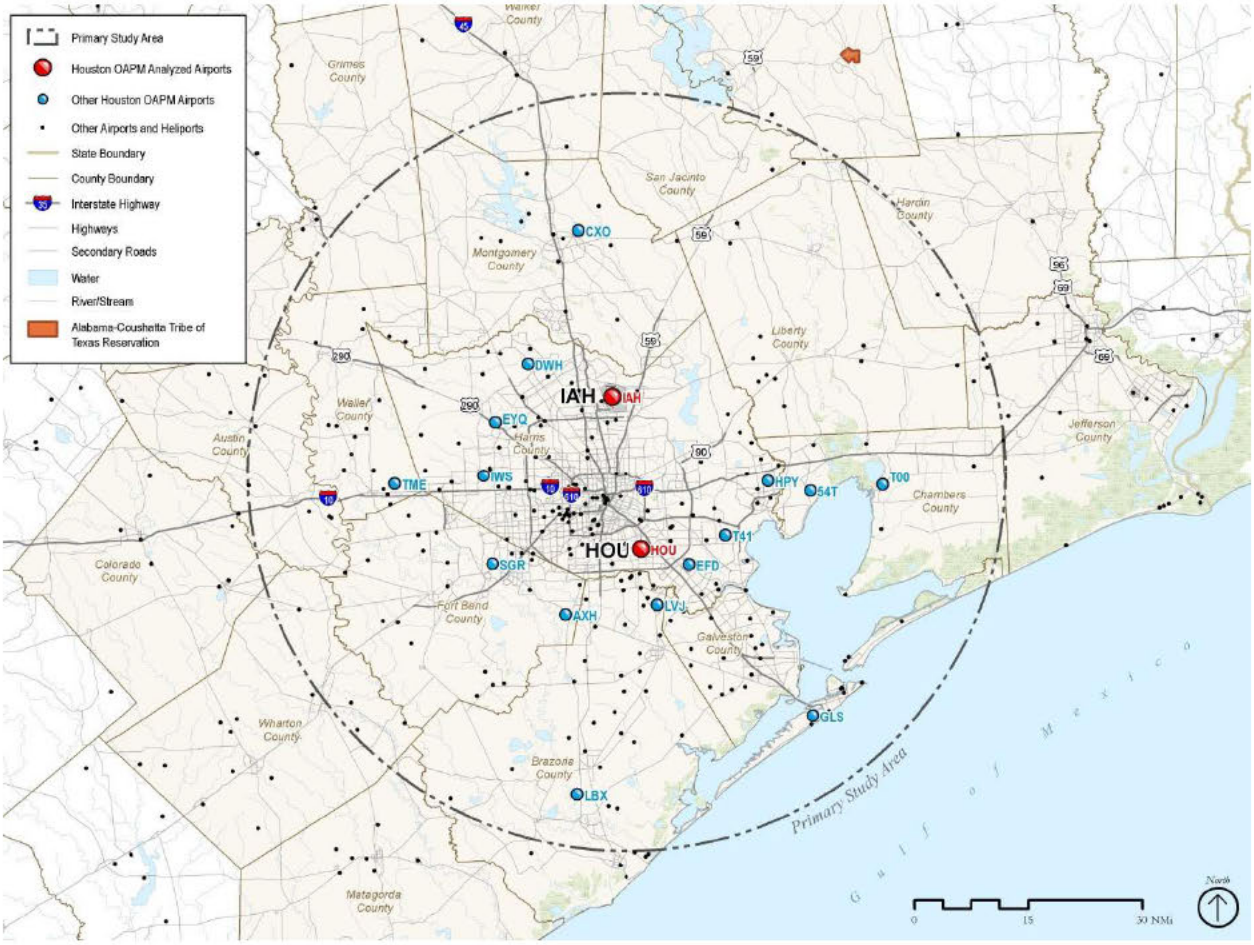


Figure 15 Houston OAPM Airports

Table 13 Analyzed Airports

Primary Airports	Satellite Airports
George Bush Intercontinental/Houston (IAH) William P Hobby (HOU)	Ellington Field (EFD) David Wayne Hooks Memorial (DWH) West Houston (IWS) Texas Gulf Coast Regional (LBX) Sugar Land Regional (SGR)

4.2 Potentially Affected Environmental Impact Categories

This section provides information on the existing conditions within the PSA and SSA for the following environmental impact categories, which the Proposed Action could potentially affect:

- Noise
- Compatible Land Use
- Department of Transportation Act, Section 4(f)
- Historical, Architectural, Archeological, and Cultural Resources

- Air Quality
- Natural Resources and Energy Supply (Aircraft Fuel)[80]
- Climate
- Fish, Wildlife, and Plants
- Light Emissions and Visual Impacts
- Environmental Justice

4.2.1 Noise

Aircraft noise is often the most noticeable environmental effect associated with aviation projects. FAA Order 1050.1E, Appendix A, Section 14 provides specific policy and procedures for the assessment of aircraft noise for compliance with NEPA, as well as other laws and statutes.

For the Houston OAPM EA, the FAA conducted aircraft noise exposure modeling within the Study Area. The following sections include a description of the aircraft noise modeling methodology used for this EA and a discussion of the existing aircraft noise exposure level within the PSA. Appendix G, *Aircraft Noise Analysis* provides background information on the physics of sound, the effects of noise on people, noise metrics, and greater detail about noise modeling for this EA.

4.2.1.1 Definition of Impact Category

Day-Night Average Sound Level (DNL) Metric

The FAA has determined that the exposure of individuals to noise resulting from aviation activities must be analyzed in terms of the yearly Day-Night Average Sound Level (DNL).[81] DNL is a single value of sound exposure for a complete 24-hour period, including all of the time-varying sound energy within the period, computed for the Average Annual Day (AAD) of aircraft operations for specified years of interest.[82] To emphasize the greater annoyance factor of noise events that occur at nighttime, when people typically sleep and ambient noise levels are lower, DNL includes an added 10 decibel (dB) weighting for noise events occurring between 10:00 P.M. and 7:00 A.M. The 10 dB weighting essentially equates one nighttime aircraft operation to ten daytime operations. Appendix G provides further information on the DNL metric.

[80] Aircraft fuel is the only aspect of the Natural Resources and Energy Supply impact category that is potentially affected by the Proposed Action. Otherwise, the Proposed Action would not affect this impact category (see Section 4.3).
[81] FAA Order 1050.1E, Chg. 1, App. A, sec. 14.
[82] "Average Annual Day (AAD)" is a noise modeling metric used to normalize day-to-day variations in aviation operations over a one year period, calculated as the total number of annual operations divided by 365 (i.e., the number of days in a year).

Noise Modeling Methodology

In addition to requiring the use of the DNL metric, the FAA also requires that aircraft noise be evaluated using authorized computer noise models. Specifically, for air traffic actions such as Houston OAPM, where the study area is larger than the immediate vicinity of an airport, incorporates more than one airport, or includes actions above 3,000 ft. AGL, the FAA mandates that noise modeling be conducted using the Noise Integrated Routing System (NIRS).[83]

For this EA, the FAA conducted a detailed analysis of IFR aircraft for the 2012 Base Year.[84] The FAA developed detailed operations from calendar year (CY) 2011 flight plan data, as described in Appendix G. Although the noise environment around major airports comes almost entirely from jet aircraft operations, the DNL calculations reflect noise from many types of jet and propeller aircraft operations on IFR flight plans that the Proposed Action could affect. Most aircraft around major airports operate IFR to obtain ATC separation services in these busy areas. Aircraft operating under Visual Flight Rules (VFR) are not included in the analysis. Such aircraft are unaffected by the Proposed Action. Further, VFR aircraft operating outside certain categories of controlled airspace are not required to be in contact with ATC. Since these aircraft operate at the discretion of the pilot on the "see and be seen" principle and are not required to file flight plans, the FAA has very limited information for these operations. There is no known source for comprehensive route, altitude, aircraft type, and frequency information for VFR operations for the entire study area. Even if complete information were available for VFR operations, the Proposed Action evaluated in the EA would not require a change to the route or altitude of these operations. Therefore, if modeling were possible, both the No Action and Proposed Action scenarios would show the same flight route and altitude. Forecast conditions in 2014 (the first full year of implementation) and 2019 (five years after implementation) for both the No Action Alternative and Proposed Action are described in Chapter 5.[85]

NIRS requires a variety of inputs, including local environmental data (e.g., temperature and relative humidity), runway layout, aircraft operations, runway use, and flight tracks. The FAA assembled detailed information on aircraft operations within the PSA for input into NIRS. This includes specific aircraft fleet mix information such as aircraft type, arrival and departure times, and origin/destination airport. Table 14 provides a summary of the number of aircraft operations for each primary and satellite airport listed in Table 13.

[83] FAA Order 1050.1E, Chg. 1, App. A, sec. 14.5e.
[84] The "2012 Base Year" refers to the projected baseline level of annual operations for 2012. It is not the actual number of 2012 annual operations, as the 2012 annual period was not yet complete when analysis for this assessment began. It is used to estimate or represent year 2012 existing conditions for comparison with 2014 and 2019 forecast operations. For further information, please see Appendix G.2, *Noise Modeling Technical Report*.
[85] The target date for publication of the Houston Metroplex optimized procedures is December 12, 2013.

Table 14 2012 Base Year and Forecast Annual Operations by Airport

Airport	2012			2014			2019		
	Total[1]	IFR[2]	VFR[2]	Total[1]	IFR[2]	VFR[2]	Total[1,3]	IFR[2,3]	VFR[2]
IAH	559,910	557,474	2,436	609,095	606,581	2,514	720,217	717,523	2,694
HOU	205,815	180,871	24,944	209,643	184,172	25,471	253,191	225,971	27,220
EFD	144,702	21,571	123,131	144,702	21,571	123,131	144,702	21,571	123,131
DWH	181,172	22,460	158,712	183,106	22,837	160,269	188,078	23,808	164,270
IWS	105,957	14,041	91,916	109,007	14,222	94,785	117,020	15,260	101,760
LBX	81,456	5,279	76,177	85,091	5,373	79,718	94,948	5,976	88,972
SGR	68,519	25,343	43,176	69,570	25,887	43,683	72,305	27,305	45,000

Sources:
1. FAA Terminal Area Forecast (TAF), January 2012, http://aspm.faa.gov/main/taf.asp
2. HMMH – Calculated values assuming ratios of IFR to VFR remain the same as they were in calendar year 2011 as reported by FAA Air Traffic Activity Data System, Calendar Year 2011 or FAA TAF for 2011 https://aspm.faa.gov/opsnet/sys/Main.asp?force=atads
3. HMMH – Includes an estimated increase in operations associated with the proposed Houston Hobby (HOU) Terminal Building and other Facilities Expansion for Planned International Operations (construction of five additional gates for international flights and construction of a Federal Inspection Services facility at HOU). Information provided on Houston Airport System (HAS) website http://www.fly2houston.com/HobbyInternational , in particular "The Economic Impact of International Commercial Air Service at William P. Hobby Airport"., a report dated May 9, 2012 and prepared by GRA, Incorporated and InterVISTAS Consulting LLC for the HAS.

While the fleet mix defines the number and type of aircraft operations that produce noise, runway use and flight track location and usage data provide additional information about where aircraft travel in the study area. To obtain this information, the FAA used thirty-six (36) 24-hour period samples of radar data, which provided flight route geometry (i.e., flight tracks), track usage by aircraft type and time of day, and flight profiles (i.e., altitudes). The FAA then applied this information, including more than 72,000 actual flight tracks, to create modeled flight tracks. To supplement this radar data, the Houston Airport System (HAS) – which manages the operations at IAH, HOU, and EFD – provided CY 2011 runway use data for IAH and HOU. Comparison of both data sets indicated that runway use in the 36 radar data samples was representative of annual conditions. While the HAS data were used for IAH and HOU runway use, the radar data and CY 2011 flight plan data were used to develop operations for all Analyzed airports and runway use for all other Analyzed Airports.[86] Additional details on NIRS and development and summary of the noise modeling inputs are available in Appendix G.

[86] The Houston Airport System (HAS) provided the FAA data regarding CY 2011 IAH and HOU operations. HAS had provided the same data to the Texas Commission on Environmental Quality (TCEQ) at an earlier date. The HAS data were used for IAH and HOU because they represented a complete calendar year and for consistency with HAS and TCEQ analysis and reports. Appendix G presents additional details regarding the use of data are presented.

