Draft Environmental Assessment for North Texas Optimization of Airspace and Procedures in the Metroplex

Volume I – Main Document

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Table of Contents – Volume I

List of Tables

List of Exhibits

Table of Contents – Volume II

APPENDIX A

APPENDIX B

APPENDIX C

APPENDIX D

APPENDIX E

APPENDIX F

APPENDIX G

TECHNICAL REPORTS (available on the North Texas OAPM website at http://oapmenvironmental.com/ntx_metroplex/ntx_docs.html)

NTX OAPM Study Team Technical Report

NTX OAPM Design & Implementation Team Technical Report

Average Annual Day Flight Schedules

Aircraft Noise Technical Report

List of Tables

List of Exhibits

1 Introduction

The *National Environmental Policy Act of 1969* (NEPA)[1] requires federal agencies to disclose to decision makers and the interested public a clear, accurate description of potential environmental impacts arising from proposed federal actions and reasonable alternatives to those actions. Through NEPA, Congress has directed federal agencies to integrate environmental factors in their planning and decision making processes and to encourage and facilitate public involvement in decisions that affect the quality of the human environment. Furthermore, as part of the NEPA process, federal agencies are required to consider the environmental effects of a proposed action, reasonable alternatives to the proposed action, and a no action alternative (assessing the potential environmental effects of not undertaking the proposed action). The Federal Aviation Administration (FAA) has established a process to ensure compliance with the provisions of NEPA through FAA Order 1050.1E, Change 1 Environmental Impacts: Policies and Procedures (FAA Order 1050.1E Chg. 1).

This Environmental Assessment (EA), prepared in accordance with FAA Order 1050.1E Chg. 1, documents the potential environmental effects associated with the optimization of Air Traffic Control (ATC) procedures intended to standardize aircraft routing to and from airports in the North Texas area. The Proposed Action, the subject of this EA, is referred to as the North Texas Optimization of Airspace and Procedures in a Metroplex (OAPM). The OAPM program is part of the FAA's NextGen initiative to modernize the National Airspace System (NAS). The procedures designed as part of the OAPM would support arriving and departing aircraft operating under Instrument Flight Rules (IFR) at the airports in the General Study Area (GSA), using current and readily available technology.

This EA consists of the following chapters and appendices:

- **Chapter 1: Introduction.** Chapter 1 provides basic background information on the air traffic system, the Next Generation Air Transportation System program, performance based navigation including area navigation (RNAV) technology, the FAA's OAPM program, and information on the North Texas OAPM Metroplex (North Texas Metroplex) and Study Airports.
- **Chapter 2: Purpose and Need.** Chapter 2 documents the need (problem) and purpose (goal) for airspace and procedure optimization in the North Texas Metroplex area and identifies the Proposed Action that is the subject of this EA.
- **Chapter 3: Alternatives.** Chapter 3 discusses the No Action and Proposed Action alternatives analyzed as part of the environmental review process as well as designs not carried forward for analysis.
- **Chapter 4: Affected Environment.** Chapter 4 discusses existing conditions within the North Texas Metroplex area.
- **Chapter 5: Environmental Consequences.** Chapter 5 discusses the potential environmental impacts associated with the Proposed Action Alternative.
- **Appendix A: Agency and Public Coordination.** Appendix A documents agency and public coordination associated with the EA process and includes: 1) comments

[1] 42 United States Code (USC), Sec. 4321 et seq.

received in response to early coordination efforts, 2) comments received during the public review period of the Draft Environmental Assessment (DEA), and 3) responses to comments.

- **Appendix B: List of Preparers and Receiving Parties.** Appendix B lists the preparers of the EA and parties that received a copy of the Draft and Final EA documents.
- **Appendix C: References.** Appendix C lists the references used in the preparation of the EA document.
- **Appendix D: List of Acronyms and Glossary of Terms.** Appendix D lists acronyms and provides a glossary of terms used in the EA.
- **Appendix E: Basics of Noise.** Appendix E explains acoustics and noise terminology, the effects of aircraft noise on people, community annoyance, and noise/land use compatibility guidelines.
- **Appendix F: Inventory of Potential Department of Transportation Act, Section 4(f) Resources and Noise Exposure.** Appendix F provides tables with coordinates and noise exposure values under existing conditions, the Proposed Action, and the No Action Alternative for potential Department of Transportation (DOT), Section 4(f) resources in the GSA.
- **Appendix G: Inventory of Historic and Cultural Resources and Noise Exposure.** Appendix G provides tables with coordinates and noise exposure values under existing conditions, the Proposed Action, and the No Action Alternative for potential historic resources in the GSA.
- **Technical Reports.** There are four technical reports that provide additional information to support the Draft and Final EA documents. They are listed below and are available on the OAPM website **(**http://oapmenvironmental.com/ntx_metroplex/ntx_docs.html):
  - NTX OAPM Study Team Technical Report
  - NTX OAPM Design & Implementation Team Technical Report
  - Average Annual Day Flight Schedules
  - Aircraft Noise Technical Report

1.1 Project Background

On January 16, 2009, the FAA requested the Radio Technical Commission for Aeronautics (RTCA) create a joint government-industry task force[2] to establish consensus on recommendations for implementation of the Next Generation Air Transportation System (NextGen[3]) operational improvements for the nation's air transportation system. NextGen represents an important and long-term change in the management and operation of the national air transportation system. This is a comprehensive initiative that involves the development of new technologies such as satellite navigation and control of aircraft, advanced digital communications, and enhanced connectivity between all components of the national air transportation system. In response, RTCA assembled the NextGen Mid-

[2] RTCA, Inc. Executive Summary of the NextGen Mid-Term Implementation Task Force Report, September 9, 2009

[3] http://www.jpdo.gov/About_Us.asp

Term Implementation Task Force (i.e., Task Force 5), which included more than 300 members representing commercial airline, general aviation, military, manufacturer, and airport stakeholders.[4] The NextGen program is discussed in more detail in Section 1.2.4.[5]

On September 9, 2009, RTCA issued the NextGen Mid-Term Implementation Task Force Report, which provided the Task Force 5 consensus recommendations. One of these recommendations suggested that the FAA should undertake planning for the implementation of Performance-Based Navigation (PBN)[6] procedures such as Area Navigation (RNAV) and Required Navigation Performance (RNP) procedures on a Metroplex basis.[7] (RNAV and RNP procedures are further discussed in Section 1.2.4) Based on this recommendation, the FAA created the OAPM initiative.

The purpose of the OAPM initiative is to optimize air traffic procedures in metropolitan areas (i.e., a Metroplex). This would be accomplished by employing technological advances in navigation such as RNAV while ensuring access to terminal airspace[8] for aircraft that are not equipped to use RNAV. This approach addresses congestion and other factors that reduce efficiency in busy Metroplex areas and accounts for all operating airports and airspace in the Metroplex. The intent is to use the limited airspace as efficiently as possible in congested Metroplex areas.[9]

1.2 Air Traffic Control and the National Airspace System

The following sections are intended to provide the reader with basic background knowledge of air traffic control, the National Airspace System (NAS) and other concepts discussed in this document. Topics include the structure of the NAS, the role of Air Traffic Control (ATC), the methods used by air traffic controllers to safely manage the ATC system, and the phases of aircraft flight. Following this discussion, information is provided on the FAA's NextGen program and the OAPM initiative.

1.2.1 National Airspace System

Under the Federal Aviation Act of 1958 (49 USC § 40101 et seq.), the FAA is charged with the responsibility for developing plans and policy for the use of navigable airspace necessary to ensure the safety of aircraft and the efficient use of airspace.[10] To help fulfill

[4] RTCA, Inc. is a private, not-for-profit corporation that develops consensus-based recommendations regarding communications, navigation, surveillance and air traffic management system issues. RTCA functions as a federal advisory committee and includes roughly 400 government, industry and academic organizations from the United States and around the world. Members represent all facets of the aviation community, including government organizations, airlines, airspace users, airport associations, labor unions, and aviation service and equipment suppliers. More information is available at http://www.rtca.org.

[5] RTCA Inc., Executive Summary of the NextGen Mid-Term Implementation Task Force Report. September 9, 2009.

[6] Additional information on Performance-Based Navigation is provided on the U.S. Department of Transportation, Federal Aviation Administration's Fact Sheet, "NextGen Goal: Performance-Based Navigation," April 24, 2009 http://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=8768 (Accessed April 11, 2012)].

[7] A Metroplex is a geographic area covering several airports, serving major metropolitan areas and a diversity of aviation stakeholders.

[8] Terminal Airspace: an area of airspace defined by boundaries and altitudes assigned to a radar control facility associated with an airport or group of airports. The facility that manages this airspace is referred to as the Terminal Radar Approach Control (TRACON). The boundaries and altitudes are based on factors such as traffic flows, neighboring airports and terrain. The primary traffic flows are arrivals and departures to and from the airport(s) located within the terminal airspace.

[9] Department of Transportation, Federal Aviation Administration, FAA Response to Recommendations of the RTCA NextGen Mid-Term Implementation Task Force. January 2010. Pg. 14.

[10] 49 U.S.C. 40103

this mandate, the FAA established the National Airspace System (NAS). Within the NAS, the FAA manages aircraft takeoffs and landings and the flow of aircraft between airports through a system of infrastructure (e.g., air traffic control facilities), people (e.g., air traffic controllers, maintenance, and support personnel), and technology (e.g., radar, communications equipment, ground-based navigational aids (NAVAIDs)[11] etc.). The NAS is governed by various rules and regulations promulgated by the FAA.

The NAS comprises one of the most complex aviation networks in the world. Accordingly, to better fulfill its mission, FAA is continuously reviewing the design of all NAS resources to ensure they are managed effectively and efficiently. When changes are proposed for portions of the NAS, the FAA works to ensure that the changes maintain or enhance system safety and improve efficiency. One way to accomplish this mission is to employ emerging technologies to increase system flexibility and predictability.[12] The FAA Air Traffic Organization (ATO) is the primary organization within the FAA responsible for optimizing airspace and flight procedures used in the NAS. In working to improve the NAS, the FAA must comply with NEPA and other applicable laws and regulations.

1.2.2 Air Traffic Control within the National Airspace System

The combination of infrastructure, people, and technology used to monitor and guide or direct aircraft within the NAS is referred to collectively as ATC. ATC is responsible for separating aircraft (keeping minimum distances between aircraft) to maintain safety and expedite the flow of traffic operating in the NAS. Air traffic controllers are responsible for providing these air traffic services to aircraft operating in the airspace. This is accomplished through communications with pilots and by using various technologies such as radar.

Aircraft operate under two distinct categories of flight rules: Visual Flight Rules (VFR) and Instrument Flight Rules (IFR).[13] These flight rules generally correspond with two categories of weather conditions: Visual Meteorological Conditions (VMC) and Instrument Meteorological Conditions (IMC).[14] VMC generally exist during fair to good weather with good visibility. IMC occur during periods when visibility falls to less than three statute miles or the ceiling (the distance from the ground to the bottom layer of clouds when the clouds cover more than 50 percent of the sky) drops to lower than 1,000 ft. Under VFR, pilots are able to fly whatever route they chose and are responsible to "see and avoid" other aircraft and obstacles such as terrain to maintain safe separation. Under IFR ATC is responsible for providing separation from other aircraft and terrain and pilots use cockpit instruments and radar to fly routes specified by ATC and to comply with ATC instructions. Pilots must follow IFR during IMC; however, due to various factors such as the general requirement for aircraft to operate under IFR in Class A airspace (i.e., en route airspace between 18,000 ft. MSL and 60,000 ft. MSL)[15], the majority of commercial air traffic operate under IFR regardless of weather conditions.

[11] NAVAIDs are facilities that transmit signals that define key points or routes.

[12] U.S. Department of Transportation, Federal Aviation Administration, Order JO 7400.2G, Change 3, Procedures for Handling Airspace Matters, Section 32-3-5(b) "National Airspace Redesign," April 10, 2008

[13] 14 Code of Federal Regulations (C.F.R.) Part 91.

[14] 14 C.F.R. §§ 91.151 through 91.193, "Visual Flight Rules" and "Instrument Flight Rules."

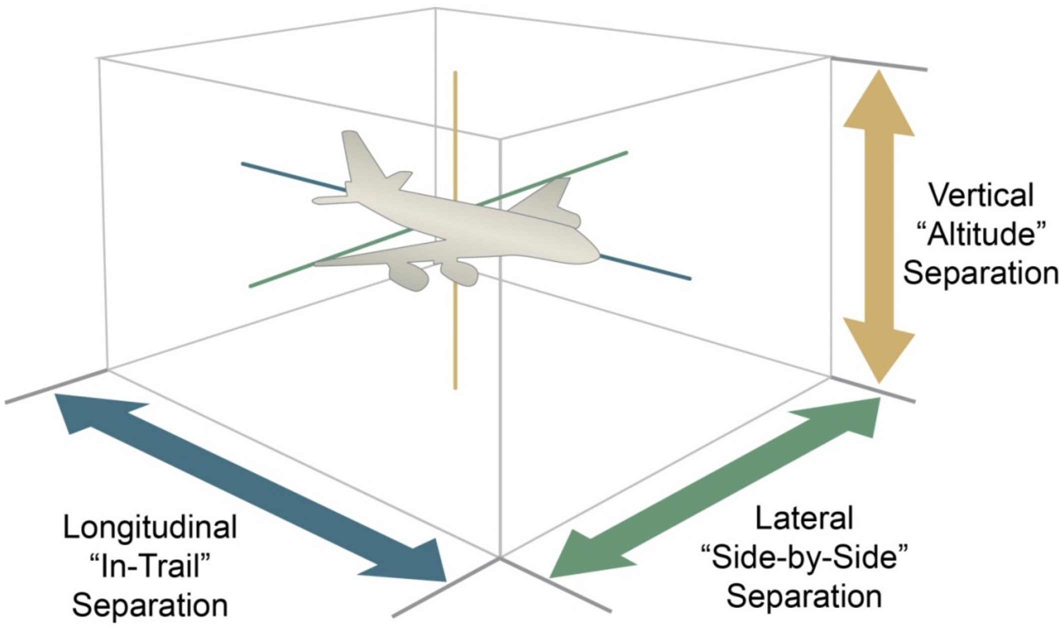
[15] 14 C.F.R. § 91.135.

Based on factors such as aircraft type and weather, air traffic controllers apply criteria to maintain defined minimum distances (referred to as separation) between aircraft.[16] These types of separations include:

- **Vertical or "Altitude" Separation:** separation between aircraft operating at different altitudes;
- **Longitudinal or "In-Trail" Separation:** the separation between two aircraft operating along the same flight route referring to the distance between a lead and a following aircraft; and,
- **Lateral or "Side-to-Side" Separation:** separation between aircraft (left or right side) operating along two separate but nearby flight routes.

Exhibit 1-1 depicts the three dimensions around an aircraft used to determine separation.

Exhibit 1-1 Three Dimensions around an Aircraft



Source: ATAC Corporation, December 2012.
Prepared by: ATAC Corporation, December 2012.

For aircraft operating under IFR, air traffic controllers maintain separation by monitoring and, as needed, directing pilots following standard instrument procedures. Standard instrument procedures define the routes along which aircraft operate. These procedures are intended to provide predictable, efficient routes to move aircraft through the airspace in an orderly manner. They also minimize the need for communication between the controller and pilot as the aircraft operates in the terminal airspace and transitions to and from the en route airspace. Standard instrument procedures are considered "conventional" if they are based on ground-based Navigational Aids (NAVAIDs)[17], which provide instrument guidance

[16] Defined in FAA Order 7110.65U, Air Traffic Control.

[17] NAVIGATIONAL AID (NAVAIDs) - Any visual or electronic device airborne or on the surface which provides point-to-point guidance information or position data to aircraft in flight. C/PG http://www.faa.gov/air_traffic/publications/atpubs/pcg/N.HTM

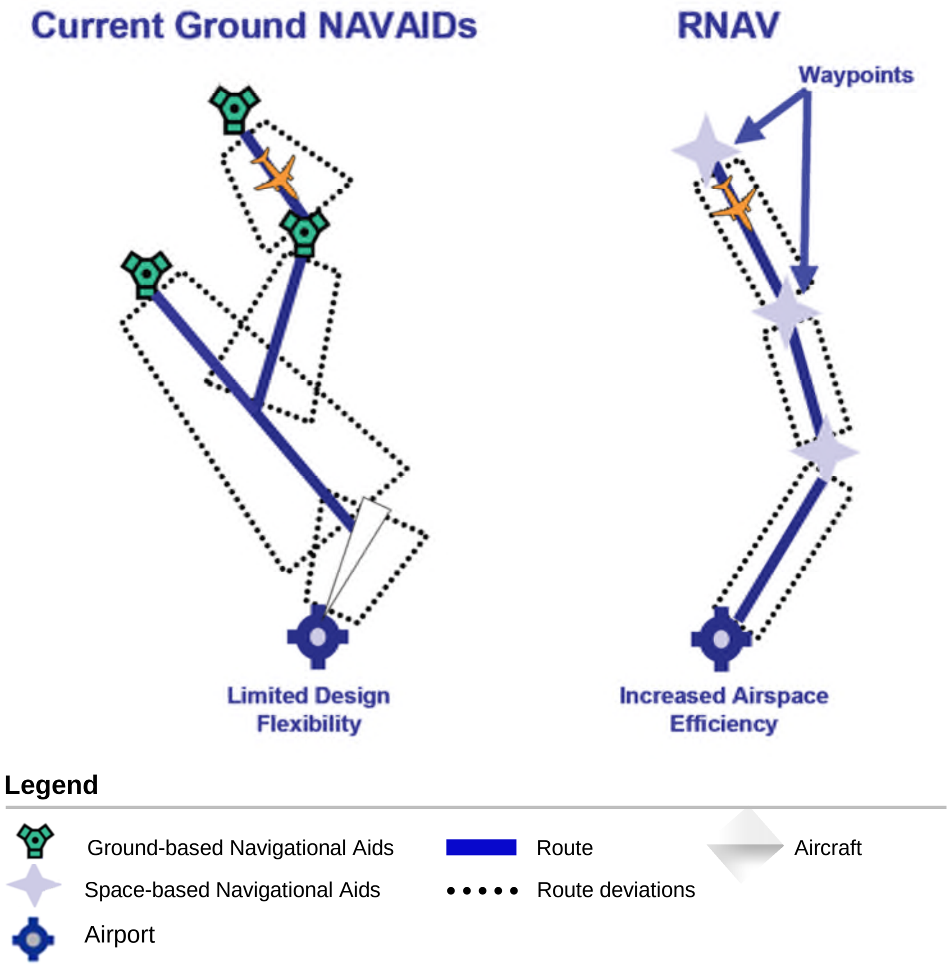
to an overflying aircraft, or if they are based on verbal instructions from an air traffic controller.

In its effort to modernize the NAS, the FAA is developing standard instrument procedures using new and alternate technologies. One alternate technology is RNAV, which allows an RNAV-trained pilot, operating an RNAV-equipped aircraft, to fly a more direct route based on instrument guidance. RNAV technology references an aircraft's position within the coverage of ground-based NAVAIDs or space-based NAVAIDs that use Global Positioning System (GPS) technology. **Exhibit 1-2** compares an RNAV procedure to a conventional procedure.

If there is a lack of standard instrument procedures in the terminal airspace – either the procedures do not exist or the existing procedures are unable to accommodate demand due to congestion – ATC must maintain safety within the airspace it controls by using one or a combination of several management tools and coordination techniques. The more frequently this is done, the more complex controller workload becomes. The management tools and coordination techniques include:

- **Vectoring:** Controllers issue a series of headings to a pilot to route an aircraft. This can increase aircraft flight distance and flight time resulting in increased fuel burn, decreased flight route predictability, and increased air traffic controller/pilot communication requirements and workload.
- **Speed Control:** Controllers direct aircraft to reduce or increase aircraft speed. A reduction in speed can increase aircraft flight time resulting in increased fuel burn, decrease flight route predictability, and increase air traffic controller/pilot communication requirements and workload.
- **Hold Pattern/Ground Hold:** Controllers assign aircraft to a holding pattern in the air or hold aircraft on the ground before departure. Holding an aircraft on the ground can result in delays and increased flight time. Assigning an aircraft to a holding pattern in the air increases flight time resulting in greater fuel burn and air traffic controller/pilot communication requirements and workload.
- **Level-off:** Controllers direct an aircraft to level off during ascent or descent. This can increase flight time and distance, resulting in increased fuel burn, by disrupting a continuous ascent or descent and increasing air traffic controller/pilot communication requirements and workload.
- **Reroute:** Controllers reroute aircraft to terminal airspace entry or exit gates other than the preferred or most direct gate. This can increase flight time, distance, and fuel burn; decrease flight route predictability; and increase air traffic controller/pilot communication requirements, complexity, and workload.
- **Point-out:** Controllers point out, or notify a controller managing an adjacent sector of the proximity of an aircraft to the adjacent sector's boundary (close to one and a half miles from the shared boundary). Point outs can be done verbally or electronically and can result in added complexity to air traffic controller communications and increased workload.

Exhibit 1-2 Comparison of Routes Following Conventional versus RNAV Procedures



Source: U.S. Department of Transportation, Federal Aviation Administration, "Performance-Based Navigation (PBN)" brochure, 2009.
Prepared by: ATAC Corporation, December 2012.

As an aircraft moves from origin to destination, ATC personnel function as a team and transfer control of the aircraft from one controller to the next and from one ATC facility to the next. Overall, managing the flow of departing aircraft (departure flow) is less complicated because aircraft can often be held on the ground to maintain appropriate aircraft separation if conflicts are anticipated. Managing the arrival flow tends to be more complex because arriving aircraft are already airborne and thus require more complicated management to maintain a safe airspace environment.

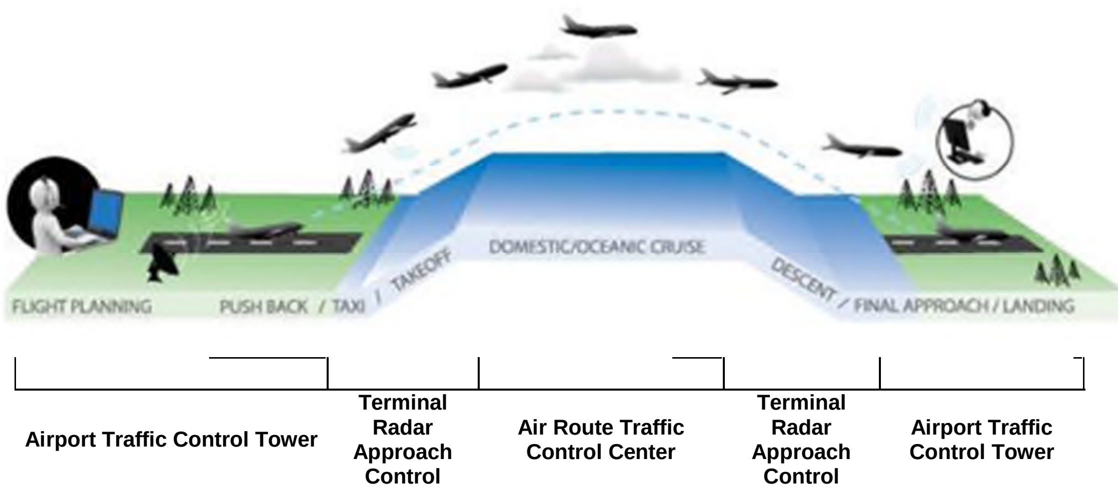
1.2.3 Aircraft Flow within the National Airspace System

An aircraft traveling from airport to airport typically operates through six phases of flight (plus a "preflight" phase.) **Exhibit 1-3** depicts the typical phases of flight for a commercial aircraft. These phases include:

- **Preflight (Flight Planning):** The preflight route planning and checks in preparation for takeoff.

- **Push Back/Taxi/Takeoff:** The transition of an aircraft from push back at the gate, to taxiing to an assigned runway, and takeoff from the runway.
- **Departure:** The in-flight transition of an aircraft from takeoff to the en route phase of flight, during which the aircraft climbs to its assigned cruising altitude following a standard instrument procedure (predefined set of guidance instructions that define a route for a pilot to follow) or a series of verbally issued instructions from an air traffic controller.
- **En Route:** The generally level segment of flight ("cruising altitude") between the departure and destination airports.
- **Descent:** The in-flight transition of an aircraft from the assigned cruising altitude to the point at which the pilot initiates the approach to a runway at the destination airport.
- **Approach:** The segment of flight during which a pilot follows a standard procedure or series of verbal instructions from an air traffic controller to guide the aircraft to the landing runway.
- **Landing:** Touch-down of the aircraft at the destination airport's runway and taxiing from the runway end to the gate or parking position.

Exhibit 1-3 Typical Phases of a Commercial Aircraft Flight



Source: U.S. Department of Transportation, Federal Aviation Administration. NextGen Implementation Plan, "Operating in the Mid-Term." March 2011.
Prepared by: Harris Miller Miller & Hanson Inc., 2013.

1.2.4 Air Traffic Control Facilities

The NAS is organized into three-dimensional areas of navigable airspace (defined by a floor, a ceiling, and a lateral boundary), which are managed by different ATC facilities. These airspace areas are further broken down into sectors.[18] The three types of ATC facilities include:

[18] A sector is a region or volume of airspace defined by vertical and lateral boundaries that has its own discreet frequency and is assigned to a controller or team of controllers.

- **Airport Traffic Control Tower:** Controllers at an Airport Traffic Control Tower (ATCT) located at an airport manage phases of flight associated with an aircraft taking off from and landing at an airport. ATCT typically controls airspace extending from the airport out to a distance of several miles,
- **Terminal Radar Approach Control:** Controllers at a Terminal Radar Approach Control (TRACON) facility manage aircraft as they transition between an airport and the en route phase of flight. This includes the departure, climb, descent, and approach phases of flights. TRACON controllers are responsible for separating aircraft operating within the terminal airspace sectors. As an aircraft moves from sector to sector, responsibility for management of that aircraft is transferred from controller to controller. The terminal airspace in the North Texas Metroplex area consists of airspace delegated to the Dallas/Fort Worth Terminal Radar Approach Control and is referred to as "D10" as shown on **Exhibit 1-4**,
- **Air Route Traffic Control Centers:** Controllers at Air Route Traffic Control Centers (ARTCCs or "Centers") manage the flow of traffic to, from, and within the en route airspace. En route airspace includes low-altitude routes called "V-routes; high altitude jet routes called "J-routes" (both defined by a series of ground-based NAVAIDS); low altitude RNAV routes called "T-routes"; and high altitude RNAV routes called "Q-routes." The RNAV routes provide a more direct path to a destination airport. **Exhibit 1-4** shows how en route airspace is delegated to different ARTCCs in the southern central United States. The area that includes D10 and the North Texas Metroplex project is referred to as "ZFW." Similar to terminal airspace, en route airspace is divided into sectors.[19]

The following sections discuss how air traffic controllers at these ATC facilities control the phases of flight for aircraft operating under IFR.

1.2.4.1 Departure Flow

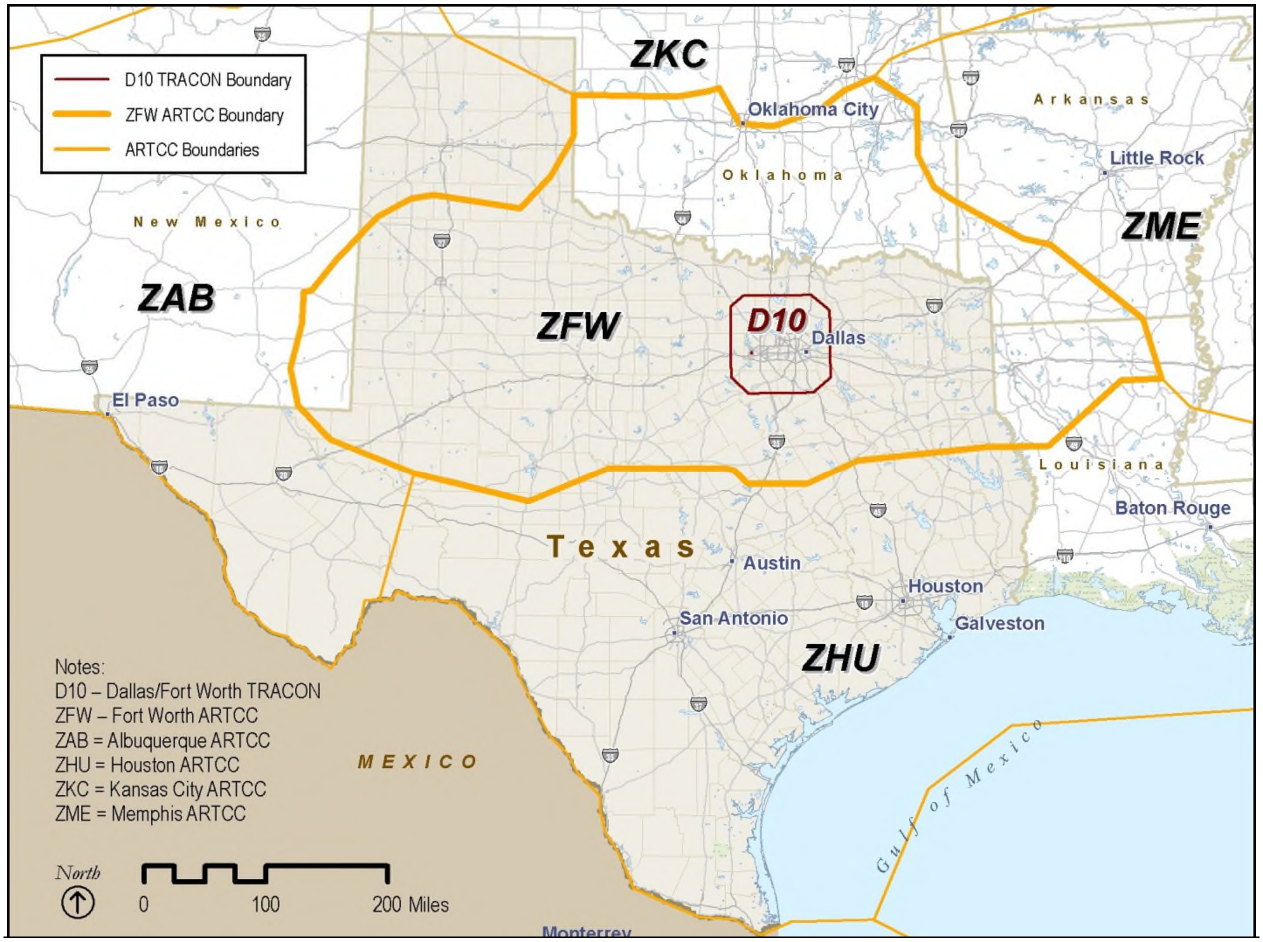
As an aircraft operating under IFR departs a runway and follows its assigned heading, it moves from the ATCT airspace, through the terminal airspace, and into en route airspace where it proceeds on a specific route or airway. Once on an airway, an aircraft flies along the route until it nears its destination airport.

Within the terminal airspace, TRACON controllers are responsible for controlling aircraft departing from the ATCT airspace to an exit point. An exit point represents an area along the boundary between terminal airspace and en route airspace. When aircraft pass through the exit point, control is passed from TRACON to ARTCC controllers who then direct the aircraft on to a jet airway.

To maintain safe distances between aircraft within the terminal airspace, TRACON controllers must maintain separation standards for departing aircraft (as well as between arriving and departing aircraft). Aircraft separation is further discussed in Section 1.2.4.3.

[19] ATC service is provided within airspace units having a specifically defined dimension and volume, the boundaries of which are normally documented in FAA Orders, Instructions, and Letters of Agreement between facilities providing ATC services (e.g., an ARTCC and a TRACON). An airspace unit under the jurisdiction of a particular facility is often subdivided into sectors. A controller is responsible for providing ATC services to aircraft passing through his/her sector(s).

Exhibit 1-4 Airspace Overlying South-Central United States



Sources: National Flight Data Center Facility Aeronautical Data Distribution System, Accessed March 2013 (airspace boundaries); National Atlas of the United States of America: U.S. County and State Boundaries; Water Bodies; Bureau of Transportation Statistics: National Transportation Atlas Database; FAA: NFDC Airport and Runway databases; Harris Miller Miller & Hanson Inc. - Study Area Boundary
Prepared by: Harris Miller Miller & Hanson Inc., 2013

Standard Instrument Departures

Departing aircraft operating under IFR use an instrument procedure called a Standard Instrument Departure (SID). A SID provides pilots with defined lateral and vertical guidance to facilitate safe and predictable navigation from an airport through the terminal airspace to a jet route in the en route airspace. A SID may be based on vectoring, following a route defined by ground-based NAVAIDs, or a combination of both. This is called a “conventional” SID. Because of the increased precision inherent in RNAV technology, an RNAV SID, which provides GPS-based navigation, defines a more predictable route through the airspace than does a conventional SID.

The portion of a SID that provides a path serving a particular runway at an airport is referred to as a “runway transition.” A SID may have several runway transitions serving one or more runways at one or more airports. From the common segment of the route, guidance may then be provided in the SID to one or more jet routes in the en route airspace. This is referred to as an “en route transition.”

1.2.4.2 Arrival Flow

A pilot will initiate the descent phase of flight within the en route airspace. During descent, the aircraft will enter the terminal airspace for the destination airport at an entry gate. The entry point represents a point along the boundary between terminal airspace and en route airspace. When aircraft pass through the entry point, control of the aircraft is passed from ARTCC to TRACON controllers. Similar to departing aircraft, TRACON controllers maintain separation standards for arriving aircraft. Separation is further discussed in Section 1.2.4.3.

Standard Terminal Arrival Routes

Aircraft arriving within the terminal airspace follow a standard instrument procedure called a Standard Terminal Arrival Route (STAR.) A STAR proceeds from a route in the en route airspace to the final approach to a runway. The final approach is the segment of flight when an aircraft is aligned with the landing runway and operates along a straight route at a constant rate of descent to the runway. Like the SIDs, there are both Conventional and RNAV STARs.

A STAR provides full guidance from en route airspace through a terminal airspace entry gate to a commonly used segment of the STAR in the terminal airspace. Some STARs also provide guidance to the final approach to one or more runways at one or more airports. Guidance from the en route airspace to the terminal airspace is called “en route transition” and from the common segment of the STAR in the terminal airspace to the final approach to a runway end is called a “runway transition.”

1.2.4.3 Aircraft Separation

As TRACON controllers manage the flow of aircraft in the terminal airspace, they apply the following separation standards between aircraft:

- **Altitude separation (vertical):** when operating below 29,000 ft. above mean sea level (MSL), two aircraft on separate routes that cross or converge must be at least 1,000 ft. above/below each other at the point where the two routes intersect. When operating above 29,000 ft. MSL, the two aircraft must be at least 2,000 ft. above/below each other.[20]
- **In-Trail separation (longitudinal):** Within a TRACON radar controlled area and within 40 miles of the radar site being used to track the aircraft, the minimum distance between two aircraft on the same route (or in-trail) is three miles. Beyond 40 miles from the radar site, or when aircraft are under the control of an ARTCC, the minimum longitudinal separation of aircraft increases to five miles due to limitations in radar coverage capabilities.[21] Consequently, as aircraft proceed further from the TRACON radar transmitter sites and approach the exit points at the TRACON/ARTCC boundary, ATC must increase departure aircraft separation from three miles to five miles as the aircraft nears the exit point to match the separation standards that would apply when control is transferred from the TRACON to the ARTCC. To ensure that a minimum five-mile separation standard is always maintained, ATC may separate aircraft by as much as seven miles.

[20] Mean Sea Level: elevation (on the ground) or altitude (in the air) of any object, relative to the average sea level measured in 1991 (called the North American Vertical Datum of 1988).

[21] Michael S. Nolan, Chapter 9, “Radar Separation,” in Fundamentals of Air Traffic Control, Fourth Edition, 2004, pages 363-367

- **Side-to-Side separation (lateral):** Similar to in-trail separation, the minimum side-to-side (left or right side of an aircraft) distance between aircraft operating at the same altitude within the terminal airspace must be at least three miles within 40 miles of the primary radar site, and at least five miles beyond 40 miles from the primary radar site.

1.2.5 Special Use Airspace

Special Use Airspace (SUA) is airspace with defined boundaries in which certain activities, such as military flight training and air-to-ground military exercises, must be confined. These areas either restrict other aircraft from entering or the type of aircraft activity allowable within the airspace. There are six types of special use airspace: prohibited areas, restricted areas, warning areas, military operating areas, alert areas, and controlled firing areas. One of these, the Military Operating Area, is found in the North Texas metroplex airspace:

- **Military Operating Area:** Military Operating Areas (MOAs) consist of airspace with defined vertical and lateral limits established for the purpose of separating certain military training activities (e.g., air combat tactics, air intercepts, aerobatics, formation training, and low-altitude tactics) from IFR traffic. Whenever a MOA is being used, nonparticipating IFR traffic may be cleared through a MOA if IFR separation can be provided by ATC. Otherwise, ATC will reroute or restrict nonparticipating IFR traffic.

1.2.6 Next Generation Air Transportation System

The Next Generation Air Transportation System (NextGen) program is the FAA's long-term plan to modernize the NAS through evolution from a ground-based system of air traffic control to a GPS-based system of air traffic management.[22] A key step in achieving the NextGen ATC system is implementation of PBN procedures, such as Area Navigation (RNAV) and Required Navigation Performance (RNP) procedures, which use GPS-based technology and aircraft "auto pilot" and Flight Management System (FMS) capabilities. The OAPM's objective is to accomplish this step in the overall process of transitioning to the NextGen system by 2018. These capabilities are now readily available and PBN can serve as the primary means aircraft use to navigate along a route. Currently, over 90 percent of air carrier aircraft are RNAV equipped and nearly 50 percent are RNP equipped.[23] The following sections describe PBN procedures in detail.

Exhibit 1-5 shows a comparison of conventional and RNAV procedures (including a subset of RNAV procedures called RNP). RNAV enables aircraft traveling through terminal and en route airspace to follow more accurate and better defined, direct flight routes, primarily relying on GPS-based navigational aids. This results in more predictable routes with fixed locations and altitudes that can be planned ahead of time by the pilot and air traffic control. In addition, fixed routes help maintain segregation between aircraft by providing the ability to separate traffic both vertically and horizontally. As a result, some routes can be shortened and the need for level-offs can be minimized.

[22] U.S. Department of Transportation, Federal Aviation Administration's Fact Sheet, "NextGen Goal: Performance-Based Navigation," April 24, 2009. [http://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=8768 (Accessed April 11, 2012)].

[23] U.S. Department of Transportation, Federal Aviation Administration, NextGen Implementation Plan-2012," March 2012, page 46.

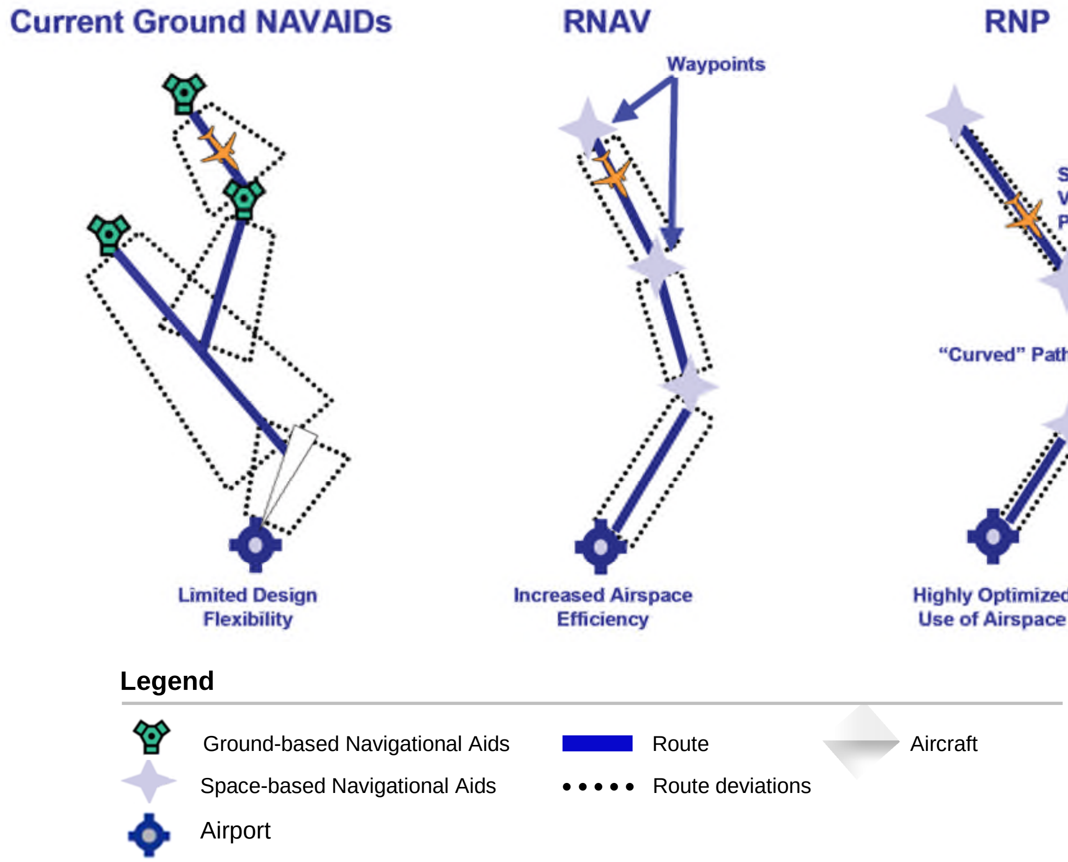
Ground-based NAVAID routing is often limited by issues such as line-of-sight and signal reception accuracy. Ground-based NAVAIDs such as, Very High Frequency (VHF) Omnidirectional Range (VOR) are affected by terrain and other obstructions that can limit their signal accuracy. Consequently, due to signal accuracy routes using ground-based NAVAIDS require at least four nautical miles (NM) of reserved airspace on either side of the route's main path to account for potential obstructions. This requirement increases the farther an aircraft is from the VOR. In comparison, the accuracy of the RNAV signal decreases the requirement for reserving airspace on either side of the procedure's main path thus reducing the amount of unusable airspace. RNAV procedures can mirror conventional procedures or provide routes within the airspace using satellite technology that were not previously possible with ground-based NAVAIDs. RNAV also provides routes that enable transition routes to multiple runways. These runway transition route options provide more flexibility in managing arrival traffic.

RNAV-based procedures facilitate more efficient design and use of airspace that collectively result in improved access, predictability, and operational efficiency while maintaining or enhancing safety and increasing opportunities to reduce fuel consumption. The resulting improved predictability of aircraft operation when following RNAV procedures can reduce the need for controllers to employ management tools, such as vectoring and holding, and therefore, reduce controller and pilot workload and airspace complexity.