4.2.1.2 Existing Conditions

The FAA calculated noise exposure from aircraft operations at more than 120,000 locations throughout the PSA and SSA, including:

1. Population centroids in the PSA only (i.e., centers of census blocks, described below)[87]
2. Certain specific cultural resources (see Section4.2.4) and areas potentially protected under the Department of Transportation Act, Section 4(f) (see Section 4.2.3)
3. Evenly-spaced grids over the PSA and SSA to document aircraft noise levels at potential noise sensitive locations that were not otherwise identified

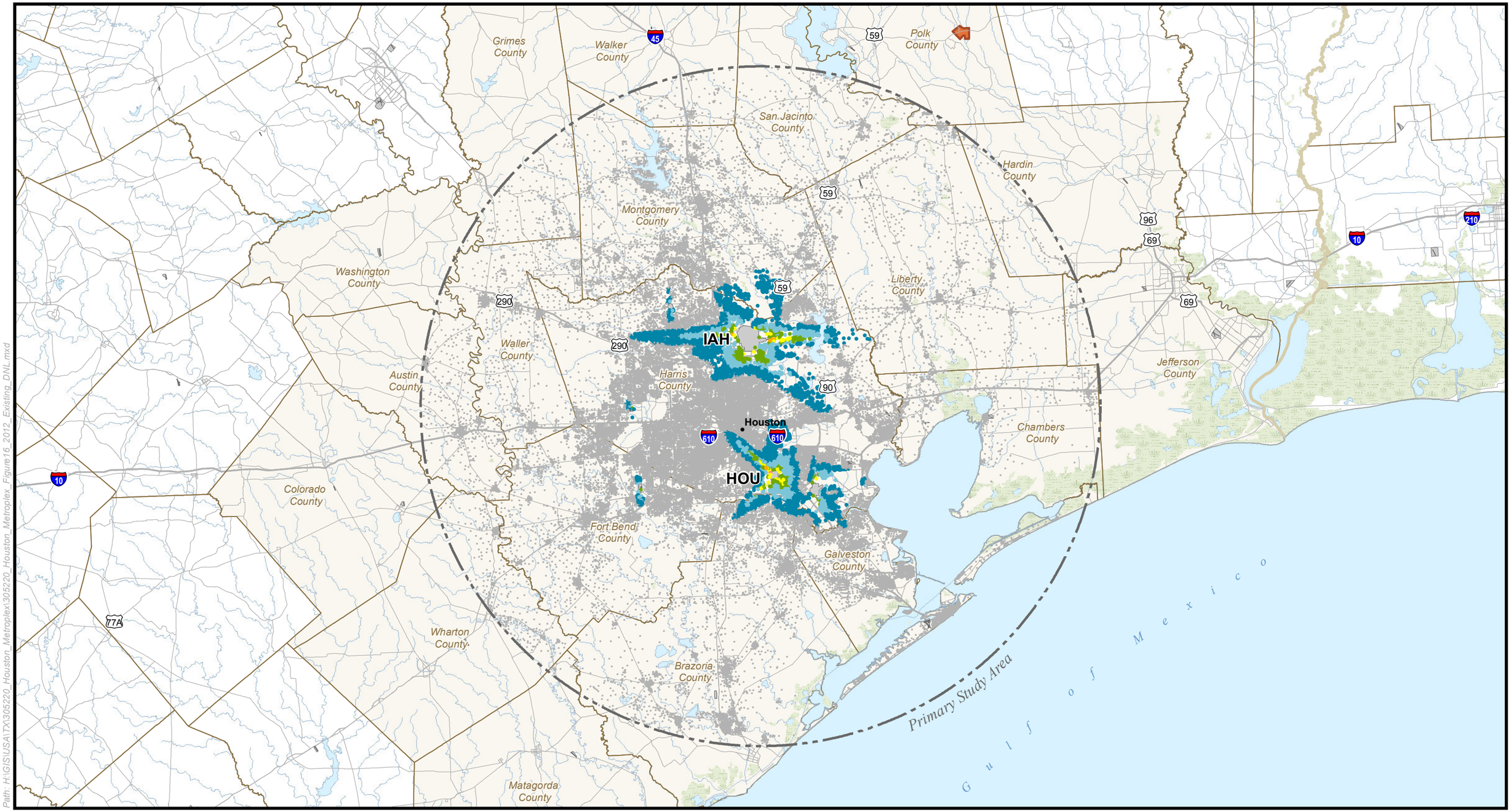
Census blocks are the smallest geographic unit for which the U.S. Census Bureau tabulates data. Streets, legal boundaries and other features generally bound census blocks. For this noise analysis, the FAA estimated the exposure to various noise levels of all census block centroids[88] in the Study Area , categorized in ranges of DNL (e.g., less than 45 dB, 45-50 dB, etc.). The FAA then estimated the population exposed to those noise levels as the number of people residing in each census block. As noise levels may vary throughout a census block, the actual number of people affected at a given noise level may be more or less than the total population of that census block. For the Houston OAPM, the FAA analyzed 67,184 census blocks in the study areas.

To describe the Affected Environment, the FAA established existing conditions noise exposure data to provide the public an opportunity to relate current personal experience with the degree of noise exposure reported. In addition, the 2012 noise analysis is the foundation upon which the noise modeling for the future conditions (i.e., 2014, first full calendar year of implementation and 2019, five years beyond implementation) is developed. The information provided refers to noise exposure levels only within the PSA. Table 15 provides the population exposed to Average Annual Day (AAD) DNL in ranges of 5 dB increments from DNL 45 dB to 75 dB, and the population exposed to DNL less than 45 dB and greater than 75 dB. Figure 16 provides a graphical representation of existing exposure levels to aircraft noise for all population centroid locations within the entire PSA for the 2012 Base Year. For each population centroid, the DNL ranges defined in Table 15 correspond with a color in Figure 16.

[87] The FAA analyzed population centroids only for the PSA because the purpose of the SSA is to evaluate potential effects of changes in aircraft routing up to 18,000 ft. AGL over national parks and wildlife refuges.
[88] The centroid is a single point that is the geographical center of the census block.

Table 15 Population Exposed to Aircraft Noise

2012 Estimated Population Exposed to Aircraft Noise			
DNL Range (dB)	Population	Percent of Total Population	Color on Figure 16
Less than 45	4,773,339	80.40%	Gray
45 to less than 50	765,173	12.89%	Dark Blue
50 to less than 55	300,687	5.06%	Light Blue
55 to less than 60	85,215	1.44%	Green
60 to less than 65	11,682	0.20%	Yellow
65 to less than 70	792	0.01%	Orange
70 to less than 75	10	<0.01%	Pink
Greater than or equal to 75	-	0.00%	Red
Total	5,936,898	100.00%	



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Data Source: Environmental Systems Research Institute, Inc.(ESRI) (Airport/Airport Runways), March 14, 2012; ESRI (State Boundaries/County Boundaries), February 14, 2012; ESRI (Cities), February 8, 2012; ESRI (Roads), March 14, 2012; Houston-Galveston Area Council (Water Features), March 14, 2012; National Atlas (Lakes/Rivers), September 10, 2012 (Updated); National Atlas (Tribal Land/Wilderness Areas), February 08, 2012;

Prepared By: Harris Miller Miller & Hanson Inc., December, 2012

North

0 10 20 Miles

Primary Study Area
Airport Boundary
State Boundary
County/Parish Boundary
Interstate Highway
Highways
Secondary Roads
Water
River/Stream
Alabama-Coushatta Tribe of Texas Reservation

2012 Existing DNL Levels

- DNL < 45.0 dB
- DNL 45.0 - 50.0 dB
- DNL 50.0 - 55.0 dB
- DNL 55.0 - 60.0 dB
- DNL 60.0 - 65.0 dB
- DNL 65.0 - 70.0 dB
- DNL 70.0 - 75.0 dB
- DNL > 75.0 dB

2012 Base Year Aircraft Noise Exposure at Population Centroids

Figure 16

Houston OAPM EA

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Areas closer to airports are exposed to higher aircraft noise exposure levels than areas farther from airports. Additionally, as Figure 16 illustrates, areas with higher noise levels generally align with primary runways and flight patterns. The majority of the PSA population (80 percent) is exposed to aircraft DNL of less than 45 dB and the smallest population group (less than one-hundredth of a percent) is exposed to aircraft DNL of 70 dB and greater.

4.2.2 Compatible Land Use

This section describes land cover classification located within the PSA. The FAA obtained land coverage data from the USGS National Land Cover Database 2006 (NLCD 2006) to document the entire study area with either land use or land cover. Land cover classifications include Developed (low, medium, high, and open space), Pasture/Cultivated Crops, Shrub/Scrub/Grassland, Wetlands, and Barren and Forests (deciduous, evergreen, and mixed). Developed land use occurs primarily within and adjacent to the City of Houston, and Planted/Cultivated and Shrub/Scrub/Grassland land uses occur in rural areas. Figure 17 illustrates general land cover classification within the PSA.

The PSA includes numerous large parks, recreational areas, and wildlife refuges, and other types of resources managed by the U.S. Forest Service (USFS), the National Park Service (NPS), and the U.S. Fish and Wildlife Service (USFWS). Sections 4.2.3 and 4.2.4 provide further information on these resources.

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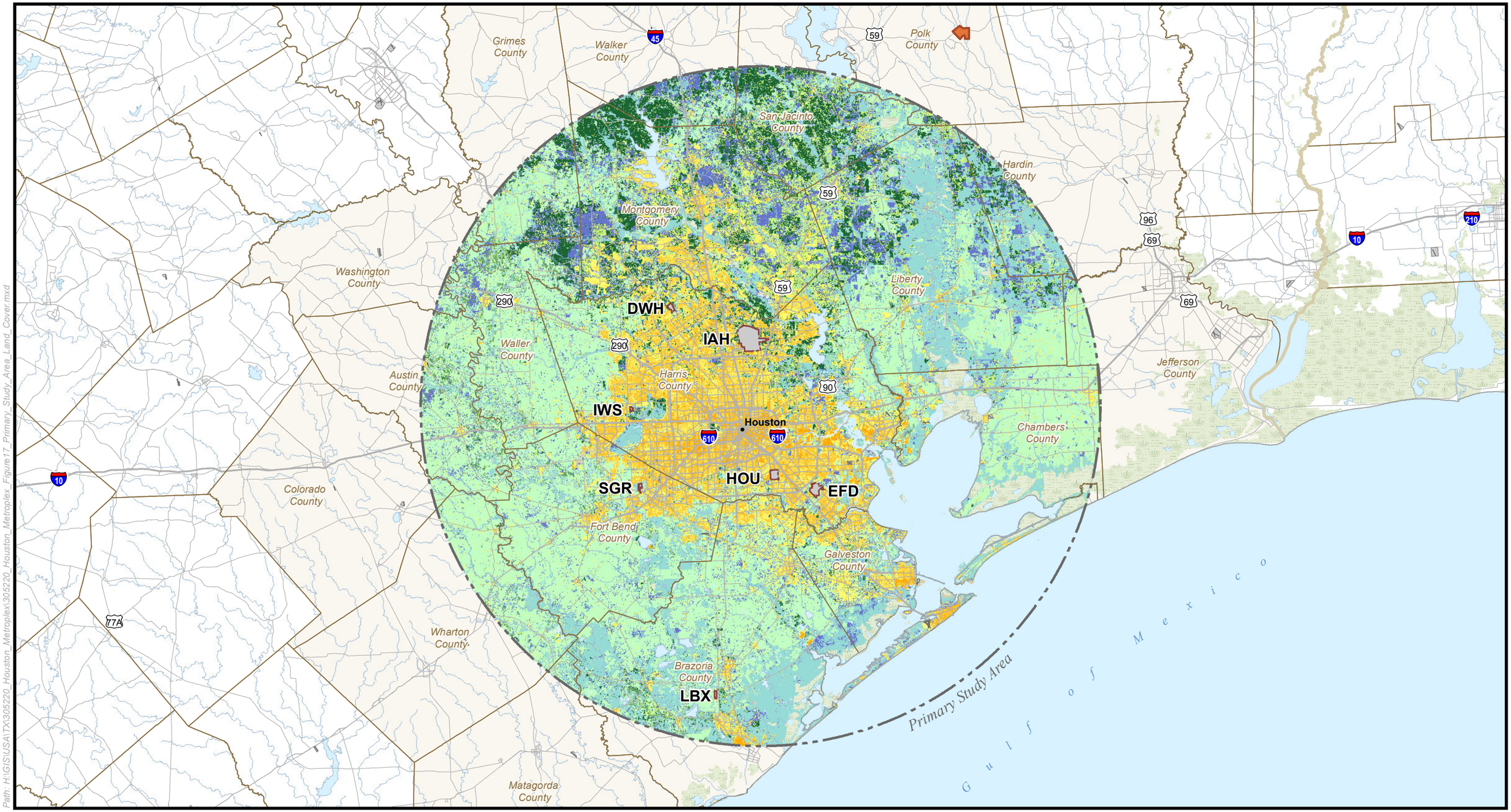

Path: H:\GIS\USA\TX\305220_Houston_Metroplex\305220_Houston_Metroplex_Figure17_Primary_Study_Area_Land_Cover.mxd

Data Source: Environmental Systems Research Institute, Inc.(ESRI) (Airport/Airport Runways), March 14, 2012; ESRI (State Boundaries/County Boundaries), February 14, 2012; ESRI (Cities), February 8, 2012; ESRI (Roads), March 14, 2012; Houston-Galveston Area Council (Water Features), March 14, 2012; National Atlas (Lakes/Rivers), September 10, 2012 (Updated); National Atlas (Tribal Land/Wilderness Areas), February 08, 2012; Research Institute (ESRI), USGS via Houston-Galveston Area Council (USGS National Land Cover Database 2006 (NLCD 2006)), March 8, 2012;

Prepared By: Harris Miller Miller & Hanson Inc., January, 2013

North

0 10 20 Miles

Primary Study Area
Airport Boundary
State Boundary
County/Parish Boundary
Interstate Highway
Highways
Secondary Roads
Water
River/Stream
Alabama-Coushatta Tribe of Texas Reservation

National Land Cover Classification

Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub/Grassland/Herbaceous
Pasture Hay / Cultivated Crops
Wetlands
Water

Primary Study Area Land Cover

Figure 17

Houston OAPM EA

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4.2.3 Department of Transportation Act, Section 4(f) Resources

This section includes a brief synopsis of the protections afforded to publicly owned parks, recreation areas, wildlife and waterfowl refuges, and public or private historic sites under Section 4(f) of the Department of Transportation (DOT) Act of 1966.[89] As with compatible land use (see Section 4.2.2), the FAA assesses this impact category in terms of the effects that aircraft noise may have on these properties, since the Proposed Action does not include construction or land-disturbing activities that could affect properties protected under Section 4(f).