1.2.6.1 RNP

RNP is an RNAV procedure that is flown with the addition of an onboard performance monitoring and alerting system. A defining characteristic of an RNP operation is the ability for an RNP-capable aircraft navigation system to monitor the accuracy of its navigation (based on the number of GPS satellite signals available to pinpoint the aircraft location) and inform the crew if the required data becomes unavailable. **Exhibit 1-5** compares conventional, RNAV, and RNP procedures and shows how an RNP-capable aircraft navigational system provides a more accurate location (down to less than a mile from the intended path) and will follow an exact path, including turns. The enhanced accuracy and predictability makes it possible to implement procedures within a controlled airspace that are not possible under the current air traffic system.

Exhibit 1-5 Performance-Based Navigation – Conventional/RNAV/RNP



Source: U.S. Department of Transportation, Federal Aviation Administration. "Performance-Based (PBN) Brochure" October 2009.
Prepared by: Harris Miller Miller & Hanson, Inc., 2013

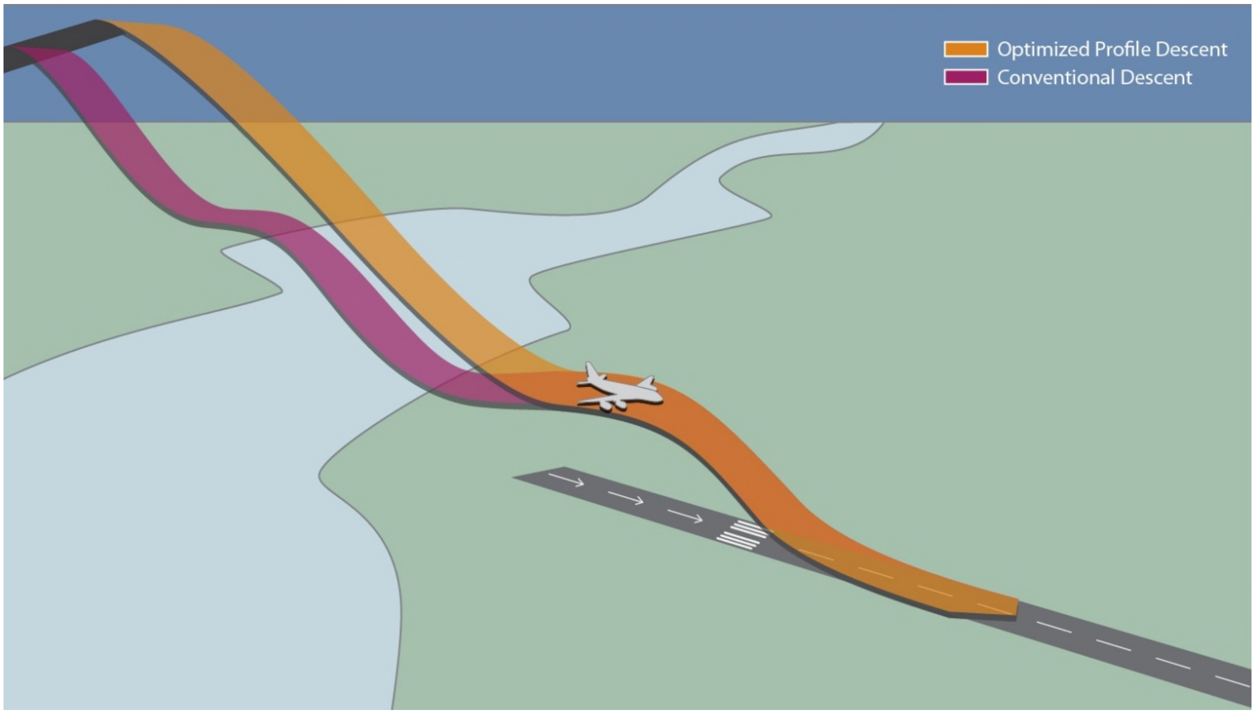
1.2.6.2 Optimized Profile Descent

Optimum Profile Descent (OPD) is an RNAV/RNP dependent flight procedure that uses the aircraft FMS to fly continuously from the top of descent to landing without intervening level-off segments. **Exhibit 1-6** illustrates an OPD procedure compared to a conventional descent. Aircraft that fly OPD can maintain higher altitudes and use less thrust for longer periods. This results in reduced fuel burn and corresponding reductions in emissions and noise. OPD also reduces communications between controllers and pilots.

1.2.7 OAPM

The FAA proposes to design and implement RNAV procedures that will take advantage of the readily available technology in the majority of aircraft as part of the OAPM initiative. OAPM specifically addresses congestion, airports in close geographical proximity, SUAs, and other limiting factors that reduce efficiency in busy Metroplex airspace. Efficiency is improved by expanding the implementation of RNAV-based standard instrument procedures and connecting the routes defined by the standard instrument procedures to high and low altitude RNAV routes. Taking advantage of RNAV technology maximizes the use of the limited airspace in congested Metroplex environments.

Exhibit 1-6 Optimum Profile Descent Compared to a Conventional Descent



Source: ATAC Corporation, 2012
Prepared by: ATAC Corporation, 2012

1.3 The North Texas Metroplex

The following sections describe the airspace structure and existing standard instrument procedures of the North Texas Metroplex that would be affected by the North Texas OAPM project.

1.3.1 North Texas Metroplex Airspace

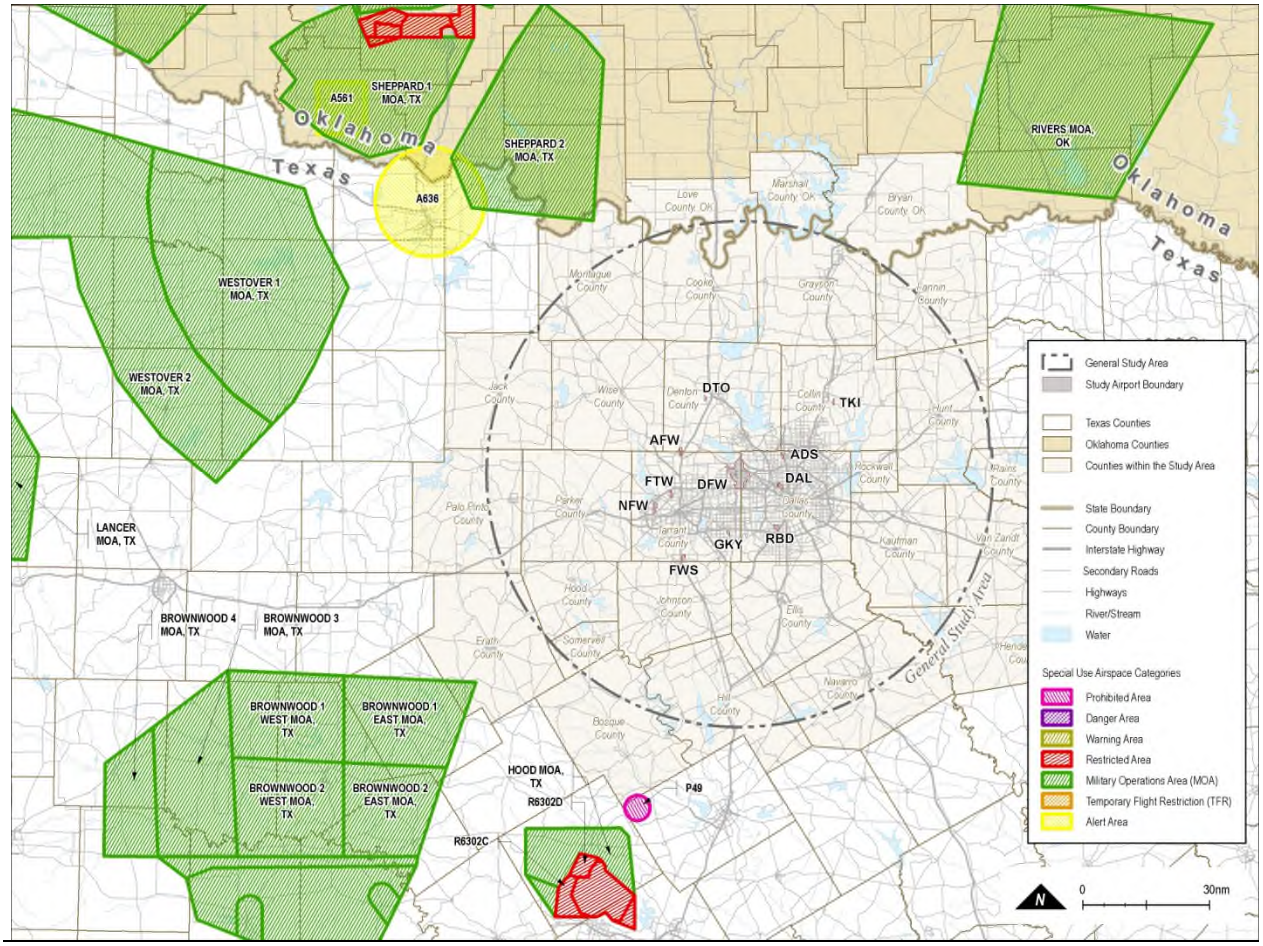
Exhibit 1-4 depicts part of the airspace structure in the North Texas Metroplex. Air traffic controllers in the D10 TRACON facility control a portion of airspace designated as D10 that is located within the Dallas/Fort Worth ARTCC (ZFW) airspace. Surrounding ARTCC airspace includes Kansas City (ZKC), Houston (ZHU), Albuquerque (ZAB), and Memphis (ZME).

The lateral boundary of the D10 airspace is irregularly shaped, extending from DFW to between approximately 31 to 33 NM to the north, 34 to 37 NM to the east, 35 to 38 NM to the south, and 34 to 36 NM to the west. D10 currently manages all airspace 17,000 MSL and below everywhere except for the "Frisco Finger", an area delegated from ZFW to D10, where D10 manages airspace from 4,000 MSL to 12,000 MSL on as needed basis. ZFW controllers manage the airspace above and adjacent to the D10 airspace.

1.3.1.1 North Texas Metroplex Special Use Airspace

The physical configuration of the D10 airspace is not constrained by the existence of SUA. However, there are SUA areas just outside of D10 airspace that impact designs and availability of arrival and departure procedures. One procedure (ALIAN SID) is only available when the LANCER MOA and the White Sands Missile Range Airspace Complex are not active. STARS throughout the southwest corner also avoid the BROWNWOOD MOA. There is no SUA associated with Forth Worth Naval Air Station (NAS). FTW NAS is designated as class D airspace and abuts Fort Worth Meacham International Airport (KFTW) class D airspace. **Exhibit 1-7** depicts the boundaries of SUA in proximity to D10.

Exhibit 1-7 Special Use Airspace



Sources: National Flight Data Center National Airspace System Resources database, accessed September 16, 2012 (airspace boundaries); National Atlas of the United States of America: U.S. County and State Boundaries; Water Bodies; Bureau of Transportation Statistics: National Transportation Atlas Database; FAA: NFDC Airport and Runway databases; ATAC Corporation: Study Area Boundary
Prepared by: Harris Miller Miller & Hanson Inc., 2013

1.3.2 Current STARs and SIDs

As of December 2011, 50 published STARs and SIDs served the airports within the D10 terminal airspace. Of these, 34 are conventional procedures and 16 are RNAV procedures. All 16 RNAV procedures are DFW SIDs that provide RNAV guidance from the runways to the en route airspace. The RNAV SIDs currently in place were implemented in September of 2003 as the availability of RNAV-technology in aircraft cockpits increased and RNAV design criteria were improved.

1.4 North Texas Metroplex Airports

The focus of the proposed North Texas OAPM project is on the Study Airports that are connected to standard procedures subject to change under the proposed action. **Table 1-1** lists the GSA airports, their locations, and their runways. **Exhibit 1-8** shows where the airports are located geographically in D10 airspace.

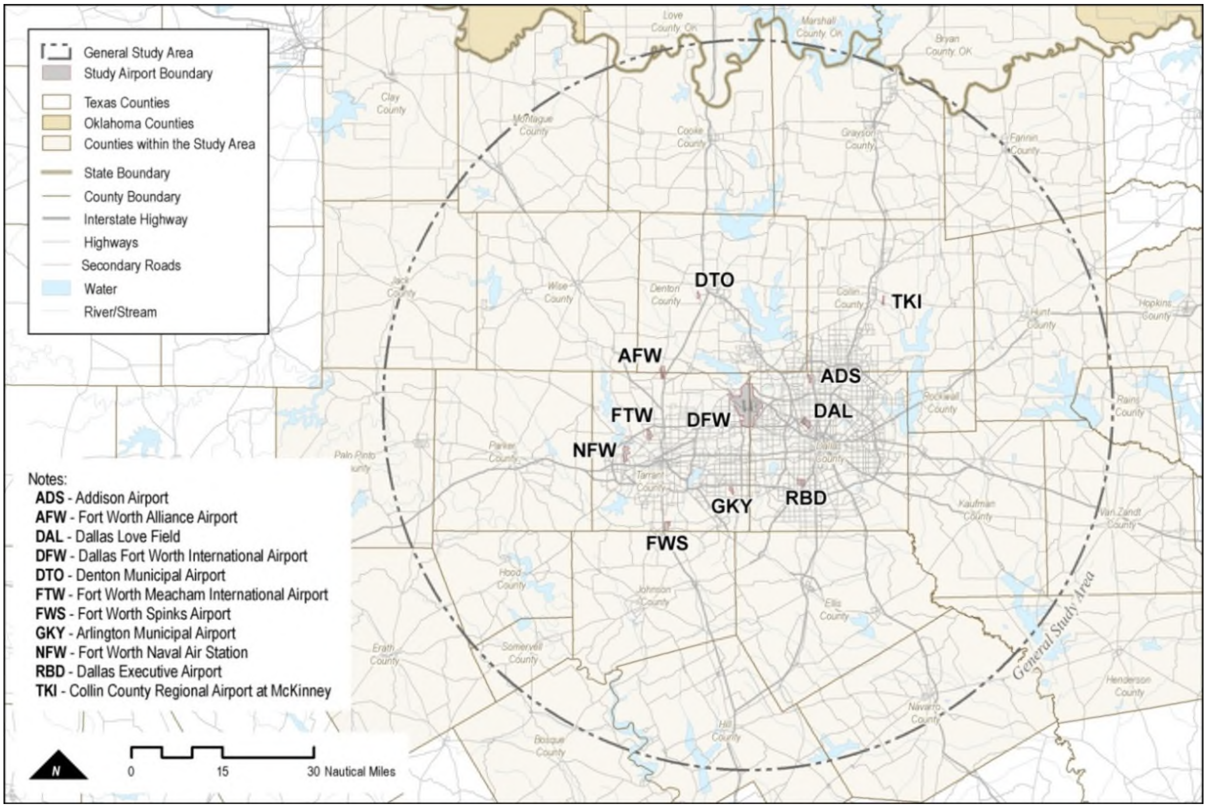
Table 1-1 North Texas Metroplex EA Study Airports

Airport Name	Airport Code	Location	Runways[1]
Major Airports			
Dallas Fort Worth International Airport	DFW	Dallas-Fort Worth, TX	13R, 31L, 18R, 36L, 18L, 36R, 17R, 35L, 17C, 35C, 13L, 31R, 17L, 35R
Dallas Love Field Airport	DAL	Dallas, TX	13L, 31R, 13R, 31L, 18, 36
Satellite Airports			
Addison Airport	ADS	Addison, TX	15, 33
Fort Worth Alliance Airport	AFW	Fort Worth, TX	16L, 34R, 16R, 34L
Fort Worth Meacham International	FTW	Fort Worth, TX	9, 27, 16, 34, 17, 35
Denton Municipal	DTO	Denton, TX	18, 36
Collin County Regional Airport	TKI	McKinney, TX	18, 36
Arlington Municipal Airport	GKY	Arlington, TX	16, 34
Dallas Executive	RBD	Dallas, TX	13, 17, 31, 35
Fort Worth Spinks	FWS	Fort Worth, TX	17L, 35R, 17R, 35L
Fort Worth Naval Air Station JRB / Carswell Field	NFW	Fort Worth, TX	17, 35

Notes:
1/ A runway can be used in both directions, but are named in each direction separately. Runway number is based on the magnetic direction of the runway (e.g., Runway 09 points to the east direction). The two numbers on either side always differ by 180 degrees. If there is more than one runway pointing in the same direction, each runway number includes an 'L', 'C' or 'R' at the end. This is based on which side a runway is next to another one in the same direction.

Source: FAA, 5010 Database
Prepared by: Harris Miller Miller & Hanson Inc., March 201

Exhibit 1-8 Study Airport Locations



Sources: FAA: NFDC Airport and Runway databases; HMMH: GSA Boundary
Prepared by: Harris Miller Miller & Hanson Inc., July 2013

1.4.1 Major Study Airports

The North Texas Metroplex airports are divided into major Study Airports and satellite airports. The major Study Airports include the following:

Dallas/Fort Worth International Airport (DFW) is classified as a large-hub primary commercial service airport in the National Plan of Integrated Airport Systems (NPIAS). DFW is the primary commercial airport serving the North Texas Metroplex area.[24] DFW receives scheduled commercial service and accommodates at least three percent of total U.S. enplaned passengers. DFW supports a mix of domestic and international passenger airlines, air cargo carriers, corporate aviation, and general aviation activity. The airport has 14 runways, which are described in **Table 1-1**. Currently, an aircraft arriving at DFW may be assigned one of ten conventional STARs. A departing aircraft may be assigned to one of 16 RNAV SIDs or one of 12 conventional SIDs.[25]

Dallas Love Field Airport (DAL) is located approximately seven (7) nautical miles southeast of DFW and accommodates a mix of commercial, corporate, and general aviation

[24] Federal Aviation Administration, Report of the Secretary of Transportation to the United States Congress Pursuant to Section 47103 of Title49, United States Code, National Plan of Integrated Airport Systems (NPIAS), 2013-2017, Appendix A: List of NPIAS Airports with 5-Year Forecast Activity and Development Cost.

[25] Department of Transportation, Federal Aviation Administration. Digital-Terminal Procedures. April 5, 2012 [http://aeronav.faa.gov/index.asp?xml=aeronav/applications/d_tpp; accessed June 7, 2012].

activity. DAL is classified as a large-hub commercial service airport in the NPIAS.[26] The airport has six runways, described in **Table 1-1**. Currently DAL IFR arrivals may be assigned one of 6 conventional STARs depending upon where they enter the terminal airspace. Departing aircraft may be assigned one of 14 conventional SIDs.[27]

Approximately 87 percent of all IFR traffic within the North Texas Metroplex area operates at the major Study Airports. As shown in **Table 1-2**, in 2011, the combined major and satellite Study Airports IFR traffic is 77 percent of all traffic that departed or landed under FAA control in or out of the North Texas Metroplex area (specifically within the D10 TRACON controlled airspace).

Table 1-2 Distribution of 2011 IFR Traffic under FAA Control for Study Airports in D10

Airport	Itinerant IFR Operations	Percent of Itinerant Total Operations
Dallas/Fort Worth International Airport (DFW)	644,630	69%
Dallas Love Field Airport (DAL)	165,205	18%
Addison Airport (ADS)	32,686	3%
Fort Worth Alliance Airport (AFW)	29,602	3%
Fort Worth Meacham International Airport (FTW)	27,678	3%
Denton Municipal (DTO)	8,618	1%
Collin County Regional Airport at McKinney (TKI)	7,556	1%
Arlington Municipal Airport (GKY)	6,947	1%
Dallas Executive (RBD)	5,421	1%
Fort Worth Spinks (FWS)	2,796	0%
Fort Worth Naval Air Station JRB/Carswell Field (NFW)	3,573	0%
Total IFR Operations	934,712	100%
Total Study Area Operations (IFR & VFR)	1,217,990	77% (IFR Percent)

Note: Sorted from highest IFR operations to lowest

Source: FAA Air Traffic Activity Data System (ATADS), https://aspm.faa.gov/opsnet/sys/Main.asp?force=atads (accessed June 28, 2012); NFW, Air Traffic Activity Report provided by the Base: NFW Itinerant and IFR Operations Estimated from Radar; data Sorted by IFR Counts

Prepared by: Harris Miller Miller & Hanson Inc., February 2013

1.4.2 Major Study Airport Runway Operating Configurations

The major Study Airports often operate under several different runway operating configurations depending on conditions such as weather, prevailing wind, and air traffic conditions. As a result, it is possible for the runway ends used for arrivals and departures to change several times throughout a day. ATCT controllers at these airports generally use two different runway operating configurations, and each runway operating configuration may designate primary and secondary arrival and departure runway ends for each configuration. **Exhibits 1-9** and **1-10** illustrate the primary runway operating configurations at DFW and DAL.

[26] Federal Aviation Administration, Report of the Secretary of Transportation to the United States Congress Pursuant to Section 47103 of Title49, United States Code, National Plan of Integrated Airport Systems (NPIAS), 2011-2015, Appendix B: State Maps.

[27] Department of Transportation, Federal Aviation Administration. Digital-Terminal Procedures. April 5, 2012 (http://aeronav.faa.gov/index.asp?xml=aeronav/applications/d_tpp; accessed June 7, 2012).

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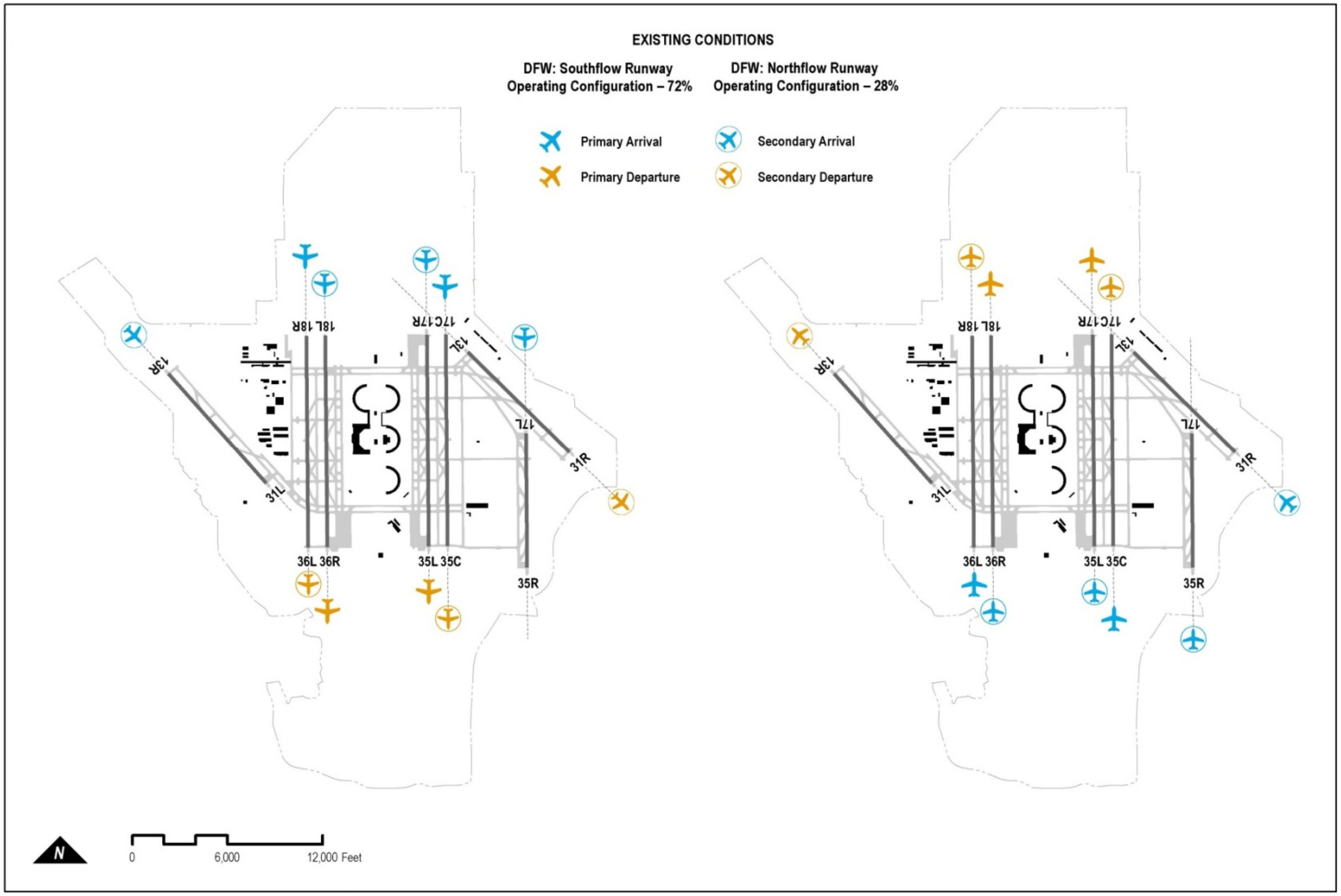
Exhibit 1-9 DFW Operating Configurations



Source: 2011 PDARS Data
Prepared by: Harris Miller Miller & Hanson Inc., 2013

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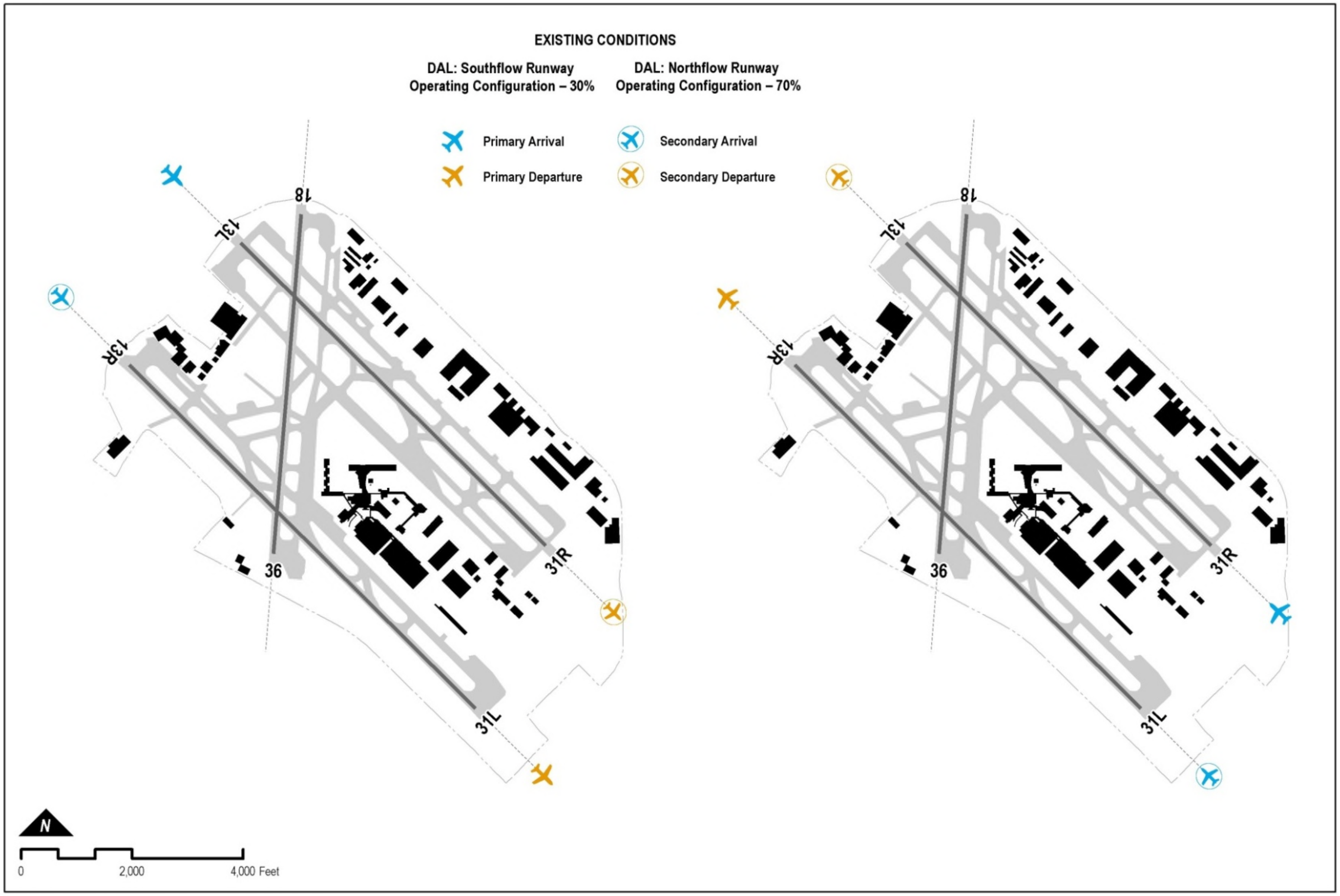
Exhibit 1-10 DAL Operating Configurations



Source: 2011 PDARS Data
Prepared by: Harris Miller Miller & Hanson Inc., 2013

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2 Purpose and Need

As discussed in Chapter 1, the FAA Modernization and Reform Act of 2012 ("the Act") was enacted in February 2012 to help modernize the nation's air transportation system. Among other provisions, the Act requires the implementation of performance-based airspace procedure enhancements at 35 of the nation's busiest airports[28] and at any medium or small hub airports located within the same Metroplex area as determined by the FAA Administrator. The Act also requires that all performance-based procedures be certified, published, and implemented by June 30, 2015. Therefore, the purpose of the FAA's Proposed Action is to comply with this federal mandate. Accordingly, the Federal Aviation Administration (FAA) proposes to increase the efficiency of the North Texas Metroplex airspace through the implementation of area navigation (RNAV) defined Instrument Flight Procedures (IFPs)[29] that improve upon existing, but less efficient ground-based and/or radar vector procedures.[30]

2.1 The Need for the Proposed Action

In the context of an EA, "need" refers to the problem that the Proposed Action is intended to resolve. The problem in this case is the reliance on land-based or conventional NAVAID technology in the North Texas Metroplex, which results in a less efficient airspace system when compared to one based on RNAV technology. This is due to the use of older NAVAID technology when newer RNAV technology is readily available. As described in Chapter 1, the majority of commercial aircraft operating in the North Texas Metroplex are RNAV equipped; however, most procedures currently used in the North Texas Metroplex are conventional and rely upon ground-based NAVAIDs. Because conventional procedures cannot provide more predictable controls inherent in RNAV procedures, such as specific speeds or altitudes, controllers use vectoring and speed adjustments to manage traffic. This leads to increased controller and pilot workload. By contrast, RNAV procedures are free of such lateral and vertical flight path limitations typical of conventional procedures.

This inefficient use of available technology impedes FAA's ability to meet one of its primary missions as mandated by Congress – to provide for the efficient use of airspace. Furthermore, as discussed in Section 1.2.6.1, RNAV technology can add efficiency to an air traffic system with enhanced predictability, flexibility, and route segregation.

The following sections describe the problem in detail followed by a discussion of the causal factors that have contributed to the problem. A detailed explanation of the technical terms and concepts used in this chapter can be found in Chapter 1, *Background*.

2.1.1 Description of the Problem

Many existing Standard Instrument Departure (SID) and Standard Terminal Arrival Route (STAR) procedures require aircraft to use ground-based NAVAIDs to navigate to and from

[28] The 35 airports are identified under the Act as Operational Evolution Partnership (OEP) airports. OEP airports are commercial U.S. airports with significant activity. These airports serve major metropolitan areas and also serve as hubs for airline operations. More than 70 percent of U.S. passengers move through these airports.

[29] Instrument Flight Procedures (IFP) - Instrument flight procedures specify standard routings, maneuvering areas, flight altitudes, and visibility minimums for instrument flight rules (IFR). These procedures include airways, jet routes, off-airway routes, Standard Instrument Approach Procedures (SIAP(s)), Standard Instrument Departure Procedures/ Departure Procedures (SID(s))/ DP(s)), and Standard Terminal Arrival Routes (STAR(s)). (FAA Order 8200.1C United States Standard Flight Inspection Manual).

[30] "Procedure" is a predefined set of guidance instructions that define a route for a pilot to follow.

air carrier and General Aviation (GA) airports in the North Texas Metroplex. As discussed in Section 1.2.6.1, *RNAV*, conventional procedures are less accurate because of radio signal limitations that can arise between NAVAIDs and aircraft due to factors such as terrain. As a result, ground-based NAVAID procedures require large areas of clearance on either side of a route's main path to account for potential obstructions. Furthermore, conventional procedures are dependent upon where ground-based NAVAIDs are located which can result in less efficient routing. Because conventional procedures are less accurate, the actual location of an aircraft both laterally and vertically, can be less predictable for both ATC and pilots.

The lack of accuracy and predictability requires ATC to use aircraft management tools and coordination techniques such as speed control, level flight segments, and vectoring to guide aircraft. These tools and coordination techniques are further discussed in Section 1.2.2., *Air Traffic Control within the National Airspace System*. Applying these tools and techniques without a more precise means to predict exactly where aircraft are located along an assigned procedure is complex. In most situations, these tools and techniques lead to less efficient aircraft operations and inefficient use of airspace. For example, Air Traffic Control (ATC) may issue instructions requiring an aircraft to level off during climb and descent to prevent conflicts with other aircraft. This leads to increased fuel burn and pilot/controller workload. Furthermore, more frequent communications may result in lag time between command and response and may lead to less precise flight paths. As a result, more airspace must be protected to allow aircraft the latitude to operate, leading to less efficient and less flexible operations.

The lack of precision resulting from the use of ground-based technology also lowers levels of predictability and accuracy and requires ATC to issue additional instructions to pilots, again increasing pilot/controller workload. Combined, these factors form the basis for the problem within the North Texas Metroplex.

The lack of RNAV SIDs and STARs adversely affects FAA's ability to efficiently manage available airspace. Therefore, the problem is the inability to provide additional efficiency afforded by RNAV technology. **Table 2-1** presents the number of currently available standard instrument procedures dependent upon conventional navigation (radar vectors or ground-based NAVAIDs), the number of procedures dependent upon RNAV, and the total number of standard instrument procedures, unique to an individual airport or shared by multiple airports.

Table 2-1 Currently Available Standard Instrument Procedure Counts

Airport	Conventional Procedures	RNAV Procedures	Total Unique (Shared) Standard Procedures
KDFW	BONHAM FIVE, BOWIE ONE, CEDAR CREEK SIX, COYOTE FIVE, DALLAS NINE, DUMPY THREE, GARLAND THREE, GLEN ROSE NINE, HUBBARD SIX, JACKY FOUR, JAGGO THREE, JONEZ FOUR, JOE POOL FOUR,	AKUNA FOUR, ARDIA FOUR, BLECO FOUR, CEOLA FIVE, CLARE THREE, DARTZ FOUR, FERRA FIVE, GRABE FOUR, JASPA THREE, LOWGN FOUR, NEYLN THREE, NOBLY FOUR, PODDE FOUR, SLOTT FOUR, SOLDO THREE,	25 (13)

Airport	Conventional Procedures	RNAV Procedures	Total Unique (Shared) Standard Procedures
	JUMBO THREE, KEENE SIX, KINGDOM SEVEN, MASTY TWO, TEXOMA ONE, TRI-GATE SIX, WILBR THREE, WORTH SIX, WYLIE FIVE	TRISS FOUR	
KDAL	BACHMAN SIX, BOWIE TWO, COYOTE FIVE, DALLAS NINE, DUMPY THREE, FINGR THREE, GARLAND THREE, GLEN ROSE NINE, GREGS SIX, HUBBARD SIX, JOE POOL FOUR, KINGDOM SEVEN, KRUMM FOUR, KNEAD SIX, LOVE TWO, TEXOMA ONE, TRINITY SIX, VENUS SEVEN, WORTH SIX, WYLIE FIVE	None	5 (15)
All Satellites	DALLAS NINE, DODJE THREE, GARLAND THREE, HUBBARD SIX, JOE POOL FOUR, KINGDOM SEVEN, TEXOMA ONE, WORTH SIX, WYLIE FIVE	None	1 (8)
East Satellites	DUMPY THREE, FINGR THREE, GLEN ROSE NINE, GREGS SIX, JONEZ FOUR*, KNEAD SIX	None	0 (6)
West Satellites	MOTZA SIX, SASIE TWO, SLUGG SIX	None	3 (0)
Total	17 (17)	16 (0)	34 (16)

Table Notes:
Counts in parentheses represent procedures shared by more than one airport.

Airports

4T2 - Kenneth Copeland	DFW- Dallas Fort Worth International	GKY – Arlington Municipal	NFW- Fort Worth Naval Air Station Joint Reserve Base/Carswell Field
50F- Bourland Field	DTO- Denton Municipal	GPM – Grand Prairie Municipal	RBD-Dallas Executive
ADS- Addison Airport	F41- Ennis Municipal	HQZ – Mesquite Metro	Sats – Satellite Airports**
AFW- Alliance Forth Worth	F46- Rockwall Municipal	JWY – Mid-Way Regional	TKI – Collin County Regional at McKinney
CPT-Cleburne Municipal	FTW- Fort Worth Meacham International	LNC – Lancaster Regional	WEA – Parker County
DAL-Dallas Love Field	FWS – Fort Worth Spinks	LUD – Decatur Municipal	

** ADS only*
** East Satellites consist of the following airports: ADS, F41, F46, HQZ, JWY, LNC, RBD and TKI.

West Satellites consist of the following airports: AFW, CPT, DTO, FTW, FWS, GKY, GPM, LUD, NFW, WEA, 4T2 and 50F.

Source: National Flight Data Center (NFDC), 4/5/2012 charting cycle, accessed 3/12/2012.
Prepared By: HMMH Inc, July 2013.

To take full advantage of current RNAV technology, the number of RNAV procedures should be close to the total number of existing procedures. For the North Texas Metroplex, as of March 2012, there were 50 standard instrument procedures, 32 percent of which were RNAV based (16 unique procedures). The conventional procedures do not segregate traffic efficiently due to dependence on conventional navigation using ground-based NAVAIDs or a mix of conventional and RNAV navigation. Section 2.1.2 describes the current factors that lead to limited means of providing additional efficiency.

It is important to note that a key design constraint is safety. Any proposed change to a procedure must not degrade safety and must, if possible, should enhance safety. Current published procedures do not include any safety issues, because published procedures must have already met defined safety criteria; accordingly, the Proposed Action reflects changes aimed at improving efficiency while maintaining safety.

2.1.2 Causal Factors

A problem (or need) is best addressed by examining the circumstances or causal factors that gave rise to the problem. As previously described, the problem for the North Texas Metroplex is the prevalence of existing SID and STAR procedures that are dependent on older ground-based NAVAID technology, which has led to inefficiencies in the North Texas Metroplex airspace.

The need for the Proposed Action can be better understood and addressed based on the specific factors causing the problem.

Three key factors were identified by the North Texas Metroplex Study Team as causes for lower efficiency in the North Texas Metroplex air space:

- Lack of flexibility in the efficient transfer of traffic between the en route and terminal area airspace;
- Complex converging interactions between arrival and departure flight paths; and,
- Lack of predictable standard routes defined by procedures to/from airport runways to/from en route airspace.

The following sections describe these three causal factors in detail.

2.1.2.1 Lack of Flexibility for the Efficient Transfer of Traffic between the En Route and Terminal Area Airspace

This section describes the relationship between the flexibility in transfers of traffic between the en route and terminal airspace and the efficiency of operations. Flexibility allows ATC to plan and adapt to traffic and weather demands, which change frequently within any given hour. Even though flights are scheduled, delays in other regions of the U.S. or severe weather along an aircraft's route may cause aircraft to enter or exit the en route and terminal area airspace at times other than those previously scheduled. Controllers require options to manage dynamic traffic demand.

Elements such as additional entry and exit points, individual procedures for each Study Airport, and the ability to diverge aircraft (turn aircraft on different headings away from each other) earlier, reduces the amount of vectoring needed to merge traffic and maintain safe separation. These elements also provide additional options when one procedure is too busy to accommodate additional traffic.

The "four corner post" airspace design presents the most efficient way to transfer aircraft to an airport from an entry gate and from an airport to an exit gate. In a typical four-corner post system, aircraft depart the terminal airspace through exit gates to the north, east, south, and west. Aircraft arrive at the terminal airspace through entry gates to the northeast, southeast, southwest, and northwest (see Exhibit 2-1).

Need for Separation of Entry Points

The limited number of terminal airspace entry points in the North Texas Metroplex, results in gaps in arrival flows to the Study Airports within the D10 terminal area airspace[31] to maintain safe separation between merging aircraft, controllers must create sufficient gaps between arriving aircraft to safely line up multiple arrival flows. For example, the arrival flows for DFW and DAL must be merged over two of the four corner posts (see Exhibit 2-1). At times due to the timing and sequence of the arriving aircraft, the gaps created by controllers result in unused arrival slots. Consequently merging flows for the two major study airports, that could otherwise operate independently with dedicated arrival procedures, results in reduced efficiency.

Tailored Departure Point locations (known as "floating fixes") to Correlate with Specific Flow Conditions

Departure flow inefficiencies under current airspace design are a result of the location of exit points being static regardless of the flow conditions at airports inside of D10. To illustrate this point, when in south flow, a number of aircraft departing for southern destinations are flown north to a specific departure fix before being routed back south again. As a result, departing aircraft are forced to fly miles off optimal course, adding miles flown. Most of the extra mileage could have been avoided if the departure fix was located further south while in south flow. Redesigning the procedures to tailor the exit point locations (known as "floating fixes") to correlate with specific flow conditions would enable controllers to continue to organize the traffic into departure streams. This would facilitate orderly air traffic management as aircraft transition from terminal to en route airspace, and reduce overall miles flown.

The following sections further discuss flexibility issues specific to the terminal area airspace entry and exit points.

Entry Points

Exhibit 2-1 depicts the entry points into the D10 terminal airspace where control is transferred from en route airspace (ZFW) to terminal airspace (D10). These entry points are often shared by aircraft arriving at different Study Airports. **Table 2-2** lists the STAR procedures and associated transition points for the major Study Airports.

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[31] Flow: multiple aircraft operations assigned to a procedure that operate along the same route, and includes variation in aircraft location over the ground. A traffic flow is typically defined by several days of radar flight tracks. Traffic flows may also be represented by corridors based on a frequently traveled area characterized by one or more well-traveled routes.

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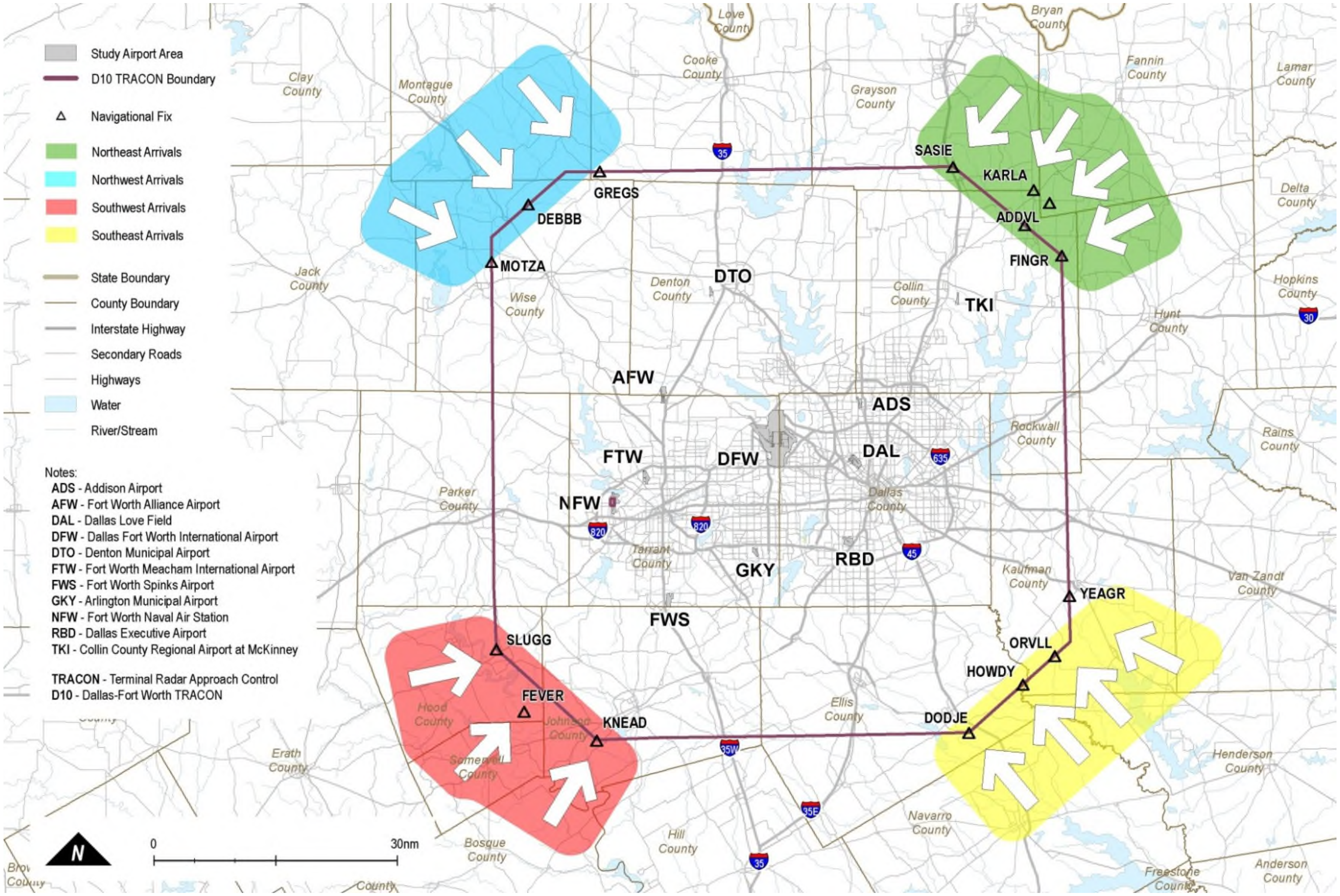
Exhibit 2-1 Terminal Airspace Control Transfer Areas – Arrivals



Source: National Flight Data Center (NFDC), 4/5/2012 charting cycle, accessed 3/12/2012
Prepared By: HMMH Inc, July 2013.

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Table 2-2 STAR Arrival Entry Points and Arrival Transitions

Airport	Procedure Name (STAR)	Corner Post	Arrival Metering Fix (Entry Point)	Arrival Transitions
DFW	BONHAM FIVE	Northeast	KARLA	MCALESTER (MLC) VOR, TULSA (TUL) VOR, FORT SMITH (FSM) VOR, LITTLE ROCK (LIT) VOR, TEXARKANA (TXK) VOR, PARIS (PRX) VOR,
DFW	WILBR THREE	Northeast	ADDVL	MLC, TUL, FSM, LIT, TXK, PRX
DFW (ATC Assigned) & ADS	JONEZ FOUR	Northeast	SASIE	JONEZ Intersection
DAL/East Satellite Airports	FINGR THREE	Northeast	FINGR	ARDMORE (ADM) VOR, WILL ROGERS (IRW) VOR, BONHAM VOR (BYP),MLC, TUL, FSM, LIT, TXK, PRX
West Satellite Airports	SASIE TWO	Northeast	SASIE	ADM, BYP, MLC, TUL, FSM, LIT, TXK, PRX
DFW (Propeller) & DAL/East Satellite Airports	DUMPY THREE	Southeast	YEAGR	ELM GROVE (EMG) VOR, GREGG COUNTY (GGG) VOR, HERRI INT, QUITMAN (UIM) VOR, SIDON (SQS) VOR, JACKSON (JAN) VOR, ALEXANDRIA (AEX) VOR, MONROE (MLU) VOR,
DFW (Propeller) & DAL/East Satellite Airports	DUMPY THREE	Southeast	ORVLL	HUMBLE (IAH) VOR, LEONA (LOA) VOR, CENTEX (CWK) VOR, CEDAR CREEK (CQY), NAVYS INT, WACO (ACT) VOR
DFW	CEDAR CREEK SIX	Southeast	HOWDY	ACT, EMG, GGG, HERRI INT, UIM, SQS, JAN, AEX, IAH, LOA, CWK, MLU, NAVYS INT
DFW (ATC Assigned)	JAGGO THREE	Southeast	DODJE	JAGGO Intersection
Satellite Airports	DODJE THREE	Southeast	DODJE	UIM, SQS, JAN, AEX, IAH, LOA, CWK, CQY, EMG, GGG, HERRI INT, MLU, NAVYS INT, ACT
DFW DAL/East Satellite Airports	GLEN ROSE NINE	Southwest	FEVER	CWK, SAN ANTONIO (SAT) VOR, WINK (INK) VOR, GEENI INT, JUMBO INT, ACT,
DFW (ATC Assigned)	JUMBO THREE	Southwest	KNEAD	CWK, SAT
DAL/East Satellite Airports	KNEAD SIX	Southwest	KNEAD	ACT, TEMPLE (TPL) VOR, CWK, SAT, INK, ABILENE (ABI) VOR, JEN, JUMBO INT
West Satellite Airports	SLUGG SIX	Southwest	SLUGG	ACT, CWK, SAT, INK, ABI, JEN, JUMBO INT
DFW & DAL	BOWIE ONE	Northwest	DEBBB	GUTHRIE (GTH) VOR, TEXICO (TXO) VOR, PANHANDLE (PNH) VOR, BORGER (BGD) VOR, IRW, TUL, WICHITA FALLS (SPS) VOR

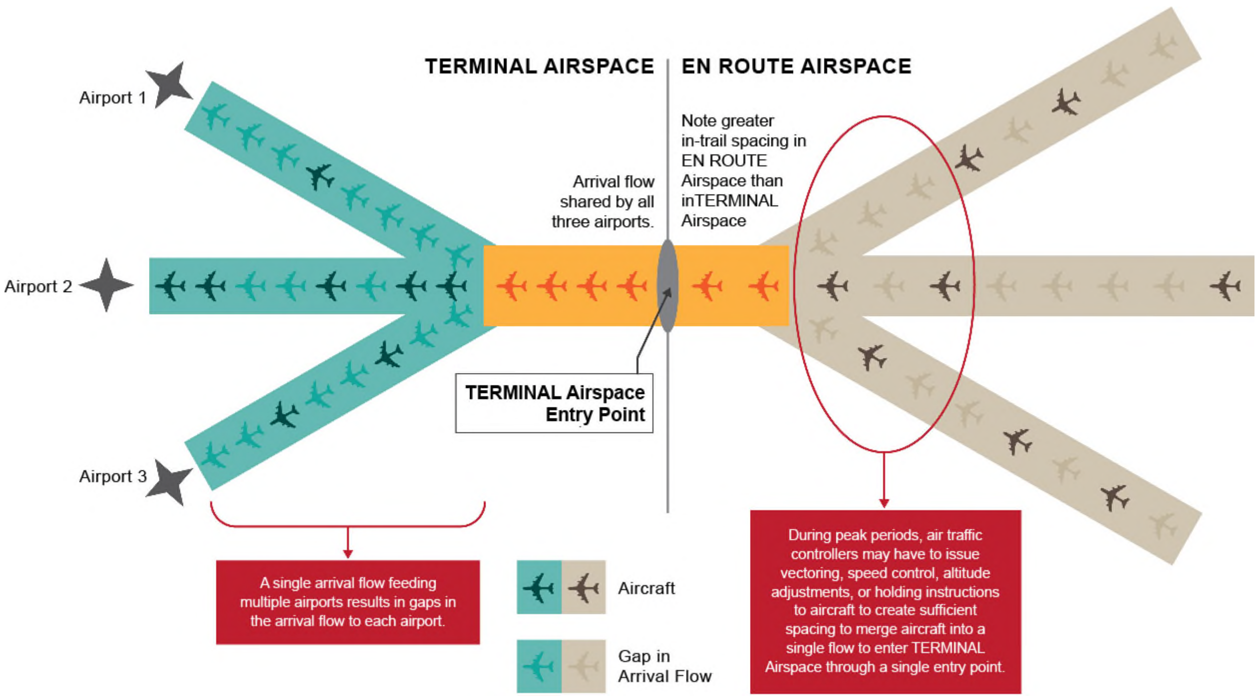
Airport	Procedure Name (STAR)	Corner Post	Arrival Metering Fix (Entry Point)	Arrival Transitions
DAL/East Satellite Airports	GREGS SIX	Northwest	GREGS	GTH, TXO, PNH, BGD, HYDES INT, IRW, TUL, SPS, BOWIE (UKW) VOR
DFW (ATC Assigned)	MASTY TWO	Northwest	GREGS	HYDES INT, TUL, SPS, IRW
West Satellite Airports	MOTZA SIX	Northwest	MOTZA	GTH, TXO, PNH, BGD, IRW, TUL, UKW, SPS

Source: National Flight Data Center (NFDC), 4/5/2012 charting cycle, accessed 3/12/2012
Prepared by: Harris Miller Miller & Hanson Inc., November 2012

The limited number of entry points results in challenges that affect the efficient management of aircraft traffic. Given the geographic location of the North Texas Metroplex area, the greatest proportion of aircraft enters the terminal airspace from the northeast followed by the northwest and southwest. Approximately 33 percent of all traffic arriving to the North Texas Metroplex passes through the northeast entry points, 26 percent passes through the southeast entry point, 25 percent passes through the northwest entry point, and 16 percent passes through the southwest entry point.[32] Given the limited number of entry points, airspace congestion occurs at the busiest entry points during periods of high demand. The resulting congestion requires the issuance of air traffic instructions such as vectoring, controlling speed, holding aircraft, leveling off aircraft, or rerouting aircraft to other entry points, which, as described in Section 2.1.1, increases pilot and controller workload, increases complexity for both controllers and pilots, and can result in delays.

Exhibit 2-2 illustrates how aircraft arrivals are sequenced in the en route airspace and then merged to enter terminal airspace at a single point.

Exhibit 2-2 Illustration of Single Terminal Airspace Entry Point and Single Arrival Flow with Traffic Sequenced to Multiple Airports



Source: Federal Aviation Administration, July 2012.
Prepared by: ATAC Corporation, June 2012.

Aircraft destined for each of the Study Airports share standard instrument arrival procedures and must enter the terminal airspace on a single arrival flow through one of the D10 entry points. Aircraft are then split from a single arrival flow by ATC and receive instructions for final approaches to the various runways at the Study Airports. The following section provides specific examples of these interactions within the North Texas Metroplex area.

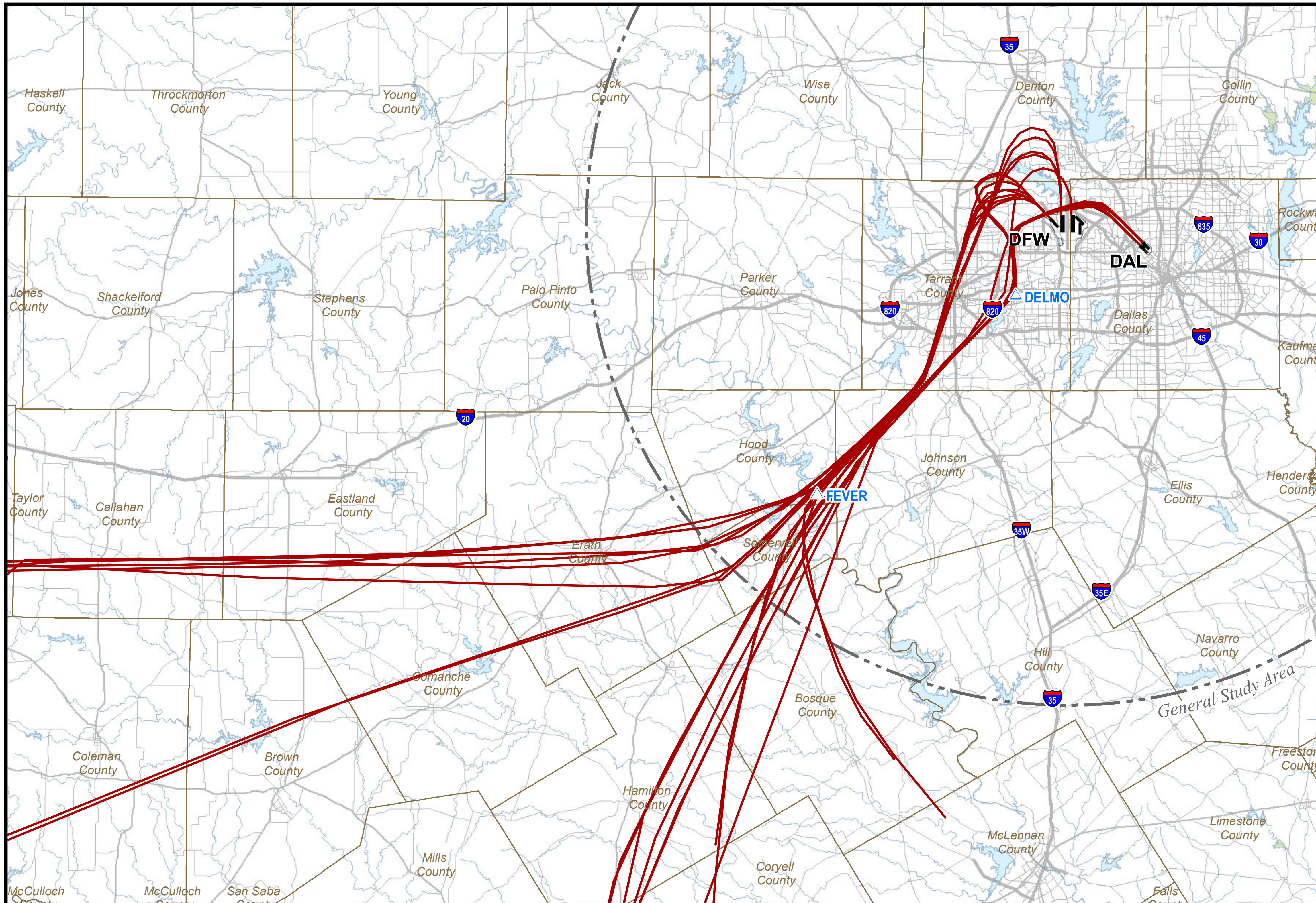
[32] PDARS 2011 Radar data analysis, November, 2012

Merging arrival streams at the arrival metering fix (entry point) FEVER:

As depicted in **Exhibit 2-3** below, in south flow, to enter the D10 terminal airspace over the southwest corner post for landing at DFW and DAL, multiple arrival streams use a single STAR, the GLEN ROSE NINE arrival procedure. This instrument flight procedure (IFP) has traffic merging at the FEVER arrival metering fix, only to be separated again at DELMO waypoint for landing at the individual airports. The inefficiencies of such design were described in the preceding paragraphs. Furthermore, a shared STAR prevents the use of automated traffic management tools that examine, forecast, and assist in efficient sequencing of near-term arrival demand.

Exit Points

Exhibit 2-4 depicts the exit points where control is transferred from D10 terminal airspace to ZFW for aircraft departing the North Texas Metroplex airspace. As indicated in **Exhibit 2-4**, there are 16 existing exit points: four to the north, four to the south, four to the west, and four to the east.



LEGEND

- General Study Area
- Airport
- GLEN ROSE NINE Arrival Tracks
- Intersection
- VORTAC
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport

0 30nm

N

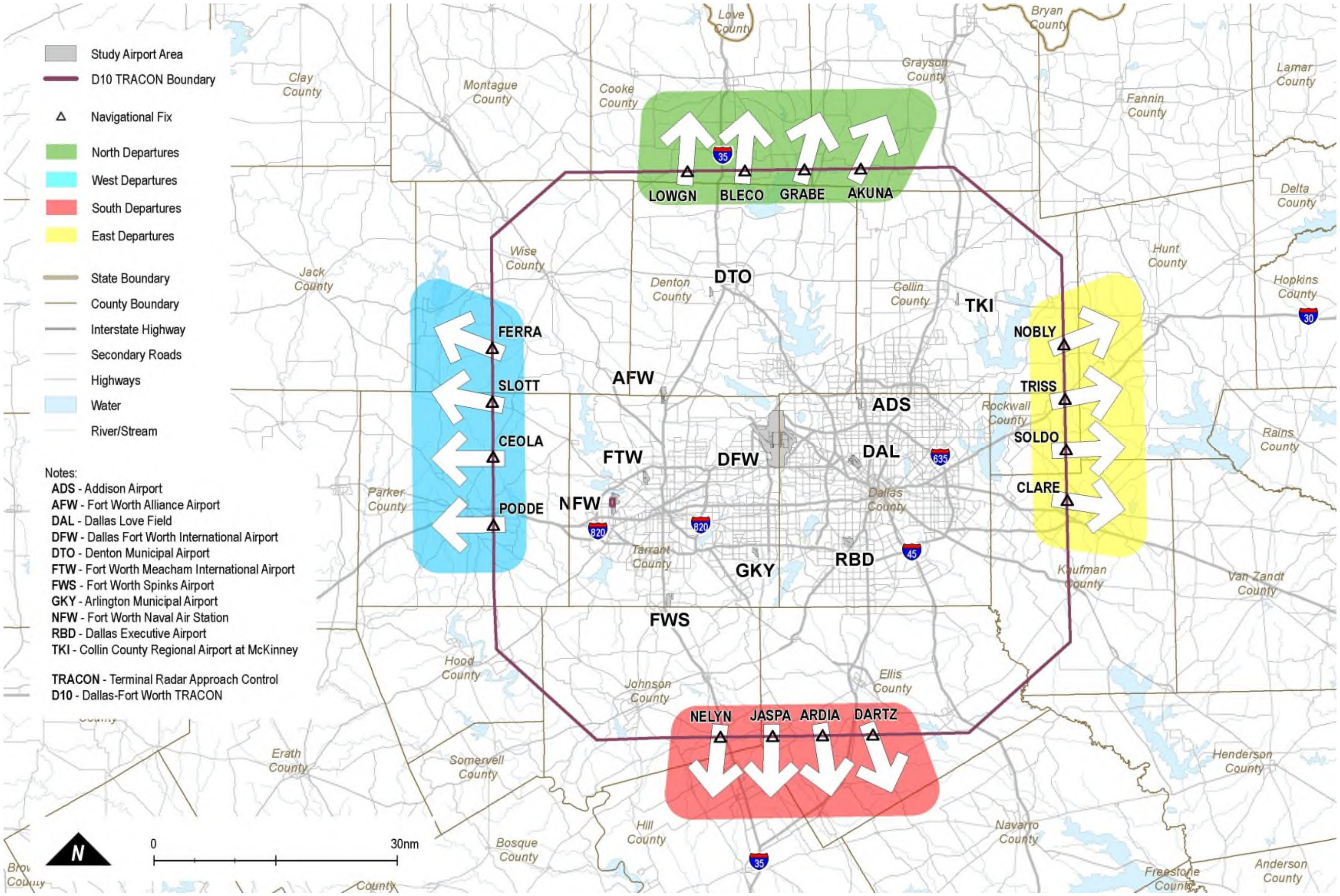
Path: H:\GIS\USA\TX\305220_North_Texas_OAPM\305220_NTx_EA_Exhibit2_3_Exist_DFW_DAL_ARR_Conflict.mxd

Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012; Texas Water Development Board (Reservoirs), October 19, 2012; HMMH Analysis, 2012 (Study Area Boundary); PDARS (Traffic Flow Data); Digital En-Route Supplement (Navigation Fixes);
Prepared By: Harris Miller Miller & Hanson Inc., August, 2013

Exhibit 2-3

Merging and Desegregating Arrival Flows Over a TRACON Entry Point (GLEN ROSE NINE Arrival)

Exhibit 2-4 Terminal Airspace Control Transfer Areas - Departures



Source: National Flight Data Center (NFDC), 4/5/2012 charting cycle
Prepared by: HMMH, November 2012.

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Table 2-3 lists the departure exit points and departure transitions for each SID that serves the North Texas Metroplex airspace. During peak departure periods, controllers must merge departures from multiple Study Airports into a limited number of departure streams due to the limited number of exit points. The exit points are located on the long-sides of the D10/ZFW boundary to separate departure streams from arrival streams coming into the D10 airspace over the corner posts. Merging departing aircraft leads to delays because controllers must frequently employ management tools such as holding departing aircraft on the ground before takeoff to control air traffic sequencing in the surrounding airspace. This directly affects departure efficiency at the Study Airports.

In addition to holding aircraft on the ground, controllers may also assign vectors and level-offs to aircraft during their departure climbs to provide adequate spacing as aircraft are gradually merged into a departure route. The need to merge aircraft into departure routes increases the complexity of managing the terminal airspace and can decrease the efficiency of the airspace. Vectoring can also increase flight distances and reduce predictability, as aircraft are assigned less direct routes which they must continue to follow as they proceed further away from an airport.

Table 2-3 SID Departure Exit Points and Departure Transitions

Airport	Procedure Name (SID)	Boundary Side	Exit Point	Departure Transitions
DFW, DAL, & Satellites	DALLAS NINE	East	**NOBLY, TRISS, SOLDO, CLARE**	LIT, TXK, SQS, MERIDIAN (MEI) VOR, BELCHER (EIC)VOR AND SAWMILL (SWB) VOR
DFW, DAL, & Satellites	GARLAND THREE	East	**NOBLY, TRISS, SOLDO, CLARE**	PRX, TXK, UIM, GREGG COUNTY (GGG) VOR, TYR
DFW, DAL, & Satellites	HUBBARD SIX	East	**NOBLY, TRISS, SOLDO, CLARE**	PRX, TXK, UIM, GGG, TYR
DFW & DAL	WYLIE FIVE	East	**NOBLY, TRISS, SOLDO, CLARE**	LIT, TXK, SQS, MEI, EIC, SWB
DFW	NOBLY FOUR RNAV	East	**NOBLY**	LIT
DFW	TRISS FOUR RNAV	East	**TRISS**	TXK
DFW	SOLDO THREE RNAV	East	**SOLDO**	EL DORADO (ELD) VOR, MEI, UIM, SQS
DFW	CLARE THREE RNAV	East	**CLARE**	EIC, SWB
DAL	BACHMAN SIX	East	**NOBLY, TRISS, SOLDO, CLARE**	LIT, TXK, SQS, MEI, EIC, SWB
DFW	TRI-GATE SIX	Southeast	**N/A**	N/A
DAL (Rwy 13R Only)	TRINITY SIX	Southeast	N/A	N/A
DFW, DAL, & Satellites	JOE POOL FOUR	South	**DARTZ, ARDIA, JASPA, NELYN**	NAVASOTA (TNV) VOR, COLLEGE STATION (CLL) VOR, CWK, SAT
DFW	DARTZ FOUR	South	**DARTZ**	TNV
DFW	ARDIA FOUR	South	**ARDIA**	CLL, ELLVR Intersection
DFW	JASPA THREE	South	**JASPA**	WINDU Intersection
DFW	NELYN THREE	South	**NELYN**	ACT, HOARY Intersection, SAT
DAL (Rwy 13 R Only)	VENUS SEVEN	South	**DARTZ, ARDIA, JASPA, NELYN**	TNV, CLL, CWK, SAT

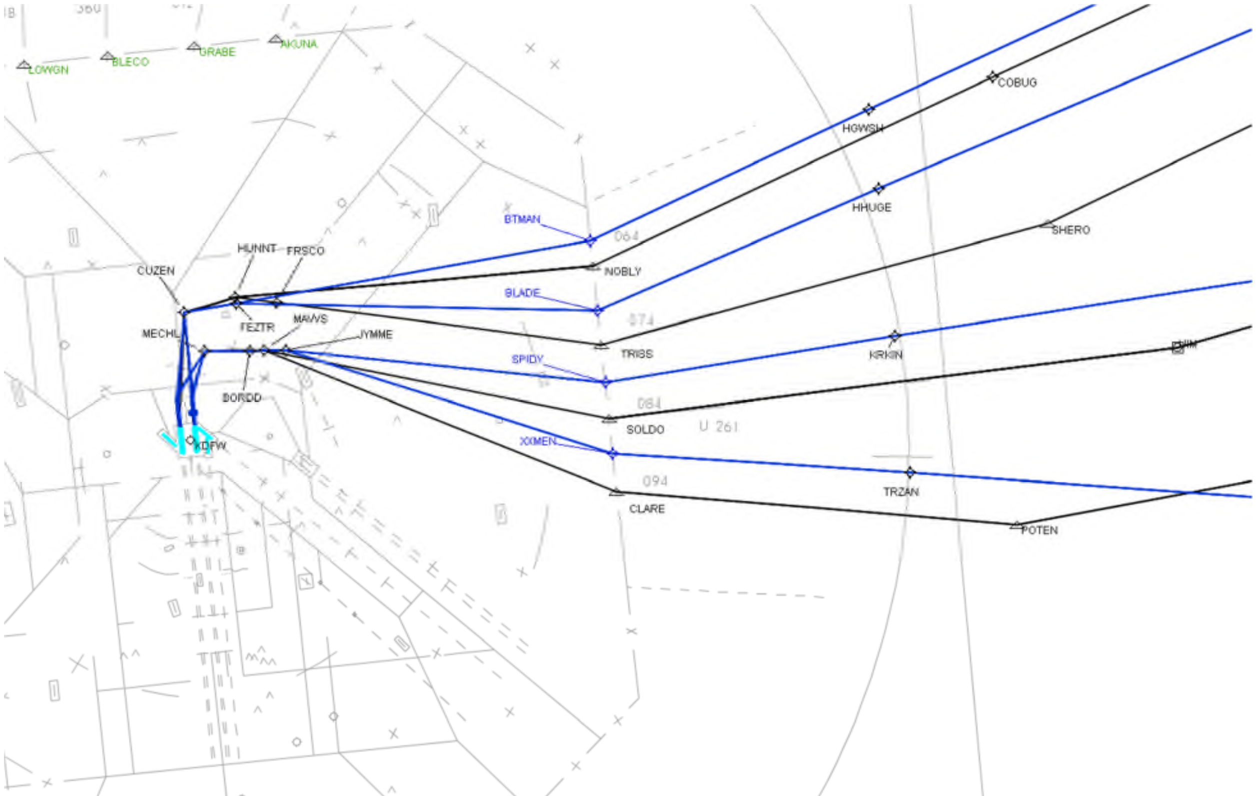
Airport	Procedure Name (SID)	Boundary Side	Exit Point	Departure Transitions
DFW	KEENE SIX	Southwest	**N/A**	N/A
DFW, DAL, & Satellites	WORTH SIX	West	**PODDE, CEOLA, SLOTT, FERRA**	ABI, CNX, TXO, TUCUMCARI (TCC) VOR, PNH
DFW, DAL, & Satellites	KINGDOM SEVEN	West	**PODDE, CEOLA, FERRA**	MILLSAP (MQP) VOR, GTH, SPS
DFW & DAL	COYOTE FIVE	West	**PODDE, CEOLA, SLOTT, FERRA**	ABI, CNX, TXO, TCC, PNH
DFW	POODE FOUR	West	**PODDE**	ABI
DFW	CEOLA FIVE	West	**CEOLA**	CNX, TXO
DFW	SLOTT FOUR	West	**SLOTT**	TCC
DFW	FERRA FIVE	West	**FERRA**	PNH
DAL	LOVE TWO	West	**PODDE, CEOLA, SLOTT, FERRA**	ABI, CNX, TXO, TCC,PNH
DFW	TRI-GATE SIX	Northeast Corner	N/A	**N/A**
DFW, DAL & Satellites	TEXOMA ONE	North	**LOWGN, BLECO, GRABE, AKUNA**	ROLLS INTERSECTION, IRW, TUL, OKMULGEE (OKM) VOR, MLC
DFW	LOWGN FOUR	North	**LOWGN**	ROLLS
DFW	BLECO FOUR	North	**BLECO**	IRW, TUL
DFW	GRABE FOUR	North	**GRABE**	OKM
DFW	AKUNA FOUR	North	**AKUNA**	MLC
DAL	KRUMM FOUR	North	**LOWGN, BLECO, GRABE, AKUNA**	ROLLS, IRW, TUL, OKM, MLC

*Notes: **Bold** indicates shared exit points.*

Source: National Flight Data Center (NFDC), 4/5/2012 Charting cycle
Prepared by: HMMH, November 2012

The location of exit points being static regardless of the flow conditions at airports inside of D10 further limits the efficiency of departure flows. Redesigning the procedures to tailor the exit point locations to correlate with specific flow conditions (known as “floating fixes”) would enable controllers to continue to organize the traffic into departure flows, facilitating orderly air traffic management as aircraft transition from terminal to en route airspace, while reducing overall miles flown. **Exhibit 2-5** shows that, in a north flow, aircraft would fly to the blue waypoints as opposed to today’s boundary fixes shown in black (BTMAN vs. NOBLY, BLADE vs. TRISS, etc.,). In doing so, the aircraft would not fly as far south before turning back north as they do with today’s RNAV SIDs.

Exhibit 2-5 Floating Fixes in North Flow



Source: MITRE Corporation
Prepared by: MITRE analysis, email 8/12/2013

In short, sharing entry and exit points for the D10 airspace between multiple flows into several airports results in the following inefficiencies:

- The need to merge arriving aircraft into a single arrival flow at each entry point can increase flight time and distances.
- Gaps in the final arrival flows do not allow for the formation of a constant stream of aircraft to the Study Airports. This prevents the full use of the potential arrival throughput at the Study Airports.
- Holding aircraft on the runway to create the necessary gaps in the departure routes leads to departure delays at all Study Airports, especially during peak travel periods. This prevents full use of the potential departure throughput at the Study Airports.
- The need for additional controller-to-pilot communication to issue the variety of instructions required to merge and desegregate the flow of aircraft adds to the workload of both controllers and pilots.

2.1.2.2 Complex Converging Interactions between Arrival and Departure Flight Paths

This section provides three general examples of complex converging interactions between flight routes, followed by specific demonstrations of these examples in the North Texas Metroplex. In some areas, the required separation between flight paths prevents efficient use of the airspace. Examples of such interactions and complexities are presented below.

1. **Many arrival and departure routes converge or cross.** This is necessary to move aircraft to an airport from the appropriate entry point and from an airport to the appropriate exit point. To maintain appropriate separation between aircraft, the controller issues altitude assignments that rely on vertical distances of 1,000 ft. or more. Crossing routes include level flight segment “bridges” where, at key points, aircraft stop their descent or climb and level off to allow departures to cross and climb away from the departing aircraft’s path. Aircraft may then fly at this altitude until they have moved away from other aircraft crossing the same area.
2. **ATC typically splits arrival and departure control responsibilities.** Control of aircraft is passed on from one controller to the next as the aircraft progresses through airspace. Vertical separation between aircraft arrivals and departures is maintained primarily through defined ceiling and floor altitudes. An arriving aircraft cannot descend until the aircraft is clear of the dimensional airspace reserved for departures. When an aircraft clears one airspace area, it is transferred by a controller to the next airspace area controlled by another controller. During this handoff between controllers, aircraft may have to level off until the next controller acknowledges control and the aircraft is able to resume its climb.
3. **Two aircraft must be separated laterally by at least three nautical miles (NM) in the terminal environment, and 5 NM in the en route airspace setting**. This separation is achieved in the terminal environment by keeping aircraft at least 1.5 NM (or 2.5 NM in the en route setting) from an airspace boundary assigned to a specific air traffic controller prior to handoff. As conventional navigation is not as accurate as RNAV, two to three nautical mile buffers from the boundary are used to ensure the 1.5 (or 2.5) NM distances are always met. These limitations create unusable airspace.

The scenarios described above require additional verbal communication among air traffic controllers or between controllers and pilots, thus increasing pilot/controller workload and system complexity. In addition, vectoring and level flight segments reduce airspace efficiency and flight efficiency. Vectoring and interrupted climbs and descents (i.e., level flight segments) add distance and time to flights operating in the North Texas Metroplex.

The following sections provided more specific examples of these interactions within the North Texas Metroplex area.

DFW and DAL Proximity and Conflicting Runway Alignment

Performance characteristics of the jet and turboprop aircraft types operating from DFW and DAL, in conjunction with a conflicting runway alignment of these two airports with center points separated by less than 10 NM from each other, presents a separation challenge for controllers. The distance between the departure flight routes from DFW and DAL is insufficient for the airspace to be used efficiently, requiring controllers to carefully observe aircraft activity along the proximate or crossing flight routes to be prepared to actively manage aircraft to maintain safe separation. For example, many departure flight routes from DAL cross over or under departure flight routes from DFW, particularly for operations taking off from south to north at DFW, while operations at DAL are taking off from southeast to northwest.

As previously mentioned air traffic controllers use level flight segments to maintain aircraft separation. A specific instance of this occurs for those aircraft departing DAL that are destined to the south or southwest (e.g., San Antonio) when DFW is operating in a north flow (i.e., takeoffs and landings are occurring from south-to-north). As a result, the southwest bound DAL departures flying a greater distance than would otherwise be required if DFW traffic were not present. The right (clockwise) turn to the south or southwest that is required to avoid the DFW traffic is longer than the more direct left (counterclockwise) turn would be from a northwest takeoff heading.

In other cases, departing aircraft on nearby flight routes will be vectored to ensure safe lateral separation. For example, aircraft departing DAL and taking off from southeast to northwest, but headed eastbound, conflict at times with eastbound departures from DFW. In order to prevent traffic conflicts, DFW aircraft are vectored further toward the north than would otherwise necessary before being allowed to resume their desired course and turning eastbound.

As depicted in **Exhibit 2-6**, during north flow conditions, those DFW departures ultimately headed to the east must delay their turn to the right to avoid converging traffic departing from DAL. During this same flow condition, the DAL departures headed to the southwest are required to turn quickly to the right, as opposed to turning left for a more direct route, to avoid the DFW departures. Issues regarding this interaction include crossing restrictions and level-off requirements, which prevent optimized departures.

Southeast DFW Jet Arrival (Cedar Creek Six) and South DAL Departure (Joe Pool Four) Conflict

Current arrival procedures for aircraft landing at DFW and arriving over the southeast corner post can often present traffic conflicts with southbound DAL departure routes during a south flow condition. As depicted in **Exhibit 2-7**, DFW arrivals from the southeast (in red) interact with DAL departures to the south (in green). Inefficiencies involved in this interaction include required level flight segments and limited use of arrival transitions due to conflicting altitudes. For example: the current JOE POOL FOUR departures from DAL are forced to fly runway heading longer then optimal before turning south in order to avoid overflying DFW landing traffic.

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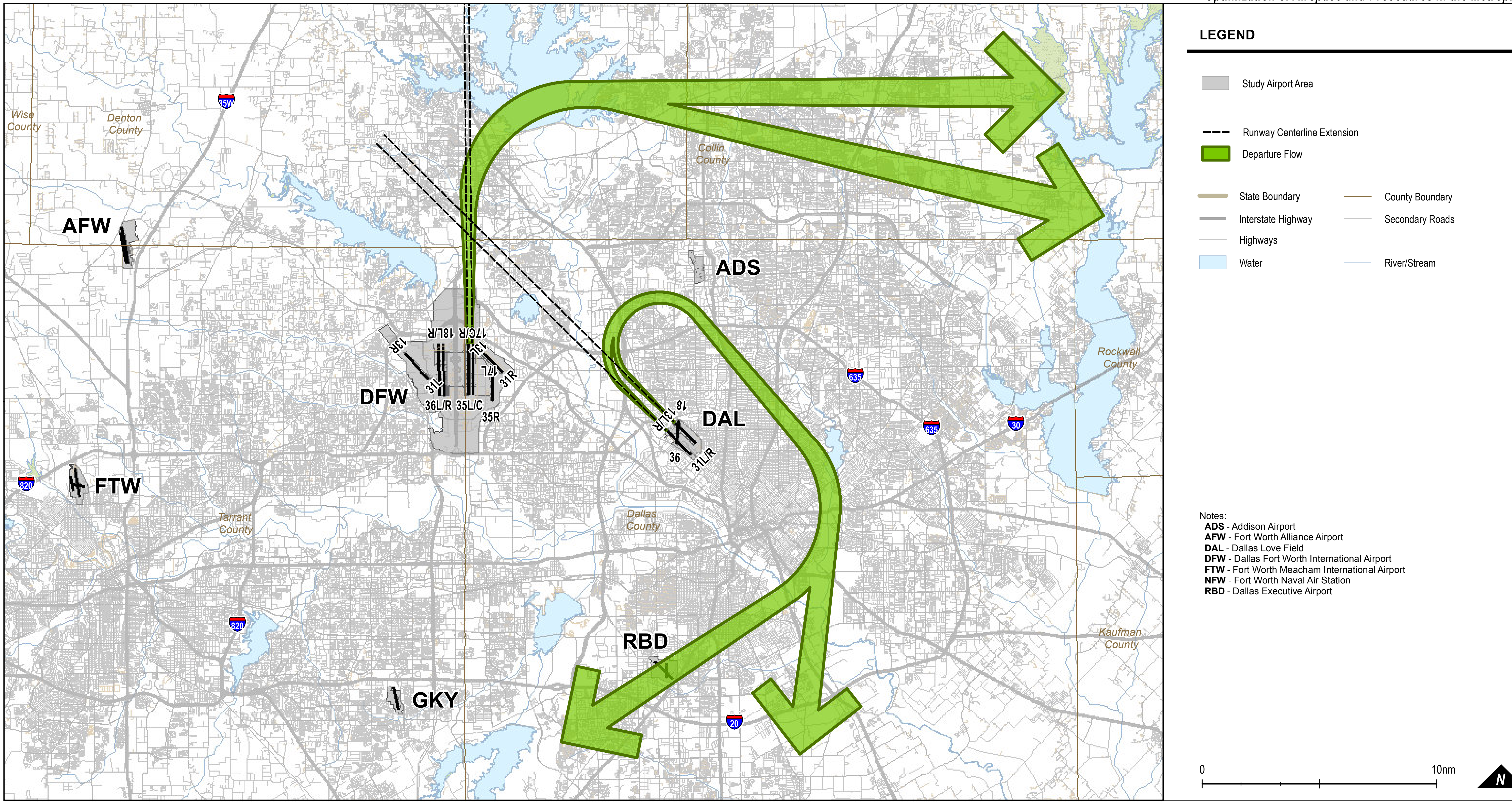
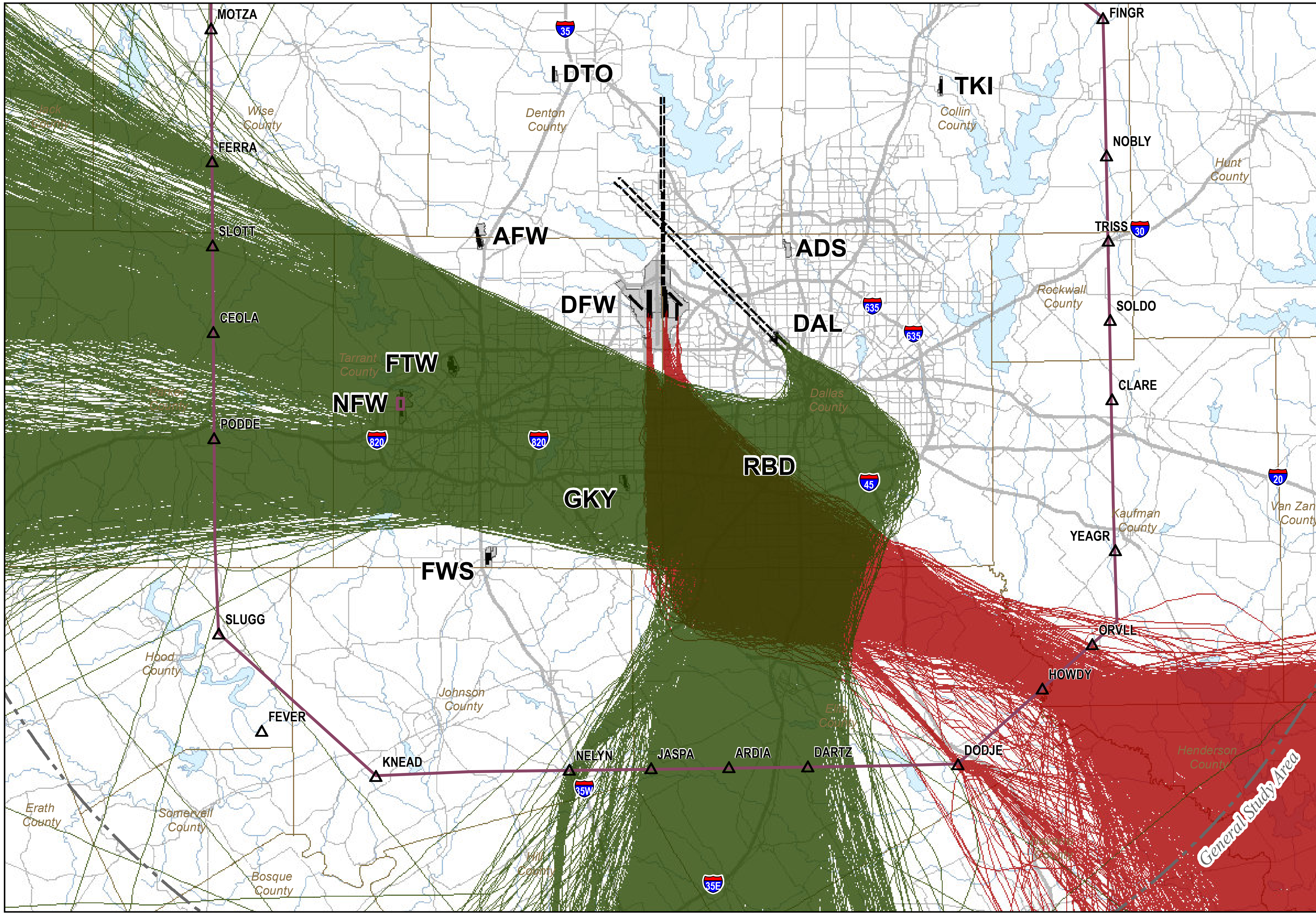


Notes:
ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
FTW - Fort Worth Meacham International Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport

Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012; Texas Water Development Board (Reservoirs), October 19, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 2-6

DFW and DAL Proximity and Conflicting Runway Alignment



LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- Navigational Fix
- DFW Arrival Flight Track from Southeast
- DAL Departure Flight Track to South and West
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012; Texas Water Development Board (Reservoirs), October 19, 2012; HMMH Analysis, 2012 (Study Area Boundary); MITRE (TRACON Boundary), August 22, 2012; PDARS (Traffic Flow Data); Digital En-Route Supplement (Navigation Fixes)
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 2-7

DFW Arrival and DAL Departure Conflicts (Southeast Corner)

2.1.2.3 Lack of Predictable Standard Procedures

This section describes the correlation between the increased use of RNAV procedures and the predictability of aircraft operations. …..Predictability provides pilots and controllers the ability to know ahead of time how, where, and when an aircraft should be operated along a defined route allowing them to better plan airspace use and the control of aircraft in the given volume of airspace. A predictable route may include expected locations (where), altitudes (where and how high), and speeds (how fast and when) at key points. A procedure that provides these elements results in a more predictable route for the pilot and controller.