4.2.3.1 Definition of Impact Category

Section 4(f) of the Department of Transportation (DOT) Act states that the "Secretary of Transportation will not approve a project that requires the use of any publicly-owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance or land from a historic site of national, state, or local significance as determined by the officials having jurisdiction thereof, unless there is no feasible and prudent alternative to the use of such land and the project includes all possible planning to minimize harm resulting from the use." The term "use" encompasses both direct physical taking of Section 4(f) lands (i.e., permanent or temporary incorporation or occupancy of land as part of a transportation project) as well as "constructive" use of such lands. Constructive use occurs when the proximity impacts (e.g., noise) of a proposed project adjacent to, or near, a Section 4(f) property result in substantial impairment of the property. Substantial impairment occurs only when the activities, features, or attributes of the Section 4(f) property that contribute to its significance or enjoyment are substantially diminished. Substantial impairment would occur when impacts to Section 4(f) lands are sufficiently serious that the value of the site in terms of its prior significance and enjoyment are substantially reduced or lost. With respect to aircraft noise, for example, the noise must be at levels high enough to have negative consequences of a substantial nature that amount to a taking of a park or portion of a park for transportation purposes. Privately-owned parks, recreation areas and wildlife refuges are not subject to Section 4(f). If the FAA determines there would not be substantial impairment of a Section 4(f) resource, the action would not constitute a constructive use and would not therefore invoke Section 4(f).

In determining whether a constructive use would occur because of aircraft noise, the FAA uses the guidelines for land use compatibility in *Code of Federal Regulations (CFR)*, Title 14, Part 150 to the extent those guidelines are relevant to the value, significance, and enjoyment of the Section 4(f) lands in question.[90] When assessing use of Section 4(f) properties located in a quiet setting, where the setting is a generally recognized feature or attribute of the site's significance, the FAA carefully evaluates reliance on the Part 150 guidelines. Additional factors are weighed in determining

[89] *U.S. Code*. Title 49, sec. 303(c) (commonly referred to as "Section 4(f)")
[90] *Code of Federal Regulations*, Land Use Compatibility with Yearly Day-Night Average Sound Levels, Title 14, sec. 150, App. A, Table 1.

whether to apply the thresholds listed in Part 150 guidelines to determine the significance of noise impacts on noise-sensitive areas within national parks, national wildlife refuges, and historic sites including traditional cultural properties. The FAA consults appropriate Federal, state, and local officials having jurisdiction over the affected Section 4(f) resources when determining whether project-related noise impacts would substantially impair the resource.

Some Section 4(f) properties are also subject to Section 6(f) of the Land and Water Conservation Fund (LWCF) Act.[91] Section 6(f) states that no public outdoor recreation areas acquired or developed with any LWCF assistance can be converted to non-recreation uses without the approval of the Secretary of the Interior. The Secretary of the Interior may only approve conversions if they are in accordance with the comprehensive statewide outdoor recreation plan and if other recreation lands of reasonably equivalent usefulness and location will replace the converted areas.

4.2.3.2 Existing Conditions

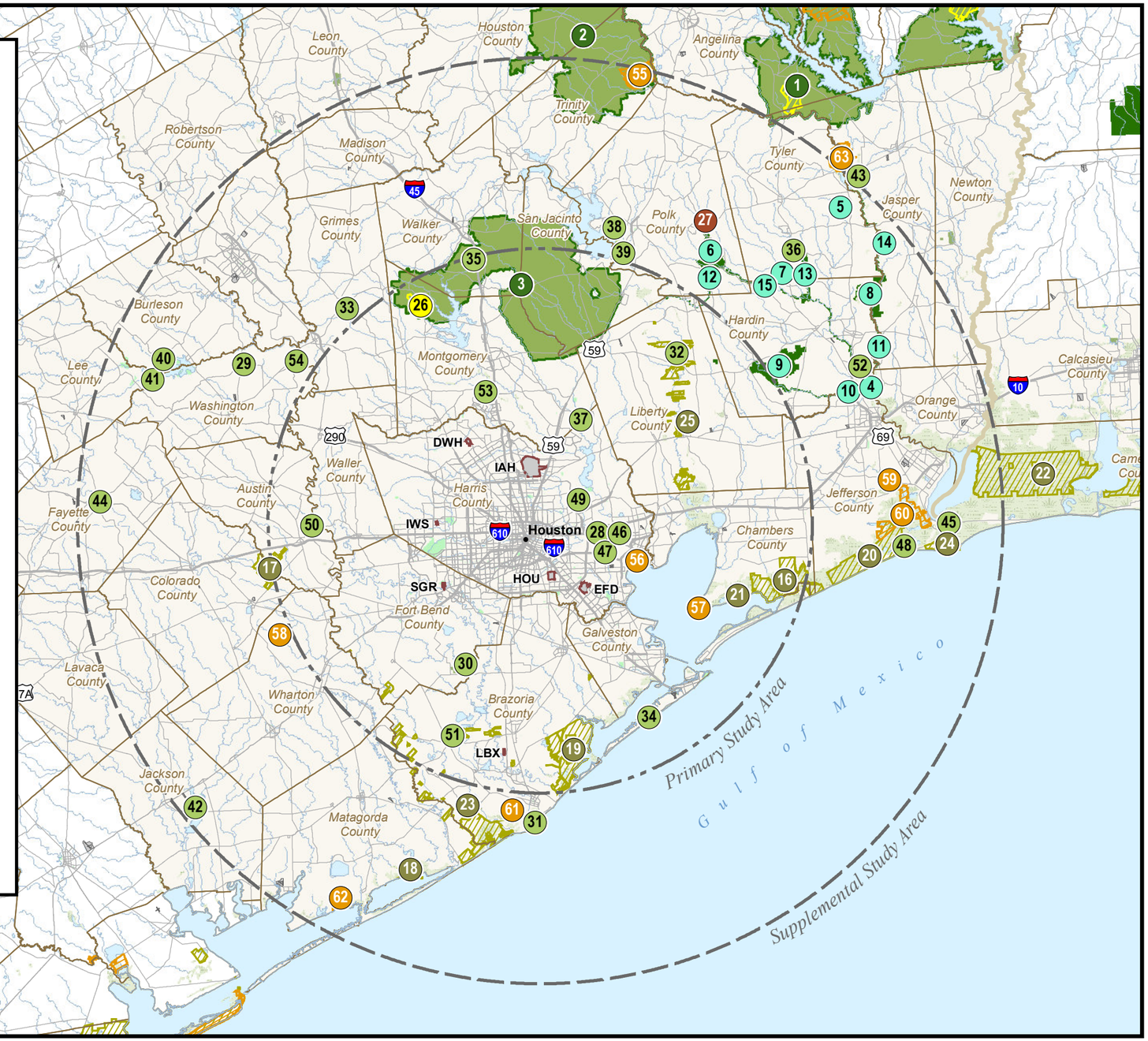
The PSA and SSA include numerous Federal, state, county, and city parks, as well as other potential Section 4(f) resources.[92] Figure 18 identifies the Federal and state resources. The FAA identified over 520 county and municipal parks in the PSA. A list of these is included in Appendix H, *Inventory of Potential Department of Transportation, Section 4(f) Resources and Noise Exposure*. The FAA developed the SSA to identify national parks and wildlife refuges that underlie proposed changes to air traffic procedures up to 18,000 ft. AGL. Although not required by FAA policy, this analysis also includes state parks and state wildlife management areas. The FAA identified potential national and state Section 4(f) resources within the PSA and SSA. The FAA identified these resources to assist in characterizing conditions in the existing environment.

The FAA sent letters to the appropriate Federal and state agencies responsible for management of potential Section 4(f) properties in the PSA and the SSA. These letters are included in Appendix J, *Coordination and Consultation*.

[91] *U.S. Code*. Title 16, sec. 450.
[92] The FAA collected data on publicly owned parks, refuges, National Atlas, Texas Natural Resource Information System (TNRIS), US Fish & Wildlife Service, United States Department of Agriculture, National Park Service, and the Environmental Systems Research Institute (ESRI).

National Forest	
1	Angelina National Forest
2	Davy Crockett National Forest
3	Sam Houston National Forest
National Parks	
4	BTNP - Beaumont Unit
5	BTNP - Beech Creek Unit
6	BTNP - Big Sandy Unit
7	BTNP - Hickory Creek Unit
8	BTNP - Jack Gore Baygall Unit
9	BTNP - Lance Rosier Unit
10	BTNP - Little Pine Island Bayou Unit
11	BTNP - Lower Neches Unit
12	BTNP - Menard Creek Unit
13	BTNP - Turkey Creek Unit
14	BTNP - Upper Neches Unit
15	BTNP - Village Creek
	BTNP: Big Thicket National Preserve
National Wildlife Refuge	
16	Anahuac National Wildlife Refuge
17	Attwater Prairie Chicken National Wildlife Refuge
18	Big Boggy National Wildlife Refuge
19	Brazoria National Wildlife Refuge
20	Mcfaddin National Wildlife Refuge
21	Moody National Wildlife Refuge
22	Sabine National Wildlife Refuge
23	San Bernard National Wildlife Refuge
24	Texas Point National Wildlife Refuge
25	Trinity River National Wildlife Refuge
National Wilderness Area	
26	Little Lake Creek Wilderness
Tribal Land	
27	Alabama-Coushatta Indian Reservation

State Parks	
28	Battleship Texas (BB-35)
29	Baylor University State Park
30	Brazos Bend State Park
31	Bryan Beach State Recreation Area
32	Davis Hill State Park
33	Fanthorp Inn State Historic Site
34	Galveston Island State Park
35	Huntsville State Park
36	John H Kirby State Forest
37	Lake Houston State Park
38	Lake Livingston State Park
39	Lake Livingston State Recreation Area
40	Lake Somerville State Park - Birch Creek
41	Lake Somerville State Park - Nails Creek
42	Lake Texana State Park
43	Martin Dies Jr. State Park
44	Monument Hill / Kreische Brewery State Historic Site
45	Sabine Pass Battleground - State Historical Park
46	San Jacinto Battleground State Historic Site
47	San Jacinto Battleground State Historic Site
48	Sea Rim State Park
49	Sheldon Lake State Park
50	Stephen F. Austin State Park
51	Varner-Hogg Plantation State Historical Park
52	Village Creek State Park
53	W G Jones State Forest
54	Washington-On-The-Brazos State Historic Site
State Wildlife Management Area	
55	Alabama Creek Wildlife Management Area
56	Atkinson Island WMA
57	Candy Abshier WMA
58	D R Wintermann WMA
59	J D Murphee State Wildlife Management Area
60	J D Murphee Wildlife Management Area
61	Justin Hurst/Peach Point WMA
62	Mad Island Wildlife Management Area
63	State Wildlife Scientific Area



Path: H:\GIS\USA\TX\305220_Houston_Metroplex\305220_Houston_Metroplex_Figure18_Primary_Study_Area_4f_Sites.mxd

Data Source: Environmental Systems Research Institute, Inc.(ESRI) (Airport/Airport Runways), March 14, 2012; ESRI (State Boundaries/County Boundaries), February 14, 2012; ESRI (Cities), February 8, 2012; ESRI (Mountain Peaks), February 28, 2012; ESRI (Roads), March 14, 2012; National Atlas (Tribal Land/Wilderness Areas), February 08, 2012; Texas Natural Resource Information System (TNRIS) (Wildlife Management Areas), February 08, 2012; US Fish & Wildlife Service (National Wildlife Refuge), June 13, 2012; United States Dept of Agriculture (National Forest), May 07, 2012; National Park Service (National Park), February 07, 2012; TNRIS (State Parks or Forest/Local Parks), May 03, 2012; ESRI (Local Parks), May 03, 2012; TNRIS (Department of Defense), February 08, 2012

Prepared By: Harris Miller Miller & Hanson Inc., January, 2013

North

0 20 40 Miles

Primary Study Area
Secondary Study Area
Study Airports
Other Airports
County/Parish Boundary
National Forest
National Park
State Park or Forest
Local Park or Recreation Area
Alabama-Coushatta Tribe of Texas Reservation
National Wilderness Area
National Wildlife Refuge
State Wildlife Management Area
Water

Potential Department of Transportation Act, Section 4(f) Resources

Figure 18

Houston OAPM EA

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Land and Water Conservation Fund Act, Section 6(f) Resources

According to the U.S. Department of Interior (National Park Service)[94] since 1965 there have been 190 Land and Water Conservation Fund (LWCF) grants, totaling over $45.4 million, approved for a variety of state and local agencies within the 19 PSA counties. The grant funds have been provided to develop or improve regional parks and trails, state parks, and historic sites within the PSA counties.[95]

Existing Noise Exposure

For each resource, the FAA modeled the existing conditions (CY 2012) aircraft noise levels for potential Section 4(f) locations within the PSA at one or more grid points. The modeled aircraft noise levels for these locations varied depending on the property's proximity to a nearby airport. DNL values for the 3,246 grid points ranged from DNL 16 dB to 66 dB. Similarly, the FAA computed the 2012 aircraft noise levels in the SSA. As previously mentioned, noise modeling for these points was extended up to an altitude of 18,000 ft. AGL. The noise levels for the 152 grid points representing the Big Thicket National Preserve (all units) range from DNL 22 dB to 34 dB. Appendix H includes additional information, including a summary of the modeled noise exposure values at the grid points.

4.2.4 Historical, Architectural, Archeological, and Cultural Resources

This section presents information on the presence of known historical, architectural, archaeological, and cultural resources that the Proposed Action could affect. Similar to the manner in which aircraft noise influences the analysis of compatible land use and DOT Section 4(f) properties (see Sections 4.2.2 and 4.2.3), an assessment of the effects that the Proposed Action may have on historical, architectural, archaeological, and cultural uses occurs primarily in the context of the effects that aircraft noise could have on these resources.

4.2.4.1 Definition of Impact Category

The National Historic Preservation Act of 1966 (NHPA) requires the FAA to consider the effects of its undertakings on properties in or eligible for listing in the National Register of Historic Places (NRHP).[96] The NHPA requires the Secretary of the Interior to establish standards by which individual resources (both archaeological and architectural) are evaluated to determine their eligibility for listing on the NHRP.[97] Resources may include buildings, sites, objects, and structures. They are placed on the NRHP in reference to their (1) association with events that have made a significant contribution to the broad patterns of American history, (2) association with the lives of

[94] U.S. National Park Service (NPS), "Land & Water Conservation Fund (LWCF), Detailed Listing of Grants Grouped by County": http://waso-lwcf.ncrc nps.gov/public/index.cfm (accessed August 22, 2012).
[95] This review summary is at the county level and includes grants and projects outside the PSA, but within the 19 PSA counties.
[96] *Code of Federal Regulations*, Protection of Historic Properties, Title 36, Part 800.
[97] Ibid.

persons significant in our past, (3) architectural or archaeological significance, and/or (4) ability to yield information important in prehistory or history.[98]

Compliance with Section 106 of the NHPA may require consultation with the Tribal Historic Preservation Officer (THPO), the Advisory Council on Historic Preservation (ACHP), and/or the State Historic Preservation Officer (SHPO) if a Federal undertaking has a potential for an adverse effect to historic properties on or eligible for listing on the NRHP. The Proposed Action (changes to instrument flight procedures), is an undertaking under the meaning of *Code of Federal Regulations,* Title 36, sec. 800.16(y). The FAA provided notice to the Alabama-Coushatta Tribe of Texas and the SHPO in July 2012 that it was preparing this EA, soliciting information on potential historic and cultural resources and inviting comment on those already identified by the FAA (see Appendix J, *Coordination and Consultation*).

4.2.4.2 Existing Conditions

The Proposed Action would only involve changes in aircraft routing and would not involve land acquisition or construction that could cause physical destruction of, alterations to, or relocations to any properties or resources listed or eligible for listing in the NRHP, or listed by the Texas Historical Commission (THC) on its register of Recorded Texas Historic Landmarks. The THC serves the role of the SHPO in Texas. Under the NHPA, the Federal government, specifically the Department of the Interior (DOI), and the SHPO both have duties for this impact category.[99] Due to the lack of any physical ground disturbance, this EA does not consider effects on potential archaeological resources, as there is no potential for adverse effect of that impact category. To assess potential noise impacts to historic sites, architecture, landmarks, and traditional cultural properties, the FAA identified the historic districts and historic sites within the PSA, listed by either NHRP or THC.[100] The FAA sent this inventory to the ACHP, the Department of the Interior, the National Park Service (which maintains the NRHP), and the THC for review. These letters are included in Appendix J.

The Alabama-Coushatta Indian Reservation lies within the SSA, located east of Livingston, Texas and north of Big Thicket National Preserve, covering approximately 4,600 acres of timberland. Ninety percent of the Reservation is classified as commercial forestry. The Tribe's Forestry Department oversees all forestry-related activities on the Reservation, including protection and development of timber stands, wildfire protection and prevention, endangered species protection management (e.g., Red-Cockaded Woodpecker), and the protection of cultural and historical sites.[101] The Alabama-Coushatta Indian Reservation also includes the Lake Tombigbee

[98] *Code of Federal Regulations*, National Register of Historic Places, Title 36, sec. 60.
[99] Ibid., sec. 800.2(c).
[100] NPS, "National Register of Historic Places, Download Center": http://nrhp.focus.nps.gov/natreg/docs/Download html (accessed July 3, 2012).
Texas Historical Commission: ftp://ftp.thc.state.tx.us/ (accessed March 07, 2012).
[101] Alabama-Coushatta Tribe of Texas, "Tribal Departments, Natural Resources, Forestry": http://www.alabama-coushatta.com/TribalDepartments/NaturalResources/Forestry.aspx (accessed August 1, 2012).

Campgrounds. Located adjacent to the 26-acre Lake Tombigbee, camping facilities include a pavilion, picnic tables, fire rings, and swimming areas.[102] The FAA has notified the Alabama-Coushatta Tribe of Texas of this project, and a copy of that correspondence is included in Appendix J.

Figure 19 identifies the Alabama-Coushatta Tribe of Texas Reservation and other historic and cultural resources in the PSA.[103] A list of these resources, their designation status (Federal, state, or both), and modeled noise values is included in Appendix I, *Inventory of Historic Places and Noise Exposure*.

[102] Alabama-Coushatta Tribe of Texas, "Services, Campground": http://www.alabama-coushatta.com/Services/Campground.aspx (accessed August 1, 2012).
[103] This figure does not show the SSA boundary.

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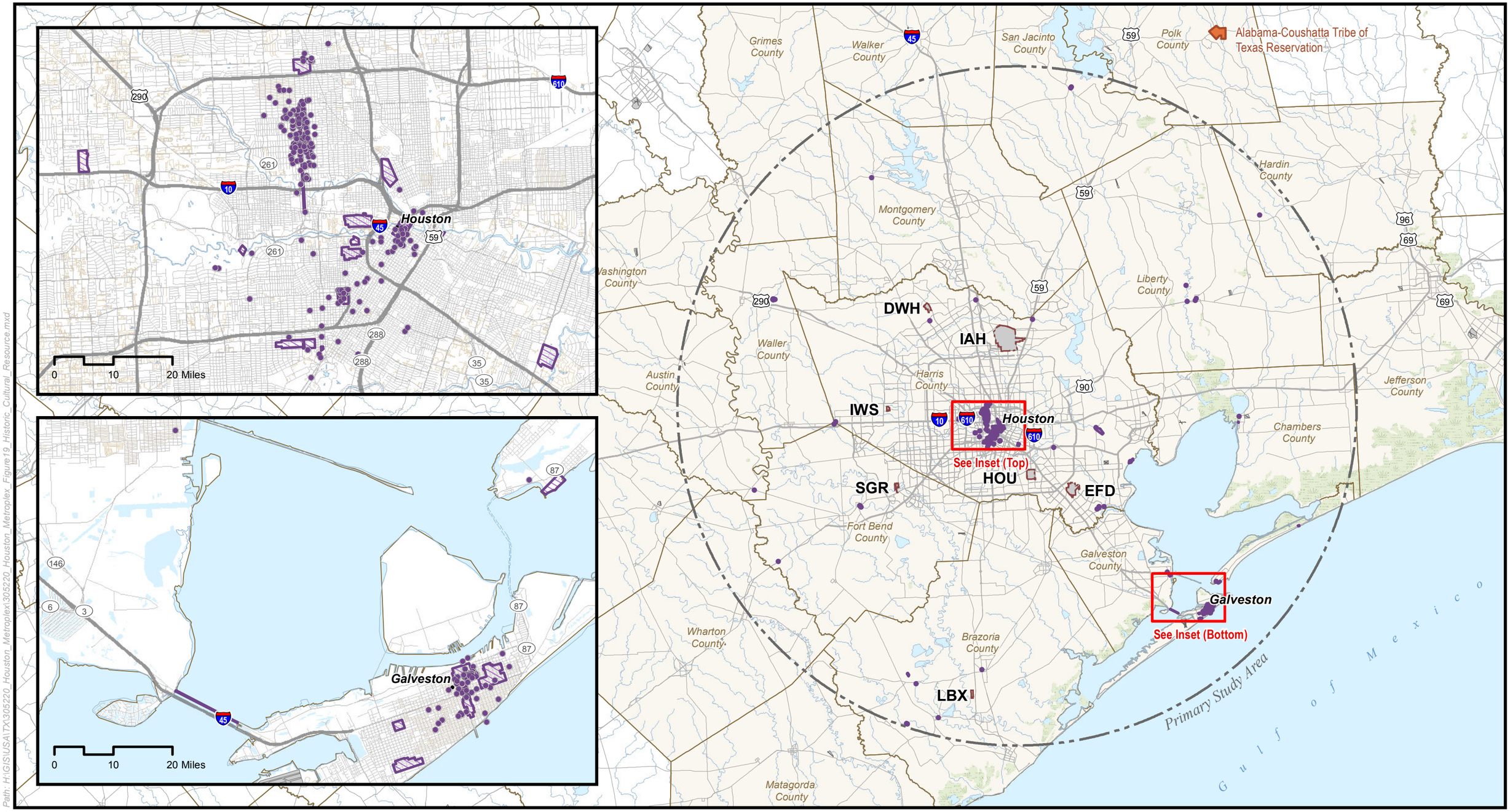

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Data Source: Environmental Systems Research Institute, Inc.(ESRI) (Airport/Airport Runways), March 14, 2012; ESRI (State Boundaries/County Boundaries), February 14, 2012; ESRI (Cities), February 8, 2012; ESRI (Roads), March 14, 2012; Houston-Galveston Area Council (Water Features), March 14, 2012; National Atlas (Lakes/Rivers), September 10, 2012 (Updated); National Atlas (Tribal Land/Wilderness Areas), February 08, 2012; National Park Service (National Register of Historic Places), July 3, 2012; National Park Service (National Register of Historic Districts), July 3, 2012; Texas Historical Commission (Historic Properties), March 7, 2012;

Prepared By: Harris Miller Miller & Hanson Inc., January, 2013

North

0 10 20 Nautical Miles

Primary Study Area
Airport Boundary
Other Airports
State Boundary
County/Parish Boundary
Interstate Highway
Highways
Secondary Roads
Water
River/Stream
Alabama-Coushatta Tribe of Texas Reservation
National and/or State Listed Historic Place
National and/or State Listed Historic District

Primary Study Area Historical and Cultural Resources

Figure 19

Houston OAPM EA

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4.2.5 Air Quality

This section describes the legislative and regulatory directives that protect air quality. It also addresses the framework for assessing the effects that the Proposed Action may have on air quality, and the presence of existing pollutants in the 19 counties within the PSA. The section also includes a description of the current EPA attainment status designations (i.e., areas meeting or not meeting national air quality standards, as discussed below), and a summary of the local air monitoring data.

4.2.5.1 Definition of Impact Category

Pursuant to the Federal Clean Air Act of 1970 (CAA)[104], the U.S. Environmental Protection Agency (EPA) established National Ambient Air Quality Standards (NAAQS) for major pollutants, called "criteria pollutants." Currently there are six criteria pollutants: ozone (O3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM), and lead (Pb). PM includes particles with a diameter less than 10 micrometers (PM_{10}) and with a diameter of less than 2.5 micrometers ($PM_{2.5}$).

Table 16 shows the primary and secondary NAAQS for the criteria pollutants.[105] The NAAQS are two-tiered. The first tier (i.e., primary) is intended to protect public health; the second tier (i.e., secondary) is intended to prevent further degradation of the environment.

[104] *U.S. Code*. Title 42, sec. 7401 – 7676.
[105] *Code of Federal Regulations*, Title 40, Part 50.

Table 16 National Ambient Air Quality Standards

Pollutant	Averaging Time	Primary Standards [1,2]	Secondary Standards [1,3]
CO	8- hour	9 ppm	None
	1- hour	35 ppm	None
Pb [4]	Rolling 3-Month Average	0.15 µg/m³	Same as Primary
NO_2	Annual Arithmetic Mean	0.053 ppm	Same as Primary
	1-hour	0.100 ppm[5]	None
PM_{10}	Annual Arithmetic Mean	None	None
	24-hour	150 µg/m³	Same as Primary
$PM_{2.5}$	Annual Arithmetic Mean	15 µg/m³	Same as Primary
	24-hour	35 µg/m³	Same as Primary
O_3	8-hour (2008 standard)	0.075 ppm[8]	Same as Primary
	8-hour (1997 standard)	0.08 ppm[9]	Same as Primary
	1-hour	0.12 ppm[6]	Same as Primary
SO_2	1-hour	75 ppb[7]	None
	3-hour		0.5 ppm

ppm – parts per million
ppb – parts per billion
µg/m³ – micrograms per cubic meter

Notes:
National standards (other than ozone, particulate matter, and those based on annual averages) are not to be exceeded more than once per year. The ozone standard is attained when the fourth highest eight-hour concentration in a year, averaged over three years, is equal to or is less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 ug/m³ is equal to or is less than one. For $PM_{2.5}$, the 24-hour standard is attained when 98% of the daily concentrations, averaged over three years, are equal to or are less than the standard.

1. Primary Standards: Levels necessary to protect public health with an adequate margin of safety.
2. Secondary Standards: Levels necessary to protect the public from any known or anticipated adverse effects.
3. Lead is categorized as a "toxic air contaminant" with no threshold exposure level for adverse health effects determined.
4. To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm.
5. EPA has revoked the 1-hour ozone standard in all areas within the PSA.
6. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.
7. To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)
8. To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

The standards in Table 16 apply to the concentration of a pollutant in outdoor ambient air. If the air quality in a geographic area meets or exceeds the national standard, it is designated an attainment area. Areas that do not meet the national standard are designated non-attainment areas. If there is insufficient information to classify an area as attainment or non-attainment for a particular air pollutant, the area is designated unclassifiable for that pollutant. Once a non-attainment area meets the standards, the EPA will designate the area as a "maintenance area."

Each state is required to draft a State Implementation Plan (SIP) to improve further the air quality in non-attainment areas and to maintain the air quality in attainment and maintenance areas. The SIP outlines the measures that the state will take in order to improve air quality.

4.2.5.2 Existing Conditions

Table 17 presents the EPA-designated attainment status for the counties, in part or in whole, within the PSA. The EPA has designated parts of the area as non-attainment for the 8-hour ozone NAAQS. There are also counties previously designated as non-attainment for the old 1-hour ozone standard.[106] The counties in the PSA are in attainment of the NAAQSs for the remaining criteria pollutants (i.e., CO, SO_2, NO_2, PM_{10}/$PM_{2.5}$, and Pb).

[106] EPA revoked the 1-hour standard as of June 15, 2005.