Aircraft performance and/or piloting technique can vary, and as a result, may also play a factor in reducing predictability. Because conventional procedures are less precise than RNAV procedures and less predictable, controllers will use vectoring as well as instructions governing speed and altitude level-offs to ensure safe vertical and lateral separation between aircraft. As discussed in Section 1.2.6.1, RNAV procedures enable aircraft to follow more accurate and better defined, direct flight routes in areas covered by GPS-based navigational aids. This allows for predictable routes with fixed locations and altitudes that can be planned ahead of time by the pilot and air traffic control. Fixed routes help maintain segregation between aircraft by allowing defined vertical and horizontal separation of traffic. As a result, some routes can be shortened and the need for level-offs can be reduced. This allows for improved use of the airspace. Therefore, the greater the number of RNAV procedures in a Metroplex the greater the degree of predictability.

Table 2-4 summarizes current availability of conventional and RNAV-based procedures for the Study Airports.

Table 2-4 Current Procedures by Type in the North Texas Metroplex

	Current Procedures			
	Conventional		RNAV	
Airport	*Arrival*	*Departure*	*Arrival*	*Departure*
DFW	10	12	0	16
DAL	4	5	0	0
Satellites	3	0	0	0
TOTAL	17	17	0	16

Notes:

1. *Certain conventional navigation SIDs and STARs serve more than one airport. In those cases, an IFP jointly serving DFW and other Study Airports is counted only once, and is shown under the DFW data. An IFP serving jointly DAL and a satellite airport is counted only once, under the DAL data. There are no conventional navigation SIDs that serve only a satellite airport without also serving either DFW or DAL. There are, however, three conventional navigation STARs that serve west side satellite airports without also serving either DFW or DAL.*
2. *There are currently no RNAV STARs published for use at airports in the North Texas Metroplex.*
3. *The only RNAV SIDs currently published for use at airports in the North Texas Metroplex serve DFW.*

Source: National Flight Data Center (NFDC), 4/5/2012 charting cycle
Prepared by: HMMH, November 2012

The following sections describe the three areas - ground path, vertical path, and runway transitions - in which conventional procedures in the North Texas Metroplex result in less predictable air traffic management as compared to RNAV-based procedures. The following sections describe the conditions that reduce predictable air traffic management.

Ground Path

Airports with a significant volume of aircraft operating under Instrument Flight Rules (IFR) need SID and STAR procedures to direct air traffic flows and various runway configurations to achieve optimal efficiency. The intention of SID and STAR procedures is to maintain a predictable flow of aircraft to/from an airport. This is achieved by establishing consistent flight route expectations, reducing the need for communications between controllers and pilots. These procedures also reduce the need to hold aircraft on the ground or in the air, or to make use of other aircraft management tools and coordination techniques to satisfy aircraft separation requirements.

Several STAR and SID procedure designs use ground-based NAVAIDs. As discussed in Section 2.1.1, navigation based on ground-based NAVAIDs can be hindered by line-of-site issues and signal degradation that limits where conventional procedure routes can be located. Due to these factors, it can be difficult for a non-RNAV equipped aircraft to follow an accurate ground path. The ground path is the track or trace along the surface of the earth directly below the aircraft which represents where the aircraft should be flying. Because these procedures cannot provide more predictable controls such as specific speeds or altitudes, controllers use vectoring and speed adjustments to manage traffic. This leads to increased controller and pilot workload. **Table 2-5** shows the current number of procedures for the five major study airports as of December 2011.

Table 2-5 Existing STAR and SID Procedures for DFW, DAL and Satellite Airports (1 of 2)

	Current Procedures			
	Conventional		RNAV	
Airport	STAR	SID	STAR	SID
KDFW	BONHAM FIVE, BOWIE ONE, CEDAR CREEK SIX, DUMPY THREE, GLEN ROSE NINE, JAGGO THREE, JONEZ FOUR, JUMBO THREE, MASTY TWO, WILBR THREE	COYOTE FIVE, DALLAS NINE, GARLAND THREE, HUBBARD SIX, JACKY FOUR, JOE POOL FOUR, KEENE SIX, KINGDOM SEVEN, TEXOMA ONE, TRI-GATE SIX, WORTH SIX, WYLIE FIVE	NONE	AKUNA FOUR, ARDIA FOUR, BLECO FOUR, CEOLA FIVE, CLARE THREE, DARTZ FOUR, FERRA FIVE, GRABE FOUR, JASPA THREE, LOWGN FOUR, NELYN THREE, NOBLY FOUR, PODDE FOUR, SLOTT FOUR, SOLDO THREE, TRISS FOUR
KDAL	BOWIE ONE, DUMPY THREE, FINGR THREE, GLEN ROSE NINE, GREGS SIX, KNEAD SIX	BACHMAN SIX, COYOTE FIVE, DALLAS NINE, GARLAND THREE, HUBBARD SIX, JOE POOL FOUR, KINGDOM SEVEN, KRUMM FOUR, LOVE TWO, TEXOMA ONE, TRINITY SIX, VENUS SEVEN, WORTH SIX, WYLIE FIVE		
All Satellites	DODJE THREE,	DALLAS NINE, JOE POOL FOUR, TEXOMA ONE, WORTH SIX		

Table 2-5 Existing STAR and SID Procedures for DFW, DAL and Satellite Airports (2 of 2)

	Current Procedures			
	Conventional		RNAV	
Airport	**STAR**	**SID**	**STAR**	**SID**
East Satellites	DUMPY THREE, FINGR THREE, GLEN ROSE NINE, GREGS SIX, JONEZ FOUR*, KNEAD SIX,	GARLAND THREE, HUBBARD SIX, KINGDOM SEVEN, WYLIE FIVE	NONE	NONE
West Satellites	MOTZA SIX, SASIE TWO, SLUGG SIX		NONE	NONE

Table Notes:
**-ADS only*

Source: National Flight Data Center (NFDC), 4/5/2012 charting cycle
Prepared By: HMMH, MITRE Corporation, August 2013

Vertical Path

Aircraft climb or descend when instructed by a controller. The point when an aircraft reaches an assigned altitude may vary depending upon a combination of factors, including aircraft performance, weather conditions, and/or piloting technique. Aircraft arriving to or departing from the Study Airports are frequently required to level off during descent/climb to maintain vertical separation from other arriving and departing aircraft. Unpredictable vertical guidance resulting from conflicting traffic leads to increased controller workload and inefficient aircraft operation.

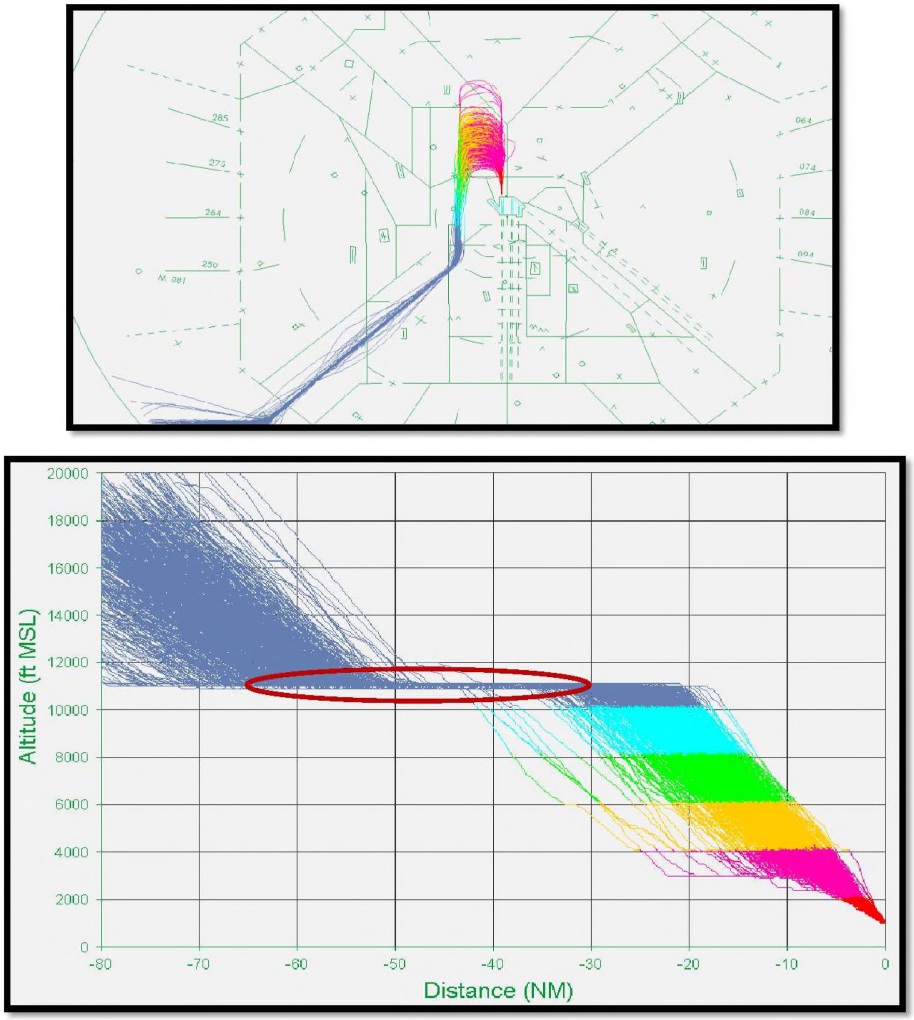
Some routes in the North Texas Metroplex require climbing or descending aircraft to level-off to accommodate aircraft crossing above or below. In these instances, aircraft efficiency suffers due to: 1) power variability during leveling-off; 2) power variability in reinitiating the climb or descent; and 3) increased fuel consumption. The level-off in the climb phase typically results in aircraft taking longer to reach final altitude and decreases fuel efficiency. During the descent phase, the level-off requires application of thrust for aircraft preparing to land to maintain altitude. This results in extended fuel burn.

For example, the current GLEN ROSE NINE arrival over the GLEN ROSE VOR, crossing the southwest corner post entry point at FEVER, currently must level-off at 11,000 ft. MSL in order to maintain vertical separation from other, primarily departing aircraft. The lateral course routes and vertical profiles of flight tracks crossing over GLEN ROSE VOR in the southwest corner post area of D10 airspace are portrayed in **Exhibit 2-8**. The extended level flight segment is noted by the dark blue flight track collection in an area circled in red. This situation involves additional pilot-controller communications, including additional point-outs,[33] which add to complexity and reduce airspace efficiency.

[33] While the aircraft is in a climb or descent, controllers may need to alert adjacent aircraft or another controller, who is responsible for a nearby airspace sector, of the proximity of a nearby aircraft. This notification is called a “point-out.” This adds to the airspace complexity, because of the communication requirement and time taken to provide the point-out and receive confirmation from the recipient. Reducing point-outs improves efficiency in communications.

Exhibit 2-8 Vertical Arrival Flow Profile Example

Selected Altitudes (ft MSL)	11000
Avg Time in Level Flight (MM:SS)	06:04



Note: Color Bands are in 2,000-foot increments up to 10,000 ft. MSL

Source: North Texas OAPM Metroplex Study Team Site Package, September 2010
Prepared by: North Texas OAPM Metroplex Study Team

RNP-ARs

RNP-ARs are approach procedures designed to offer the ability to fly predictable ground-tracks to the runway, similar to visual approaches flown under VMC, during IMC conditions. This increases flight track predictability in all weather conditions and may reduce miles flown and pilot/controller communication and workload. There are currently no RNP-ARs available in the North Texas Metroplex airspace.

Satellite Airports

Currently, aircraft operating to North Texas Metroplex satellite airports, which serve both GA and military air traffic while functioning as reliever airports for DFW and DAL, make use of conventional navigation SIDs and STARs. However, these IFPs are shared with aircraft departing from or arriving to DFW and DAL, which mixes aircraft of varying performance capabilities in arrival or departure streams, adversely affecting system efficiency.

2.2 Purpose of the Proposed Action

The purpose of the Proposed Action is to take advantage of the benefits of performance based navigation by implementing RNAV procedures that will help improve the efficiency of the airspace in the North Texas Metroplex. Implementing RNAV procedures will also comply with direction issued by Congress in the Modernization and Reform Act of 2012.To meet this goal, the Proposed Action would optimize procedures serving the North Texas Metroplex Study Airports while maintaining or enhancing safety in accordance with FAA's mandate under federal law. This would be achieved by reducing dependence on ground-based NAVAID technology in favor of more efficient satellite-based navigation. Specifically, the objectives of the Proposed Action are as follows:

- Improve the flexibility in transitioning traffic between en route and terminal area airspace and between terminal area airspace area and the runways;
- Improve the segregation of arrivals and departures in terminal area and en route airspace and reduce complex converging flight paths; and
- Provide RNAV arrival and departure en route transitional and terminal area airspace procedures to provide a more predictable ground and vertical path.

With implementation of the Proposed Action, air traffic controller workload and controller-to-pilot communication would be expected to decrease, reducing both workload and airspace complexity. Improvements in arrival and departure segregation among the North Texas Metroplex Study Airports would reduce the need for vectoring and level flight segments, resulting in shorter and more predictable routes.

Each objective of the Proposed Action is discussed in greater detail below.

2.2.1 Improve Flexibility in Transitioning Aircraft

One objective of the Proposed Action is to minimize the need for merging by increasing the number of entry/exit points and procedures dedicated to specific Study Airports. As discussed in Section 2.1.2.1, the limited number of entry and exit points and associated procedures constrains the efficiency of the air traffic routes in the terminal and en route transitional airspace; this is a result of the need to merge multiple routes prior to arrival to and departure from terminal airspace. This objective can be measured with the following criteria:

- Where possible, increase the number of entry and exit points compared with the No Action Alternative (measured by number of exit/entry points).
- Segregate major Study Airport traffic from other major Study Airport and/or satellite Study Airport traffic to/from Study Airports (measured by count of RNAV STARs and/or SIDs that can be used independently to/from Study Airports).

2.2.2 Segregate Arrivals and Departures

A second objective of the Proposed Action is to implement procedures that would achieve better segregation of arrivals and departures within the terminal airspace. As discussed in Section 2.1.2.2, arrival and departure flight routes frequently cross, converge, or are located within close proximity of each other in some portions of the en route and terminal airspace. This requires controllers to actively manage the traffic using the tools available to them to ensure that safe vertical and lateral separation between aircraft is maintained. This objective can be measured with the following criterion:

- Where possible, increase the number of RNAV STARs and SIDs compared with the No Action Alternative (measured by total count of RNAV STARs and RNAV SIDs for the North Texas Metroplex.)

2.2.3 Improve the Predictability of Air Traffic Flow

A third objective is to improve the predictability of air traffic flows. As discussed in Section 2.1.2.3, current procedures in the North Texas Metroplex do not take full advantage of RNAV capabilities. RNAV procedures can increase predictability by taking better advantage of aircraft performance capabilities (e.g., speed control and altitude restrictions) and by designing procedures that reflect these capabilities. These enhancements would provide for more predictable, repeatable, and efficient routes than is currently possible with most conventional procedure designs.

In addition, RNAV departure procedures with runway transitions and RNP-ARs approaches to DAL provide for a more predictable flow of air traffic through the airspace and require less controller-to-controller coordination and controller-to-pilot communications to manage air traffic flows. Additional runway transitions from each runway would provide controllers more flexibility to balance demand, maintain runway departure separations, and segregate routes without the need for controller intervention. This objective can be measured with the following criteria:

- Ensure that the majority of STARs and SIDs to and from the Study Airports are based on RNAV technology (measured by count of RNAV STARs and SIDs for an individual Study Airport);
- Increase the number of runway transitions in the RNAV SIDs and RNP-AR approaches in comparison to the No Action Alternative. (measured by count of procedures that include runway transitions from runways and RNP-ARs); and,
- Increase the number of climbs and descents with predictable altitudes along a route (measured by number of procedures with an Optimized Descent Profile (OPD) design component).

2.3 Criteria Application

The Proposed Action is evaluated to determine how well it meets the project purpose and need based on the measurable criteria for each objective described above. The evaluation of alternatives will include the No Action Alternative, under which the existing (2011) air traffic procedures serving the Study Airports would be maintained, along with approved procedure modifications already planned and approved for implementation. The criteria are intended to aid in comparing the Proposed Action Alternative with the No Action Alternative.

2.4 Description of the Proposed Action

The Proposed Action considered in this study would include the implementation of optimized RNAV SID and STAR procedures and RNP-AR approaches that would reduce reliance on conventional procedures. The primary objectives of the Proposed Action are to redesign standard instrument arrival and departure procedures to more efficiently serve the Study Airports and to improve the flexibility and predictability of air traffic routes. The Proposed Action is described in detail in Chapter 3, *Alternatives*.

Implementation of the Proposed Action would not result in an increase in the number of aircraft operations at the Study Airports. Instead, inefficiencies in the air traffic routes currently serving the Study Airports would be reduced. The Proposed Action does not involve physical construction of any facilities, such as additional runways or taxiways, or such as permitting. Therefore, the implementation of the proposed changes to procedures in the North Texas Metroplex would not require any physical alterations to environmental resources identified in FAA Order 1050.1E.

2.5 Required Federal Actions to Implement Proposed Action

Implementation of the Proposed Action requires the following actions to be taken by the FAA:

- Controller training; and,
- Publication of new or revised STARs, SIDs, transitions, RNP-ARs.

2.6 Agency Coordination

On May 6, 2013, the FAA distributed an early notification letter to 210 federal, state, regional, and local officials. The purpose of the letter was to provide notice of the initiation of the EA; request background information related to the EA study area; and to gain an understanding of issues, concern, policies, and/or regulations that may affect the environmental analysis. A subsequent notification letter was sent to an additional 10 federal, state, local, and tribal officials on June 12, June 14, and July 9, 2013.

Appendix A, *Agency Coordination, Agency Consultation, and Public Involvement*, includes a copy of the early coordination letter (and attachments) as well as a list of the receiving agencies and tribes.

3 Alternatives

The alternative analysis was conducted pursuant to Council on Environmental Quality (CEQ) regulations and Federal Aviation Administration (FAA) guidance provided in FAA Order 1050.1E, Chg. 1, *Environmental Impacts*: Policies and Procedures (FAA Order 1050.1E). This chapter discusses the following topics:

- Alternative Development Process
- Alternatives Overview
- Comparison of Alternatives
- Listing of Federal Laws and Regulations

The technical terms and concepts discussed in this chapter are explained in Chapter 1, *Background*.

3.1 Alternative Development Process

The development of an alternative for the North Texas Optimization of Airspace and Procedures in the Metroplex (NTX OAPM) project was a multi-step process that began with the formation of the NTX OAPM Study Team (Study Team). The Study Team was charged with defining operational issues in the North Texas Metroplex and recommending conceptual designs for procedures that would address these issues. The recommended procedures were then provided to the North Texas OAPM Design and Implementation (D&I) Team. The D&I Team were responsible for designing individual procedures based on the Study Team's recommended conceptual procedures. Each procedure designed by the D&I Team was required to meet FAA air traffic procedures design criteria and the project Purpose and Need. As defined in Chapter 2, the need for the Proposed Action is to address existing North Texas Metroplex Standard Instrument Departures (SIDs), Standard Terminal Arrival Routes (STARs), and Standard Instrument Approach Procedures (SIAPs), collectively referred to as Instrument Flight Procedures (IFPs) that are not achieving the higher levels of efficiency found in procedures designed to use Area Navigation (RNAV) technology. The D&I Team rejected individual procedures if, on their own merit, they would not meet the Purpose and Need.

For purposes of the NTX OAPM project, the Proposed Action alternative evaluated in this Environmental Assessment (EA) contains 96 individual procedures combined into one alternative. This group of procedures were considered and evaluated in combination with one another to determine whether the alternative could meet the project's Purpose and Need. The D&I Team considered one or more versions of each proposed air traffic procedure; those that did not meet the objectives of the Purpose and Need of the project were not carried forward for analysis.

The complexity of the operations occurring within the North Texas Metroplex was described in Chapter 1, *Background,* and in Chapter 2, *Purpose and Need* of this document. Given that complexity, the development of proposed changes to instrument procedures must be considered holistically. Otherwise proposed improvements when considered in isolation may be beneficial for one aspect of operations (e.g., arrivals) or geographical area (e.g., northeast corner-post area), or a single airport (e.g., DFW), but may in fact adversely impact overall Metroplex operations. Therefore, the FAA used an iterative process to analyze the current procedure design as a whole across the Metroplex and developed potential solution elements which were then examined to insure that their implementation would improve overall operations. This iterative process was one which occurred over a period spanning several months. During this period: 1) deficiencies were identified or opportunities were noted; 2) proposed changes were generated; and 3) proposed changes were tested, refined, and recommended or rejected based on their ability to meet design criteria and to realize the opportunities for optimization noted in the *Purpose and Need*.

Together, the Study Team and the D&I Team identified and evaluated potential alternatives to individual procedures. This series of procedures when employed together provided efficiency to the NTX Metroplex and became the Proposed Action. The following sections describe in additional detail the alternative development process the FAA used to create a series of procedures that when employed together would add efficiency to the NTX Metroplex.

3.1.1 North Texas OAPM Study Team

In September 2010, the NTX OAPM Study Team began work to define operational problems in the North Texas Metroplex and to identify potential solutions. The Study Team included experts on the Air Traffic Control (ATC) system. The work completed was intended to provide a guide for later design efforts by the D&I Team. The Study Team met with and obtained input from local FAA facilities, airspace users (e.g., pilots), and aviation industry representatives to learn more about the challenges of operating in the North Texas Metroplex. These meetings helped identify operational challenges related to individual procedures and potential solutions that would increase efficiency. Initially, the Study Team identified over 105 issues related to existing procedures in the North Texas Metroplex. As the Study Team identified additional issues, they were grouped together into 17 generalized categories based on similarity.

Next the Study Team identified potential designs for arrival and departure procedures that would addressed the identified issues. The modifications proposed were conceptual in nature, and did not include a detailed technical assessment, which was reserved for the D&I Team. The final set of Study Team recommendations was documented in the Study Team Final Report.[34]

3.1.2 North Texas OAPM Design and Implementation Team

Following completion of the Study Team's Final Report in March 2011, the D&I Team began work on the procedure designs in July 2011. First, the Study Team proposals were prioritized based on complexity, interdependencies with other procedures, and degree of potential benefit to the Metroplex. Second, the D&I Team set up workgroups to further develop and refine the Study Team proposals into preliminary designs. Finally, the preliminary designs were brought to the whole D&I Team for review and modification, if necessary.

The D&I Team adopted, refined, rejected, and added to the proposal elements recommended by the Study Team. Airspace users and environmental specialists were regularly engaged for feedback throughout deliberations.

[34] NTX OAPM Study Team Final Report, March 2011.

In developing the proposed procedures, the D&I Team was responsible for following regulatory and technical guidance as well as meeting criteria and standards in three general categories:

- **RNAV Design Criteria and Air Traffic Control Regulatory Requirements** - Flight procedure design is subject to requirements found in several FAA Orders, including FAA Order 7100.9D, Standard Terminal Arrival Program and Procedures, FAA Order 8260.43, Flight Procedures Management Program, FAA Order JO 7110.65U, Air Traffic Control, FAA Order 1050.1E Policies and Procedures for Considering Environmental Impacts. The Guidelines for Implementing Terminal RNAV Procedures, to be followed in conjunction with the requirements of FAA Order 8260.43, includes an "18-Step Process" for developing, reviewing, and implementing RNAV procedures. In addition, FAA Order JO 7110.65U includes requirements governing air traffic control procedures, air traffic management, and appropriate technical terminology.
- **Operational Criteria** – Operational criteria were consistent with the Purpose and Need for the project and included: 1) increasing efficiency, 2) increasing flexibility, and 3) decreasing complexity in air traffic management. The criteria were measured for all procedures using a full motion simulator, a stationary simulator, and/or flight training devices. The flight simulations helped ensure that aircraft could fly the procedure as designed and that efficiency (e.g., ATC and pilot workload) would not be limited by the proposed procedures. The criteria were also measured for many procedures using real time Human-In-The-Loop Simulations (HITLs). The HITLs assisted in validating that the proposed route structure was functional.
- **Safety Factors** – Procedures were subject to evaluation using the FAA's Air Traffic Organization's (ATOs) Safety Management System (SMS). The SMS is the ATO's system for managing the safety of ATC and navigation services in the National Airspace System (NAS). In compliance with SMS requirements, the procedures were evaluated by a Safety Risk Management Panel (SRMP) following a five step process: 1) describe the system; 2) identify the hazards in the system; 3) analyze the risks; 4) assess the risk; and, 5) mitigate the risk. If a procedure introduced a new hazard or increased the severity and/or likelihood of an existing hazard that is being mitigated, the design was adjusted to reduce the hazard to acceptable levels.

To ensure that procedures included in the Proposed Action were viable, the D&I team undertook validation exercises that further refined the procedures. Over a multi-month period, the D&I Team worked to further refine the procedures and meet Final Design milestones. To reach the milestones, the D&I Team relied on the use of design solution tools (e.g., design and testing software), and applied the criteria described above. The combined final procedure designs have been brought forward in this EA as the Proposed Action alternative.

To illustrate the iterative process, the following two sections are examples of unique procedures considered by the D&I Team that were either modified or eliminated from further consideration.

3.1.2.1 Study Team Recommendation: MOTZA/SLUGG Arrival

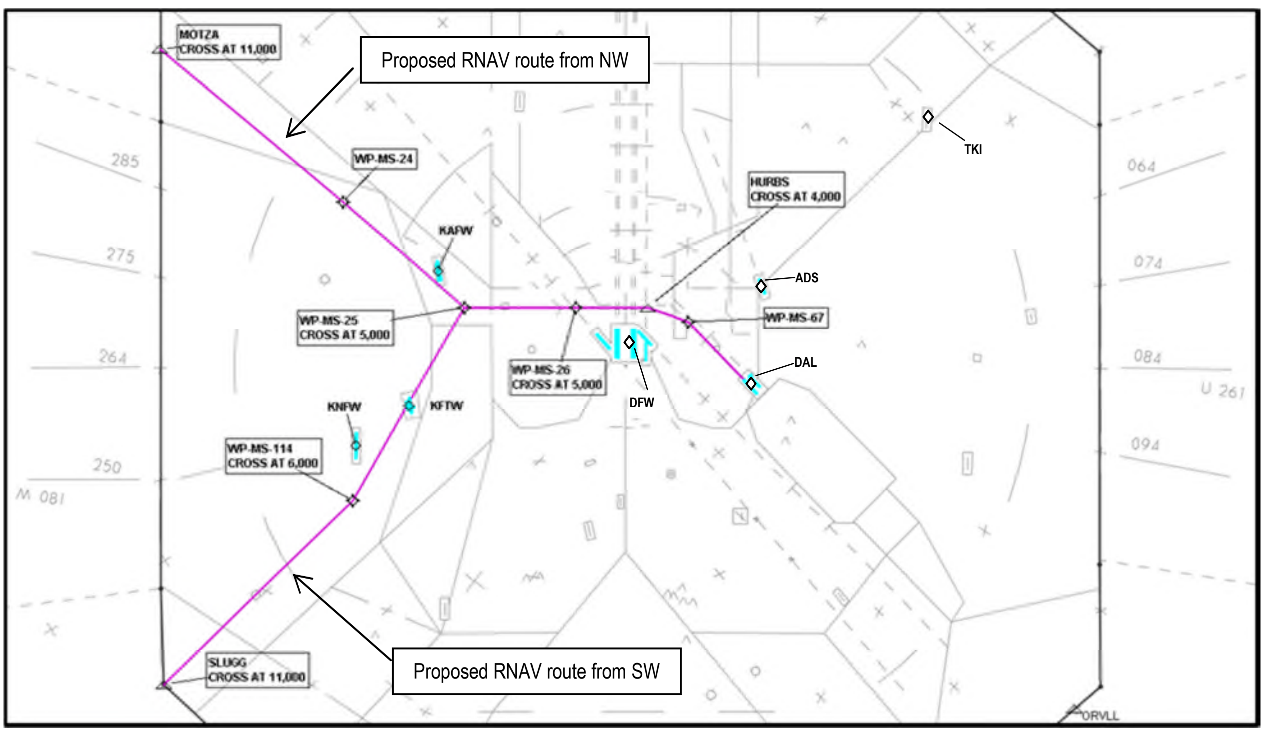
The NTX Study Team recommended three DAL RNAV STARs from MOTZA and SLUGG waypoints. The Study Team's recommendations were designed to create an RNAV version of what pilot's commonly refer to as the "over the top/slam dunk".

The "over the top/slam dunk" starts in the southwest corner of D10's airspace via the GLEN ROSE NINE STAR and crosses over the top of DFW in a South Flow, only for landing at DAL/ADS/TKI. During periods of high traffic volume, high winds or inclement weather, DAL/ADS/TKI arrivals are routinely taken off of the GLEN ROSE NINE STAR and given the KNEAD SIX STAR.

From the northwest corner of D10's airspace, there is also an informal route that is routinely requested by pilots, that goes over the top of DFW (commonly referred to by pilots as the "reverse slam dunk") for landing at DAL. High traffic volume, high winds and inclement weather may prevent the reverse slam dunk from being issued and DAL arrivals will be given the GREGS SIX STAR.

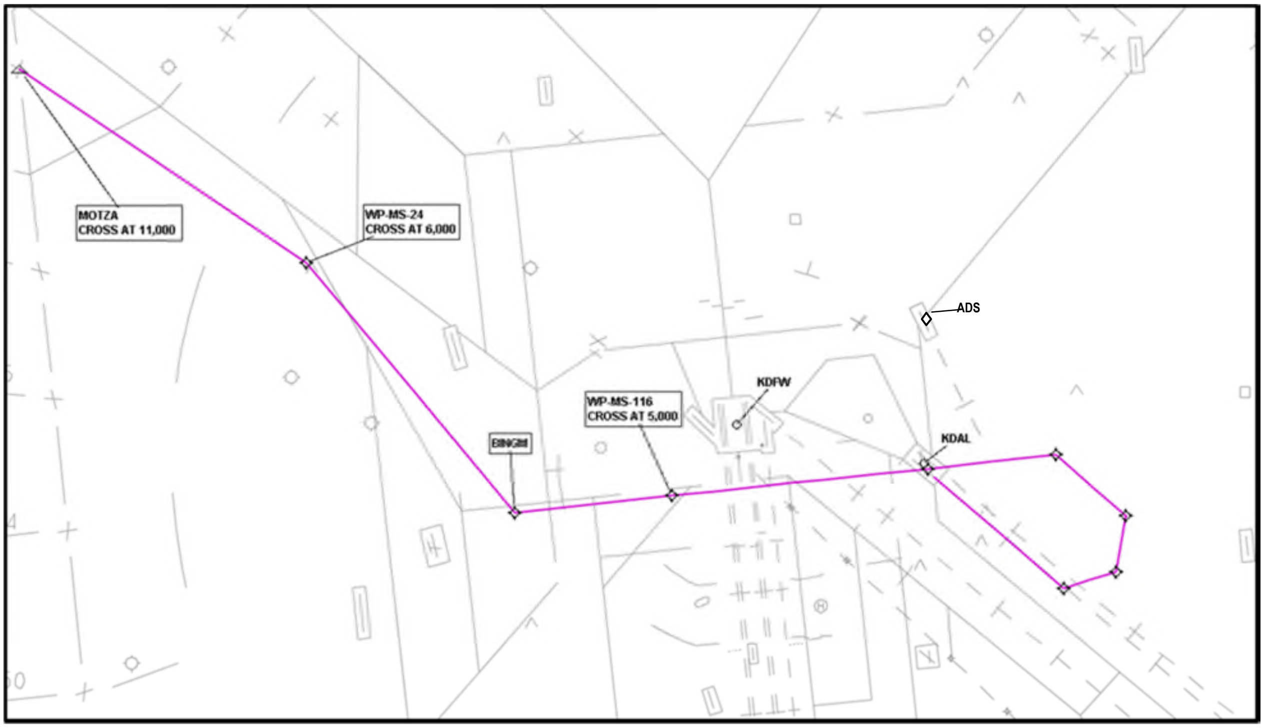
The Study Team proposed two RNAV STARs, one starting at MOTZA waypoint and one starting at SLUGG waypoint in a South flow. These procedures merged west of DFW into a single stream, and then crossed north of DFW as depicted in **Exhibit 3-1.** A third RNAV STAR was proposed starting at MOTZA waypoint in a North flow. This procedure followed a similar track to that of the south flow MOTZA procedure, except that it passed south of DFW and east of DAL, then tear-dropped back into DAL, as depicted in **Exhibit 3-2**.

Exhibit 3-1 Study Team MOTZA/SLUGG Concept – South Flow



Sources: MITRE Inc., August 2013
Prepared by: MITRE Inc., August 2013.

Exhibit 3-2 Study Team MOTZA Concept – North Flow



Sources: MITRE Inc., August 2013
Prepared by: MITRE Inc., August 2013.

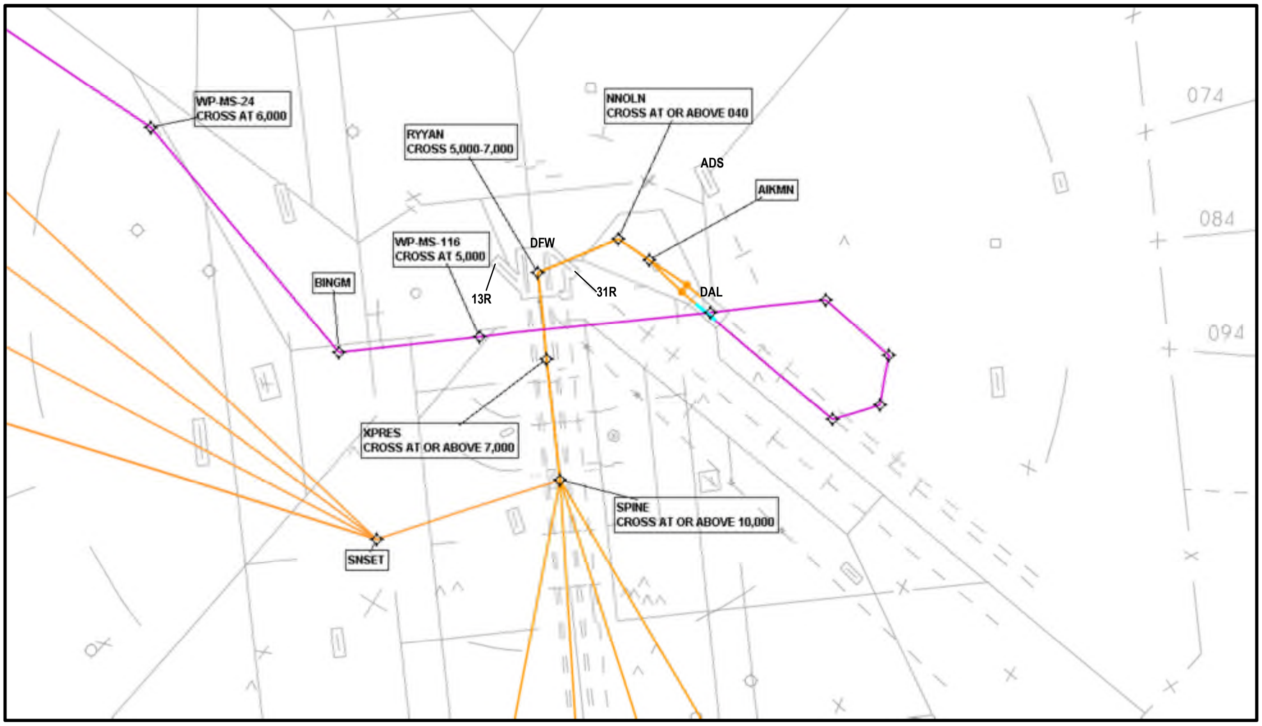
The Study Team recommendations were not based on any flight simulation evaluations, but based on Industry input. The D&I Team identified concerns with the MOTZA/SLUGG merge in a south flow. First, the proposed altitude at the MOTZA/SLUGG merge point was 5,000 ft., which would be in direct conflict with propeller traffic from the southwest and turbojet traffic from the southeast corners arriving runway 13R at DFW. This would force the MOTZA/SLUGG merge traffic to lower altitudes, which would create additional conflicts with AFW, NFW and FTW arrivals and departures. It would also create mission impact to military aircraft operating at NFW by delaying high-performance climbing military departures and high arrivals. Second, there were concerns regarding the sequencing of DAL arrivals at the merge point because of inadequate airspace to allow for vectored sequencing, and the available traffic metering[35] tool is insufficient for automatic sequencing the MOTZA/SLUGG merge. As a result of this impact to safety and efficiency the proposed MOTZA/SLUGG RNAV STARs in south flow was not carried forward for further evaluation of the proposed action.

The D&I Team then looked at the proposed MOTZA RNAV STAR in north flow. The Team identified concerns regarding potential conflicts with the proposed DAL south bound and west bound SIDs that turn south over DFW. Slow climbing DAL departure aircraft on high temperature days could pose a potential conflict with DAL arrivals crossing south of DFW as shown in **Exhibit 3-3**. The proposed altitudes on the east side of DAL would also pose concerns for propeller arrivals from the northwest corner arriving runway 31R at DFW.

[35] METERING- A method of time-regulating arrival traffic flow into a terminal area so as not to exceed a predetermined terminal acceptance rate. (P/CG)

Finally, the tear-drop on the east side of DAL would increase congestion on the east side downwind with both DAL arrivals from the northeast corner and for ADS arrivals from the southeast and southwest corners. As a result of these potential impacts to safety and efficiency the proposed MOTZA RNAV STAR in North flow was not carried forward for further evaluation in the proposed action.

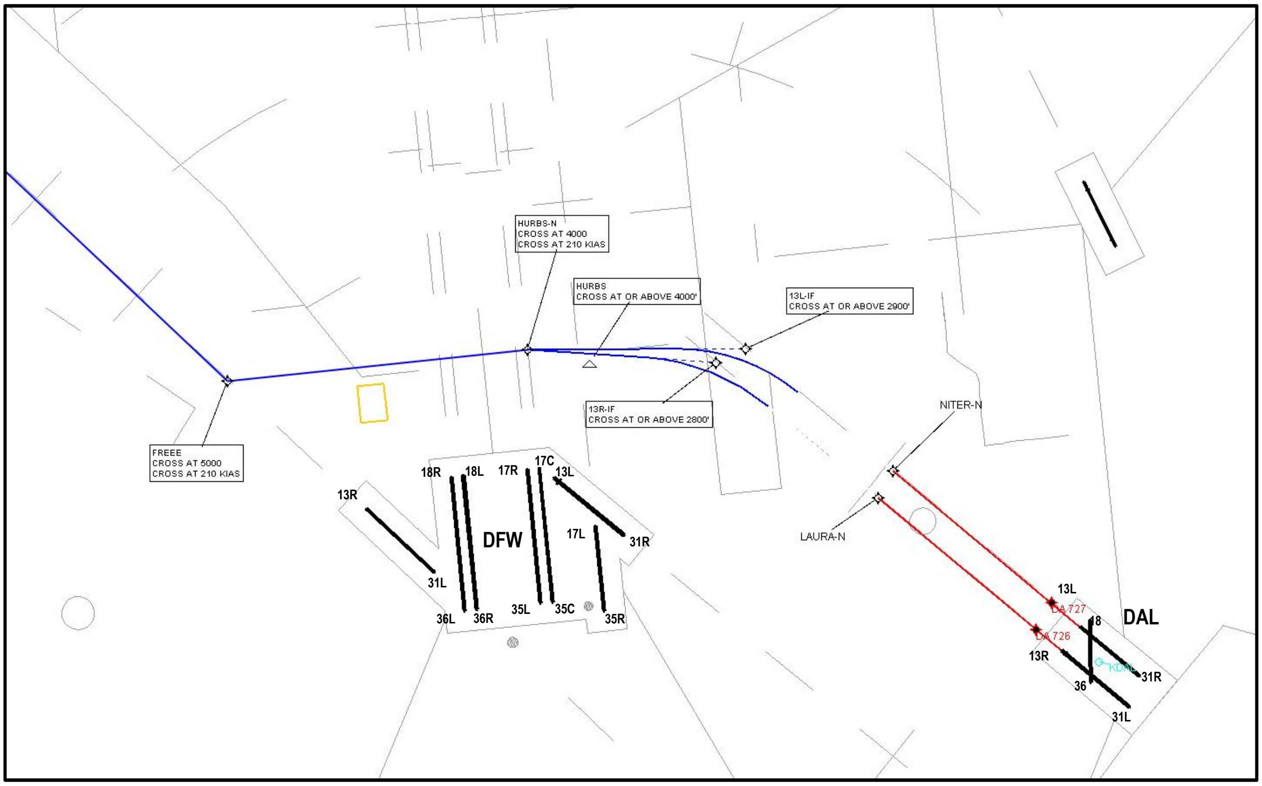
Exhibit 3-3 DAL Departure and Arrival Conflicts – MOTZA North Flow



Sources: MITRE Inc., August 2013
Prepared by: MITRE Inc., August 2013.

The D&I Team made minor refinements to the Study Team's proposed MOTZA RNAV STAR in a south flow. Specifically, it modified the lateral track from MOTZA waypoint to eliminate concerns with northwest corner arrivals to Runway 13R at DFW. Industry representatives expressed a desire to tie this RNAV STAR to the proposed RNP-AR procedures at DAL. By doing so, arrivals would no longer cross the HURBS intersection at or above 4,000 ft. mean sea level (MSL) as they do today, but at a lower altitude as shown in **Exhibit 3-4**. The D&I Team concluded that this lower altitude would cause a safety concern with the go-around/missed approach altitudes for Runway 17L arrivals at DFW, because DFW Tower requires 2,000 and 3,000 ft. MSL altitudes for missed approaches. These altitudes are required to ensure separation between aircraft operating from Runways 17 L/C/R and 18 L/R due to the close proximity of the runways to one another. The option of lowering the approach altitudes for Runway 17L was not deemed viable by the D&I Team because it would limit the availability of visual approaches to that runway. As a result of these concerns, the proposed MOTZA RNAV STAR in south flow was not carried forward for further evaluation in the proposed action.