Table 17 EPA Designated Attainment Status for PSA

County	Pollutant[1]	Designated Attainment Status[4,5,6]
Austin	Ozone 8-hour (1997)[2] Ozone 8-hour (2008)[3]	Attainment Attainment
Brazoria	Ozone 8-hour (1997)[2] Ozone 8-hour (2008)[3]	Severe-15 Marginal
Colorado	Ozone 8-hour (1997)[2] Ozone 8-hour (2008)[3]	Attainment Attainment
Chambers	Ozone 8-hour (1997)[2] Ozone 8-hour (2008)[3]	Severe-15 Marginal
Fort Bend	Ozone 8-hour (1997)[2] Ozone 8-hour (2008)[3]	Severe-15 Marginal
Galveston	Ozone 8-hour (1997)[2] Ozone 8-hour (2008)[3]	Severe-15 Marginal
Grimes	Ozone 8-hour (1997)[2] Ozone 8-hour (2008)[3]	Attainment Attainment
Hardin	Ozone 8-hour (1997)[2] Ozone 8-hour (2008)[3]	Maintenance Attainment
Harris	Ozone 8-hour (1997)[2] Ozone 8-hour (2008)[3]	Severe-15 Marginal
Jefferson	Ozone 8-hour (1997)[2] Ozone 8-hour (2008)[3]	Maintenance Attainment
Liberty	Ozone 8-hour (1997)[2] Ozone 8-hour (2008)[3]	Severe-15 Marginal
Montgomery	Ozone 8-hour (1997)[2] Ozone 8-hour (2008)[3]	Severe-15 Marginal
Polk	Ozone 8-hour (1997)[2] Ozone 8-hour (2008)[3]	Attainment Attainment
San Jacinto	Ozone 8-hour (1997)[2] Ozone 8-hour (2008)[3]	Attainment Attainment
Matagorda	Ozone 8-hour (1997)[2] Ozone 8-hour (2008)[3]	Attainment Attainment
Waller	Ozone 8-hour (1997)[2] Ozone 8-hour (2008)[3]	Severe-15 Marginal
Walker	Ozone 8-hour (1997)[2] Ozone 8-hour (2008)[3]	Attainment Attainment
Washington	Ozone 8-hour (1997)[2] Ozone 8-hour (2008)[3]	Attainment Attainment
Wharton	Ozone 8-hour (1997)[2] Ozone 8-hour (2008)[3]	Attainment Attainment

Notes:
1. There are also counties previously designated as non-attainment for the old 1-hour ozone standard. EPA has since revoked the 1-hour standard as of June 15, 2005.
2. Ozone 8-hour (1998) denotes attainment status with the 1997 standard.
3. Ozone 8-hour (2008) denotes attainment status with the 2008 standard.
4. Severe 17 Area has a design value of 0.190 up to 0.280 ppm and has 17 years to attain.
5. Severe 15 Area has a design value of 0.120 up to but not including 0.127 ppm
6. Marginal Area has a design value of 0.076 up to but not including 0.086 ppm.

EPA and local state agencies operate ambient monitoring stations that are used to assess air quality in each state. To characterize the existing conditions of the counties in the PSA, the FAA reviewed the most recent data from the Texas Commission on

Environmental Quality (TCEQ) and the EPA AirData database. The TCEQ operates these monitoring stations to measure ambient air quality and ensure compliance of the NAAQS. Since IAH and HOU are located in Harris County, the FAA chose the highest monitored values recorded within Harris County for 2011. This is conservative since the highest values were chosen regardless of location or representativeness to IAH or HOU. The analysis consisted of the criteria pollutants regulated by the NAAQS. Table 18 presents a summary of the ambient background air quality concentrations.

The review showed that there were no violations of the NAAQS at any of the Harris County monitoring locations, except for the 8-hour ozone standard. TCEQ operated 17 ozone-monitoring locations within Harris County for 2011, measuring 139 exceedences against the 8-hour ozone standard for 2011. TCEQ measured the maximum 8-hour ozone concentration of 0.101 ppm at the Croquet location for 2011. The EPA revoked the 1-hour ozone standard on June 15, 2005 for all affected counties within the PSA and, therefore, was not included in this analysis.

Table 18 Ambient Background Air Quality Concentrations

County	Carbon Monoxide (CO)		Nitrogen Dioxide (NO_2)		Sulfur Dioxide (SO_2)		Ozone	$PM_{2.5}$		PM_{10}	Lead
	1-Hour	8-Hour	1-Hour	Annual	1-Hour	3-Hour	8-Hour	24-Hour	Annual	24-Hour	Quarterly
Harris	3.0	2.0	60	No Data	41	No data Available	0.101	24	13.3	92	0.015
NAAQS	35 ppm	9 ppm	100ppb	0.053 ppm	75 ppb	0.14 ppm	0.075 ppm	35 ug/m³	15 ug/m³	150 ug/m³	0.15 ug/m³

Notes:
1. CO monitor located at 4401 ½ Lang Road, Houston, TX.
2. NO_2 monitor located at 2311 Texas Ave, Houston, TX.
3. SO_2, PM_{10}, $PM_{2.5}$ monitor located at 9525 Clinton Dr., Houston, TX.
4. Ozone monitor located at 13826 ½ Croquet, Houston, TX.
5. Lead monitor located at 1262 ½ Mae Dr., Houston, TX.

Source: http://www.epa.gov/airdata/

4.2.6 Natural Resources and Energy Supply (Aircraft Fuel)

The natural resource and energy supply environmental impact category covers a wide range of activities. However, for the purposes of this EA and the Proposed Action only aircraft fuel consumption is relevant. This section describes fuel consumption related to the existing movement of aircraft within the SSA (and 10 NM outside the SSA[107]), using the same operational inputs as discussed in Section 4.2.1.

[107] The tracks developed for NIRS go 10 NM beyond the SSA. This extra 10 NM allows modeling of noise values up to the edge of the SSA.

4.2.6.1 Definition of Impact

Executive Order 13123, "Greening the Government through Efficient Energy Management," requires agencies to reduce petroleum use, air quality emissions, and water consumption.[108] According to FAA Order 1050.1E and consistent with NEPA and CEQ regulations, it is also the policy of the FAA that all elements of the transportation system should be "designed with a view to their aesthetic impact, conservation of resources such as energy, pollution prevention, harmonization with community environment, and sensitivity to the concerns of the traveling public."[109]

In addition, *Code of Federal Regulations,* Title 40, sec. 1502.16(e-f) require Federal agencies to assess each alternative's energy requirements, energy conservation, and the use of natural or consumable resources.

In determining the significance of impacts, FAA Order 1050.1E, Appendix A, section 13 states the following:

> "For most actions, changes in energy demands or other natural resource consumption will not result in significant impacts. If an EA identifies problems such as demands exceeding supplies, additional analysis may be required in an EIS. Otherwise, it may be assumed that impacts are not significant."

In assessing the potential for significant impacts, this analysis considers the following factors in assessing the potential to cause demands that would exceed available or future (project year) natural resource or energy supplies:

- The action would cause a substantial demand on available energy or natural resource supplies.
- When compared with future no action conditions, changes in aircraft movements would cause a statistically significant increase in fuel consumption.

4.2.6.2 Existing Conditions

The FAA calculated aircraft fuel burn to estimate aircraft fuel consumption associated with air traffic flows in existing conditions (i.e., 2012 Base Year) using NIRS, which calculates fuel burn using the same input used for calculating aircraft noise. According to the NIRS calculation, approximately 524,701 Metric Tons (MT) of fuel are forecasted to be burned in the 2012 Base Year by IFR aircraft arriving at and departing from the Analyzed Airports, while in flight through the SSA (and 10 NM outside the SSA).[110]

[108] U.S. Department of Energy (DOE), Executive Order 13123, "Greening the Government through Efficient Energy Management: Guidance Documents for Federal Agencies," December 2000.
[109] FAA Order 1050.1E, App. A, sec. 13.1b, p. A-58.
[110] One metric ton (MT) = 1,000 kilograms (kg)

4.2.7 Climate

This section presents a discussion of global climate change as it relates to aircraft emissions of greenhouse gases (GHGs). It also provides the calculated GHG emissions based on estimated aircraft fuel burn for existing conditions, as derived in Section 4.2.6.

4.2.7.1 Definition of Impact Category

The Council on Environmental Quality (CEQ) has recently affirmed the need to describe GHG emissions and their effect on climate as part of the NEPA analysis.[111] Executive Order 13514, "Federal Leadership in Environmental, Energy, and Economic Performance," defines GHG emissions as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydro fluorocarbons (HFCs), and sulfur hexafluoride (SF_6). In accordance with the CEQ document *Federal Greenhouse Gas Accounting and Reporting Guidance* (October 6, 2010),[112] and to provide a single metric that embodies all GHGs, emissions should be reported in metric tons of carbon dioxide equivalent (MT CO_2e). It is important to note that for aircraft, CO_2 emissions are equivalent to CO_2e emissions because CO_2 is the only combustion product of the six GHGs in the CEQ document.

Research has shown there is a direct correlation between fuel combustion and GHG emissions. In terms of U.S. contributions, the General Accounting Office (GAO) reports that according to EPA data, "domestic aviation contributes about 3 percent of the total carbon dioxide emissions" compared with other industrial sources including the remainder of the transportation section (20 percent) and power generation (41 percent)[113]. The International Civil Aviation Organization (ICAO) estimates that GHG emissions from aircraft account for roughly 3 percent of all anthropogenic[114] GHG emissions globally.[115] Climate change due to GHG emissions is a global phenomenon, so the affected environment is the global environment.[116]

The scientific community is continuing efforts to better understand the impact of aviation emissions on the global atmosphere. The FAA is leading and participating in a number of initiatives intended to clarify the role that commercial aviation plays in GHG emissions and climate. The FAA, with support from the U.S. Global Change Research Program

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[111] FAA Order 1050.1E, Chg. 1, Guidance Memo#3, "Considering Greenhouse Gases and Climate under the National Environmental Policy Act (NEPA): Interim Guidance," January 12, 2012.
[112] Council on Environmental Quality (CEQ), *Federal GHG Accounting and Reporting*, and *Technical Support Document* (corresponding): http://www.whitehouse.gov/administration/eop/ceq/sustainability/fed-ghg.
[113] Government Accountability Office (GAO), "Aircraft Emissions Expected to Grow, but Technological and Operational Improvements and Government Policies Can Help Control Emissions," GAO-09-554, 2009.
[114] Anthropogenic emissions are those produced by human activities.
[115] Alan Melrose, "European ATM and Climate Adaptation: A Scoping Study", *ICAO Environmental Report*, 2010.
[116] "[Greenhouse] gases, once emitted, become well mixed in the atmosphere, meaning U.S. emissions can affect not only the U.S. population and environment but other regions of the world as well; likewise, emissions in other countries can affect the United States." U.S. Environmental Protection Agency, *Technical Support Document for Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act 2-3*, 2009: http://epa.gov/climatechange/endangerment.html

and its participating Federal agencies,[117] has developed the Aviation Climate Change Research Initiative (ACCRI) in an effort to advance scientific understanding of regional and global climate impacts of aircraft emissions. The FAA also funds the Partnership for Air Transportation Noise & Emissions Reduction (PARTNER) Center of Excellence research initiative to quantify the effects of aircraft exhaust and contrails on global and U.S. climate and atmospheric composition. ICAO is examining similar research topics at the international level.[118]

4.2.7.2 Existing Conditions

An analysis of 2012 Base Year IFR operations, using the same operational inputs as discussed in Section 4.2.1.1, indicates that approximately 524,701 MT of fuel will be burned in 2012 by aircraft arriving at and departing from the Analyzed Airports.[119] Aircraft in flight through the SSA would account for emissions of 1,655,432 MT of CO_2e.

4.2.8 Fish, Wildlife, and Plants

This section describes the legislative and regulatory directives concerning protection of certain species of fish, wildlife, and plants. It also describes the relevant baseline conditions for species that the Proposed Action could potentially affect. The Proposed Action, comprised of changes to aircraft flight procedures, would not involve construction or land disturbing activities with the potential to alter habitat for fish, wildlife, and plants on the ground. Therefore, the discussion and analysis of this impact category is limited to avian and bat species that occupy the airspace, subject to evaluation in the PSA and the 19 associated counties.

4.2.8.1 Definition of Impact Category

Endangered Species Protection Laws

The U.S. *Endangered Species Act (ESA) of 1973* protects threatened and endangered species of fish, wildlife, and plants. Endangered species are defined as those in danger of extinction throughout all or a significant portion of its range. Threatened species are defined as any species that are likely to become an endangered species, within the foreseeable future, throughout all or a significant portion of its range. Section 7 of the ESA applies to Federal agency actions and sets forth requirements for consultation to determine if the proposed action "may affect" an endangered or threatened species. If an agency determines that an action authorized, funded, or carried out by the agency "may affect" a threatened or endangered species, then Section 7(a)(2) requires

[117] Including the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), the Department of Energy (DOE), and the EPA.
[118] Lourdes Q. Maurice and David S. Lee, "Chapter 5: Aviation Impacts on Climate," in *Final Report of the International Civil Aviation Organization (ICAO) Committee on Aviation and Environmental Protection (CAEP) Workshop, October 29th – November 2nd 2007, Montreal*: http://www.icao.int/icaonet/cnfrst/CAEP_SG_20082/docs/Caep8_SG2_WP10.pdf
[119] Fuel burn and CO_2 emissions are generated in NIRS. The formula to convert fuel burn to CO_2 emissions is Fuel (kilograms)*3.155 = CO_2.

consultation with the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS), as appropriate. This consultation is intended to ensure that the action is not likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of critical habitat. For avian and bat species, Section 7 Consultation is conducted with the USFWS.