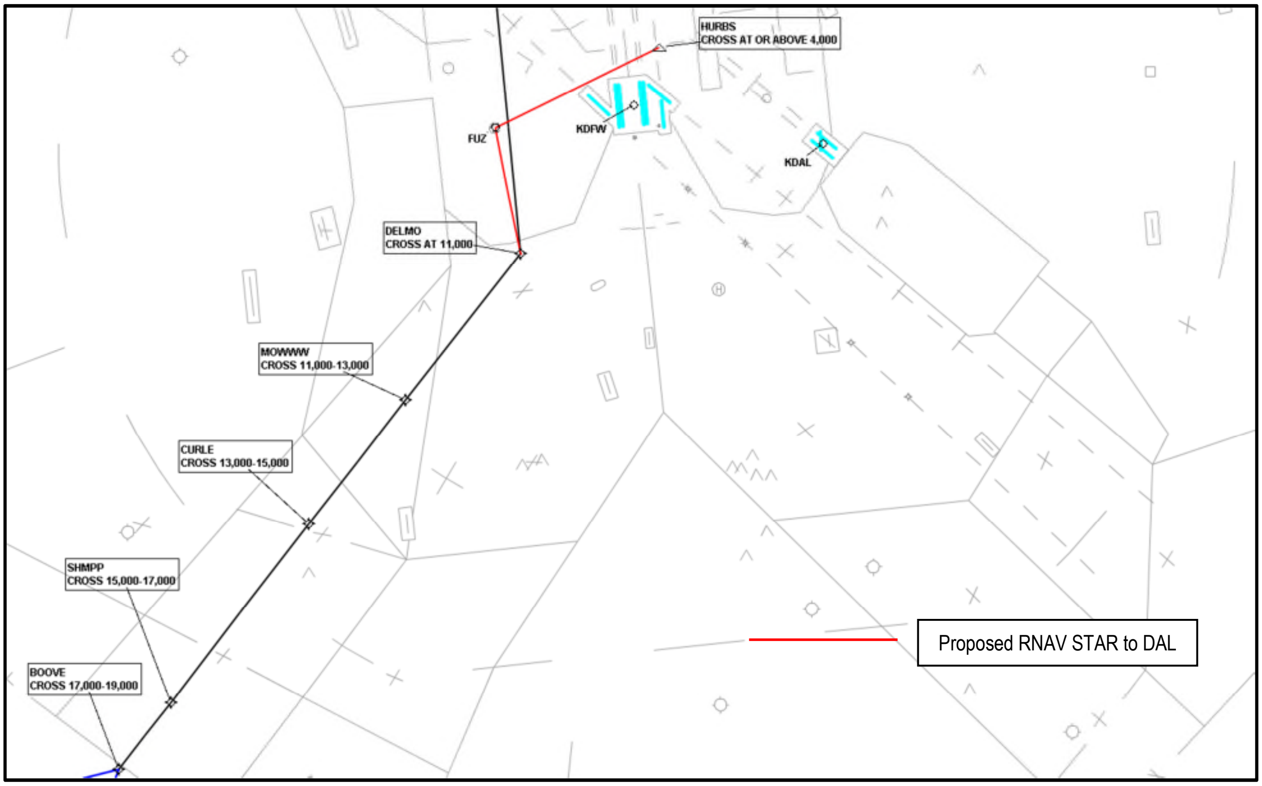
Exhibit 3-4 D&I MOTZA modification – South Flow



Sources: MITRE Inc., August 2013
Prepared by: MITRE Inc., August 2013.

In an attempt to provide an over the top capability for DAL arrivals from the southwest corner, the D&I Team proposed a modification to the SLUGG RNAV STAR that would mirror the GLEN ROSE NINE STAR flown today in a south flow. The D&I Team proposed to not segregate the DAL and DFW arrival streams and instead designed a procedure where DAL arrivals mirror the proposed DFW RNAV STAR in south flow, and then go over the top north of DFW as shown in **Exhibit 3-5**. The proposed RNAV STAR would require the DAL arrivals to cross HURBS at or above 4,000 ft. MSL as they do today. Industry representatives flew this proposed procedure in their simulator and determined it resulted in an unstable approach even with no tailwind component. Due to the unstable approach, this modified RNAV STAR was not carried forward for further evaluation in the proposed action.

Exhibit 3-5 D&I SLUGG modification – South Flow



Sources: MITRE Inc., August 2013
Prepared by: MITRE Inc., August 2013.

3.1.2.2 Study Team Recommendation: KATTZ vs. CEOLA

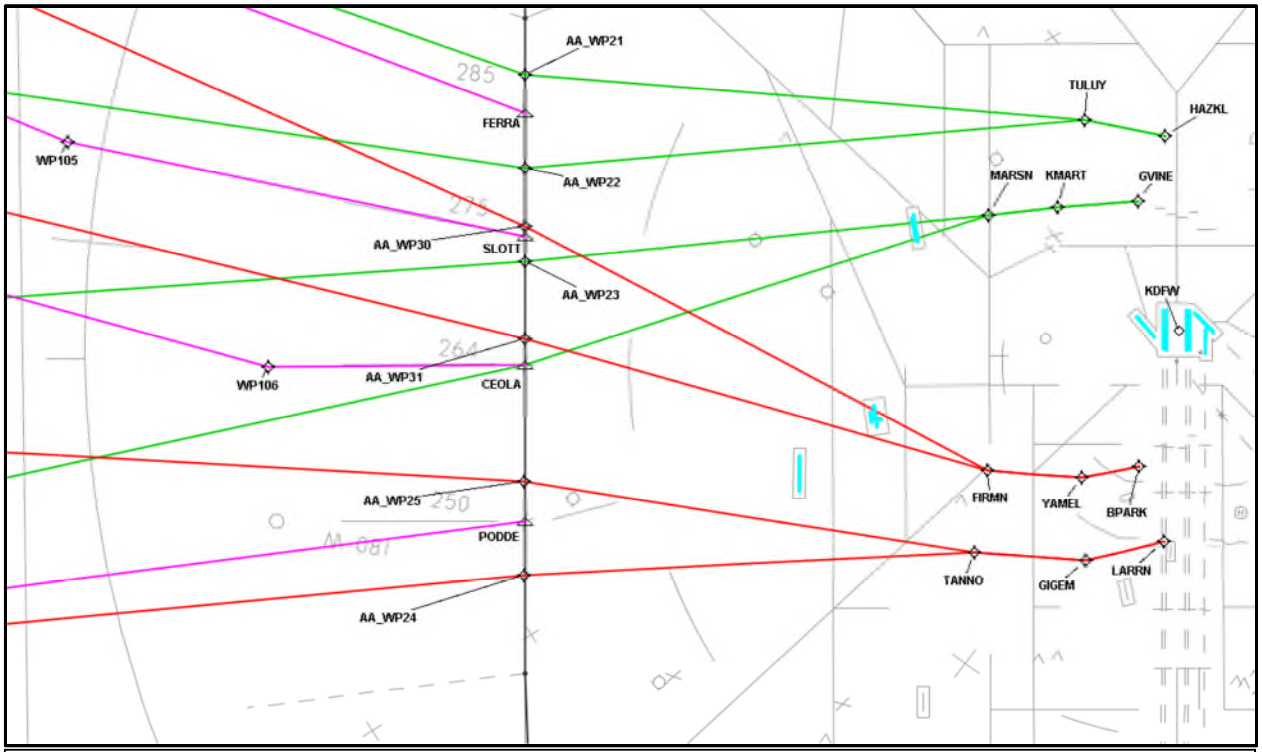
The Study Team proposed two alternatives for the DFW RNAV westbound SIDs: KATTZ and CEOLA. The published SIDs contain doglegs that are typically short-cut by air traffic controllers. Redesigning the SIDs to reflect the route that is actually flown would result in shorter distances flown.

The current RNAV SIDs have the departure exit points fairly evenly spaced across the western edge of the D10 airspace. As a result some of the traffic in either flow travels away from the desired flight path for number of miles before being turned back to its desired course.

The first alternative modified the existing CEOLA SID utilizing the existing exit points and reducing the extent of the doglegs. The first alternative is illustrated by the fuchsia tracks

The second alternative utilized a floating fix concept, which required flow-specific departure exit points that would decrease track miles for departures within the terminal airspace and remove the doglegs inside en route airspace. In the floating fix concept the exit points are specific to the flow of DFW; in the south flow the fixes are compressed to the south while the opposite is true in the north flow. Under this design the traffic is allowed a more direct route to its desired course. For alternative two, the green tracks indicate the north flow and red tracks indicate the south flow. Both designs are shown in **Exhibit 3-6**.

Exhibit 3-6 Current Static Fix Concept and the Study Team Floating Fix Concept

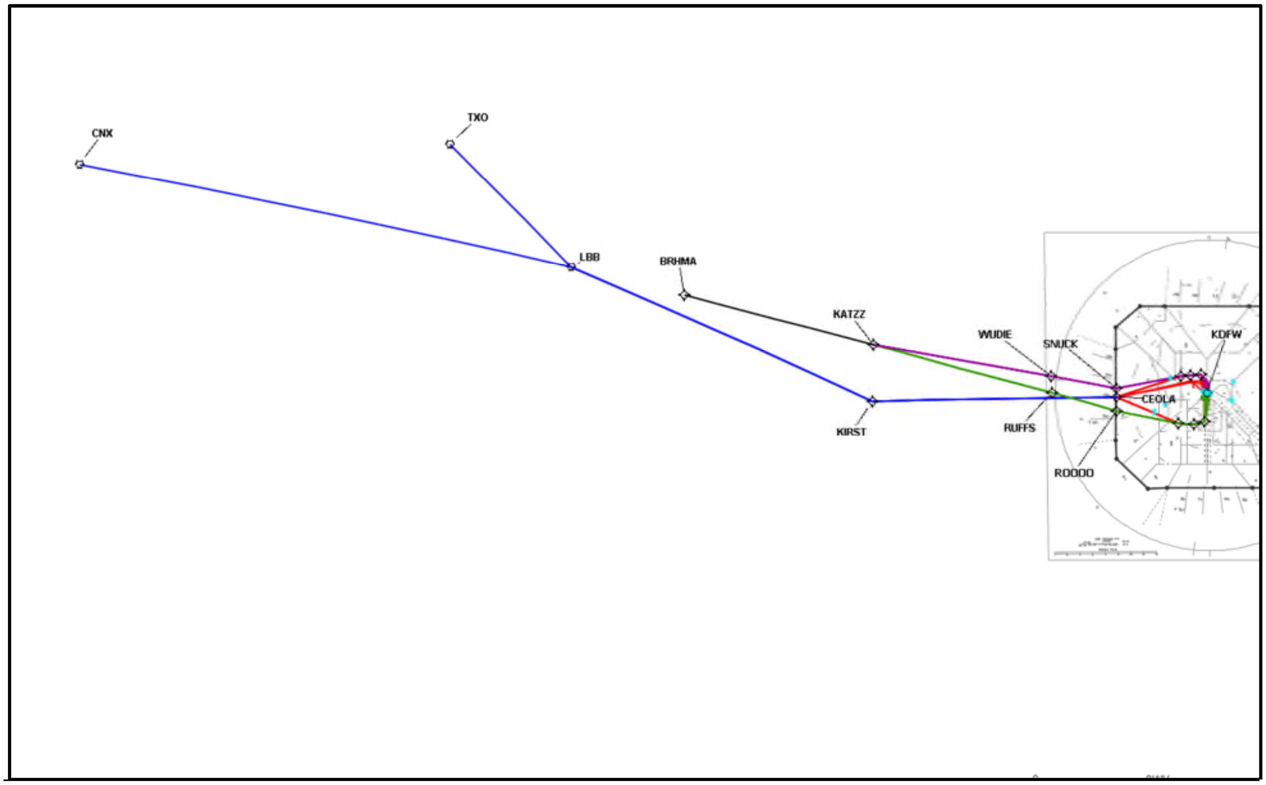


First Alternative
Second Alternative South Flow
Second Alternative North Flow

Sources: MITRE Inc., August 2013
Prepared by: MITRE Inc., August 2013.

D&I determined that the floating fix concept was the more efficient alternative and then further shortened the CEOLA SID transitions to allow for more direct routings to destination airports from the end of the SIDs. The revised SID, called KATTZ, was carried forward into the Proposed Action. Both the KATZZ SID (green in south flow; purple in north flow) and the existing CEOLA SID (in blue) are depicted in **Exhibit 3-7**.

Exhibit 3-7 Current CEOLA SID and Final KATZZ SID



Sources: MITRE Inc., August 2013
Prepared by: MITRE Inc., August 2013.

3.2 Alternatives Overview

The following sections discuss the Proposed Action and the No Action Alternative, the two alternatives carried forward for analysis in the EA.

3.2.1 No Action Alternative

Under the No Action Alternative, the procedures in use in the North Texas Metroplex as of 2011 (representing existing conditions) would generally remain the same. The only modification from today would be a change to the DUMPY FOUR arrival serving both DFW and DAL. This modification would correct ground tracks of arriving aircraft to account for historical wind drift. This change would be independent of the Proposed Action and would be implemented in the absence of the Proposed Action.

The factors that lower the level of efficiency of the North Texas metroplex are identified in Section 2.1.2. In summary, the factors are:

- Lack of flexibility for the efficient transfer of traffic between the en route and terminal area airspace;
- Complex converging interactions between arrival and departure flight paths; and
- Lack of predictable standard procedures to/from and in en route airspace.

3.2.1.1 No Action Alternative Standard Procedures

Table 3-1 lists the names of the No Action Alternative procedures, the procedure type (i.e., SID or STAR), the basis of design (indicated by the type of navigational aid the procedures are based on: NAVAID (shown as VHF Omnidirectional Range [VOR]), RNAV, or radar vectors), and the airports served. In addition, the table includes the number of runway and en route transitions for each procedure and, where applicable, by airport, and the entry/exit points served by the procedure. The No Action Alternative includes current procedures, as well as procedures with independent utility that are expected to be put into effect prior to the implementation of the North Texas OAPM.

Table 3-1 No Action Alternative SIDs and STARs (1 of 1)

No Action Alternative Procedure	Procedure Type	Basis of Design	Airport Served	Transitions (En Route / Runway)	Exit/Entry Point Served
AKUNA FOUR	SID	RNAV	DFW	1/8	North
ARDIA FOUR	SID	RNAV	DFW	2/10	South
BACHMAN SIX	SID	VOR	DAL	9/0	East
BLECO FIVE	SID	RNAV	DFW	2/10	North
BONHAM SIX	STAR	VOR	DFW	6/0	Northeast
BOWIE TWO	STAR	VOR	DFW / DAL	7/2	Northwest
CEDAR CREEK SEVEN	STAR	VOR	DFW	4/0	Southeast
CEOLA FIVE	SID	RNAV	DFW	3/0	West
CLARE THREE	SID	RNAV	DFW	2/0	East
COYOTE FIVE	SID	VOR	DFW / DAL	10/0	West
DALLAS NINE	SID	VOR	DFW / DAL / SATs	9/0	East
DARTZ FOUR	SID	RNAV	DFW	3/8	South
DODJE FOUR	STAR	VOR	SATs	13/0	Southeast
DUMPY FOUR	STAR	VOR	DFW / DAL / East SATs	13/0	Southeast
FERRA FIVE	SID	RNAV	DFW	2/0	West
FINGER FOUR	STAR	VOR	DAL / East SATs	8/0	Northeast
GARLAND THREE	SID	VOR	DFW / DAL / SATs	6/0	East
GLEN ROSE NINE	STAR	VOR	DFW / DAL / East SATs	2/0	Southwest
GRABE FIVE	SID	RNAV	DFW	2/8	North
GREGS SIX	STAR	VOR	DAL / East SATs	7/0	Northwest
HUBBARD SIX	SID	VOR	DFW / DAL / SATs	6/0	East
JACKY FIVE	SID	VOR	DFW	0/0	West
JAGGO THREE	STAR	VOR	DFW	0/0	Southeast
JASPA THREE	SID	RNAV	DFW	1/8	South

No Action Alternative Procedure	Procedure Type	Basis of Design	Airport Served	Transitions (En Route / Runway)	Exit/Entry Point Served
JONEZ FIVE	STAR	VOR	DFW / ADS	0/0	Northeast
JOE POOL FIVE	SID	VOR	DFW / DAL / SATs	11/0	South
JUMBO THREE	STAR	VOR	DFW	2/0	Southwest
KEENE SIX	SID	VOR	DFW	0/0	Southwest
KINGDOM SEVEN	SID	VOR	DFW / DAL / SATs	4/0	West
KNEAD SIX	STAR	VOR	DAL / East SATs	8/0	Southwest
KRUMM FOUR	SID	VOR	DAL	10/0	North
LOVE TWO	SID	VOR	DAL	11/0	West
LOWGN FIVE	SID	RNAV	DFW	2/10	North
MASTY TWO	STAR	VOR	DFW	4/0	Northwest
MOTZA SEVEN	STAR	VOR	West SATs	9/0	Northwest
NELYN THREE	SID	RNAV	DFW	3/8	South
NOBLY FOUR	SID	RNAV	DFW	1/0	East
PODDE FOUR	SID	RNAV	DFW	2/0	West
SASIE THREE	STAR	VOR	West SATs	7/0	Northeast
SLOTT FIVE	SID	RNAV	DFW	3/0	West
SLUGG SIX	STAR	VOR	West SATs	7/0	Southwest
SOLDO THREE	SID	RNAV	DFW	3/0	East
TEXOMA TWO	SID	VOR	DFW / DAL / SATs	11/0	North
TRI-GATE SIX	SID	VOR	DFW	0/0	Northeast / Southwest
TRINITY SIX	SID	VOR	DAL	0/0	South
TRISS FOUR	SID	RNAV	DFW	1/0	East
VENUS SEVEN	SID	VOR	DAL	9/0	South
WILBR THREE	STAR	VOR	DFW	5/0	Northeast
WORTH SEVEN	SID	VOR	DFW / DAL / SATs	11/0	West
WYLIE FIVE	SID	VOR	DFW / DAL / SATs	9/0	East

Notes:
DAL – Dallas Love Field Airport *SATs – Satellite Airports*
DFW – Dallas / Ft. Worth International Airport
SID – Standard Instrument Departure *STAR – Standard Terminal Arrival Route*
RNAV – Area Navigation *VOR - VHF Omnidirectional Range*

Sources: MITRE Inc., July 2013
Prepared by: Harris Miller Miller & Harris Inc., July 2013

Under the No Action Alternative, the final approach flows to and initial departure flows from the runways at all the Study Airports are similar to Existing Conditions (2011). For a few airports, the location of landing thresholds on the runways will change as a result of independent projects due to capital improvements.[36] These changes are taken into account in the analysis of impacts associated with the No Action Alternative (See Chapter 5, *Environmental Consequences*.)

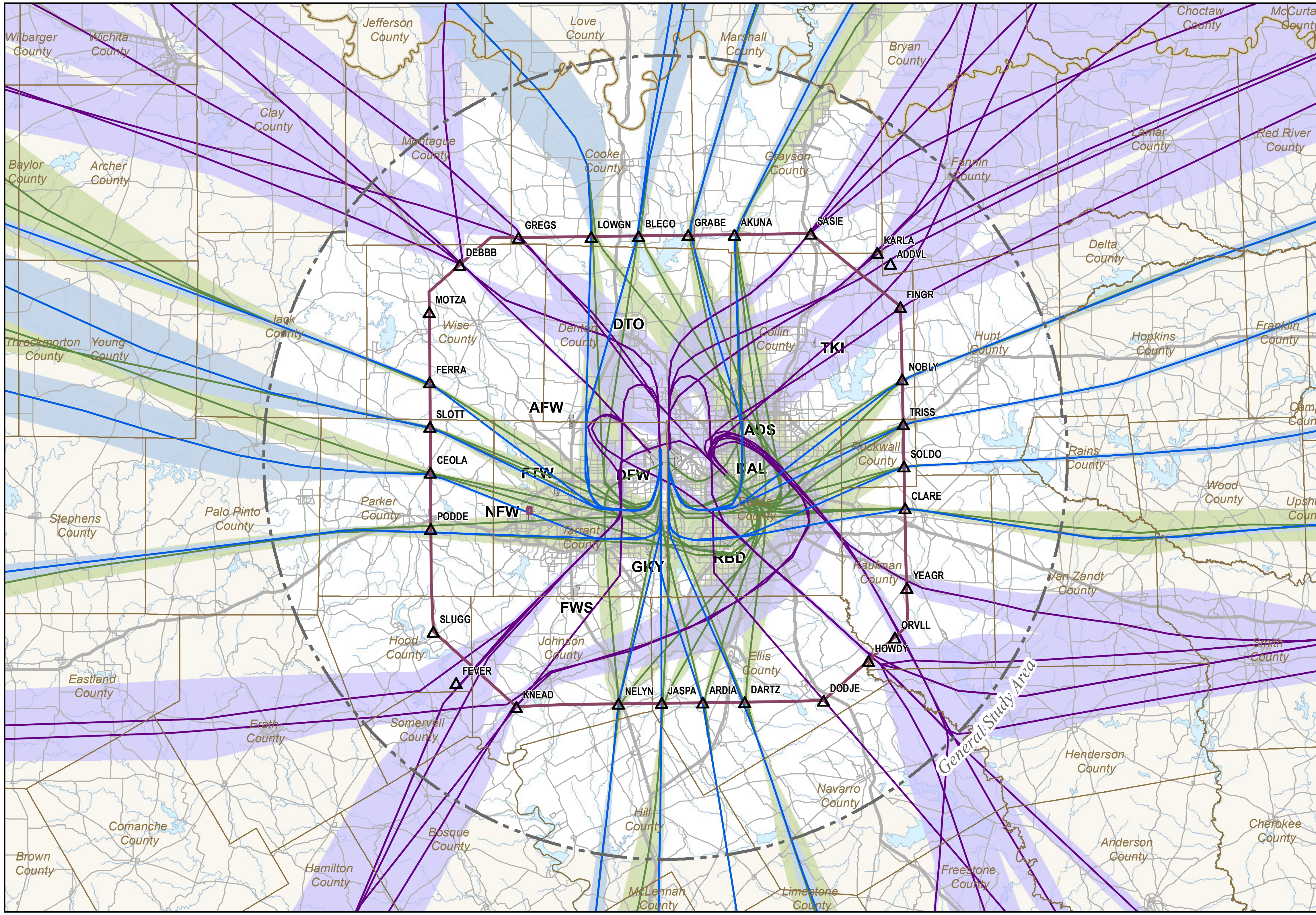
3.2.1.2 Airspace Control Structure under the No Action Alternative

When aircraft depart or arrive on an assigned route in the North Texas Metroplex, control over the aircraft is transferred between the Fort Worth Air Route Traffic Control Center (ARTCC) (ZFW) and the Dallas/Fort Worth (DFW) Terminal Radar Approach Control (TRACON) (D10). The entry and exit points between the North Texas Metroplex airspace and the ZFW Center would remain the same as under Existing Conditions (2011). **Exhibits 2-1** and **2-4** in Chapter 2 depict the locations of the entry and exit points for the North Texas Metroplex airspace, respectively. The entry and exit points associated with each procedure are shown in **Table 3-1**.

Exhibit 3-8 and **Exhibit 3-9** show all arrival and departure flows to the major Study Airports (DFW and DAL) associated with the No Action Alternative during South Flow and North Flow conditions, respectively. Corridors are grouped by procedure type (conventional or RNAV), operation (arrival or departure), and airport. Arrival and departure corridors to/from the satellite Study Airports are shown on **Exhibit 3-10**.

Exhibit 3-11 and **Exhibit 3-12** depict the arrival and departure corridors to/from the DFW and DAL under South Flow conditions, respectively. Similarly, **Exhibit 3-13** and **Exhibit 3-14** depict the arrival and departure corridors to/from the major Study Airports under North Flow conditions, respectively. **Exhibit 3-15** and **Exhibit 3-16** depict arrivals and departures to the satellite Study Airports, respectively.

[36] Collin County Regional Airport at McKinney (TKI) in 2012 constructed a new runway to the east of the existing one to bring it up to airport design standards. The existing runway was closed and converted into a taxiway. Fort Worth Alliance Airport (AFW) is extending both parallel runways to the north. The runways will be 11,000' long and are expected to be complete in 2016.



LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- No Action Departure Flow (RNAV)
- No Action Arrival Flow (Conventional)
- No Action Departure Flow (Conventional, Ground tracks unchanged between Existing/No Action/Proposed Action)
- Navigational Fix
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
For procedure names see exhibit 3-11 and 3-12

ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

TRACON - Terminal Radar Approach Control
D10 - Dallas-Fort Worth TRACON
RNAV - Area Navigation

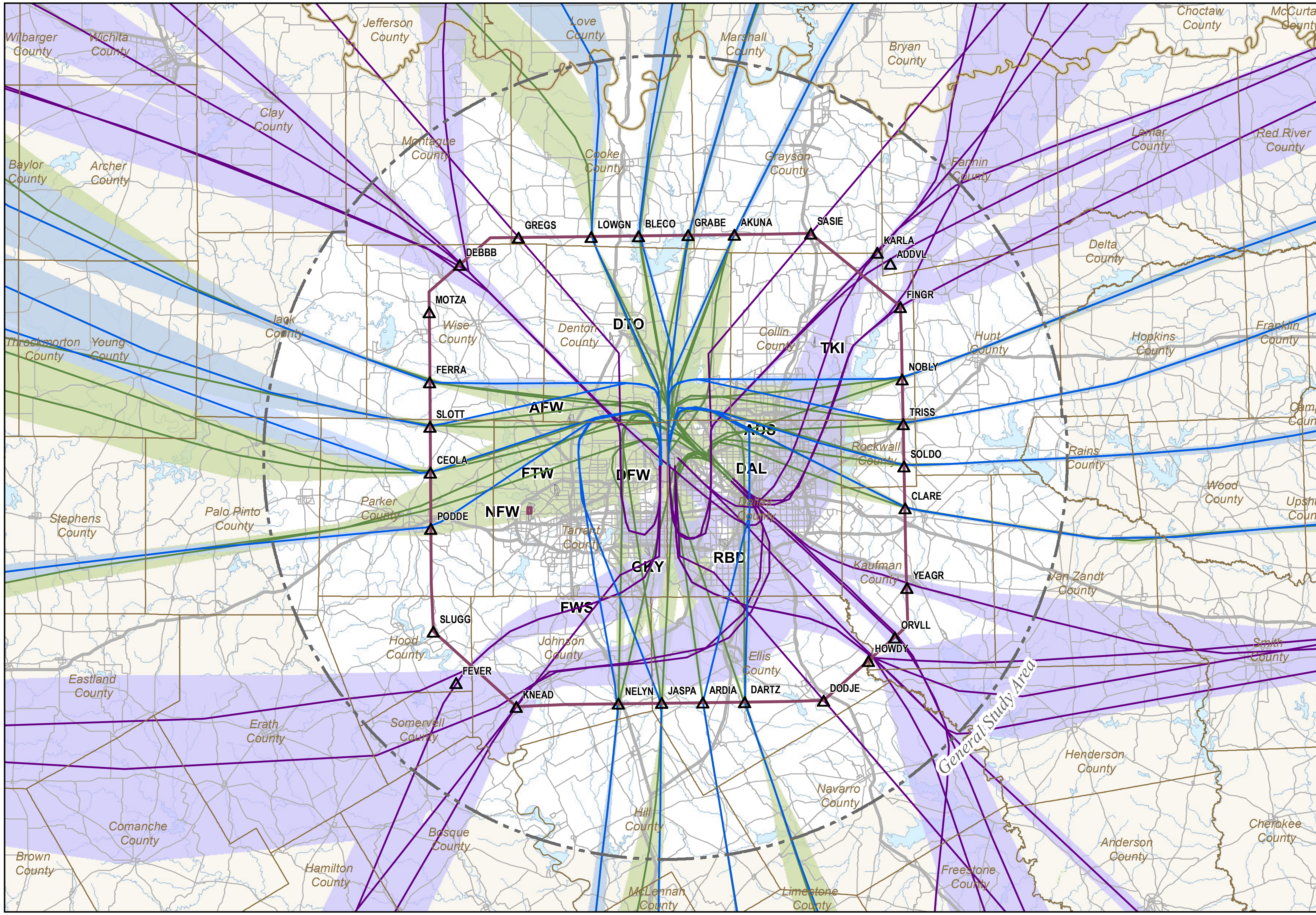
0 30nm

N

Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-8

No Action Alternative
Major Study Airports Arrivals and Departures South Flow



LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- No Action Departure Flow (RNAV)
- No Action Arrival Flow (Conventional)
- No Action Departure Flow (Conventional, Ground tracks unchanged between Existing/No Action/Proposed Action)
- Navigational Fix
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
For procedure names see exhibit 3-13 and 3-14

ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

TRACON - Terminal Radar Approach Control
D10 - Dallas-Fort Worth TRACON
RNAV - Area Navigation

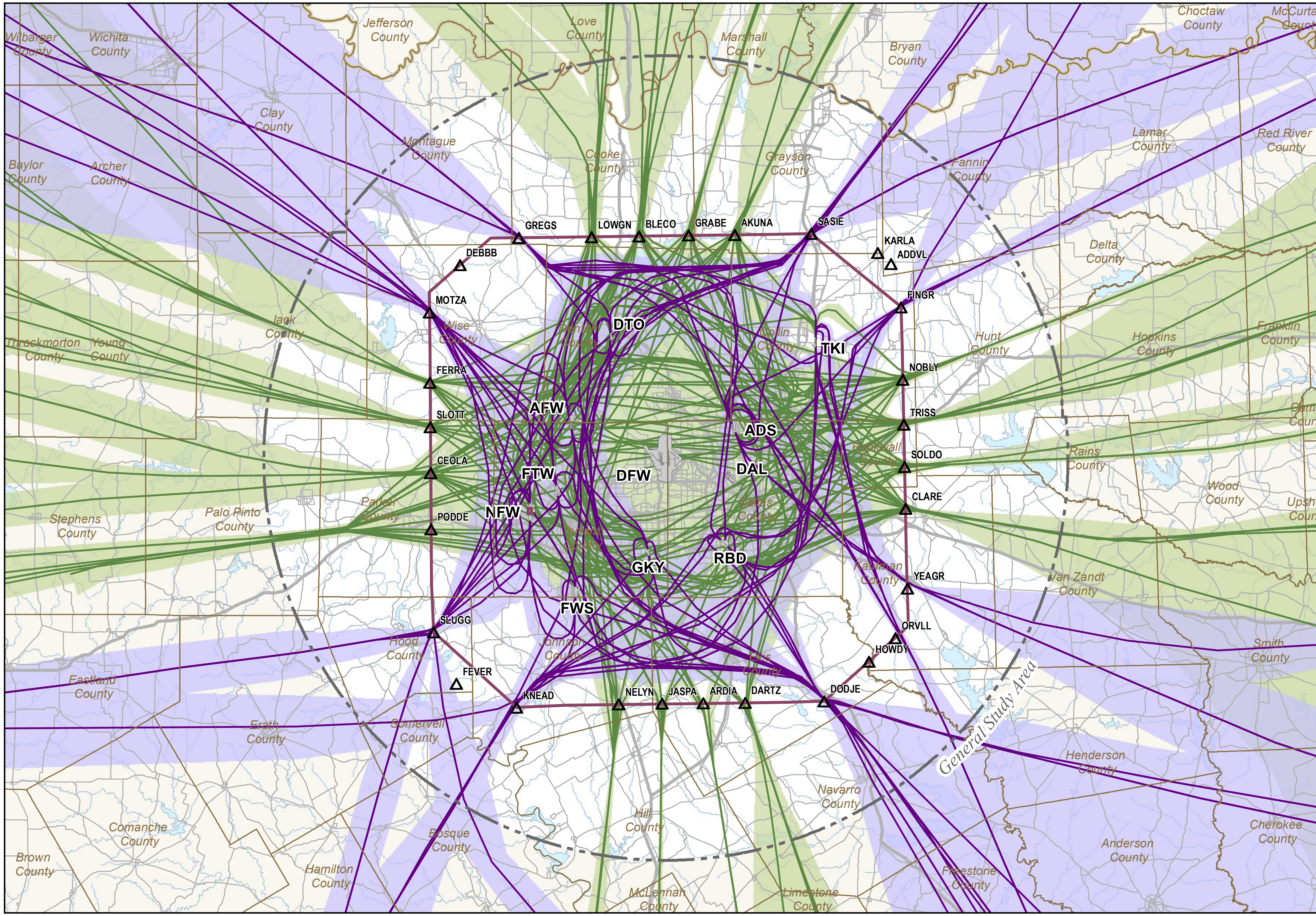
0 30nm

N

Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-9

No Action Alternative Major Study Airports Arrivals and Departures North Flow



LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- No Action Arrival Flow (Conventional)
- No Action Departure Flow (Conventional, Ground tracks unchanged between Existing/No Action/Proposed Action)
- Navigational Fix
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
For procedure names see exhibit 3-15 and 3-16

ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

TRACON - Terminal Radar Approach Control
D10 - Dallas-Fort Worth TRACON
RNAV - Area Navigation

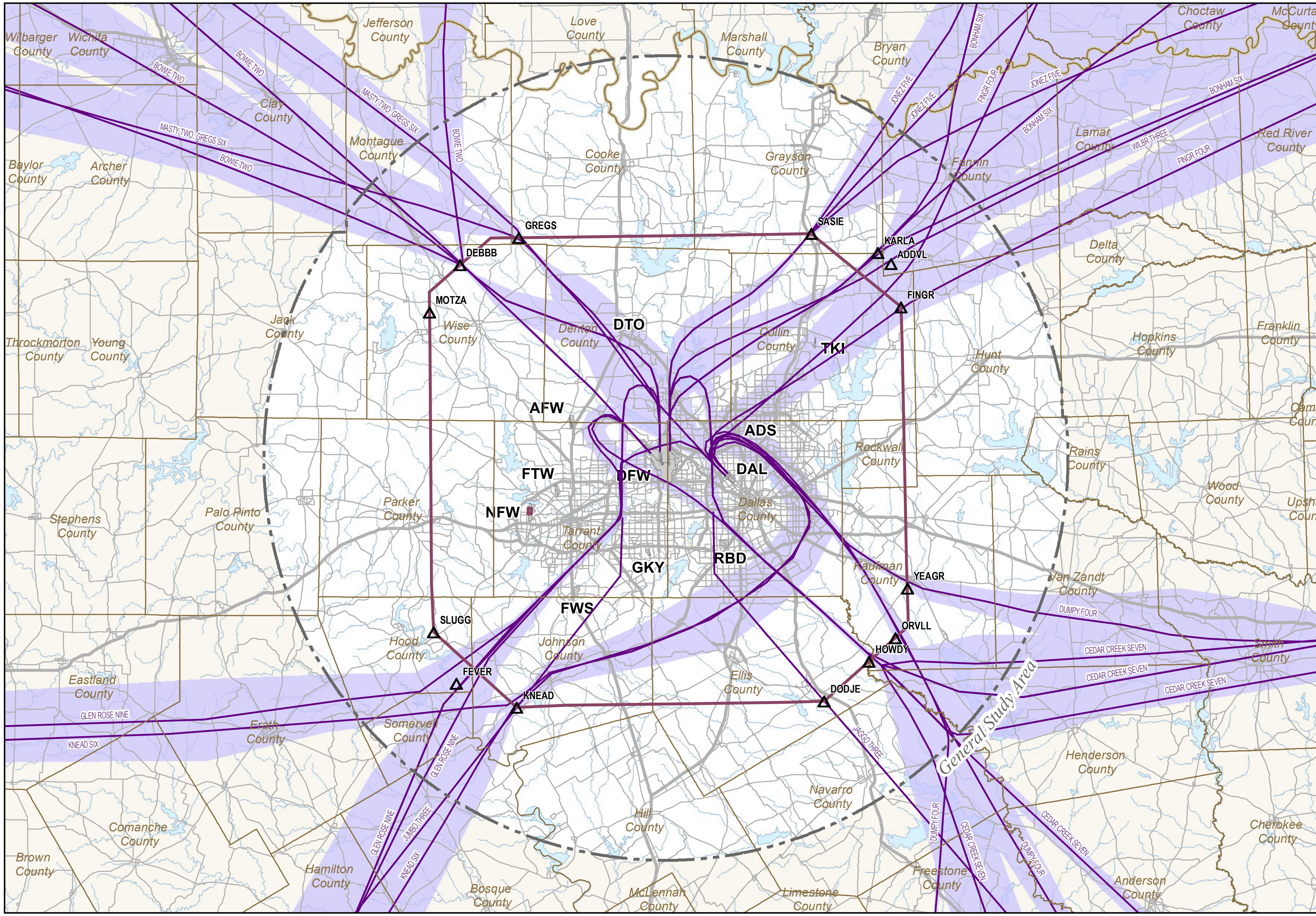
0 30nm

N

Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-10

No Action Alternative
Satellite Study Airports
Arrivals and Departures



LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- No Action Arrival Flow (Conventional)
- Navigational Fix
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
ADS - Addison Airport
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DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

TRACON - Terminal Radar Approach Control
D10 - Dallas-Fort Worth TRACON
RNAV - Area Navigation

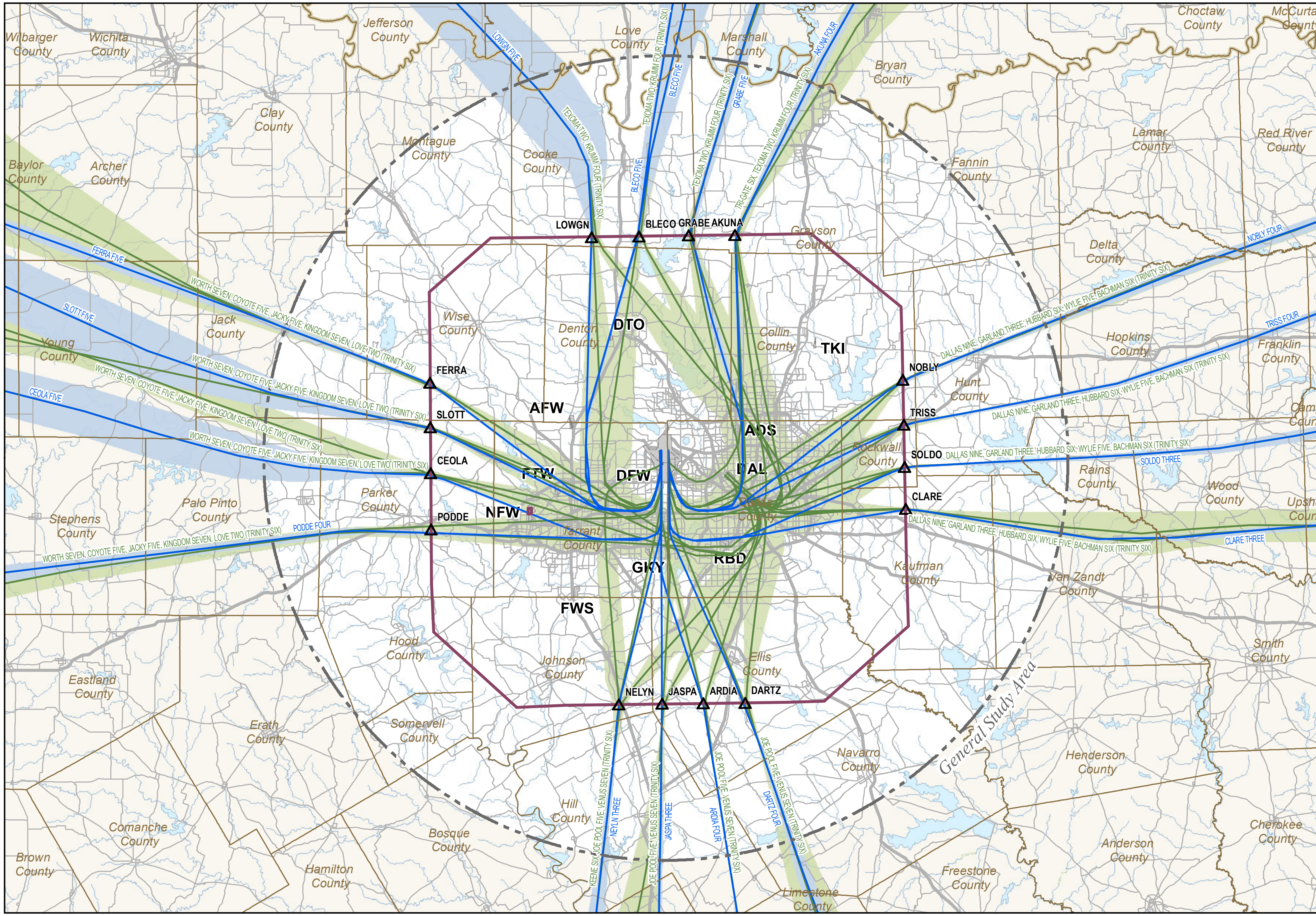
0 30nm

N

Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-11

No Action Alternative
Major Study Airports Arrivals
South Flow



LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- No Action Departure Flow (RNAV)
- No Action Departure Flow (Conventional, Ground tracks unchanged between Existing/No Action/Proposed Action)
- Navigational Fix
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

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NFW - Fort Worth Naval Air Station
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TKI - Collin County Regional Airport at McKinney

TRACON - Terminal Radar Approach Control
D10 - Dallas-Fort Worth TRACON
RNAV - Area Navigation