The Texas legislature enacted legislation in 1973 to protect endangered animal populations in the state.[120] The legislation authorized the Executive Director of the Texas Parks and Wildlife Department (TPWD) to designate as "endangered" plants and animals threatened with statewide extinction, and the TPWD Commission to designate species with the potential to become endangered in the future as "threatened." The TPWD maintains a list of species receiving Federal and state protection on its website and references the NatureServe Explorer[121] database for specific information. The TPWD also maintains the Texas Natural Diversity Database (TXNDD)[122] as the most comprehensive source for information on rare, threatened, and endangered plants, animals, invertebrates, exemplary natural communities, and other significant features.

Migratory Birds

The *Migratory Bird Treaty Act of 1918* (MBTA), as amended, prohibits the pursuit, hunting, taking, and killing, or attempts to do the same of any migratory bird, or part of a bird including egg or nest, unless permitted by regulation.[123] It authorizes the Secretary of the Interior to enforce the law and establish regulations as necessary. Executive Order 13186, "Responsibilities of Federal Agencies To Protect Migratory Birds," signed in January 2001, required all Federal agencies to enact and implement Memoranda of Understanding (MOUs) with the USFWS to enhance programs to protect migratory birds and, in particular, species of concern.[124] The MBTA and Executive Order together require that Federal agencies ensure that their actions do not impact migratory bird species populations and that the effects of those actions on migratory birds be evaluated through the NEPA process.

Code of Federal Regulations, Title 50, sec. 10.13 lists the species defined as migratory birds and included for protection under the MBTA and Executive Order 13186.[125]

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[120] Texas Parks and Wildlife Department (TPWD), "Nongame and Rare Species Program: Texas Threatened/Endangered Species Regulations": http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/txendangered/ (accessed June 13, 2012).
[121] NatureServe, *Explorer*: http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Buteo+nitidus (accessed June 13, 2012).
[122] Texas Parks and Wildlife Department (TPWD), "The Texas Natural Diversity Database (TNDD)": http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/txndd/ (accessed October 30, 2012).
[123] *U.S. Code.* Title 16, sec. 590z.
[124] USFWS, "Digest of Federal Resource Laws": http://www.fws.gov/laws/lawsdigest/EO htm#eo13186 (accessed June 13, 2012).
[125] John L. Trapp, "Bird Species of the United States and its Territories and Their Protection under the Migratory Bird Treaty Act," USFWS:

There are 1,007 species for protection under the MBTA.[126] Texas has recorded 333 species of migratory birds, more than any other state.[127] The MBTA and Executive Order 13186 protect nearly all bird species that occur in the PSA, with the exception of those that do not migrate.

Migration routes or "flyways" refer to the broad geographic corridors utilized by birds traveling from breeding to wintering grounds. The actual routes followed by a given migratory bird species differ by variables such as distance traveled, time of starting, flight speed, and geographic position and latitude of the breeding and wintering grounds.

4.2.8.2 Existing Conditions

Threatened and Endangered Species

The two animal groups described in this section are birds and bats. Table 19 includes avian and bat species identified as occurring in the 19 counties of the PSA and the status of Federal and state endangered species listing. It includes 16 bird species and one bat species. The ESA lists seven of the 17 species for protection, while Texas state endangered species law lists all 17 for protection.

Table 19 Listed Endangered Avian and Bat Species Potentially Occurring in the Study Area

Common Name	Scientific Name	Counties	Federal Listing Status[128]	State Listing Status[129]
BIRDS				
Attwater's Greater Prairie-Chicken	*Tympanuchus cupido attwateri*	Austin, Colorado, Fort Bend, Galveston, Waller, Wharton	E	E
Bachman's Sparrow	*Aimophila aestivalis*	Hardin, Liberty, Polk, San Jacinto, Walker	NL	T
Bald Eagle	*Haliaeetus*	Austin, Brazoria, Chambers, Colorado, Fort Bend,	NL	T

http://www.fws.gov/migratorybirds/RegulationsPolicies/mbta/MBTAProtectedNonprotected.html (accessed August 29, 2012).

[126] USFWS, "Official Number of Protected Migratory Bird Species Climbs to More than 1,000": http://www.fws.gov/news/NewsReleases/showNews.cfm?newsId=1A6C3012-D22E-4F75-ABD98CD33992DD42 (accessed June 14, 2012).

[127] TPWD, "Frequently Asked Questions": http://www.tpwd.state.tx.us/huntwild/wild/birding/migration/faq/ (accessed June 14, 2012).

[128] USFWS, "Endangered Species Program": http://www.fws.gov/southwest/es/EndangeredSpecies/EndangeredSpecies_Lists/EndangeredSpecies_ListSpecies.cfm (accessed June 13, 2012).

[129] TPWD: http://www.tpwd.state.tx.us/gis/ris/endangered_species/ (accessed June 13 and October 15, 2012); http://www.tpwd.state.tx.us/landwater/land/maps/gis/ris/endangered_species/ (accessed October 15, 2012).

Common Name	Scientific Name	Counties	Federal Listing Status[128]	State Listing Status[129]
	leucocephalus	Galveston, Grimes, Hardin, Harris, Jefferson, Liberty, Matagorda, Montgomery, Polk, San Jacinto, Walker, Waller, Washington, Wharton		
Eskimo Curlew	*Numenius borealis*	Brazoria, Galveston, Matagorda	E	E
Interior Least Tern	*Sterna antillarum athalassos*	Austin, Colorado, Fort Bend, Grimes, Waller, Washington, Wharton	E	E
Northern Aplomado Falcon	*Falco femoralis septentrionalis*	Matagorda	E	E
Peregrine Falcon	*Falco peregrines*	Austin, Brazoria, Chambers, Colorado, Fort Bend, Galveston, Grimes, Hardin, Harris, Jefferson, Liberty, Matagorda, Montgomery, Polk, San Jacinto, Walker, Waller, Washington, Wharton	NL	T
Piping Plover	*Charadrius melodus*	Brazoria, Chambers, Galveston, Hardin, Jefferson, Liberty, Matagorda, Montgomery, Polk, San Jacinto, Walker	T	T
Red-cockaded Woodpecker[1]	*Picoides borealis*	Grimes, Hardin, Harris, Liberty, Montgomery, Polk, San Jacinto, Walker	E	E
Reddish Egret	*Egretta rufescens*	Brazoria, Chambers, Galveston, Jefferson, Matagorda	NL	T
Sooty Tern	*Sterna fuscata*	Chambers, Hardin, Jefferson, Liberty, Polk, San Jacinto	NL	T
Swallow-tailed Kite	*Elanoides forficatus*	Chambers, Hardin, Jefferson, Liberty, Polk, San Jacinto	NL	T
White-tailed Hawk	*Buteo albicaudatus*	Austin, Brazoria, Colorado, Fort Bend, Galveston, Harris, Matagorda, Waller, Wharton	NL	T
White-faced Ibis	*Plegadis chihi*	Austin, Brazoria, Chambers, Colorado, Fort Bend, Galveston, Grimes, Hardin, Harris, Jefferson, Liberty, Matagorda, Montgomery, Waller, Washington, Wharton	NL	T
Wood Stork	*Mycteria americana*	Austin, Brazoria, Chambers, Colorado, Fort Bend, Galveston, Grimes, Hardin, Harris, Jefferson, Liberty, Matagorda, Montgomery, Polk, San Jacinto, Walker, Waller, Washington, Wharton	NL	T
Whooping Crane	*Grus americana*	Austin, Brazoria, Colorado, Fort Bend, Galveston, Grimes, Harris, Matagorda, Montgomery, Walker, Waller, Washington, Wharton	E	E
BATS				
Rafinesque's Big-Eared Bat	*Corynorhinus rafinesquii*	Hardin, Harris, Jefferson, Liberty, Montgomery, Polk, San Jacinto, Walker	NL	T

E – Endangered
T – Threatened
NL – Not Listed
Note:
1. The Red-cockaded Woodpecker was identified by the National Forests and Grasslands in Texas (NFGT) in a comment letter dated July 31, 2012 (see Appendix J.3)

The species listed above could occur in the study area when transiting to and from areas necessary to satisfy species basic life requirements of food, shelter, and breeding.

Bats

The Texas Bat Protection Law protects all bats from hunting or possession and sale.[130] While 31 species of bats occur in Texas, only two are relevant to the Proposed Action: (1) Rafinesque's big-eared bat and (2) the Mexican free-tailed bat.[131]

The Rafinesque's big-eared bat is the only bat species in Texas protected as an endangered species, listed as a "threatened" species under state law, as noted in Table 19. The USFWS considers both its identified subspecies – *C. r. macrotis* and *C. r. rafinesquii* – as rare and as a species of special concern. Rafinesque's big-eared bats occur in the Study Area as single individuals in small colonies. For more information, see the TPWD website.[132]

The Mexican free-tailed bat occurs in large colonies in Central Texas, including a colony of about 250,000 individuals that roost year-round under the Waugh Drive Bridge in Houston.[133] Figure 20 shows the location of the colony. Detailed radar studies conducted on a colony north of San Antonio recorded Mexican free-tailed bats flying at a maximum altitude of 10,000 ft. AGL, with the densest occurrence between 600 and 3,200 ft. AGL.[134] This EA accounts for the Mexican free-tailed bat in relation to the Proposed Action due to its concentrated population in specific areas of the PSA. None of the other 29 bat species known to inhabit Texas either are listed as endangered or occur in large colonies in the Study Area.

[130] Texas Bat Protection Law. *Texas Statues, 2001*. Title 5 § 63.101.
[131] U.S. Geological Survey (USGS), "House Bat Management: Discussion and Recommendations": http://www.npwrc.usgs.gov/resource/mammals/housebat/discuss.htm (accessed June 22, 2012)
[132] TPWD, "Rafinesque's Big-eared Bat (Corynorhinus rafinesquii)": http://www.tpwd.state.tx.us/huntwild/wild/species/rafinesque/ (accessed August 29, 2012)
[133] Bat Conservation International, "BCI Species Profiles: Tadarida brasiliensis": http://www.batcon.org/index.php/all-about-bats/species-profiles html?task=detail&species=1738&country=43&state=all&family=all&start=25 (accessed June 22, 2012)
[134] G.F. McCracken, "Bats Aloft: A Study of High-Altitude Feeding," *BATS* 14(3): p.7-10 (1996).

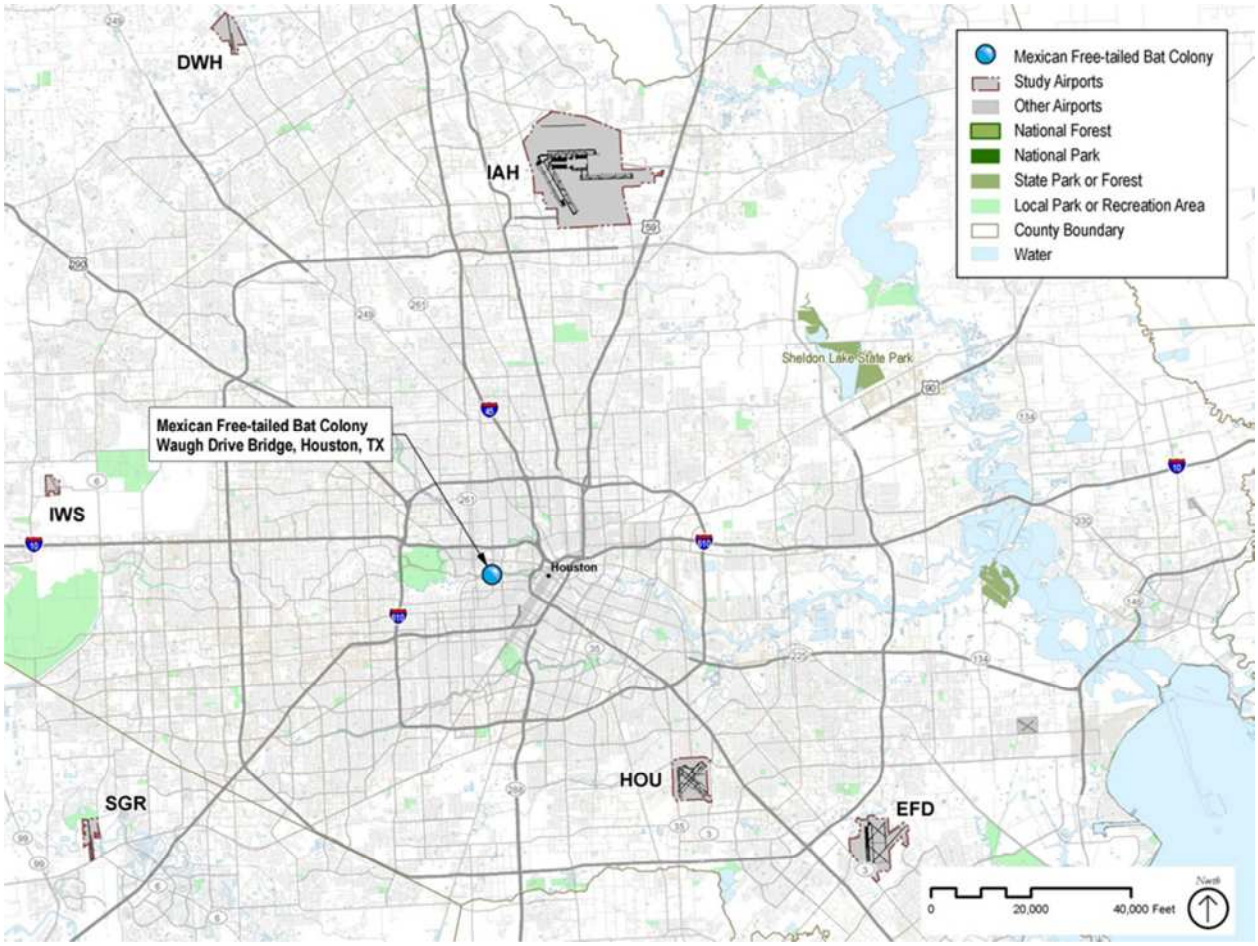

Figure 20 Mexican Free-Tailed Bat Colony

Migratory Bird Treaty Act Species

The USFWS and its partner agencies manage for migratory birds based on specific migratory route paths within North America (Atlantic, Mississippi, Central, and Pacific). Based on those route paths, state and Federal agencies developed the four administrative Flyways that administer migratory bird resources.[135] These flyways are not specific lines the birds follow but broad areas through which the birds migrate. The most frequently traveled migration routes conform very closely to major topographical features that lie in the general north-south movement of migratory bird flyways.