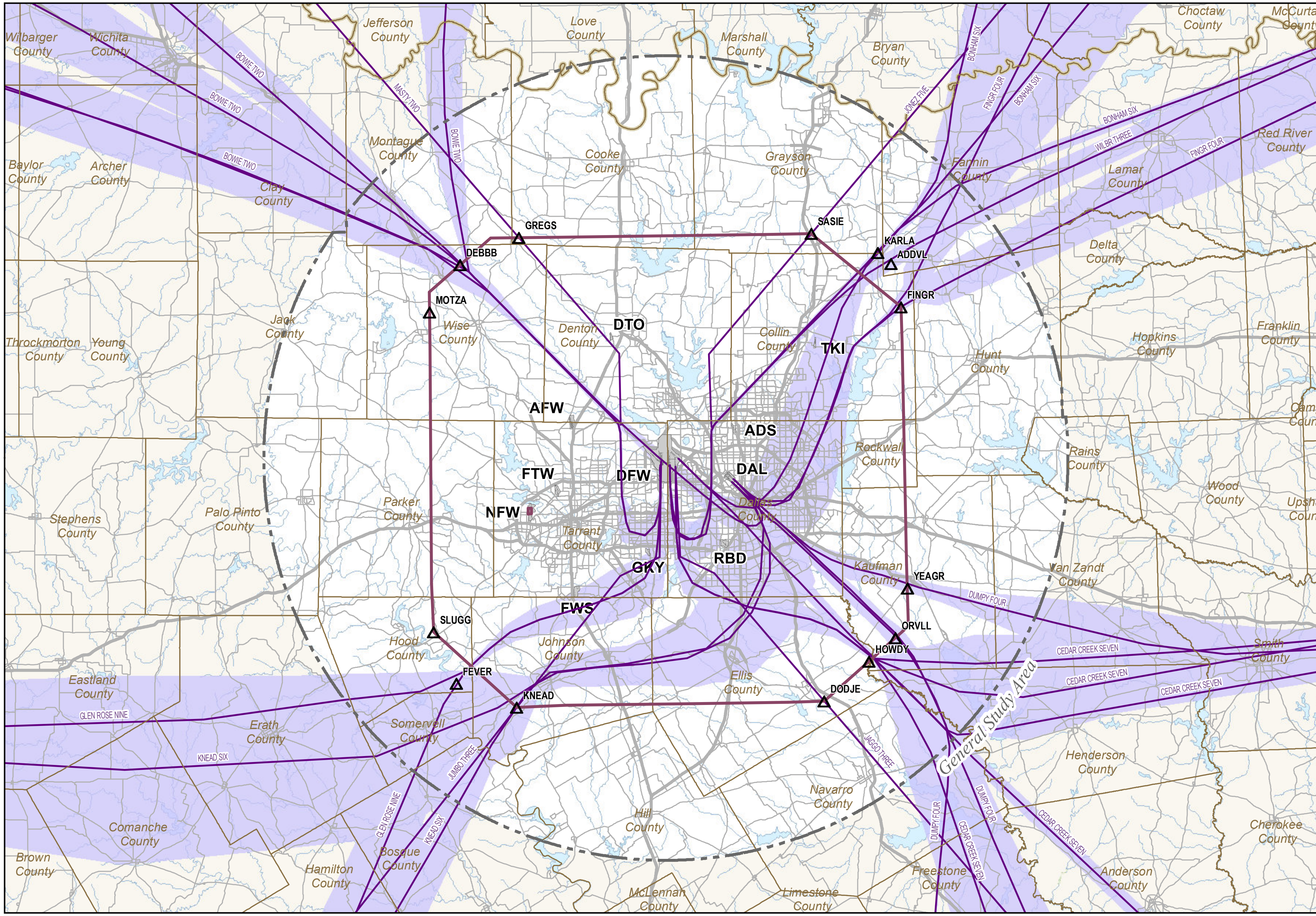
0 30nm

N

Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-12

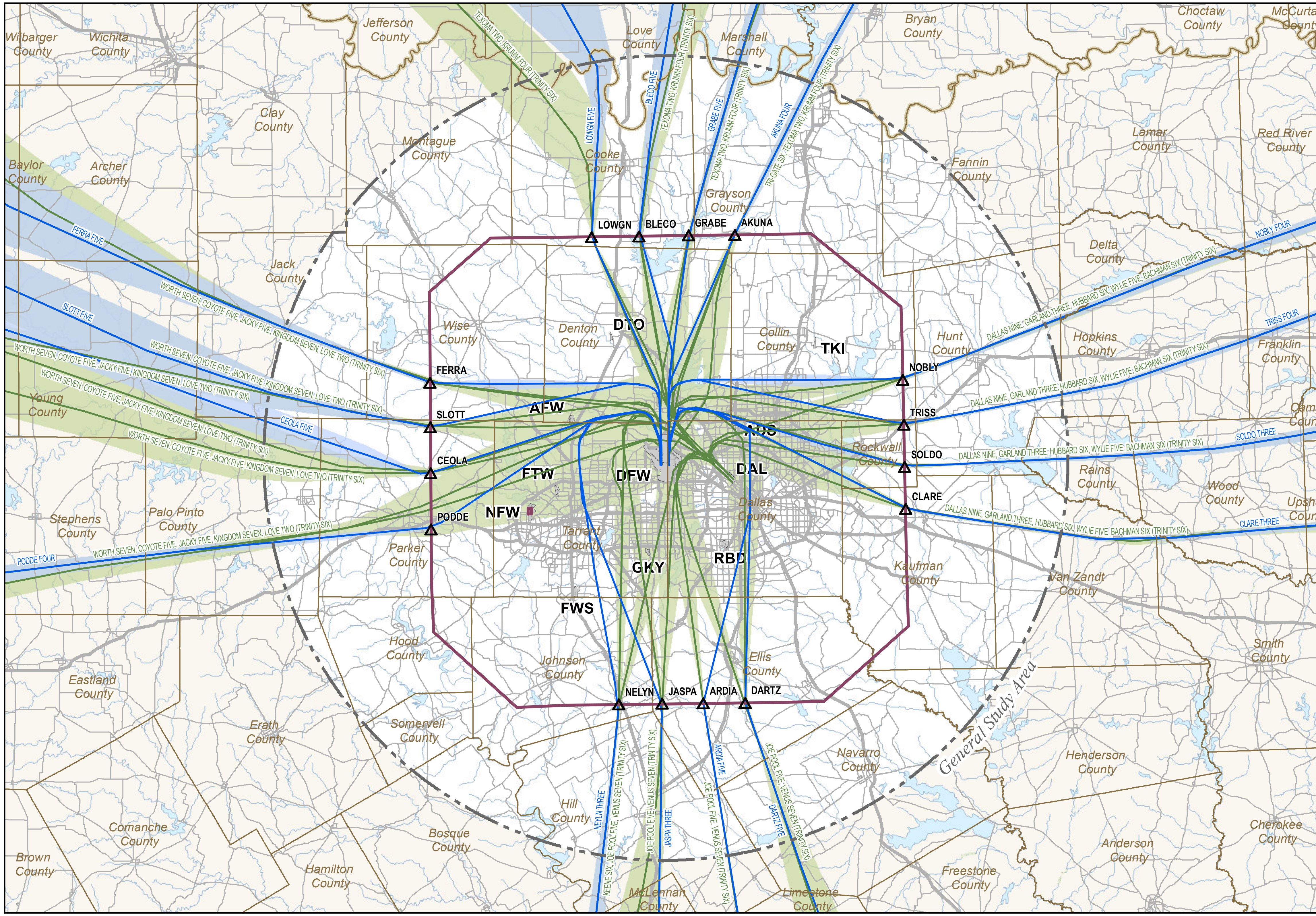
No Action Alternative
Major Study Airports Departures
South Flow



Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-13

No Action Alternative
Major Study Airports Arrivals
North Flow



LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- No Action Departure Flow (RNAV)
- No Action Departure Flow (Conventional, Ground tracks unchanged between Existing/No Action/Proposed Action)
- Navigational Fix
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
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FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

TRACON - Terminal Radar Approach Control
D10 - Dallas-Fort Worth TRACON
RNAV - Area Navigation

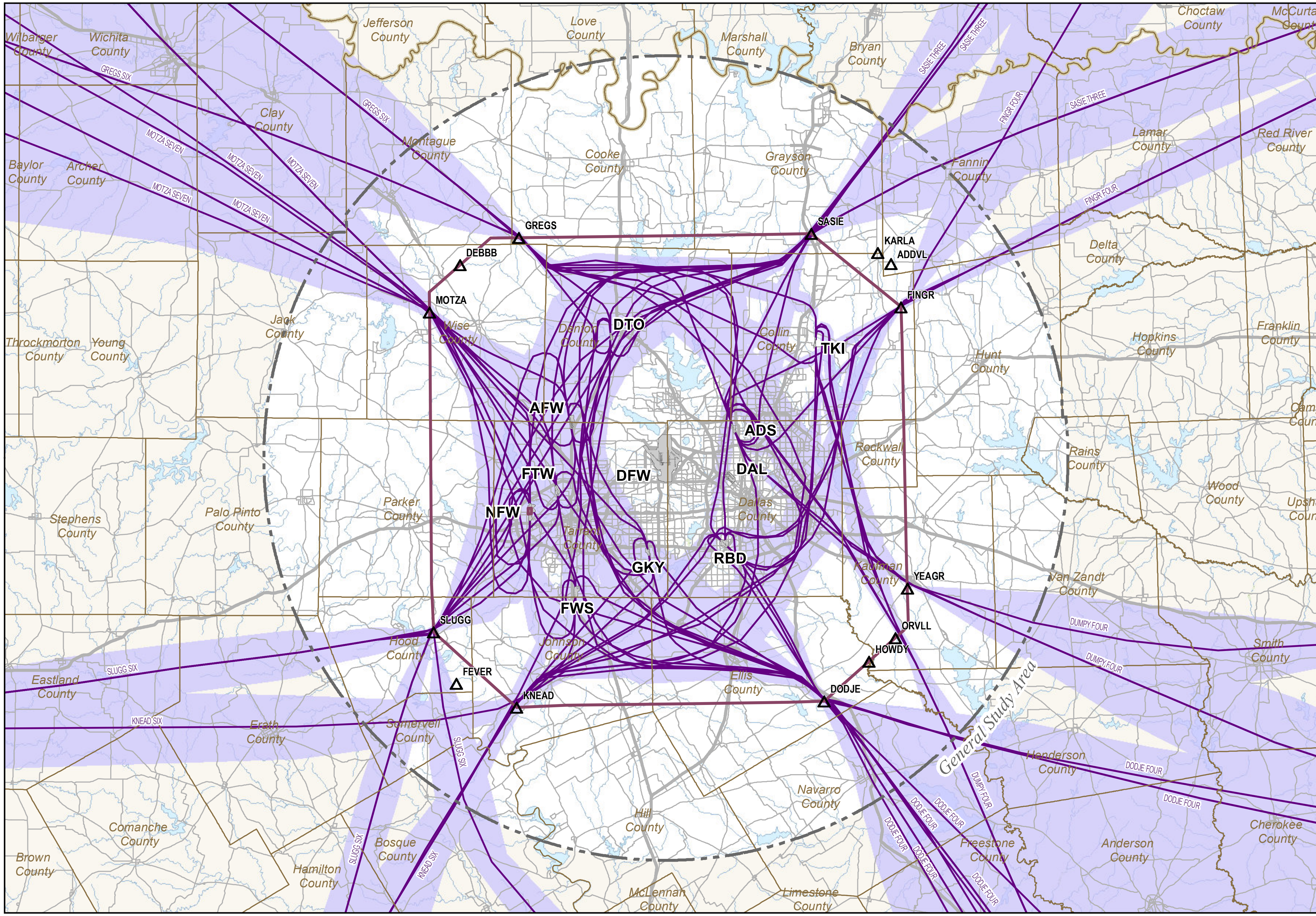
0 30nm

N

Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-14

No Action Alternative
Major Study Airports Departures
North Flow



LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- No Action Arrival Flow (Conventional)
- Navigational Fix
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
- **ADS** - Addison Airport
- **AFW** - Fort Worth Alliance Airport
- **DAL** - Dallas Love Field
- **DFW** - Dallas Fort Worth International Airport
- **DTO** - Denton Municipal Airport
- **FTW** - Fort Worth Meacham International Airport
- **FWS** - Fort Worth Spinks Airport
- **GKY** - Arlington Municipal Airport
- **NFW** - Fort Worth Naval Air Station
- **RBD** - Dallas Executive Airport
- **TKI** - Collin County Regional Airport at McKinney

- **TRACON** - Terminal Radar Approach Control
- **D10** - Dallas-Fort Worth TRACON
- **RNAV** - Area Navigation

0 30nm

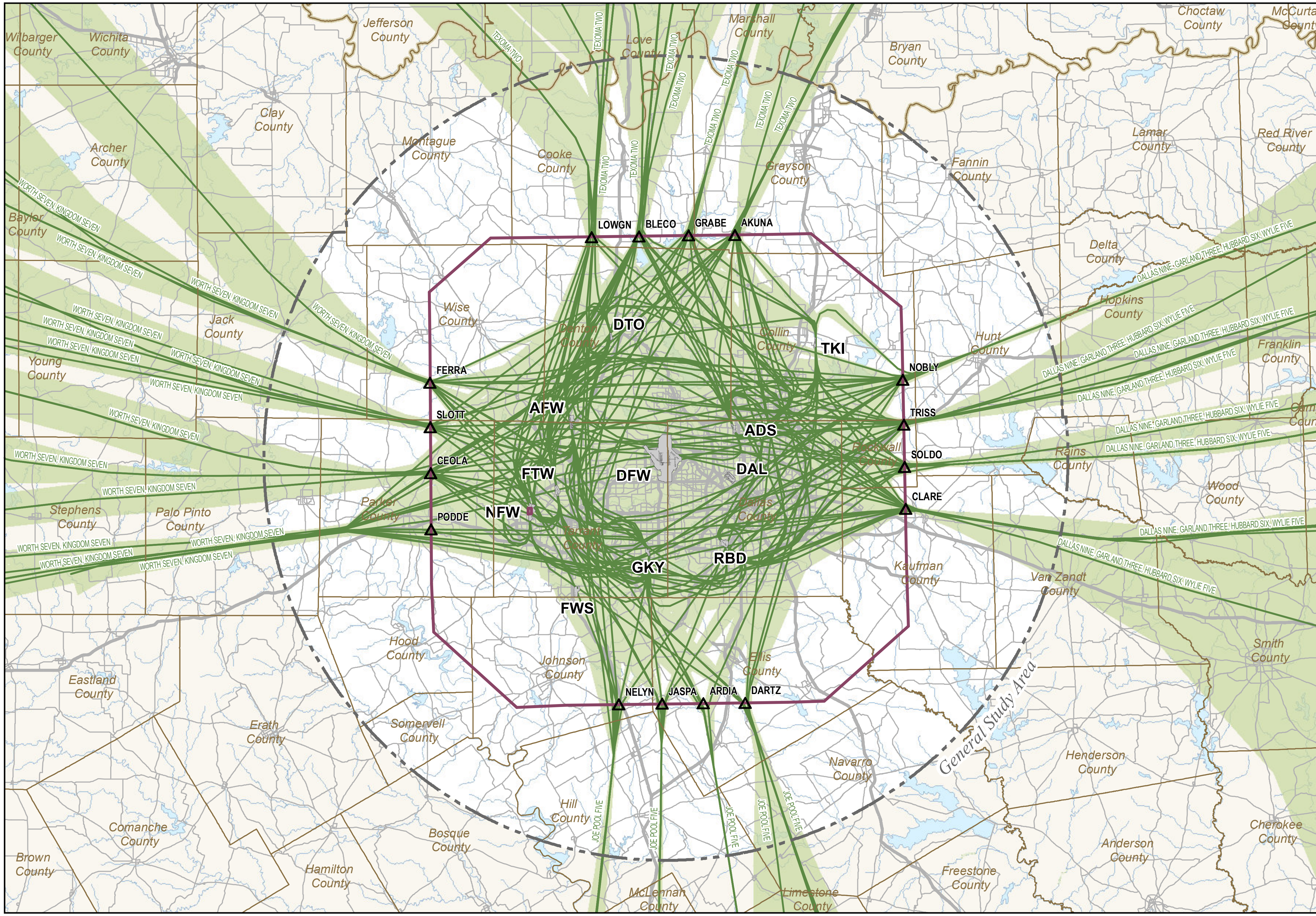
N

Path: H:\GIS\USA\TX\305220_North_Texas_OAPM\305220_NTX_EA_Exhibit3-15_NA_Satellite_Airports_ARR.mxd

Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-15

**No Action Alternative
Satellite Study Airports
Arrivals**



LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- No Action Departure Flow (Conventional, Ground tracks unchanged between Existing/No Action/Proposed Action)
- Navigational Fix
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

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FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

TRACON - Terminal Radar Approach Control
D10 - Dallas-Fort Worth TRACON
RNAV - Area Navigation

0 30nm

N

Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-16

No Action Alternative Satellite Study Airports Departures

3.2.2 Proposed Action Alternative

As discussed in Section 3.1, the Proposed Action includes the combined Proposed Final Designs for all procedures developed by the D&I Team as well as existing procedures that have been carried forward for continued use. This alternative is expected to add efficiency to airspace usage in the North Texas Metroplex by improving flexibility in transitioning aircraft, segregating arrivals and departures, and improving the predictability of air traffic flows.

The Proposed Action includes 96 procedures: 60 new procedures, 15 modified procedures developed by the D&I Team, and 21 existing procedures. In some cases, the D&I Team determined that existing procedures are efficient and a redesign was unnecessary.[37] Of the 60 new procedures developed by the D&I Team, 21 procedures are RNAV SIDs, 32 are RNAV STARs, one is a conventional STAR, and 6 are RNP-ARs. Out of the 15 modified procedures 8 were RNAV SIDs and 7 were conventional STARs.

Table 3-2 lists the names of the Proposed Action procedures, the corresponding No Action procedures, the procedure type, and the basis of design (indicated by the type of navigational aid the procedures are based on: NAVAID [shown as VOR, RNAV, or radar vectors]). In addition, the table also shows the airports served by the Proposed Action procedures, the number of runway and en route transitions for each procedure and, where applicable, by airport, and the entry/exit points served by the procedure. Finally, the table lists intent of the procedure, including the objectives identified under the purpose and need for the project (predictability, flexibility and/ segregation) that each procedure design achieves. New or updated SIDs and STARs are shaded in gray.

Exhibit 3-17 and **Exhibit 3-18** show all arrival and departure flows to the major Study Airports associated with the Proposed Action during South Flow and North Flow conditions, respectively. Corridors are grouped by procedure type (conventional or RNAV), operation (arrival or departure), and airport. Arrival and departure corridors to/from the satellite Study Airports are shown on **Exhibit 3-19.**

Exhibit 3-20 and **Exhibit 3-21** depict the arrival and departure corridors to/from the major Study Airports under South Flow conditions, respectively. Similarly, **Exhibit 3-22** and **Exhibit 3-23** depict the arrival and departure corridors to/from the major Study Airports under North Flow conditions, respectively. **Exhibit 3-24** and **Exhibit 3-25** depict arrivals and departures to the satellite Study Airports, respectively.

[37] More information on the procedure designs can be found in The Design and Implementation Team Final Report for the North Texas Metroplex, August 2013. http://oapmenvironmental.com/ntx_metroplex/ntx_docs.html

Table 3-2 Procedures Under the Proposed Action Alternative (1 of 4)

Proposed Action Procedure	No Action Alternative Procedure	Procedure Type	Basis of Design	Airport Served	Transitions (En Route / Runway)	Exit / Entry Point Served	Objective
AKUNA FIVE	AKUNA FOUR	SID	RNAV	DFW	1/8	North	De-confliction
ALIAN ONE	No Procedure	SID	RNAV	DFW	1/8	West	Flexibility
ARDIA FIVE	ARDIA FOUR	SID	RNAV	DFW	2/10	South	De-confliction
BACHMAN SIX	BACHMAN SIX	SID	VOR	DAL(Night)	9/0	East	Retention for Conventionals
BACHR ONE	KNEAD SIX	STAR	RNAV	DAL	4/0	Southwest (South Flow)	Segregation & Predictability
BAWLZ ONE	JAGGO THREE	STAR	RNAV	DFW (Dual)	4/0	Southeast (North Flow)	Flexibility
BLECO SIX	BLECO FIVE	SID	RNAV	DFW	2/10	North	De-confliction
No Procedure	BONHAM SIX	STAR	VOR	DFW	N/A	Northeast	Deletion
BOOVE ONE	GLEN ROSE NINE	STAR	RNAV	DFW	4/0	Southwest (South Flow)	Segregation & Predictability
BOWIE THREE	BOWIE TWO	STAR	VOR	DFW	7/2	Northwest	Overlay of RNAV STAR
BRDJE ONE	BONHAM SIX & WILBR THREE	STAR	RNAV	DFW	6/0	Northeast (North Flow)	Predictability
CABBY ONE	JAGGO THREE	STAR	RNAV	DFW (Dual)	4/0	Southeast (South Flow)	Flexibility
CAINE ONE	JONEZ FIVE	STAR	RNAV	DFW (Dual)	4/0	Northeast (North Flow)	Flexibility
CEDAR CREEK EIGHT	CEDAR CREEK SEVEN	STAR	VOR	DFW	4/0	Southeast	Segregation & Overlay of RNAV STAR
No Procedure	CEOLA FIVE	SID	RNAV	DFW	N/A	West	Deletion
CHUKK ONE	DUMPY FOUR	STAR	RNAV	East SATs	4/0	Southeast (South Flow)	Segregation & Predictability
No Procedure	CLARE THREE	SID	RNAV	DFW	N/A	East	Deletion
COYOTE FIVE	COYOTE FIVE	SID	VOR	DFW / DAL	10/0	West	Retention for Conventionals
CURLO ONE	JOE POOL FIVE	SID	RNAV	DAL	4/13	South (South Flow)	Predictability
DALLAS NINE	DALLAS NINE	SID	VOR	DFW / DAL / SATs	9/0	East	Retention for Conventionals
DAMNS ONE	WORTH SEVEN	SID	RNAV	SATs	6/2	West (North Flow)	Predictability
DARTZ FIVE	DARTZ FOUR	SID	RNAV	DFW	3/8	South	De-confliction
DAWGZ ONE	JONEZ FIVE	STAR	RNAV	DFW (Dual)	4/0	Northeast (South Flow)	Flexibility
DEBBB ONE	BOWIE TWO	STAR	RNAV	DFW	6/0	Northwest (South Flow)	Segregation & Predictability
DODJE FOUR	DODJE FOUR	STAR	VOR	West SATs	13/0	Southeast	Retention for Conventionals
No Procedure	DUMPY FOUR	STAR	VOR	DFW / DAL / East SATs	N/A	Southeast	Deletion
EESAT ONE	DUMPY FOUR	STAR	RNAV	East SATs	4/0	Southeast (North Flow)	Segregation & Predictability
EMMIT ONE	DALLAS NINE	SID	RNAV	DAL	5/4	East (North Flow)	Predictability
ESNYE ONE	TEXOMA TWO	SID	RNAV	DAL	12/4	North (North Flow)	Predictability
No Procedure	FERRA FIVE	SID	RNAV	DFW	N/A	West	Deletion
FINGR FIVE	FINGR FOUR	STAR	VOR	DAL / East SATs	8/0	Northeast	Overlay of RNAV STAR

Proposed Action Procedure	No Action Alternative Procedure	Procedure Type	Basis of Design	Airport Served	Transitions (En Route / Runway)	Exit / Entry Point Served	Objective
FORCK ONE	SOLDO THREE	SID	RNAV	DFW	1/8	East	Predictability
GARLAND THREE	GARLAND THREE	SID	VOR	DFW / DAL / SATs	6/0	East	Retention for Conventionals
GIBBI ONE	MASTY TWO	STAR	RNAV	DFW (Dual)	5/0	Northwest (North Flow)	Flexibility
GLEN ROSE ONE	GLEN ROSE NINE	STAR	VOR	DFW / DAL / East SATs	2/0	Southwest	Overlay of RNAV STAR
GRABE SIX	GRABE FIVE	SID	RNAV	DFW	2/8	North	De-confliction
GREGS SEVEN	GREGS SIX	STAR	VOR	DAL / East SATs	7/0	Northwest	Overlay of RNAV STAR
HIBIL ONE	FINGR FOUR	STAR	RNAV	DAL	8/0	Northeast (South Flow)	Segregation & Predictability
HRPER ONE	SLOTT FIVE	SID	RNAV	DFW	1/8	West	Predictability
HUBBARD SIX	HUBBARD SIX	SID	VOR	DFW / DAL / SATs	6/0	East	Retention for Conventionals
HUDAD ONE	FERRA FIVE	SID	RNAV	DFW	1/8	West	Predictability
JACKY FIVE	JACKY FIVE	SID	VOR	DFW	0/0	West	Retention for Conventionals
No Procedure	JAGGO THREE	STAR	VOR	DFW	N/A	Southeast	Deletion
JASPA FOUR	JASPA THREE	SID	RNAV	DFW	1/8	South	De-confliction
JFRYE ONE	GREGS SIX	STAR	RNAV	DAL / East SATs	5/0	Northwest (South Flow for DAL only)	Segregation & Predictability
No Procedure	JONEZ FIVE	STAR	VOR	ADS / DFW (Dual)	N/A	Northeast	Deletion
JOVEM ONE	BOWIE TWO	STAR	RNAV	DFW	6/2	Northwest (North Flow)	Segregation & Predictability
JOE POOL FIVE	JOE POOL FIVE	SID	VOR	DFW / DAL / SATs	11/0	South	Retention for Conventionals
No Procedure	JUMBO THREE	STAR	VOR	DFW	N/A	Southwest	Deletion
KATZZ ONE	CEOLA FIVE	SID	RNAV	DFW	1/8	West	Predictability
KEENE SIX	KEENE SIX	SID	VOR	DFW	0/0	Southwest	Retention for Conventionals
KINGDOM SEVEN	KINGDOM SEVEN	SID	VOR	DFW / DAL / SATs	4/0	West	Retention for Conventionals
KKITY ONE	WORTH SEVEN	SID	RNAV	DAL	7/4	West (South Flow)	Predictability
KNEAD SIX	KNEAD SIX	STAR	VOR	DAL / East SATs	8/0	Southwest	Retention for Conventionals
KLNDR ONE	CEDAR CREEK SEVEN	STAR	RNAV	DFW	4/0	Southeast (South Flow)	Segregation & Predictability
KRUMM FOUR	KRUMM FOUR	SID	VOR	DAL (Night)	11/0	West	Retention for Conventionals
KUSSO ONE	WYLIE FIVE	SID	RNAV	SATs	5/1	East (South Flow)	Predictability
LEEAG ONE	WYLIE FIVE	SID	RNAV	SATs	5/1	East (North Flow)	Predictability
LIKES ONE	SLUGG SIX	STAR	RNAV	West SATs	5/0	Southwest	Segregation & Predictability
LNDRE ONE	DALLAS NINE	SID	RNAV	DAL	5/4	East (South Flow)	Predictability
LOVE TWO	LOVE TWO	SID	VOR	DAL (Night)	11/0	West	Retention for Conventionals
LOWGN SIX	LOWGN FIVE	SID	RNAV	DFW	2/10	North	De-confliction
No Procedure	MASTY TWO	STAR	VOR	DFW	N/A	Northwest	Deletion

Proposed Action Procedure	No Action Alternative Procedure	Procedure Type	Basis of Design	Airport Served	Transitions (En Route / Runway)	Exit / Entry Point Served	Objective
MNNDO ONE	DUMPY FOUR	STAR	RNAV	DAL	5/0	Southeast (North Flow)	Segregation & Predictability
MOTZA SEVEN	MOTZA SEVEN	STAR	VOR	West SATs	9/0	Northwest	Retention for Conventionals
MRSSH ONE	CLARE THREE	SID	RNAV	DFW	2/10	East	Predictability
NANDR ONE	GREGS SIX	STAR	RNAV	DAL	5/0	Northwest (North Flow)	Segregation & Predictability
NELYN FOUR	NELYN THREE	SID	RNAV	DFW	3/8	South	De-confliction
No Procedure	NOBLY FOUR	SID	RNAV	DFW	N/A	East	Deletion
NRTAY ONE	KNEAD SIX	STAR	RNAV	DAL	4/0	Southwest (North Flow)	Segregation & Predictability
PAWLZ ONE	JUMBO THREE	STAR	RNAV	DFW (Dual)	2/0	Southwest (North Flow)	Segregation & Predictability
No Procedure	PODDE FOUR	SID	RNAV	DFW	N/A	West	Deletion
RAMBL ONE	JOE POOL FIVE	SID	RNAV	DAL	13/4	South (North Flow)	Predictability
REDDN ONE	DUMPY FOUR	STAR	RNAV	DAL	4/0	Southeast (South Flow)	Segregation & Predictability
REEKO ONE	DODJE FOUR	STAR	RNAV	West SATs	4/0	Southeast	Segregation & Predictability
RNP-AR	No Procedure	RNP-AR	RNP	DAL	0/6	All	Predictability
SANGR ONE	SASIE THREE	STAR	RNAV	West SATs	5/0	Northeast	Segregation & Predictability
SASIE FOUR	SASIE THREE	STAR	VOR	West SATs & ADS	7/0	Northeast	Overlay of RNAV STAR
SEAVR ONE	BONHAM SIX & WILBR THREE	STAR	RNAV	DFW	6/0	Northeast (South Flow)	Predictability
SHAAM ONE	MASTY TWO	STAR	RNAV	DFW (Dual)	5/0	Northwest (South Flow)	Flexibility
SKTER ONE	NOBLY FOUR	SID	RNAV	DFW	1/8	East	Predictability
SLANT ONE	FINGR FOUR	STAR	RNAV	East SATs	8/0	Northeast	Segregation & Predictability
No Procedure	SLOTT FIVE	SID	RNAV	DFW	N/A	West	Deletion
SLUGG SIX	SLUGG SIX	STAR	VOR	West SATs	7/0	Southwest	Retention for Conventionals
SNSET ONE	WORTH FIVE	SID	RNAV	DAL	7/4	West (North Flow)	Predictability
SOCKK ONE	GLEN ROSE NINE	STAR	RNAV	DFW	4/0	Southwest (North Flow)	Segregation & Predictability
No Procedure	SOLDO THREE	SID	RNAV	DFW	N/A	East	Deletion
SWABR ONE	WORTH SEVEN	SID	RNAV	SATs	6/1	West (South Flow)	Predictability
SWTSR ONE	TEXOMA TWO	SID	RNAV	DAL	12/4	North (South Flow)	Predictability
SWVAY ONE	KNEAD SIX	STAR	RNAV	East SATs	4/0	Southwest	Segregation & Predictability
TEXOMA TWO	TEXOMA TWO	SID	VOR	DFW / DAL / SATs	11/0	North	Retention for Conventionals
TILLA ONE	JUMBO THREE	STAR	RNAV	DFW (Dual)	2/0	Southwest (South Flow)	Flexibility
TRI-GATE SIX	TRI-GATE SIX	SID	VOR	DFW	0/0	Northeast/Southwest	Retention for Conventionals
TRINITY SIX	TRINITY SIX	SID	VOR	DAL (Night)	0/0	South	Retention for Conventionals
No Procedure	TRISS FOUR	SID	RNAV	DFW	N/A	East	Deletion
TRYST ONE	FINGR FOUR	STAR	RNAV	DAL	8/0	Northeast	Segregation &

Proposed Action Procedure	No Action Alternative Procedure	Procedure Type	Basis of Design	Airport Served	Transitions (En Route / Runway)	Exit / Entry Point Served	Objective
						(North Flow)	Predictability
TRYTN ONE	TRISS FOUR	SID	RNAV	DFW	1/8	East	Predictability
VENUS SEVEN	VENUS SEVEN	SID	VOR	DAL (Night)	9/0	South	Retention for Conventionals
WESAT ONE	MOTZA SEVEN	STAR	RNAV	West SATs	4/0	Northwest	Segregation & Predictability
WHINY ONE	CEDAR CREEK SEVEN	STAR	RNAV	DFW	4/0	Southeast (North Flow)	Segregation & Predictability
WILBR FOUR	WILBR THREE	STAR	VOR	DFW	5/0	Northeast	Overlay of RNAV STAR
WORTH SEVEN	WORTH SEVEN	SID	VOR	DFW / DAL / SATs	11/0	West	Retention for Conventionals
WSTEX ONE	PODDE FOUR	SID	RNAV	DFW	2/8	West	Predictability
WYLIE FIVE	WYLIE FIVE	SID	VOR	DFW / DAL / SATs	9/0	East	Retention for Conventionals
YEAGR ONE	DUMPY FOUR	STAR	VOR	DAL / East SATs	8/0	Southeast	Segregation

Notes:
DAL – Dallas Love Field Airport *SATs – Satellite Airports* *N/A – Not applicable*
DFW – Dallas / Ft. Worth International Airport *ADS – Addison Airport*
SID – Standard Instrument Departure *STAR – Standard Terminal Arrival Route*
RNAV – Area Navigation *VOR - VHF Omnidirectional Range*

Sources: MITRE Inc., July 2013
Prepared by: Harris Miller Miller & Harris Inc., July 2013

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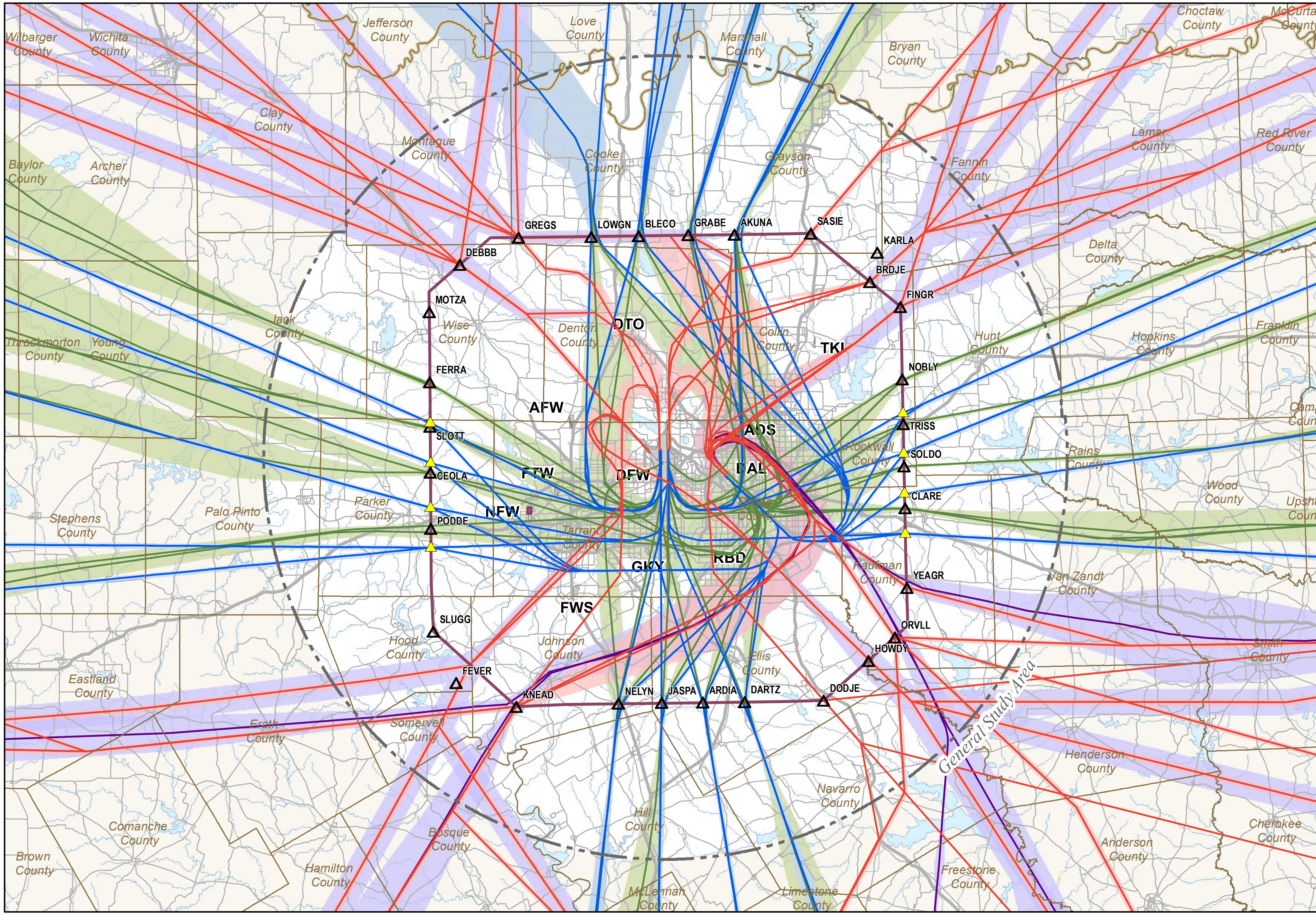


LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- Proposed Action Arrival Flow (RNAV)
- Proposed Action Departure Flow (RNAV)
- Proposed Action Arrival Flow (Conventional)
- Proposed Action Departure Flow (Conventional, Ground tracks unchanged between Existing/No Action/Proposed Action)
- Navigational Fix
- Floating Fix
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
For procedure names see exhibit 3-20 and 3-21

ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

TRACON - Terminal Radar Approach Control
D10 - Dallas-Fort Worth TRACON
RNAV - Area Navigation

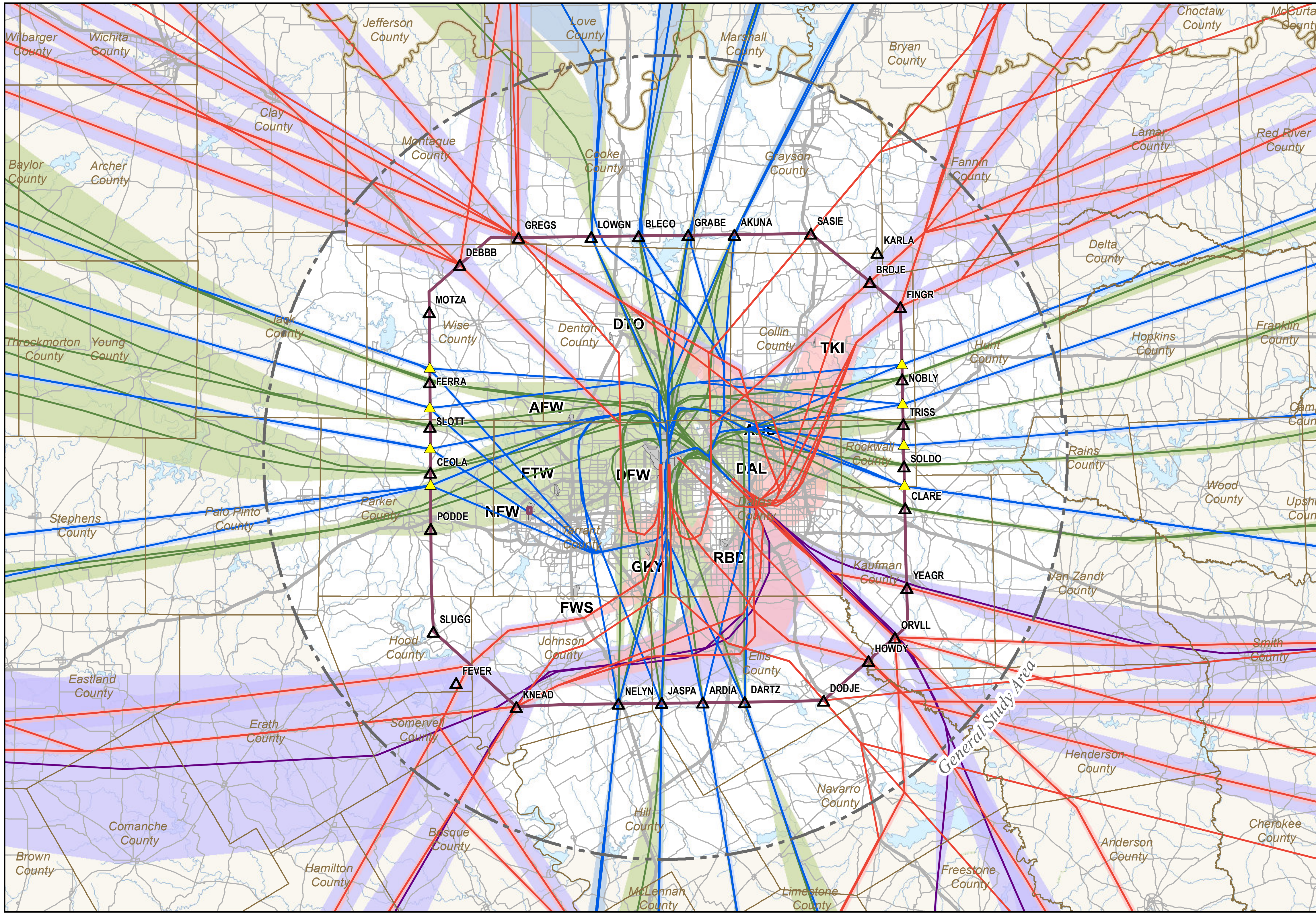
0 30nm

N

Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-17

Proposed Action Alternative Major Study Airports Arrivals and Departures South Flow



LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- Proposed Action Arrival Flow (RNAV)
- Proposed Action Departure Flow (RNAV)
- Proposed Action Arrival Flow (Conventional)
- Proposed Action Departure Flow (Conventional, Ground tracks unchanged between Existing/No Action/Proposed Action)
- Navigational Fix
- Floating Fix
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
For procedure names see exhibit 3-22 and 3-23

ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
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RNAV - Area Navigation

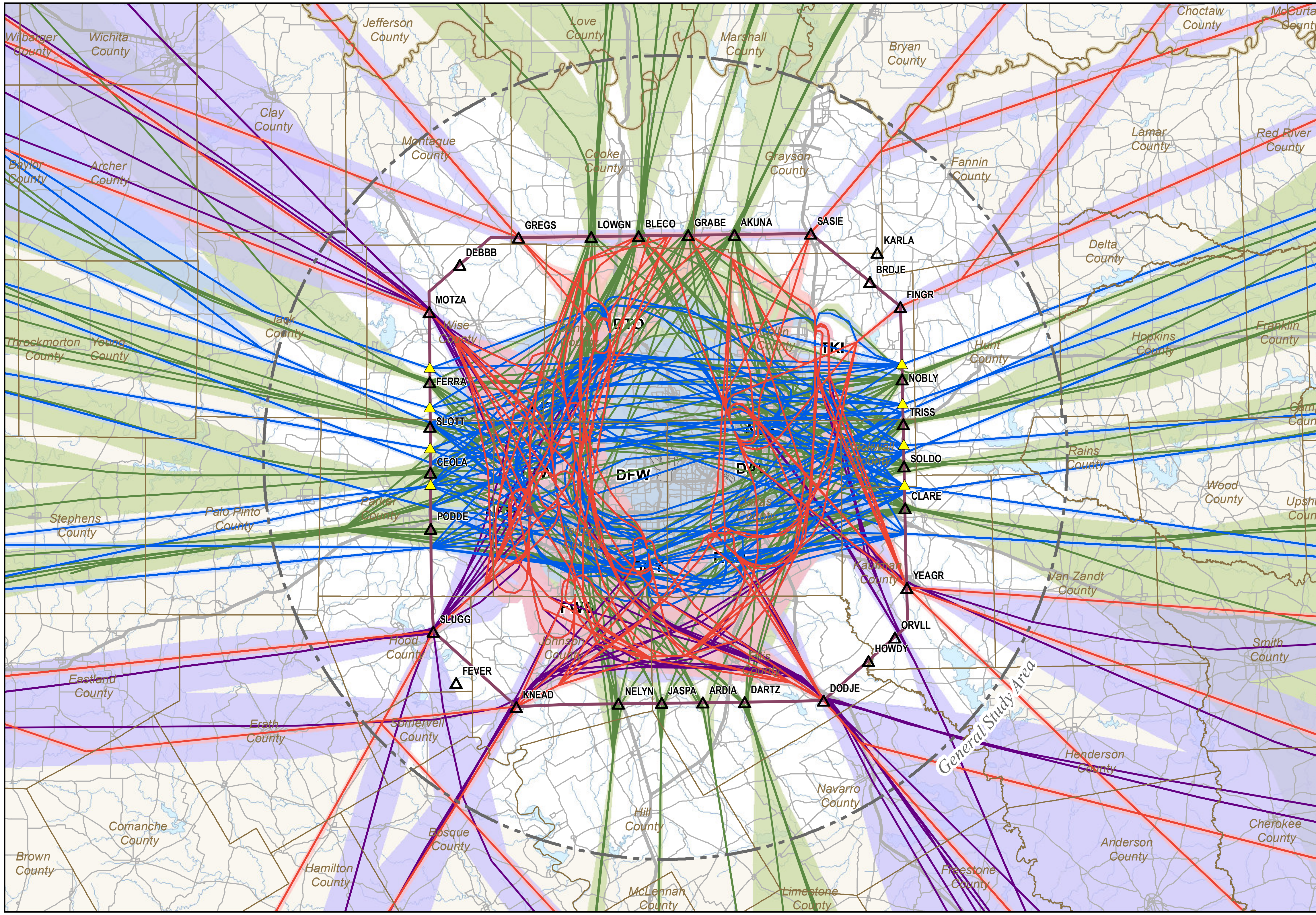
0 30nm

N

Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-18

Proposed Action Alternative Major Study Airports Arrivals and Departures North Flow



LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- Proposed Action Arrival Flow (RNAV)
- Proposed Action Departure Flow (RNAV)
- Proposed Action Arrival Flow (Conventional)
- Proposed Action Departure Flow (Conventional, Ground tracks unchanged between Existing/No Action/Proposed Action)
- Navigational Fix
- Floating Fix
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
For procedure names see exhibit 3-24 and 3-25

ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
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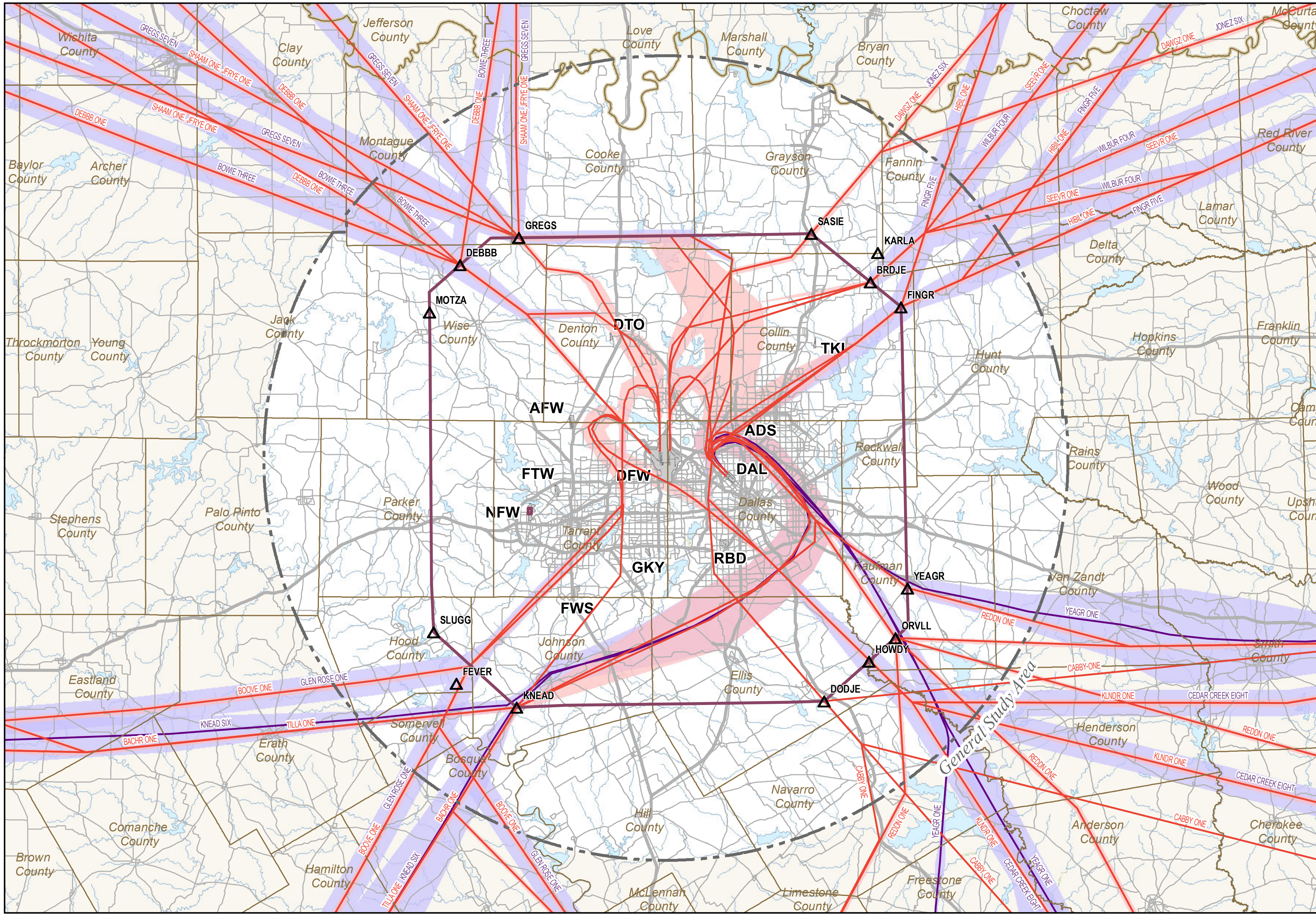
0 30nm

N

Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-19

Proposed Action Alternative
Satellite Study Airports
Arrivals and Departures



LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- Proposed Action Arrival Flow (RNAV)
- Proposed Action Arrival Flow (Conventional)
- Navigational Fix
- State Boundary
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D10 - Dallas-Fort Worth TRACON
RNAV - Area Navigation

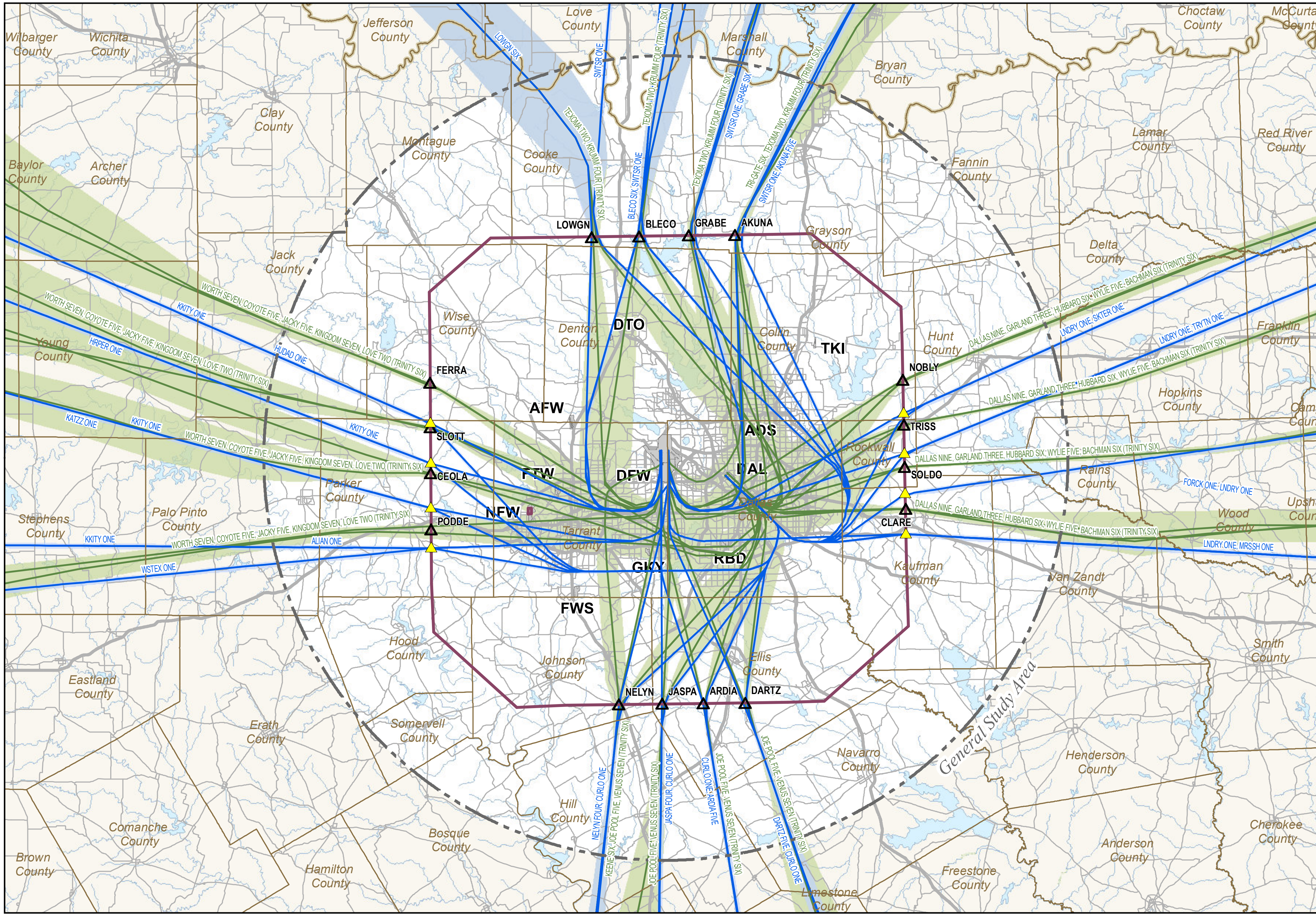
0 30nm

N

Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-20

Proposed Action Alternative
Major Study Airports Arrivals South Flow



LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- Proposed Action Departure Flow (RNAV)
- Proposed Action Departure Flow (Conventional, Ground tracks unchanged between Existing/No Action/Proposed Action)
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RNAV - Area Navigation

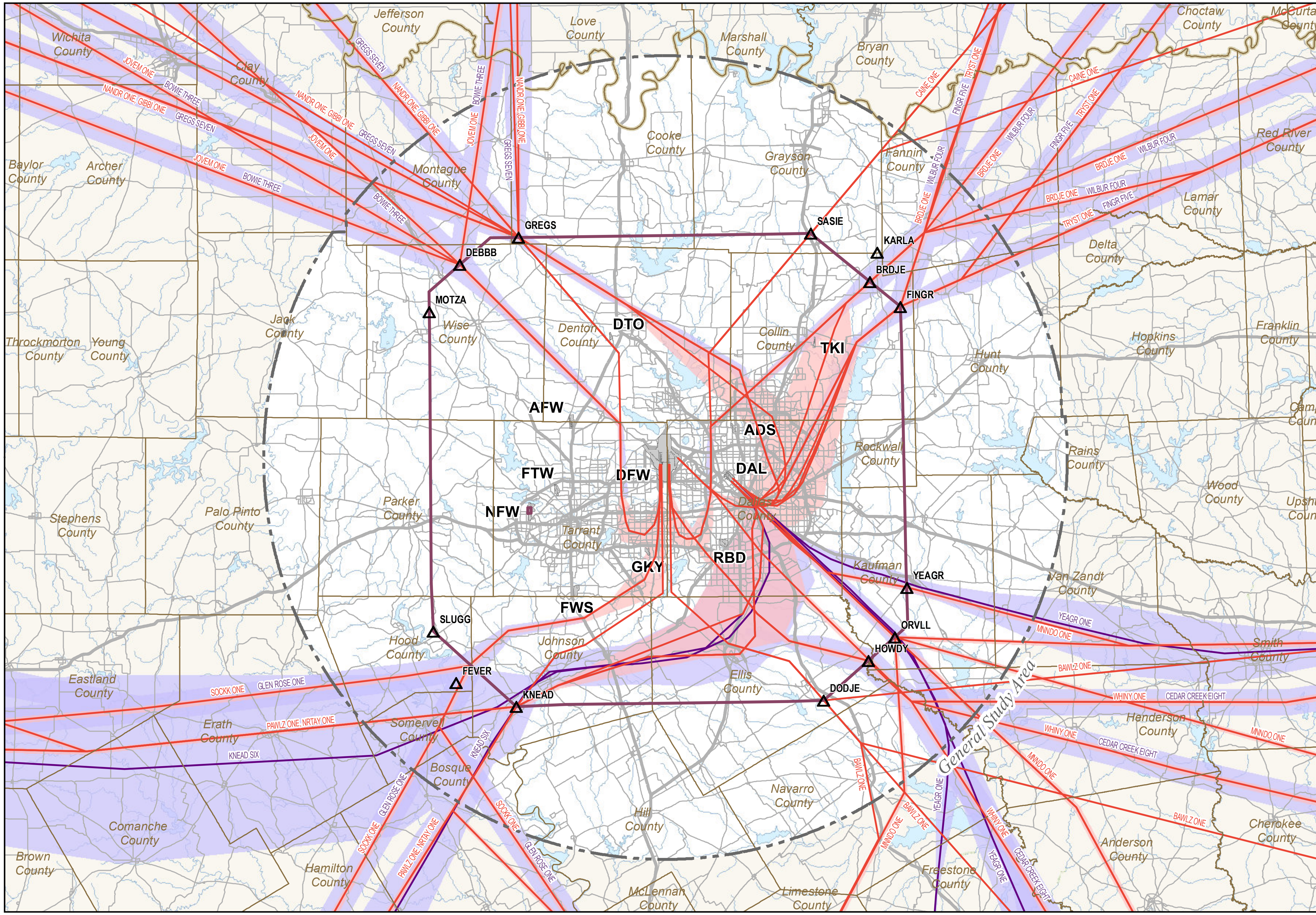
0 30nm

N

Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-21

Proposed Action Alternative
Major Study Airports Departures South Flow



LEGEND

- General Study Area
- Study Airport Area
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0 30nm

N

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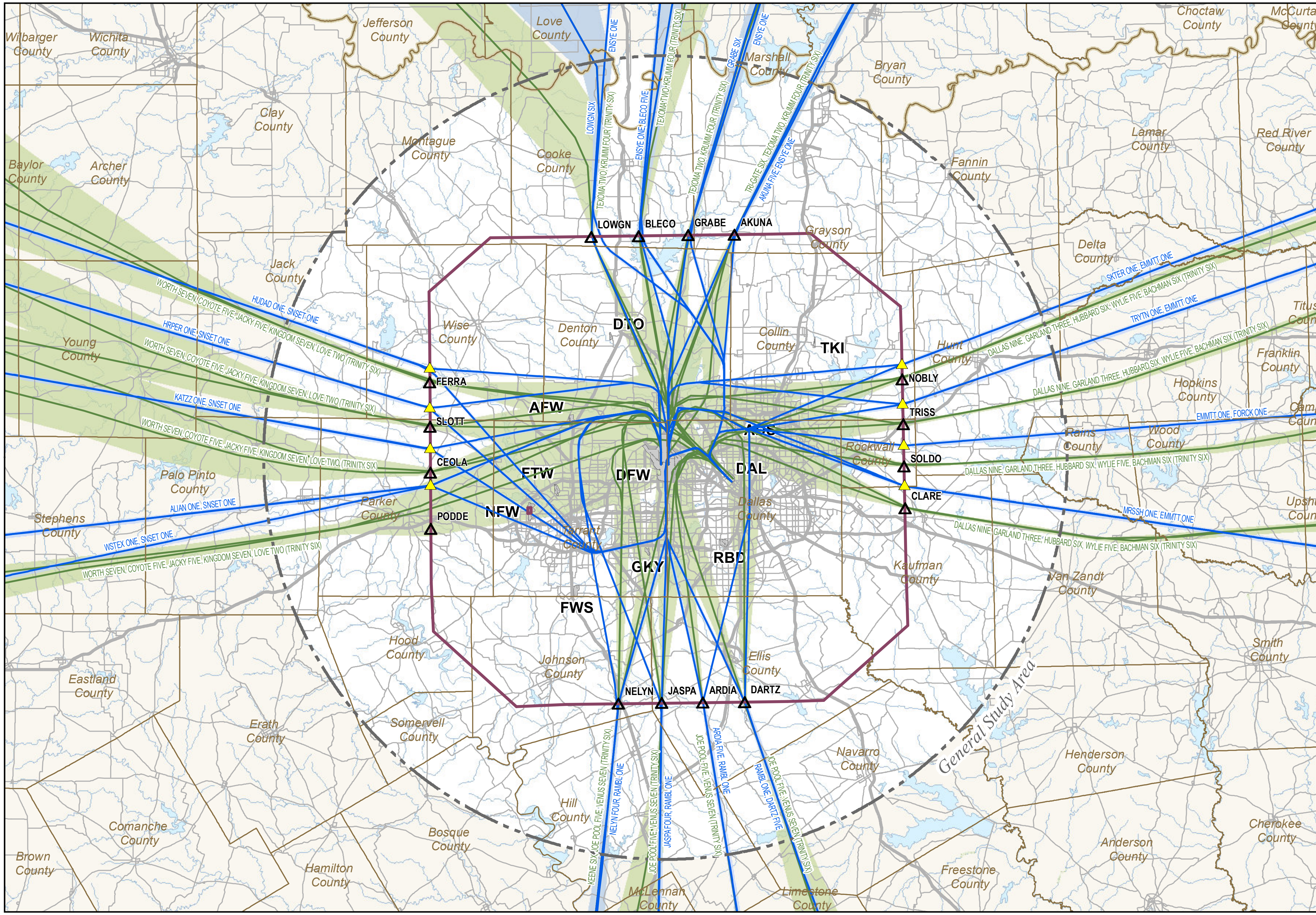
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-22

Proposed Action Alternative
Major Study Airports Arrivals North Flow



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0 30nm

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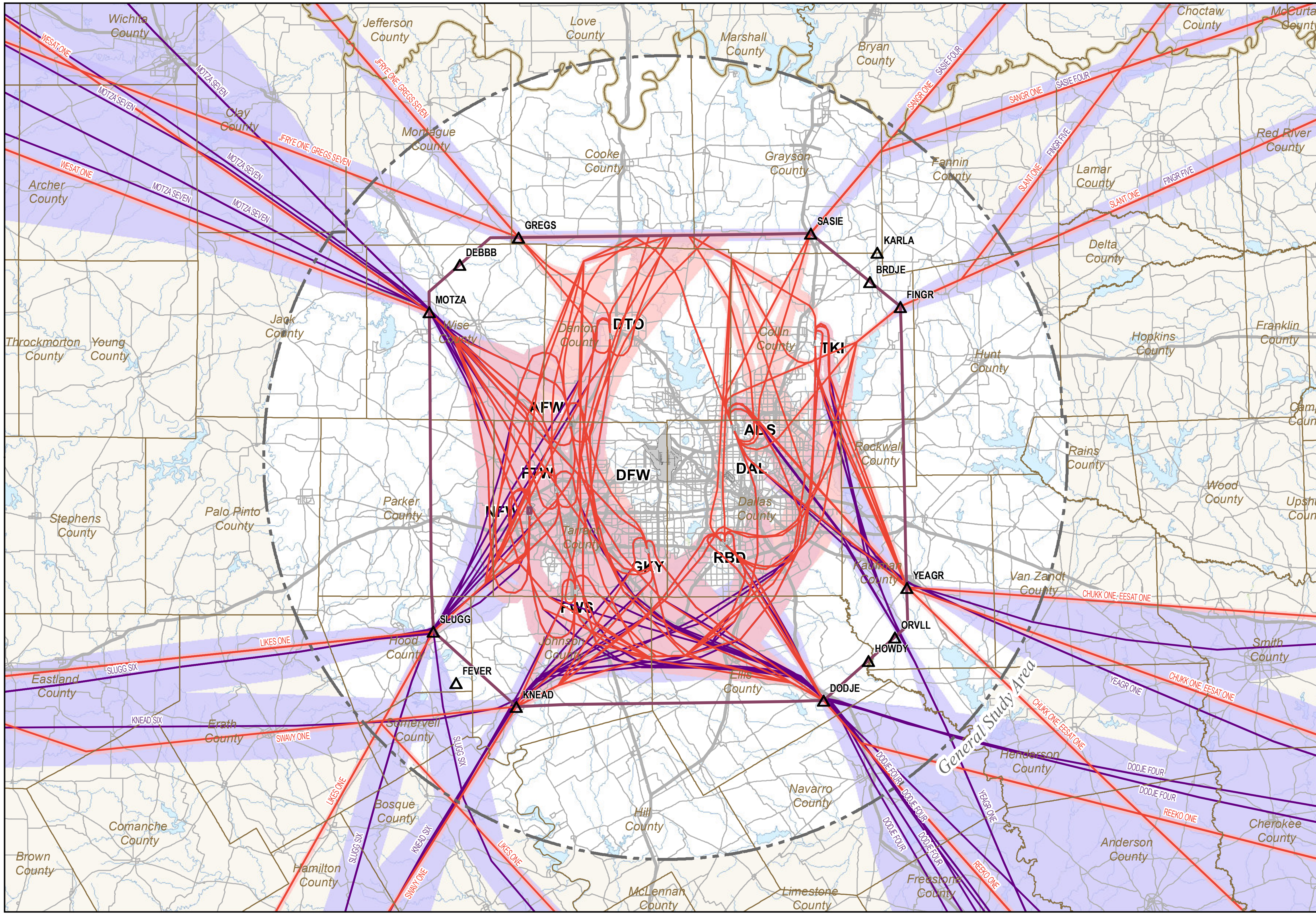
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-23

Proposed Action Alternative
Major Study Airports Departures North Flow



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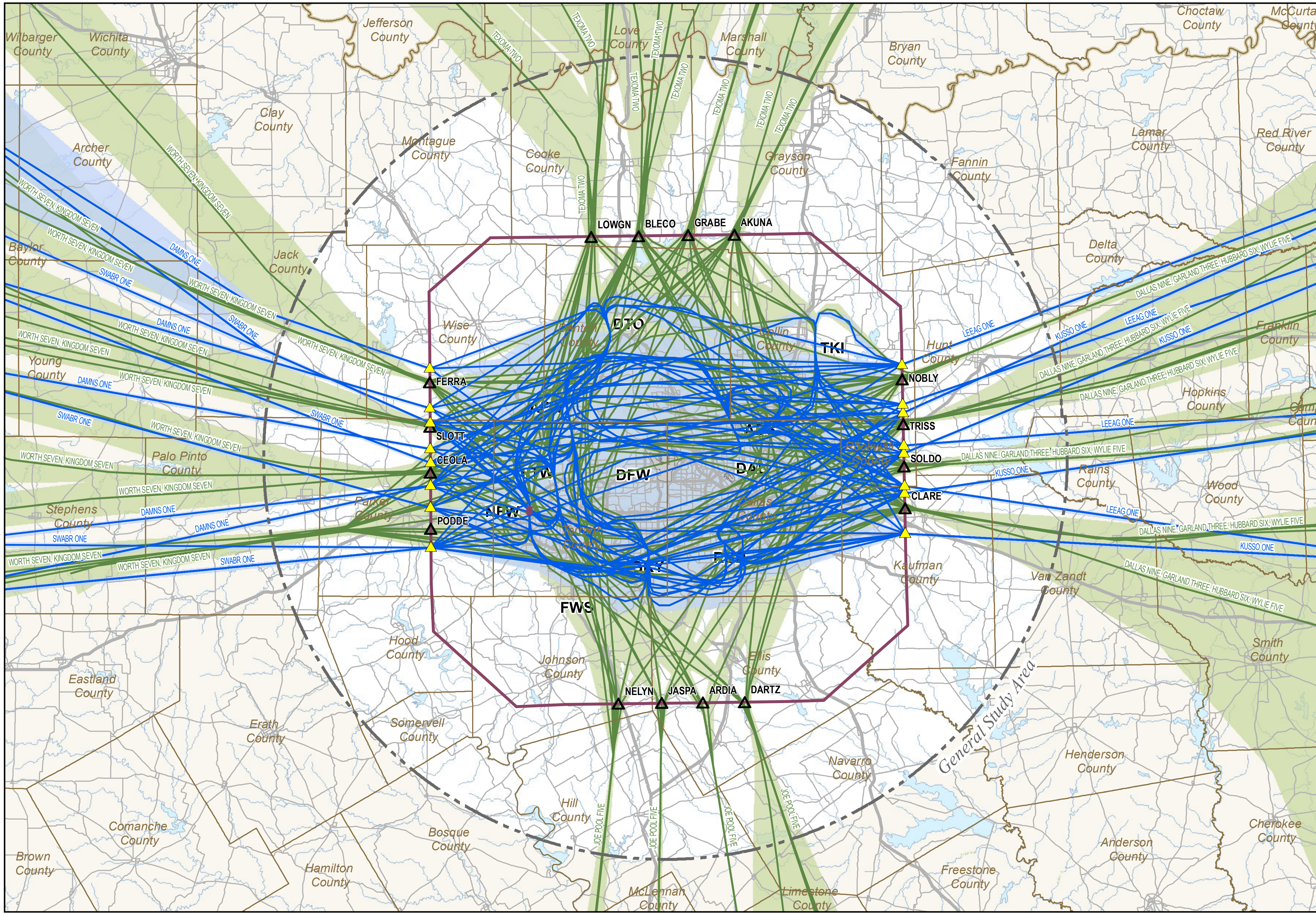
0 30nm

N

Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-24

Proposed Action Alternative
Satellite Study Airports Arrivals



LEGEND

- General Study Area
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- D10 TRACON Boundary
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TRACON - Terminal Radar Approach Control
D10 - Dallas-Fort Worth TRACON
RNAV - Area Navigation

0 30nm

N

Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-25

Proposed Action Alternative
Satellite Study Airports Departures

3.3 Summary Comparison of the Proposed Action and No Action Alternative

This section provides a comparative summary between the Proposed Action and No Action Alternative based on the objectives defined in Section 2.2:

- Improve the flexibility in transitioning traffic between en route and terminal area airspace and between terminal area airspace area and the runways;
- Improve the segregation of arrivals and departures in terminal area and en route airspace; and
- Provide RNAV arrival and departure en route transitional and terminal area airspace procedures for each individual runway with the intent to provide a more predictable ground and vertical path.

3.3.1 Improve the Flexibility in Transitioning Aircraft

Section 2.2.1 includes two criteria established to measure the objective to increase the flexibility in transitioning aircraft between the terminal and en route airspace:

1. Where possible, increase the number of entry and exit points compared with the No Action Alternative (measured by number of exit/entry points).
2. Segregate major Study Airport traffic from other major Study Airport and/or satellite Study Airport traffic to/from Study Airports (measured by count of RNAV STARs and/or SIDs that can be used independently to/from Study Airports).

The efficient use of the North Texas Metroplex airspace would be improved by providing additional entry and exit points and segregating airport traffic. **Table 3-3** provides a summary comparison of the Proposed Action and No Action Alternative based on the first criteria defined above. The total number of entry and exit points overall would increase under the Proposed Action as compared to the No Action Alternative.

Therefore, the additional entry/exit points exclusive to some Study Airports indicate that the Proposed Action Alternative would achieve the objective to increase the flexibility in transitioning aircraft between the terminal airspace and the en route airspace. This would be expected to improve the efficiency of the air traffic routes in the North Texas Metroplex airspace.

The Proposed Action includes 67 RNAV STARs, SIDs, and RNP-ARs, 66 of which can be used independently to the Study Airports. The one remaining RNAV STAR serves both DAL and the East Satellite Airports. In comparison, the No Action Alternative includes 16 RNAV procedures, 16 of which can be used independently to the Study Airports. The increased number of independent RNAV STARs and SIDs under the Proposed Action indicates that this alternative would better achieve the objective of improving flexibility in transitioning aircraft within the North Texas Metroplex airspace.

Table 3-3 Alternatives Evaluation: Provide Flexibility in Transitioning Aircraft

Criteria	No Action Alternative	Proposed Action
Entry Points		
Shared with Other Airports	10	7
Exclusive to DFW	3	4
Exclusive to DAL	0	0
Exclusive to Satellite Airports	1	2
Total	14	13
Exit Points		
Shared with Other Airports	16	32
Exclusive to DFW	0	0
Exclusive to DAL	0	0
Exclusive to Satellite Airports	0	0
Total	16	32

Sources: MITRE Inc., July 2013
Prepared by: Harris Miller Miller & Harris Inc., July 2013.

Table 3-4 PBN Procedures Dedicated to Study Airports

Airport	Type	No action (Today)	Proposed action
Dedicated to DFW	RNAV SID	16	17
	RNAV STAR	0	16
Dedicated to DAL	RNAV SID	0	8
	RNAV STAR	0	7
	RNP-AR	0	6
Dedicated to SATs Airports	RNAV SID	0	4
	RNAV STAR	0	8
Dedicated to DAL and East SATs	RNAV STAR	0	1
Total:		16	67

Source: MITRE Inc., July 2013
Prepared by: Harris Miller Miller & Hanson Inc., July 2013

3.3.2 Segregate Arrival and Departure Flows

In Section 2.2.2 one criterion was established to measure the objective to segregate traffic in portions of the airspace where arrival and departure flows cross, converge, or are within proximity of each other:

- Where possible, increase the number of RNAV STARs and SIDs compared with the No Action Alternative (Measured by total count of RNAV STARs and RNAV SIDs for the North Texas Metroplex.)

The Proposed Action includes 67 RNAV STARs/SIDs and 6 RNP-ARs. In comparison, the No Action Alternative includes 16 RNAV procedures. Therefore, the additional RNAV

STARs/SIDs included under the Proposed Action indicates that this alternative would achieve the objective of better segregating air traffic in the North Texas Metroplex airspace.

3.3.3 Improve Predictability of Air Traffic Flow

In Section 2.2.3, two criteria were established to measure the objective to improve the predictability of air traffic flow in the North Texas Metroplex airspace:

- Ensure that the majority of STARs and SIDs to and from the Study Airports are based on RNAV technology (measured by count of RNAV STARs and SIDs for an individual Study Airport); and
- Increase the number of runway transitions in the RNAV STARs and SIDs in comparison to the No Action Alternative (measured by count of procedures that include runway transitions to/from runways).

RNAV procedures provide for a predictable flow of air traffic and require less controller-to-controller and controller-to-pilot communications to manage air traffic flows through the airspace. Predictability in the North Texas Metroplex can be further improved by increasing the number of runway transitions and altitude-controlled points defined in the RNAV STARs and SIDs. An increase in the number and use of routes defined by RNAV procedures, especially those that include runway transitions, RNP-AR procedures, and/or altitude-controlled points, would be expected to decrease the number of controller-to-controller and controller-to-pilot communications. An increase in the number of runway transitions and procedures with altitude controls defined in the RNAV procedures would be expected to improve air traffic controllers' ability to more effectively serve all of the runways at the Study Airports and balance demand across the North Texas Metroplex while maintaining a predictable flow of air traffic.

Table 3-5 provides a summary comparison of the percentage of procedures based on RNAV technology under the Proposed Action and No Action Alternative; the total number of routes; and the number of RNAV procedures with altitude controls.

The majority of procedures under the Proposed Action Alternative would be RNAV STARs/SID and RNP-ARs, representing 70 percent of the total number of procedures compared to 32 percent under the No Action Alternative. Overall, the number of routes that transition from/to an entry/exit point to/from a runway end for the Proposed Action Alternative would increase over the No Action Alternative. Therefore, the Proposed Action Alternative would be expected to provide more predictability requiring less controller-to-controller and controller-to-pilot communications as compared to the No Action Alternative.

Based on the criteria above, the Proposed Action Alternative would provide a total of 67 RNAV STARs/SIDs and RNP-ARs in the North Texas Metroplex airspace compared to the 16 RNAV SIDs provided in the No Action Alternative. This represents a 419 percent increase in the number of RNAV procedures. With the increased number of predictable routes, the Proposed Action would provide better segregation of arrival and departure flows in comparison to the No Action Alternative.

Table 3-5 Alternatives Evaluation: Improve Predictability of Air Traffic Flow

Criteria	No Action Alternative	Proposed Action
Arrival Procedures		
Number of RNAV STARs	0	32
Total Arrival Procedures	17	44
Percent RNAV STARs of Total	0%	73%
Number of Runway Ends Served with RNP-AR Approach Procedures	0	6
Number of Altitude Control Points	1	298
Departure Procedures		
Number of RNAV SIDs	16	29
Total Departure Procedures	32	45
Percent RNAV SIDs of Total	50%	64%
Number of Combinations of Runway Ends and Exit Points Served by Runway Transitions in the RNAV SIDs for all Study Airports	16	24

Notes:
Blue Shading = indicates alternative that achieves desired criteria.

Sources: MITRE Inc., July 2013
Prepared by: Harris Miller Miller & Harris Inc., July 2013

3.4 Preferred Alternative

Of the two alternatives carried forward for analysis, the Proposed Action would better meet the Purpose and Need for the North Texas OAPM project based on the criteria discussed above. Therefore, the Proposed Action is the Preferred Alternative. Although it would not meet the Purpose and Need, the No Action Alternative was carried forward, as required by CEQ regulations, to establish a benchmark against which decision makers can compare the magnitude of environmental effects of undertaking the Proposed Action.

3.5 Listing of Federal Laws and Regulations Considered

Table 3-6 lists the relevant federal laws and statutes, Executive Orders, and regulations applicable to the Proposed Action and the No Action Alternative and considered in preparation of this EA.

Table 3-6 List of Federal Laws and Regulations Considered – NTX OAPM EA (1 of 3)

Federal Laws and Statutes	Citation
National Environmental Policy Act of 1969	42 U.S.C. § 4321 *et seq.*
Clean Air Act of 1970, as amended	42 U.S.C. § 7401 *et seq.*
Department of Transportation Act of 1966, Section 4(f)	49 U.S.C. § 303(c)
Aviation Safety and Noise Abatement Act of 1979	49 U.S.C. § 47501 et seq.
Federal Aviation Act of 1958, as amended	49 U.S.C. § 40101 et seq.
Endangered Species Act of 1973	16 U.S.C. § 1531 et seq.
Fish and Wildlife Coordination Act of 1958	16 U.S.C. § 661 et seq.
The Bald and Golden Eagle Protection Act of 1940	16 U.S.C. § 668 et seq.

Federal Laws and Statutes	Citation
Lacey Act of 1900	16 U.S.C. § 3371 et seq.
Migratory Bird Treaty Act of 1918	16 U.S.C. § 703 et seq.
National Historic Preservation Act of 1966, as amended	16 U.S.C. § 470
Archaeological and Historic Preservation Act of 1974, as amended	16 U.S.C. § 469 et seq.
American Indian Religious Freedom Act of 1978	42 U.S.C. § 1996
The Historic Sites Act of 1935, as amended	16 U.S.C. § 461-467

Table 3-6 List of Federal Laws and Regulations Considered – NTX OAPM EA (2 of 3)

Executive Orders	Citation
11593, Protection and Enhancement of the Cultural Environment	36 Federal Register (FR) 8921
12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	59 FR 7629
13045, Protection of Children from Environmental Health Risks and Safety Risks	62 FR 19885

Federal Regulations	Citation
Council for Environmental Quality Regulations	40 C.F.R. Part 1500 to Part 1508
General Conformity Regulations	40 C.F.R. Part 93 Subpart B
Protection of Historic Properties Regulations	36 C.F.R. 800
Airport Noise Compatibility Planning Regulations	14 C.F.R. Part 150
Federal Aviation Regulations (FAR) Part 71: Designation of Class A, Class B, Class C, Class D, and Class E Airspace Areas; Airways; Routes; and Reporting Points, December 17, 1991.	41 C.F.R. Part 71

Table 3-6 List of Federal Laws and Regulations Considered – NTX OAPM EA (3 of 3)

FAA/U.S. Department of Transportation Orders
U.S. DOT Order 5680.1: *Final Order to Address Environmental Justice in Low-Income and Minority Populations*, April 14, 1997.
FAA Order 1050.1E, Chng. 1: *Environmental Impacts: Policies and Procedures*, March 20, 2006.
FAA Order 7100.9D, *Standard Terminal Arrival Program and Procedures*, December 15, 2003.
FAA Order 8260.3B, Change 20, *United States Standard for Terminal Instrument Procedures (TERPS)*, December 7, 2007.
FAA Order 8260.40B, *Flight Management System (FMS) Instrument Procedures Development*, December 31, 1998.
FAA Order 8260.44A, Change 2, *Civil Utilization of Area Navigation (RNAV) Departure Procedures*, November 6, 2006.
FAA Order 8260.46D, *Departure Procedure (DP) Program*, August 20, 2009.
FAA Order 8260.48, *Area Navigation (RNAV) Approach Construction Criteria*, April 8, 1999.
FAA Order 8260.52, *United States Standard for Required Navigation Performance (RNP) Approach Procedures with Special Aircraft and Aircrew Authorization Required (SAAAR)*, June 3, 2005.
FAA Order 8260.54A, *The United States Standard for Area Navigation (RNAV)*, December 7, 2007.
FAA Order JO 7110.65U, Air Traffic Control, February 9, 2012.

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4 Affected Environment

This chapter of the environmental assessment (EA) describes the human, physical, and natural environmental conditions that could be affected by the Proposed Action. Specifically, the EA considers effects on the environmental resource categories identified in Appendix A of Federal Aviation Administration (FAA) Order 1050.1E, Chg. 1, *Environmental Impacts: Policies and Procedures* (FAA Order 1050.1E). The potential environmental impacts of the Proposed Action and No Action Alternatives are discussed in Chapter 5, *Environmental Consequences*.

The technical terms and concepts discussed in this chapter are explained in Chapter 1, *Background*.

4.1 General Study Area

To describe existing conditions in the North Texas Metroplex, the FAA developed a General Study Area (GSA). The GSA is used to evaluate the potential for environmental impacts that might occur as a result of implementation of the Proposed Action. Two overall objectives guided the development of the GSA:

1. The GSA was designed to capture all flight paths identified for the No Action Alternative using 2011 radar data (the latest year of complete data available at the time the EA process began) and the flight paths designed as part of the Proposed Action up to the point at which 95 percent of departing aircraft are above 10,000 ft. AGL and 95 percent of arriving aircraft are above 7,000 ft. AGL. Paragraph 14.5e of Appendix A to FAA Order 1050.1E, requires consideration of impacts of airspace actions from the surface to 10,000 ft. AGL if the GSA is larger than the immediate area around an airport or involves more than one airport. Furthermore, policy guidance issued by the FAA Program Director for Air Traffic Airspace Management states that for air traffic project environmental analyses, noise impacts should be evaluated for proposed changes in arrival procedures between 3,000 and 7,000 ft. AGL and departure procedures between 3,000 and 10,000 ft. AGL for large civil jet aircraft weighing over 75,000 pounds.[38]
2. The lateral extent of the GSA was concisely defined to focus on areas of air traffic flow. Please see section 4.1.2 for further discussion.

The following sections describe the data acquired and methodology used to develop the GSA.

4.1.1 Data Acquisition to Develop the General Study Area

The size of the GSA is based on aircraft arrivals and departures at the Study Airports. **Table 4-1** lists operations by Study Airport and the type of operation. An operation is defined as a takeoff or landing by an aircraft.

[38] Department of Transportation, Federal Aviation Administration, *Memorandum Regarding Altitude Cut-Off for National Airspace Redesign (NAR)* Environmental Analyses, September 15, 2003.

Table 4-1 Airport Operations by Airport and Category

Airport Code	Air Carrier	Air Taxi	General Aviation	Military	Total
DFW	467,912	172,629	6,074	188	646,803
DAL	87,063	29,351	61,677	1107	179,198
FTW	114	10,751	79,812	449	91,126
ADS	7,686	4,077	88,990	18726	119,479
AFW	40	7,664	67,466	749	75,919
NFW	4	756	147,115	156	148,031
TKI	1	1,328	81,557	52	82,938
GKY	18	556	74,521	102	75,197
DTO	0	426	57,375	319	58,120
RBD	0	147	54,826	222	55,195
FWS	118	0	253	27,836	28,207
Total Operations	**562,956**	**227,685**	**719,666**	**49,906**	**1,560,213**

Source: FAA ATADS (2011);
Prepared By: Harris Miller Miller & Hanson Inc., October 2012

Aircraft flight altitudes were identified for both the Proposed Action and No Action Alternative using radar data for 2011, the latest full year of data available at the time the analysis was conducted. However, only 281 days of data was used for 2011. The remaining 84 days of data for 2011 was either unavailable due to radar equipment anomalies, operational outages, or extreme weather events that made the data unreliable. The radar data was used to understand existing arrival and departure flight paths for aircraft operating under IFR conditions in the North Texas Metroplex. The initial area was analyzed and subsequently outlined to a size that was based on a detailed analysis of radar data and topography. The analysis of radar data included an assessment of existing flight tracks and profiles (altitudes) as well as consideration of proposed flight tracks and profiles. The need to capture 95 percent of departing aircraft operating within 10,000 ft. of the ground combined with the varied topography was used to set the altitude limit of the GSA. United States Geological Survey (USGS) data were acquired to define ground elevations throughout the GSA.

The radar data analysis included an assessment of existing and proposed flight tracks and profiles (altitudes)[39]. The radar data obtained to determine the GSA and existing noise conditions is further discussed in Section 4.3.1.

[39] Proposed Action tracks were based on the Terminal Area Route Generations, Evaluation, and Traffic Simulation (TARGETS) design package (June 6, 2012) provided by the FAA Design and Implementation Team.

4.1.2 Methodologies Used to Determine the General Study Area

As discussed in Section 4.1, the parameters for defining the GSA are based on the requirements of FAA Order 1050.1E (Appendix A, Paragraph 14.5e) and policy guidance issued by the Program Director for Air Traffic Airspace Management for air traffic project environmental analyses. Accordingly, the GSA is a three-dimensional block of airspace designed to capture aircraft operations to and from the Study Airports as they operate at or below 10,000 ft. AGL. The lateral dimensions of the GSA were defined using 2011 radar data to determine the point at which departing aircraft penetrate the 10,000 ft. AGL altitude and arriving aircraft penetrate the 7,000 ft. AGL altitude. Applying these criteria, the GSA captures the maximum range of flight tracks where 95 percent of aircraft pass through 10,000 ft. AGL ceiling. The outer boundaries of the GSA are largely shaped by the 7,000 ft. AGL point data[40] for arrivals because the aircraft are travelling at this altitude further away from the Study Airports compared to departures, which reach higher altitudes closer in. However, the GSA boundary was also shaped by the 10,000 ft. AGL points in areas over which departure operations predominate.

Because the GSA represents an area between the ground surface up to 10,000 ft. AGL, it was necessary to identify ground elevations throughout the North Texas Metroplex area. Data from the USGS was used to ensure the best representation of terrain conditions below the aircraft flight paths. Areas with high concentrations of air traffic flows were used to focus the GSA boundaries and to eliminate areas from the GSA with minimal or no aircraft overflights. Similarly, because the surface elevations can sometimes vary throughout the GSA, the top elevation of the GSA was established at 10,000 ft. AGL above the highest point of elevation on the ground for areas predominately overflown by departures.