Texas is in the middle of the Central Flyway, which is the primary migratory route for birds that travel from Central America through the middle of North America. As a group, migratory birds generally fly from south to north in spring and return south in the fall. Some species transit through Texas to breeding locations further north while others

[135] USFWS, "Migratory Bird Flyways": http://www.fws.gov/migratorybirds/Flyways.html (accessed June 22, 2012).

breed and nest during the summer months in Texas. Species are grouped into zoogeographic regions based on how far south they winter and how far north they breed. The Central Flyway does not include any known subsets of specific migratory routes and, therefore, the USFWS does not classify any particular area of Texas as more important to migration than another area.

Habitat for Avian Species of Concern

In response to a request for information, the U.S. Department of Agriculture (USDA) and the TXNDD submitted information on the habitat of two avian species of particular concern: Red-cockaded Woodpecker and Piping Plover. While the Proposed Action is confined to changes in aircraft flight procedures and would not involve construction or land disturbing activities with the potential to alter habitat for fish, wildlife, and plants on the ground, these comments are briefly summarized.

The USDA National Forests and Grasslands in Texas (NFGT) identified the Red-cockaded Woodpecker and its habitat in a comment letter dated July 31, 2012 (see Appendix J). The letter identifies the importance of three national forest properties (Sam Houston, Davy Crockett, and Angelina) in the study area and the concern of changes in flight patterns and altitudes over the Sam Houston National Forest, which has the largest population of Red-cockaded Woodpecker. The Wildlife Strike Database (discussed in Section 5.9) does not identify any specific strikes associated with Houston OAPM Airports of the Red-cockaded Woodpecker, or any other woodpecker species. According to BirdLife International, the Red-cockaded Woodpecker ranges in altitude from ground level to approximately 500 meters (m), or approximately 1,640 ft.[136]

The TPWD identified critical habitat for the Piping Plover on October 24, 2012 in response to a request for information through the TXNDD (see Appendix J). The USFWS has identified habitat for wintering Piping Plover on barrier beaches and mudflats along the Gulf Coast.[137] The Wildlife Strike Database does not identify any specific strikes associated with Houston OAPM Airports of the Piping Plover. However, there are two reports of plover strikes: one of an American golden plover and another of an unidentified plover struck at ground level. Research on flight altitude is limited primarily because of its strong fidelity to wintering and breeding habitats and limited movement during non-migratory periods.[138] However, flight during migration when populations are moving between breeding grounds in the Great Lakes and wintering areas along the Gulf Coast should be considered.

[136] BirdLife International, "Species Factsheet: Picoides borealis": http://www.birdlife.org (accessed August 8, 2012).
[137] USFWS, "Recovery Plan for the Great Lakes Piping Plover," USFWS Region 3, Fort Snelling, MN, September 2003.
[138] J. Thompson, K. Drake, and C. Zonick, "Movements, Habitat Use and Survival of Non-breeding Piping Plovers," *The Condor*, 103:259-267 (2001).

4.2.9 Light Emissions and Visual Impacts

This section defines the light emissions and visual impacts category and describes relevant conditions in the study area.

4.2.9.1 Definition of Impact Category

For light emissions, the FAA considers the extent to which any lighting associated with an action would create an annoyance among people in the vicinity or interfere with their normal activities. The FAA does not consider the visual sight of aircraft, aircraft contrails, or aircraft lights at night, particularly at a distance that is not normally intrusive, as constituting an adverse impact absent unusual circumstances.

4.2.9.2 Existing Conditions

The City of Houston is a highly urbanized area at the center of the PSA surrounded by suburban and rural communities. Sources of light and the visual landscape are typical of cities, suburbs, and rural areas throughout the United States.

A large number of aircraft operations currently occur and numerous aircraft are visible within the PSA airspace, flying at various altitudes. Aircraft operations consist of aircraft arrivals, departures, and overflights. According to Federal Aviation Regulations (FAR), Section 91.209, all aircraft are required to operate with position lights. These position lights are intended for the safe movement of aircraft and do not emit a significant amount of light; however, these lights are often visible from the ground.

4.2.10 Environmental Justice

The U.S. EPA defines Environmental Justice (EJ) as the "fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."[139]

4.2.10.1 Definition of Impact Category

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations," the accompanying Presidential Memorandum, and DOT Order 5610.2(a), "Department of Transportation Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," provide guidance for the Federal government, including the FAA, with regard to Environmental Justice compliance. The FAA must provide (1) meaningful public involvement by minority and low-income populations and (2) analysis, including demographic analysis, which identifies and addresses potential impacts on those populations that may be disproportionately high and adverse. The Presidential Memorandum encourages the consideration of EJ impacts in EAs, especially to determine whether a disproportionately high and adverse impact may occur. Although such an analysis is

[139] EPA, "Environmental Justice": http://www.epa.gov/environmentaljustice/ (accessed August 21, 2012).

not required in an EA, it may be helpful in determining whether there is a potentially significant impact.[140]

4.2.10.2 Existing Conditions

The FAA used data from the 2010 U.S. Census[141] and 2006-2010 American Community Survey (ACS 5 year dataset)[142] (the most recent available) to identify minority populations and low-income populations in the PSA. DOT Order 5610.2(a) defines "low-income" as "a person whose median household income is at or below the Department of Health and Human Services (HHS) poverty guidelines."[143] The order defines "minority" as one of the following categories:

- Black – a person having origins in any of the black racial groups of Africa
- Hispanic or Latino – a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race
- Asian American – a person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent
- American Indian and Alaskan Native – a person having origins in any of the original people of North America, South America (including Central America), and who maintains cultural identification through tribal affiliation or community recognition
- Native Hawaiian and Other Pacific Islander – persons having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands

This EA performed analysis at the U.S. Census block group level,[144] defining and identifying census blocks for minority and low-income population as follows:

- A *minority population census block group* is a group having a minority population percentage greater than the average minority population percentage in the PSA. Based on the 2010 data, the average percentage of minority population residing in the PSA was 60.1 percent. Therefore, the FAA identified every census block group with a percentage of minority population greater than 60.1 percent as a census block group of environmental justice concern.

[140] FAA Order 1050.1E, Chg. 1, App. A, sec. 16.2a.
[141] U.S. Census Bureau, "2010 U.S. Census data," released June 2011, http://www2.census.gov/census_2010/04-Summary_File_1/Texas/ (accessed August 14, 2012).
[142] U.S. Census Bureau, "2006-2010 American Community Survey, November 2011," http://www2.census.gov/acs2010_5yr/summaryfile/ (accessed August 14, 2012 and August 15, 2012).
[143] U.S. Department of Transportation (DOT), Order 5610.2(a), "Department of Transportation Actions to Address Environmental Justice in Minority and Low-Income Populations," May 2, 2012.
[144] A U.S. Census block group is one of several geographical units by which the U.S. Census Bureau organizes data and is the smallest such unit available for this analysis throughout the PSA. There are 3,057 individual census block groups in, or intersecting (i.e. extending beyond), the PSA. This EJ analysis used all 3,057 individual census block groups and therefore the population totals differ compared to other analyses in this EA.

- A *low-income population census block group* is a group having a low-income population percentage greater than the average low-income population percentage in the PSA. Based on the 2010 Poverty Guidelines identified by the HHS,[145] and accounting for the average household size within each census block group, the average poverty threshold in the PSA was $17,572 per household. In order to equate this to the low-income household counts available in $5,000 intervals through the ACS 5-year dataset, the FAA used a threshold of $20,000 for identifying low-income census block groups. Based on 2010 data, the average percentage of low-income population residing in the PSA was 16.3 percent. Therefore, the FAA identified every census block group with a percentage of low-income population greater than 16.3 percent as a census block group of environmental justice concern.

As a result, the FAA defined census blocks of environmental justice concern as those in which either the concentration of minority population and/or the concentration of low-income population are higher than their respective averages of the PSA. Table 20 presents the analysis results of minority and low-income population for the purposes of this environmental justice analysis.

Figure 21 depicts the areas of environmental justice concern located within the PSA, derived from census block groups. In examining Figure 21, it is important to note that population distribution is not necessarily uniform across a census block group. For that reason, the actual number of minority or low-income persons impacted can be more or less than the total population represented by a single census block group because impacts may vary throughout the census block group.

[145] U.S. National Archives and Records Administration, "Delayed Update of the HHS Poverty Guidelines for the Remainder of 2010," *Federal Register* 75, no. 148 (August 2010): 45628–45629. http://www.gpo.gov/fdsys/pkg/FR-2010-08-03/html/2010-19129 htm

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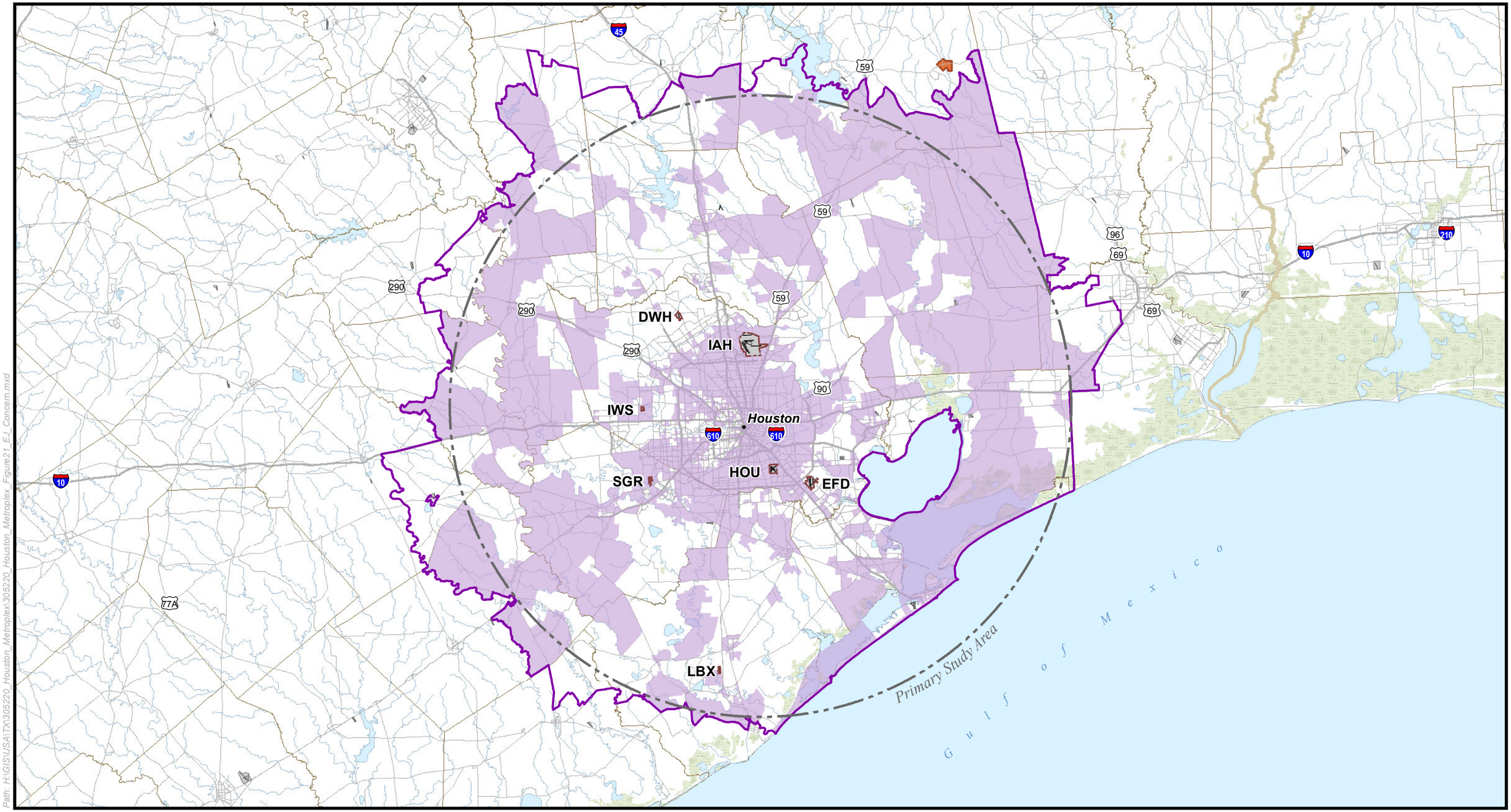

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Environmental Systems Research Institute, Inc.(ESRI) (Airport/Airport Runways), March 14, 2012; ESRI (State Boundaries/County Boundaries), February 14, 2012; ESRI (Cities), February 8, 2012; ESRI (Mountain Peaks), February 28, 2012; ESRI (Roads), March 14, 2012; Houston-Galveston Area Council (Water Features), March 14, 2012; National Atlas (Lakes/Rivers), September 10, 2012 (Updated); National Atlas (Tribal Land/ Wilderness Areas), February 08, 2012; US Census Bureau (Census Block Boundaries), March 09, 2012;

Prepared By: Harris Miller Miller & Hanson Inc., January, 2013

Primary Study Area
Airport Boundary
State Boundary
County/Parish Boundary
Interstate Highway
Highways
Secondary Roads
Water
River/Stream
Alabama-Coushatta Tribe of Texas Reservation
Areas of Environmental Justice Concern
Extent of Environmental Justice Concern Analysis

North

0 15 30 Nautical Miles

Areas of Environmental Justice Concern

Figure 21

Houston OAPM EA

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Table 20 Statistics on Low-Income and Minority Populations within the PSA

Demographic	Population	Percentage of Total
Total Population	5,988,197	100.0%
Minority Population[1]		
Hispanic or Latino	2,103,458	35.1%
Black or African American	1,005,329	16.8%
American Indian and Alaska Native	14,059	0.2%
Asian	384,853	6.4%
Native Hawaiian and Other Pacific Islander	2,931	<0.1%
Other or Two or More Races	86,917	1.5%
Total Minority Population	3,597,547	60.1%
Demographic	**Population**	**Percentage of Total**
Low-Income Households		
Total Number of Households	1,980,325	100.0%
Number of Households with Annual Income Below $20,000	322,797	16.3%
Census Block Groups	**No. Census Blocks**	**Percentage of Total**
Total Census Block Groups Intersecting PSA	3,057	100.0%
Minority Population (only) Census Block Groups[2]	495	16.2%
Low-Income Households (only) Census Block Groups[3]	390	12.8%
Minority Population and Low Income Census Block Groups	1,048	34.3%
Environmental Justice Census Blocks[4]	1,933	63.2%

Notes:
1 Names as they appear in U.S. Census 2010 data
2 For environmental justice purposes, the FAA defined a minority population census block as a census block having a percentage of minority population greater than 60.1 percent (the minority population percentage of the PSA).
3 For environmental justice purposes, the FAA defined a low-income population census block as a census block having a percentage of low-income population greater than 16.3 percent (the low-income population percentage of the PSA).
4 An environmental justice census block is defined as a census block in which either the concentration of minority population or the concentration of low-income population is higher than their respective percentages of the PSA.

4.3 Environmental Impact Categories Not Affected by the Proposed Action

The FAA considered the following environmental impact categories for purposes of potential environmental impacts but determined that further detailed analysis would not be required. There would be no potential for the Proposed Action to affect the following resource categories for reasons noted below:

- Coastal Resources – Without construction or land-disturbing activities, there is no potential for the Proposed Action to affect coastal resources or barrier islands.
- Construction Impacts – The Proposed Action does not involve any construction activities.
- Farmlands – The Proposed Action would not have potential to convert existing prime farmland to a non-agricultural use and would not affect the agricultural economy of the area.
- Floodplains – Without construction or land-disturbing activities, there is no potential for the Proposed Action to affect floodplains.

- Hazardous Materials, Pollution Prevention, and Solid Waste – The Proposed Action would not generate, disturb, transport, or treat hazardous materials.
- Natural Resources and Energy Supply (other than aircraft fuel)—The Proposed Action would not require unusual natural resources or materials, or those in short supply.
- Socioeconomic impacts and children's' environmental health and safety risks:
  - Socioeconomic impacts – The Proposed Action would not involve acquisition of real estate, relocation of residents or community businesses, disruption of local traffic patterns, loss in community tax base, or changes to the fabric of the community.
  - Children's Environmental Health - The Proposed Action would not affect products or substances that a child is likely to come into contact with, ingest, use, or be exposed to, and would not result in environmental health and safety risks that could disproportionately affect children.
- Secondary (Induced) Impacts – The Proposed Action would not have the potential for induced or secondary impacts on surrounding communities. It would not cause changes in patterns of population movement or growth, public service demands, or business and economic activity. Furthermore, the Proposed Action does not involve construction activities, so it would not involve the relocation of people or businesses.
- Water Quality – Without construction or land-disturbing activities, there is no potential for the Proposed Action to increase impervious surfaces or affect water quality or ground water.
- Wetlands – Absent construction or land-disturbing activities, there is no potential for the Proposed Action to affect wetlands.
- Wild and Scenic Rivers – The Proposed Action would not foreclose or downgrade Wild, Scenic, or Recreational river status of a river or river segment included in the Wild and Scenic River System.[146]

As stated in Chapter 2, the Proposed Action would reroute existing air traffic without generating additional aircraft operations. The same number of aircraft operations and passenger enplanements at the Houston OAPM Airports would occur with either the No Action Alternative or the Proposed Action. Therefore, the Proposed Action would not:

[146] No Wild and Scenic River segments are located within the PSA or SSA. The location of Wild and Scenic rivers is available at the National Wild and Scenic Rivers System website (http://www.rivers.gov/rivers/). The closest Wild and Scenic River is the Saline Bayou National Scenic River, which is approximately 4 mi. outside of the SSA in Saline, LA. The nearest section of the Rio Grande designated as a Wild and Scenic River is located over 100 miles outside the SSA.

- Increase the disposal of municipal solid waste (i.e., trash) or affect the capacity of local landfills
- Increase the use of potable water or disposal and treatment of wastewater
- Increase the use of energy (i.e. electricity), when compared to the No Action Alternative

In order to focus analysis on impact categories with potential for significant environmental impact, or on uncertainties that may require evaluation, the EA does not provide any detailed description of the affected environment associated with these impact categories listed in this section. Accordingly, there is no detailed discussion of these resources in Chapter 5.

4.4 Past, Present, and Reasonably Foreseeable Actions

In accordance with the CEQ regulations, this EA must consider past, present, and reasonably foreseeable future actions in the evaluation of potential cumulative effects of the Proposed Action.[147] Table 21 provides a summary of projects that have been completed, are currently ongoing, or are anticipated to be completed in the foreseeable future that could potentially affect similar resources as those affected by the Proposed Action.

Due to the nature of the Proposed Action (i.e., lack of land disturbing or construction activities), the only projects considered were those with anticipated direct or indirect effects on the following:

- The noise setting, with its corresponding implications to compatible land use, potential DOT Section 4(f) properties, historical and cultural resources, and environmental justice concerns
- Ambient air quality within the Study Area

Reasonably foreseeable actions were defined as those expected to begin within five years of the Proposed Action.

The Proposed Action is primarily anticipated to affect the noise environment. In particular, this potential effect would primarily occur when the action would involve changes to existing flight paths up to 3,000 ft. Above Ground Level (AGL). However, the search for relevant projects extended to 10,000 ft. AGL. Such changes to flight procedures would normally occur near the 17 Houston OAPM Airports for which changes to instrument flight procedures are proposed. However, only five of these airports presently have or would in the future have a sufficient number of operations to warrant detailed operational analysis and noise modeling per FAA Order 1050.1E. This EA refers to the airports for which detailed operational analysis and noise modeling occurred as the Analyzed Airports.

[147] *Code of Federal Regulations*, Title 40, sec. 1508.7.

Project Types Evaluated

- Airports Airside Improvements
- Airspace and Navigation Enhancements
- Roadway Construction and Major Improvements in vicinity of main airports
- Light Rail Construction

Project Sources

- Federal Aviation Administration
- Environmental Protection Agency
- Houston Metrorail
- Texas Department of Transportation

Table 21 Summary of Past, Present, and Reasonably Foreseeable Future Actions

Project	Description	Current Status
Projects at Houston OAPM		
Houston Intercontinental (IAH) Terminal B Improvements	Phase one of this project – scheduled for completion in 2013 – will create a new Terminal B concourse dedicated to domestic regional jet operations. Plans for the entire three-phase redevelopment project are over seven to 10 years, based on demand.	Construction began in 2012 and is expected to be ongoing after phase one in 2013.[i]
Revision to IAH SIAPs serving Runways 26L /26R / 27	Revised altitudes on approaches	Implemented Feb. 2012
Revision to IAH SIAPs serving Runways 8L/8R/9	Revised altitudes on Runway 9 approaches (no change for the 8L/8R approaches that would affect aircraft altitudes)	Implemented May 2012
Houston Hobby (HOU) Terminal Building and other Facilities Expansion for Planned International Operations	Construction of five additional gates for international flights and construction of a Federal Inspection Services facility at HOU.[ii]	Project planning documents indicate completion late 2015.
IAH Potential New Cross-field Taxiway and Terminal Improvements	Houston Airport System (HAS) is taking steps to upgrade terminal D to accommodate Airbus A-380 and Boeing B748 aircraft between 2012 and 2018. HAS is also discussing a cross-field taxiway.	A timeline for planning and construction has not been identified.
Runway Extension at Lonestar Executive Airport (CXO)	Texas DOT is considering extending Runway 14/32.	The project is currently in the planning phase. Schedule for completion is unknown.
Potential Improvements to Facilities at Ellington Field (EFD)	Various GA facility development plans are slated for EFD.[iii]	A timeline for planning and construction has not been identified.

Project	Description	Current Status
Regional Airspace Projects		
Gulf of Mexico Lateral Separation Reduction / RNAV Routes	Publication and implementation of new RNAV routes across the Gulf of Mexico	Categorical exclusion from NEPA review approved September 2012; procedures to be implemented[iv]
BAZBL STAR STROS STAR ROYOH STAR COACH STAR	Changes to HOU arrival procedures, west of the airport	Procedure changes were published effective May 2012.
North Texas OAPM	The North Texas OAPM project would optimize air traffic operations in the Dallas – Fort Worth area.	Expected implementation is after Houston OAPM.
Surface Transportation Projects		
US 290 Corridor	Construction of Roadway Improvements from Farm-to-Market (FM) 2920 to Interstate Highway 610 (IH-610), Harris County, TX	Harris County and TxDOT executed a Memorandum of Understanding for interim improvements. US 290 from IH 610 to SH 99 to bo constructed by 2017.[v]
Grand Parkway (State Highway 99 [SH-99]) Segment B	Construction from SH-288 to IH-45, Brazoria and Galveston Counties, TX	TXDOT hosted public hearings in August 2012 to discuss proposed improvements in the SH99 corridor from SH 288 to IH 45 (S).[vi]
Grand Parkway (SH-99) Segment E	Improvement Project, IH-10 to US-290, Harris County, TX	FHWA issued Revised Record of Decision (ROD) and approved the Final Environmental Impact Statement (FEIS). Re-evaluation was approved by the Federal Highway Administration on June 9, 2009.[vii]
Grand Parkway (SH-99) Segment F-1	Highway Construction, US-290 to SH-249, Harris, Montgomery, Fort Bend, Liberty, Brazoria, Galveston and Chambers Counties, TX	The Second Segment F-1 Final Environmental Impact Statement (FEIS) Re-evaluation was approved by the Federal Highway Administration on May 22, 2012.[viii]
Grand Parkway (SH-99) Segment F-2	From SH-249 to IH-45, a new four-lane, controlled access divided highway. This segment borders David Wayne Hooks Airport (DWH).	The Segment F-2 Final Environmental Impact Statement (FEIS) Re-evaluation was approved by the Federal Highway Administration on May 22, 2012.[ix]
Grand Parkway (SH-99) Segment G	From IH-45 to U.S. Highway 59 (US-59), Harris and Montgomery Counties, TX	The Segment G Final Environmental Impact Statement (FEIS) Re-evaluation was approved by the Federal Highway Administration on May 22, 2012.[x]
Grand Parkway (SH-99) Segments H and I-1	From US-59 (N) to IH-10 (E), Transportation Improvement , Montgomery, Harris, Liberty and Chambers Counties, TX	Public Hearings were held on August 9, 2011 and August 11, 2011 to inform the public and stakeholders of the proposed roadway improvements for SH 99 Grand Parkway Segments H & I-1.[xi]
Light Rail – North Corridor Fixed Guideway Project	Proposed Transit Improvements from University of Houston (UH)-Downtown Station to Northline Mall, Harris County, TX	Expected Completion in 2014[xii]
Light Rail – Southwest Corridor Project	Proposed Fixed-Guideway Transit System, Harris County, Houston, Harris County, TX	Public meetings concluded on June 12, 2012. Next steps include: Conduct detailed analysis of alternatives in Deraft Environmental Impact Statement (DEIS); Submit draft of the DEIS to the Federal Transit Administration for approval in Fall 2012; Publish DEIS and conduct public hearing in Winter 2013; Prepare final EIS in

Project	Description	Current Status
		2013[xiii]

Sources:

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ii. Houston Airport System, http://www.fly2houston.com/HobbyInternational (accessed September 23, 2012).
iii. Janelia Moreno, "More Growth Appears on Ellington's Horizon," *Houston Chronicle*, http://www.chron.com/business/article/More-growth-appears-on-Ellington-s-horizon-2160026.php (accessed August 21, 2012).
iv. FAA, En Route & Oceanic Services, http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/enroute/oceanic/gomex/ (accessed August 21, 2012).
v. US290 Environmental Project, http://www.my290.com/environmental/ (accessed August 6, 2012).
vi. Grand Parkway Segment B, "Notice of Public Hearing," http://www.grandpky.com/downloads/segmentb/GP%20B%20Hearing%20Mailer%20English-Spanish%207.18.12.pdf (accessed August 6, 2012).
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viii. Grand Parkway Segment F-1, http://www.grandpky.com/news/default.asp (accessed August 6, 2012).
ix. Grand Parkway Segment F-2, http://www.grandpky.com/segments/f-2/ (accessed August 6, 2012).
x. Grand Parkway Segment G, http://www.grandpky.com/segments/g/ (accessed August 6, 2012).
xi. Grand Parkway Segment H, http://www.grandpky.com/segments/h/ (accessed August 6, 2012).
xii. Ride Metro Current Projects List, http://www.ridemetro.org/CurrentProjects/METRORailExpansion.aspx (accessed August 6, 2012).
xiii. Ride Metro Current Projects List, http://www.ridemetro.org/CurrentProjects/90A-Southwest_RailCorridor.aspx (accessed August 6, 2012).