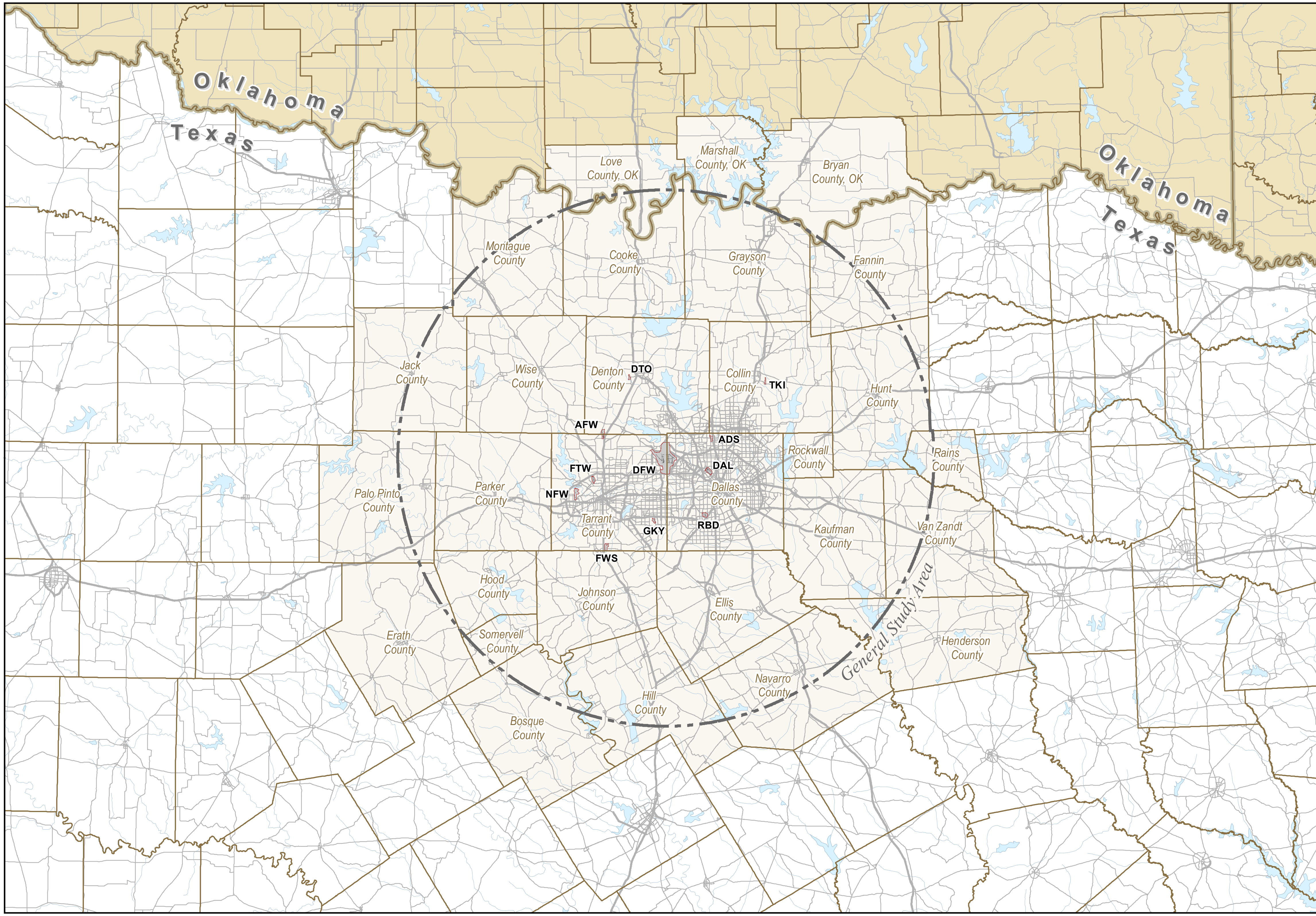
The resulting GSA consists of the area within a 60 nautical mile (NM) radius of DFW for evaluating potential impacts of proposed changes in aircraft routings below 10,000 ft. AGL. The GSA includes all or part of 29 counties in Texas and Oklahoma (26 in Texas and 3 in Oklahoma). **Exhibit 4-1** depicts the GSA developed for this EA. **Table 4-2** identifies the two states and 29 counties in the GSA.

Table 4-2 States and Counties in the General Study Area

		Texas		
Bosque	Collin	Cooke	Denton	Dallas
Ellis	Erath	Fannin	Grayson	Henderson
Hill	Hood	Hunt	Jack	Johnson
Kaufman	Montague	Navarro	Palo Pinto	Parker
Rains	Rockwall	Somervell	Tarrant	Van Zandt
Wise				
		Oklahoma		
Bryan	Love	Marshall		

Source: 2012; Environmental
Systems Research Institute, Inc. 2012
Prepared by: Harris Miller Miller & Hanson Inc., September 2012

[40] Point data or points are used to define an area of interest in GIS.



LEGEND

- General Study Area
- Study Airport Boundary
- Texas Counties
- Oklahoma Counties
- Counties within the Study Area
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
General Study Area Origin: Center of DFW (Longitude -97.037996, Latitude 32.896828), Radius: 60NMi

ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

0 60nm

N

Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, Roads, Airport Boundaries), May 03, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-1

General Study Area

4.2 Resource Categories or Sub-Categories Not Affected

This section discusses the environmental resource categories or sub-categories included in Appendix A of FAA Order 1050.1E that would remain unaffected by the Proposed Action. These resource categories would not be affected because the resource either does not exist within the GSA or the types of activities associated with the Proposed Action would not affect them. Accordingly, they are not carried forward in the EA for further detailed analysis. The resource categories or sub-categories are:

- **Coastal Resources:** The Proposed Action does not involve land acquisition or ground disturbing activities that would affect coastal resources.
- **Construction Impacts:** The Proposed Action does not involve any construction or ground disturbing activities.
- **Farmlands:** The Proposed Action would not involve land acquisition or ground disturbance that would have the potential to convert existing farmland to a non-agricultural use.
- **Fish, Wildlife and Plants**: Fish and Plants sub-categories are not affected under the proposed action: The Proposed Action is generally situated in areas above 3,000 ft. AGL and would not involve ground disturbance or other activities that would affect plant or fish. However, Wildlife (Bats and Avian) species are further discussed in section 3.4.5.
- **Floodplains:** The Proposed Action would not be situated in areas that include floodplains.
- **Hazardous Materials, Pollution Prevention, and Solid Waste**: The Proposed Action would not generate, disturb, transport, or treat hazardous materials.
- **Historic, Architectural, Archeological, and Cultural Resources**: Archeological and Architectural sub-categories are not affected under the proposed action: The Proposed Action would not involve land acquisition or ground disturbing activities that would affect archaeological or architectural resources. However, Historic and Cultural Resources are discussed further in section 4.3.4.
- **Light Emissions and Visual Impacts:** Light Emissions sub-category will not be affected by the proposed action: The Proposed Action does not involve construction of any structures that would introduce new sources of lighting. However, Visual Impacts are further discussed in section 4.3.10.
- **Natural Resources and Energy Supply:** Natural Resources sub-category will not be affected by the proposed action: The Proposed Action would not require use of unusual natural resources or other materials, or those in short supply. However, Energy Supply is further discussed in section 4.3.7.
- **Secondary (Induced) Impacts:** The Proposed Action would not cause changes in patterns of population movement or growth, public service demands, or business and economic activity. In addition, the Proposed Action does not involve construction or other ground disturbing activities that would involve the relocation of people or businesses. Furthermore, the proposed project does not include the construction of airport facilities that would result in or induce an increase in operational capacity.

- **Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks:**
  - Socioeconomic Impacts sub-category will not be affected by the proposed action: 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 and Safety Risks sub-categories will not be affected by the proposed action: The Proposed Action would not involve products or substances, with which a child is likely to be exposed, come into contact, ingest, or use. Furthermore, the Proposed Action would not result in a local increase in emissions that would have the potential to affect children's health. Accordingly, there would be no increase in environmental health and safety risks that could disproportionately affect children.
  - Environmental Justice sub-category is further discussed in section 4.3.6
- **Water Quality:** The Proposed Action does not involve any ground disturbing activities that would result in an increase in impervious surfaces or affect water quality or ground water.
- **Wetlands:** The Proposed Action does not involve land acquisition or ground disturbing activities that would affect wetlands.
- **Wild and Scenic Rivers:** There are no designated Wild and Scenic Rivers located within the GSA.

4.3 Potentially Affected Resource Categories or Subcategories

This section provides information on the current conditions within the GSA for those environmental resource categories or sub-categories that the Proposed Action could potentially affect. The sections of the document where they are described in detail are noted in parentheses. They include:

- Noise (4.3.1)
- Compatible Land Use (4.3.2)
- Department of Transportation Act: Section 4(f) (4.3.3)
- Historical, Architectural, Archeological, and Cultural Resources – Historical and Cultural Resources sub-categories (4.3.4)
- Fish, Wildlife, and Plants (4.3.5)
- Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks – Environmental Justice sub-category (4.3.6)
- Energy Supply (aircraft fuel) (4.3.7)
- Air Quality (4.3.8)
- Greenhouse Gases and Climate Change (4.3.9)
- Light Emissions and Visual Impacts (4.3.10)

4.3.1 Noise

This section discusses guidance and regulations established by the FAA for noise analyses, noise model input development, and existing aircraft noise conditions. Existing conditions are based on year 2011 operations, the most recent full calendar year at the time this analysis was begun. **Appendix E** provides background information on the physics of sound, the effects of noise on people, and noise metrics. More detailed information related to the noise model input is available on the OAPM website at http://oapmenvironmental.com/ntx_metroplex/ntx_docs.html.

4.3.1.1 Noise Modeling Methodology

To comply with NEPA requirements, the FAA developed specific guidance and requirements for the assessment of aircraft noise. This guidance, specified in FAA Order 1050.1E, requires that aircraft noise be analyzed in terms of the yearly Day-Night Average Sound Level (DNL) metric. In practice, this requirement means that DNL is computed for an average annual day (AAD) of operations for the year of interest.

The DNL metric is a single value representing the aircraft sound level over a 24-hour period. DNL includes all of the time-varying sound energy within the period. To represent the greater annoyance caused by a noise event at night, the DNL metric includes a 10-decibel (dB) weighting for noise events occurring between 10:00 P.M. and 6:59 A.M. (nighttime). The nighttime event weighting helps to account for annoyance that would potentially be caused by noise during night time periods when ambient noise levels are lower. The weighting used equates one night flight to 10 day flights. In this EA, for ease of reference, the format DNL 45 is used to represent a noise exposure level of DNL 45 dB. Additional details relating to the DNL as the metric of choice by FAA are available in **Appendix E**.

In addition to requiring the use of the DNL metric, FAA also requires that aircraft noise be evaluated using one of several authorized computer noise models. FAA Order 1050.1E states that the Noise Integrated Routing System (NIRS) should be used for flight track changes over large areas and at altitudes over 3,000 AGL. Specifically, for the Proposed Action, 1050.1E specifies use of NIRS, Version 7.0b.

For this EA, the FAA conducted a detailed analysis of aircraft operating under IFR conditions in 2011. 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 could be affected by the Proposed Action. Most aircraft around major airports operate under IFR to obtain direction on separation from surrounding aircraft from air traffic control (ATC) in these busy areas. Those aircraft operating under Visual Flight Rules (VFR) are unaffected by the Proposed Action.

When operating outside certain categories of controlled airspace, the aircraft operating under VFR described above are not required to be in contact with ATC. Because these aircraft operate at the discretion of the pilot and are often not required to file flight plans, the FAA has very limited information for these operations. Subsequently, there is no known source for comprehensive route, altitude, aircraft type, and frequency information for these VFR operations in the GSA. However, even if complete information were available for VFR operations, the Proposed Action evaluated in the EA would not require any changes to routing or altitudes to accommodate these operations. If they could be modeled, they would use the same flight routes and altitudes under the Proposed Action and No Action

Alternative scenarios. Therefore, VFR aircraft were not included in the analysis. Their operations would not be affected by the forecast conditions in 2014 (the first year of implementation) and 2019 (five years after implementation) for both the No Action Alternative and Proposed Action.

NIRS requires a variety of inputs, including local environmental data (e.g., temperature and humidity), runway layout, aircraft operations, runway use, and flight tracks. Accordingly, detailed information on aircraft operations for the Study Airports was assembled for input into NIRS. This includes specific aircraft fleet mix information such as aircraft type, arrival and departure times, and origin/destination airport.

AAD NIRS Operations: A total of 649,792 IFR-filed flights from/to the Study Airports were identified through an examination of radar data obtained from the FAA's Performance Data Analysis and Reporting System (PDARS). The PDARS database was queried for the 2011 calendar year for all IFR-filed flights that operated at the study airports within the GSA. As described in Section 4.1.1, during this 365 day period, 84 days of data were unusable. The 281 days of usable data span all seasons and runway usage configurations for the Study Airports in the GSA. This data was used to develop the AAD fleet mix, time of day (day and night) and runway use input for NIRS. More detailed information related to the NIRS input for Existing Conditions is available upon request (Please see **Appendix C** for contact information).

AAD NIRS Flight Tracks and Climb/Descent Patterns: The PDARS data provided tracks for each flight that occurred within the 281 days of 2011. The data was not only used to define the AAD track locations and use representing a typical flow of traffic, but also the typical climb and descent patterns that occur along each flow. Patterns also include top-of-climb and top-of-descent locations for fuel burn modeling purposes. The tracks were analyzed using proprietary software in order to visualize and analyze the radar data. All the trajectories were "bundled" into a set of tracks representing a flow. The flows comprise all the typical flight routings within the GSA for an average annual day. NIRS tracks are then developed based on the group of radar tracks representing each flow.

The NIRS model was used to calculate noise levels for the following specific locations on the ground:

- **Census Block Centroids:** The NIRS model can be used to calculate DNL at the geographic centers (centroids) of census blocks to estimate the population exposed to varying levels of aircraft noise exposure. For this EA, population within the GSA was analyzed using 2010 U.S. Census block geometries.[41] A census block is the smallest geographical unit used by the United States Census to collect data. The census block centroid DNL represents the DNL for the total maximum potential population within that census block. Because noise levels are analyzed only at the centroid point and applied to the entire census block area population and because the area represented by each centroid varies depending on the density of population, the actual noise exposure level for individuals will vary from the reported level based on their proximity to the geographic centroid.
- **Grid Points:** The NIRS model can also be used to calculate noise exposure at evenly spaced grid points. For this EA, the GSA was covered with a 0.5 nm by 0.5 nm grid.

[41] US Census Bureau, *2010 Tracts and American Community Survey Selected Economic Characteristics*, 2010.

- **Unique Points:** Noise levels at sites of interest too small to be captured in the 0.5 nm grid can also be analyzed using the NIRS model. Such sites include individual Section 4(f) resources that are less than one square nautical mile in area (such as significant public parks), and historic sites (such as individual buildings). See Section 4.3.3 for a discussion of what constitutes a Section 4(f) resource and Section 4.3.4 for a discussion of historic properties in the GSA.

In total, noise exposure levels were calculated at 98,511 census block centroids (centroids in the GSA that represent areas with population). In addition, 28,490 uniformly spaced grid points were modeled within the GSA, and 527 additional and unique, site-specific points (505 Historic and 22 Section 4(f)) throughout the GSA.

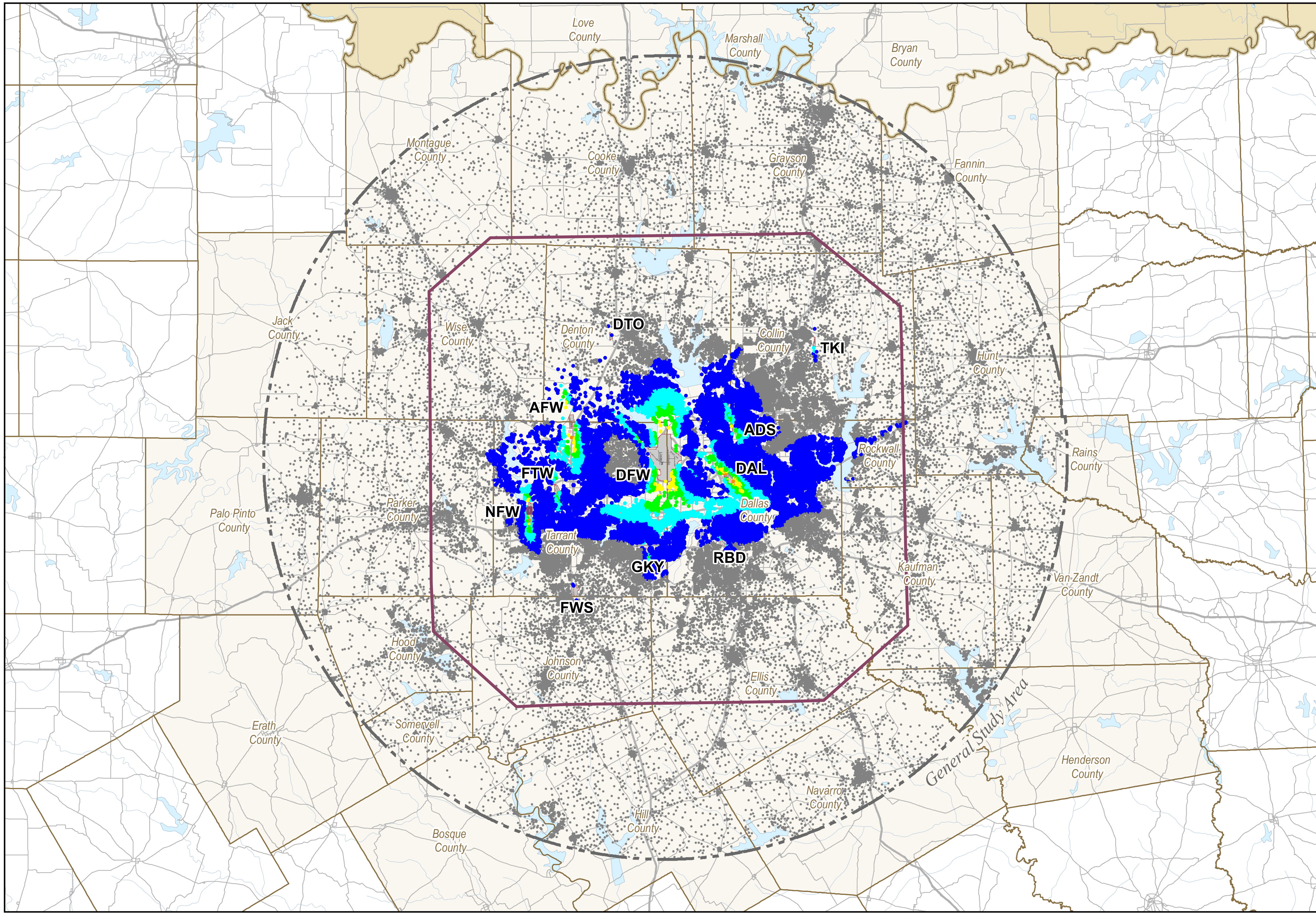
4.3.1.2 Existing Aircraft Noise Exposure

Table 4-3 describes the population exposed to AAD DNL in ranges between DNL 45dB and less, DNL45 and 50dB, DNL50 and 55dB, DNL55 and 60dB and DNL60dB and 65dB. This data is provided to establish a baseline for existing aircraft noise exposure represented by the DNL metric. The information provided refers to DNL only within the GSA. **Exhibit 4-2** provides a graphical representation of the 2011 existing condition DNL within the GSA.

Table 4-3 Existing Conditions – Estimated Population Exposed to Aircraft Noise within General study area (2011)

DNL Range (dB)	Population	Percent of Total	Color
Less than DNL 45	3220543	47.29%	Grey
DNL 45 to less than DNL 50	2662526	39.95%	Dark Blue
DNL 50 to less than DNL 55	614689	9.11%	Light Blue
DNL 55 to less than DNL 60	195674	2.85%	Dark Green
DNL 60 to less than DNL 65	49350	0.75%	Light Green
DNL 65 to less than DNL 70	2762	0.05%	Yellow
Total	6745544	100.00%	

Sources: NIRS Version 7.0b3; US Census Bureau, 2010 Census Redistricting Data (Public Law 94-171) Summary File
Prepared by: Harris Miller Miller & Hanson Inc., September 2012



LEGEND

- General Study Area
- Study Airport Boundary
- TRACON Boundary

2011 Existing DNL Levels

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

- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

0 30nm

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Path: H:\GIS\USA\TX\305220_North_Texas_OAPM\305220_NTX_EA_Exhibit4-2_General_Study_Area_2011_Exist_DNL.mxd

Data Source: MITRE (TRACON Boundary), August 22, 2012; National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, Roads, Airport Boundaries), May 03, 2012; United States Census (Census Block Centroids), July 24, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-2

Existing (2011) Noise Exposure Population Centroids

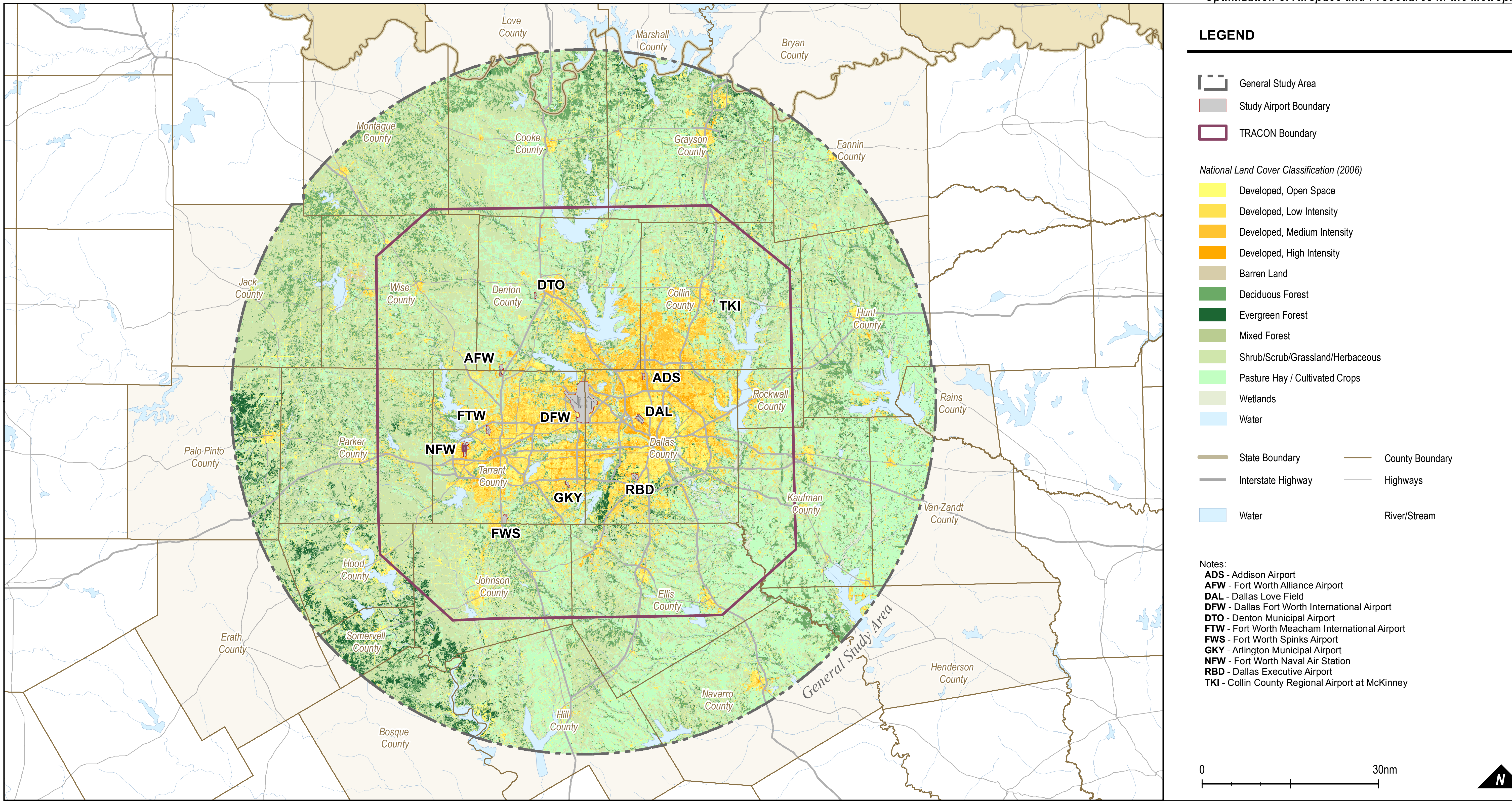
4.3.2 Compatible Land Use

Land coverage data was obtained from the USGS National Land Cover Database 2006 (NLCD 2006). Land coverage classifications located within the GSA include:

- **Open Water**—areas of open water, generally with less than 25 percent cover of vegetation or soil.
- **Developed, Open Space**—areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20 percent of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.
- **Developed, Low Intensity**— areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20 percent to 49 percent of total cover. These areas most commonly include single-family housing units.
- **Developed, Medium Intensity**— areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50 percent to 79 percent of the total cover. These areas most commonly include single-family housing units.
- **Developed, High Intensity**— highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 percent to 100 percent of the total cover.
- **Barren Land**— areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15 percent of total cover.
- **Deciduous Forest**—areas dominated by trees generally greater than five meters tall, and greater than 20 percent of total vegetation cover. More than 75 percent of the tree species shed foliage simultaneously in response to seasonal change.
- **Evergreen Forest**—areas dominated by trees generally greater than five meters tall, and greater than 20 percent of total vegetation cover. More than 75 percent of the tree species maintain their leaves all year. The canopy is never without green foliage.
- **Mixed Forest**— areas dominated by trees generally greater than five meters tall, and greater than 20 percent of total vegetation cover. Neither deciduous nor evergreen species are greater than 75 percent of total tree cover.
- **Shrub/Scrub**— areas dominated by shrubs; less than five meters tall with shrub canopy typically greater than 20 percent of total vegetation. This class includes true shrubs, young trees in an early successional stage, or trees stunted from environmental conditions.
- **Grasslands/Herbaceous**— areas dominated by graminoid or herbaceous vegetation, generally greater than 80 percent of total vegetation. These areas are not subject to intensive management such as tilling, but can be used for grazing.

- **Hay/Pasture**— areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20 percent of total vegetation.
- **Cultivated Crops**— areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20 percent of total vegetation. This class also includes all land being actively tilled.
- **Woody Wetlands**— areas where forest or shrub land vegetation accounts for greater than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
- **Emergent Herbaceous Wetlands**—Areas where perennial herbaceous vegetation accounts for greater than 80 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Exhibit 4-3 shows the distribution of land coverage types within the GSA. The GSA includes numerous large parks, recreational areas, wilderness areas, forests, and other types of resources managed by federal and state agencies. These resources are further discussed in Section 4.3.3.



Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012; United States Geological Survey (National Land Cover Data, 2006), September 24, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-3

General Study Area Land Cover

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

Section 4(f) of the DOT Act (codified at 49 U.S.C. § 303(c)), states that, subject to exceptions for *de minimis* impacts:

> "… the Secretary may approve a transportation program or project (other than any project for a park road or parkway under section 204 of title) requiring the use of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance, or land of an historic site of national, State, or local significance (as determined by the Federal, State, or local officials having jurisdiction over the park, area, refuge, or site) only if —
>
> (1) there is no prudent and feasible alternative to using that land; and
>
> (2) the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use."

The term "use" includes both physical and indirect or "constructive" impacts to Section 4(f) properties. Direct use is the physical occupation or alteration (direct use) of a Section 4(f) property or any portion of a Section 4(f) property. A "constructive" use does not require direct physical impacts or occupation of a Section 4(f) resource. A constructive use would occur when an action would result in substantial impairment of a resource to the degree that the activities, features, or attributes of the resource that contribute to its significance or enjoyment are substantially diminished. The determination of use must consider the entire property and not simply the portion of the property being used for a proposed project.

Special consideration is given to parks and natural areas where a quiet setting is a generally recognized purpose and attribute. In these areas the FAA official "…must consult all 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."

Since there is the potential for the Proposed Action to constructively "use" Section 4(f) properties due to noise effects, this section describes the 4(f) resources located within the GSA. **Table 4-4** identifies the categories of Section 4(f) properties considered in identifying these resources within the GSA, as well as the agencies responsible for managing them. Privately-owned parks, recreation areas, and wildlife refuges are not subject to the Section 4(f) provisions.

Table 4-4 Types of Section 4(f) Resources Considered in the General Study Area (1 of 2)

Section 4(f) Property Type	Responsible Agency/Agencies
Historic Sites (Only those listed on the National Register of Historic Places & National Registry of Natural Landmarks)	National Park Service, State and Local Agencies
National Forests and Grasslands	U.S. Forest Service
National Historical Park, National Historic Site, and International Historic Site	National Park Service
National Lakeshore	National Park Service

National Memorial	National Park Service
National Natural Landmarks	National Park Service
National Historic Landmarks	National Park Service
National Military Park, National Battlefield Park, National Battlefield Site, and National Battlefield	National Park Service

Table 4-4 Types of Section 4(f) Resources Considered in the General Study Area (2 of 2)

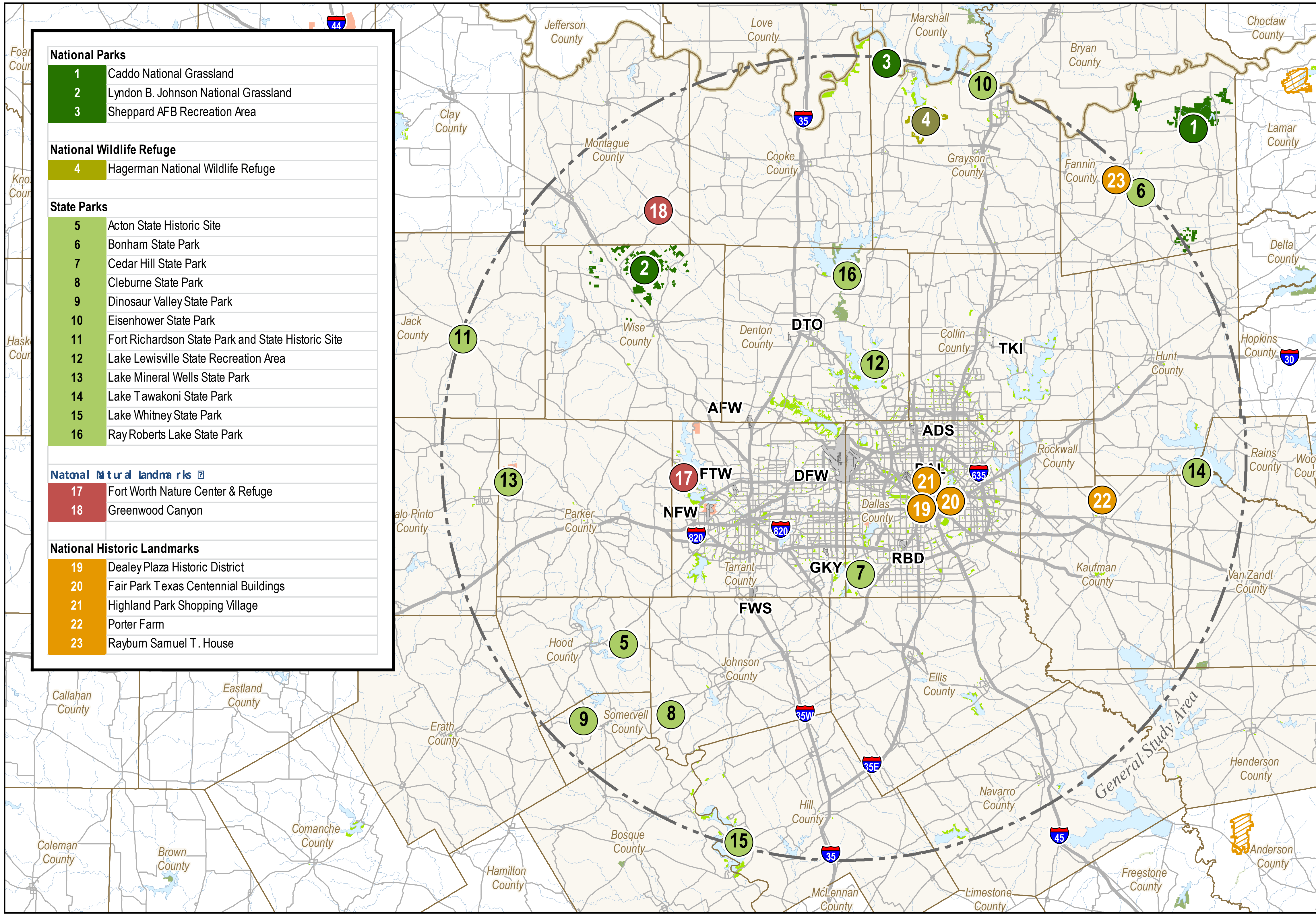
Section 4(f) Property Type	**Responsible Agency/Agencies**
National Monument	National Park Service, Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service
National Park	National Park Service
National Parkway	National Park Service
National Preserve and National Reserve	National Park Service
National Recreation Area	National Park Service, Bureau of Land Management, U.S. Forest Service
National River and National Wild and Scenic River and Riverway	National Park Service, Bureau of Land Management
National Scenic Trail	National Park Service, Bureau of Land Management
National Seashore	National Park Service
National Wilderness Areas	Bureau of Land Management
Nationally-Recognized Trails	National Park Service
Other Designations (White House, National Mall, etc.)	National Park Service
Significant Regional Parks and Trails	State Agencies
State Parks and Forests	State Agencies
State Wilderness Areas	State Agencies
Local Parks and Recreational Facilities	Local Agencies

Sources: National Park Service, 2013 National Park System Inventory, March 28, 2013; Bureau of Land Management, National Conservation Lands (http://www.blm.gov/wo/st/en/prog/blm_special_areas/NLCS.html); U.S. Fish and Wildlife Service, Marine National Monuments (http://www.fws.gov/marinenationalmonuments/); U.S. Forest Service, Recreational Resources (http://www.fs.fed.us/recreation/).
Prepared by: Harris Miller Miller & Hanson Inc., August 2013

Many Section 4(f) properties are also subject to the Section 6(f) of the Land and Water Conservation Fund Act of 1965 (LWCF) (16 U.S.C. § 460l–4 *et seq.*). 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 the converted areas will be replaced with other recreation lands of reasonably equivalent usefulness and location.

4.3.3.1 Potential Section 4(f) Resources in the General Study Area

Data collected from both federal and state sources was used to identify Section 4(f) resources located within the GSA. A total of 1,220 Section 4(f) resources were identified within the GSA. **Exhibit 4-4** depicts the locations of all potential Section 4(f) resources within the GSA, excluding historic and cultural resources. The locations of historic and cultural resources, discussed in Section 4.3.4, are depicted on **Exhibit 4-5**. **Appendix F** includes a list of the Section 4(f) resources identified in the GSA, the type of resource (i.e., federal, state, or local), the state and county in which they are located, site acreage, and DNL under existing conditions.



LEGEND

- General Study Area
- Study Airport Area
- National Forest
- National Park
- State Park or Forest
- Local Park or Recreation Area
- Department of Defense
- National Wildlife Refuge
- State Wildlife Management Area
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

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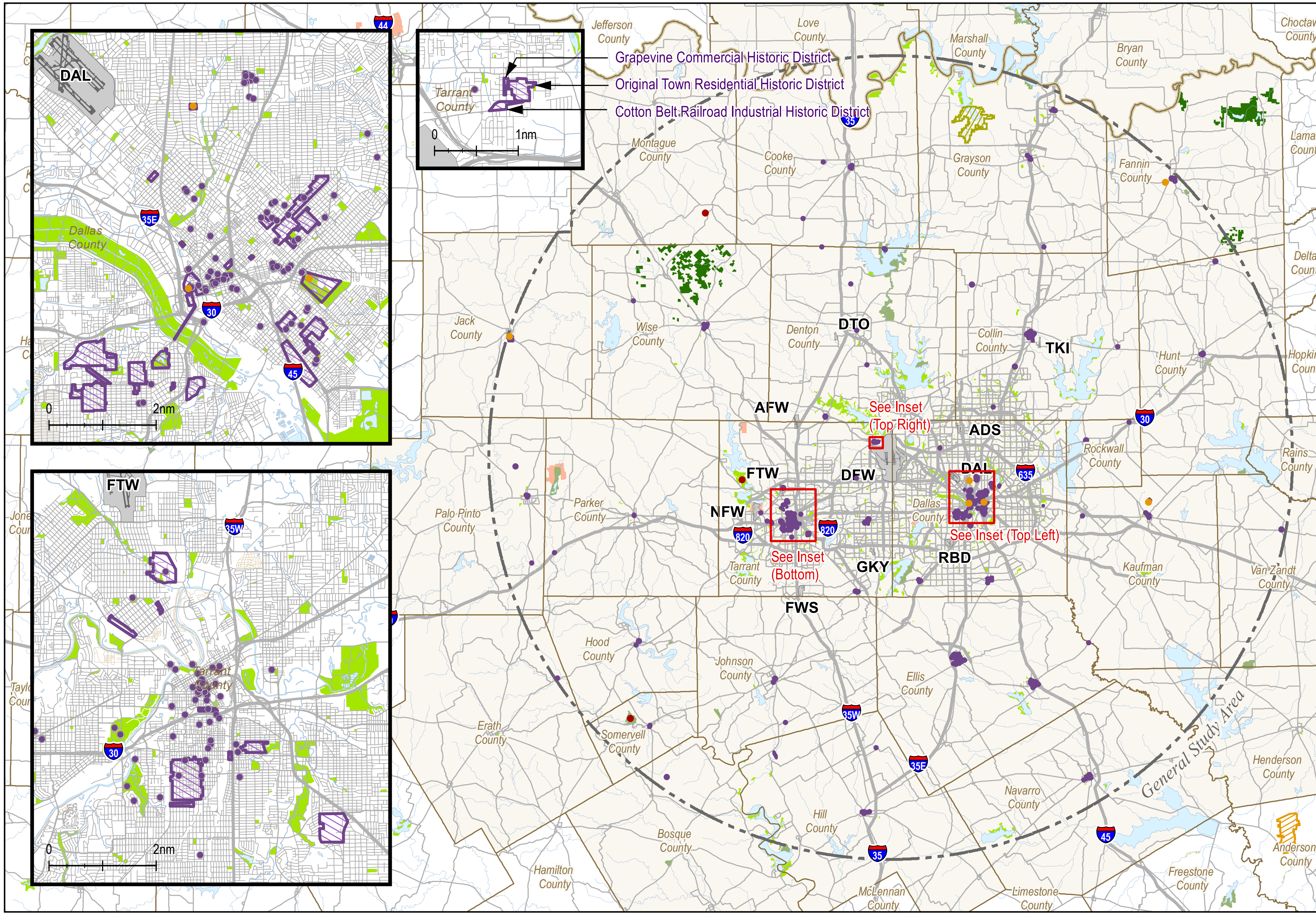
Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012; National Atlas (Wilderness Areas), February 08, 2012; Texas Natural Resource Information System (TNRIS) (Wildlife 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; TNRIS (Department of Defense), February 08, 2012; Environmental Systems Research Institute, Inc. (Local Parks (ESRI)), May 03, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-4

General Study Area 4(f) Sites



LEGEND

- General Study Area
- Study Airport Area
- National Register Historic Place
- National Register Historic District
- National Natural Landmarks
- National Historic Landmarks
- National Forest
- National Park
- State Park or Forest
- Local Park or Recreation Area
- Department of Defense
- National Wilderness Area
- National Wildlife Refuge
- State Wildlife Management Area
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
ADS - Addison Airport
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0 30nm

N

Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012; National Atlas (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; TNRIS (Department of Defense), February 08, 2012; Environmental Systems Research Institute, Inc. (Local Parks (ESRI)), May 03, 2012; National Park Service (National Register of Historic Places/Districts), July 3, 2012; Texas Historical Commission (Historic Properties), March 7, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-5

General Study Area Historical and Cultural Resources

4.3.4 Historical, Architectural, Archeological, and Cultural Resources– Historic, Archeological and Cultural Resources Sub-Categories

The National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. § 470, as amended) requires federal agencies to consider the effects of their undertakings on properties listed or eligible for listing in the National Register of Historic Places (NRHP). Compliance requires consultation if there is a potential adverse effect to historic properties on or eligible for listing on the NRHP. If required, such consultation would occur with the Advisory Council on Historic Preservation, State Historic Preservation Officers (SHPO), and/or the Tribal Historic Preservation Officers (THPO). Additionally, the Historic Sites Act of 1935 (Public Law 74-292) (16 U.S.C. 461 et seq.) was also used to augment the analysis specifically as it relates to NHLs and NNLs within the study area.

It is possible that changes in aircraft flight routes could introduce or increase aircraft routing over historic resources. This could result in potential adverse aircraft noise or visual impacts, depending on the setting of the property and how it is used. Therefore, historic properties in the GSA have been identified for this EA. For the purpose of this EA, historic properties are defined as resources that are listed or eligible for listing in the NRHP or relevant SHPO listings, or that have been identified through tribal consultation for values other than their archaeological qualities. As noted in Section 4.2, the Proposed Action does not involve ground disturbance that could potentially impact archaeological resources. Thus, archaeological resources are not further discussed in this EA.

4.3.4.1 Historic and Cultural Resources in the General study area

Exhibit 4-5 shows the location of historic and cultural resources identified in the GSA. A total of 515 properties (506 NRHP listed properties, 3 National Natural Landmark (NNL) properties and 6 National Historic Landmark (NHL) properties) were identified within Texas and none in Oklahoma. **Appendix G** includes a list of the historic and cultural resources identified in the GSA, the state and county in which they are located, and DNL under existing conditions.

4.3.5 Fish, Wildlife, and Plants

This section discusses the existing wildlife resources within the GSA. The Proposed Action involves redesign of the airspace (specifically the standard instrument arrival and departure procedures primarily above 3,000 ft. AGL and the supporting airspace management structure) serving the Study Airports. Accordingly, the discussion is limited to avian and bat species that may be present within the GSA.

Threatened and Endangered Species and Migratory Birds

The Endangered Species Act (ESA) of 1973, (16 U.S.C. § 1531 *et seq*. (1973)), requires the evaluation of all federal actions to determine whether a Proposed Action is likely to jeopardize any proposed, threatened, or endangered species or proposed or designated critical habitat. A federal action is one conducted, funded, or permitted by a federal agency. Section 7 of the ESA requires the lead federal agency (in this case the FAA) to consult with the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) Fisheries to determine whether the proposed federal action would jeopardize the continued existence of any species listed or proposed for listing as threatened or endangered; or result in the destruction or adverse modification of designated or proposed critical habitat. Critical habitat includes areas that will contribute to the recovery or survival of a listed species. Federal agencies are responsible for determining if an action “may affect” listed species. If so, the federal agency is required to prepare a Biological Assessment (BA) to determine if the action is “likely to adversely affect the species.” The potential for federal and state listed avian and bat species was assessed based on agency lists and reports. Data from the USFWS were used to identify potential federally-listed species.

Furthermore, the Texas legislature enacted legislation in 1973 to protect endangered animal populations in the state.[42] The legislation authorized the Executive Director of the Texas Parks and Wildlife Department (TPWD) to name as endangered species being threatened with statewide extinction, and the TPWD Commission to name as threatened species those determined to become endangered in the future. The TPWD maintains a list of species receiving federal and state protection on its website and references the NatureServe Explorer[43] database for specific information.

Migratory Birds

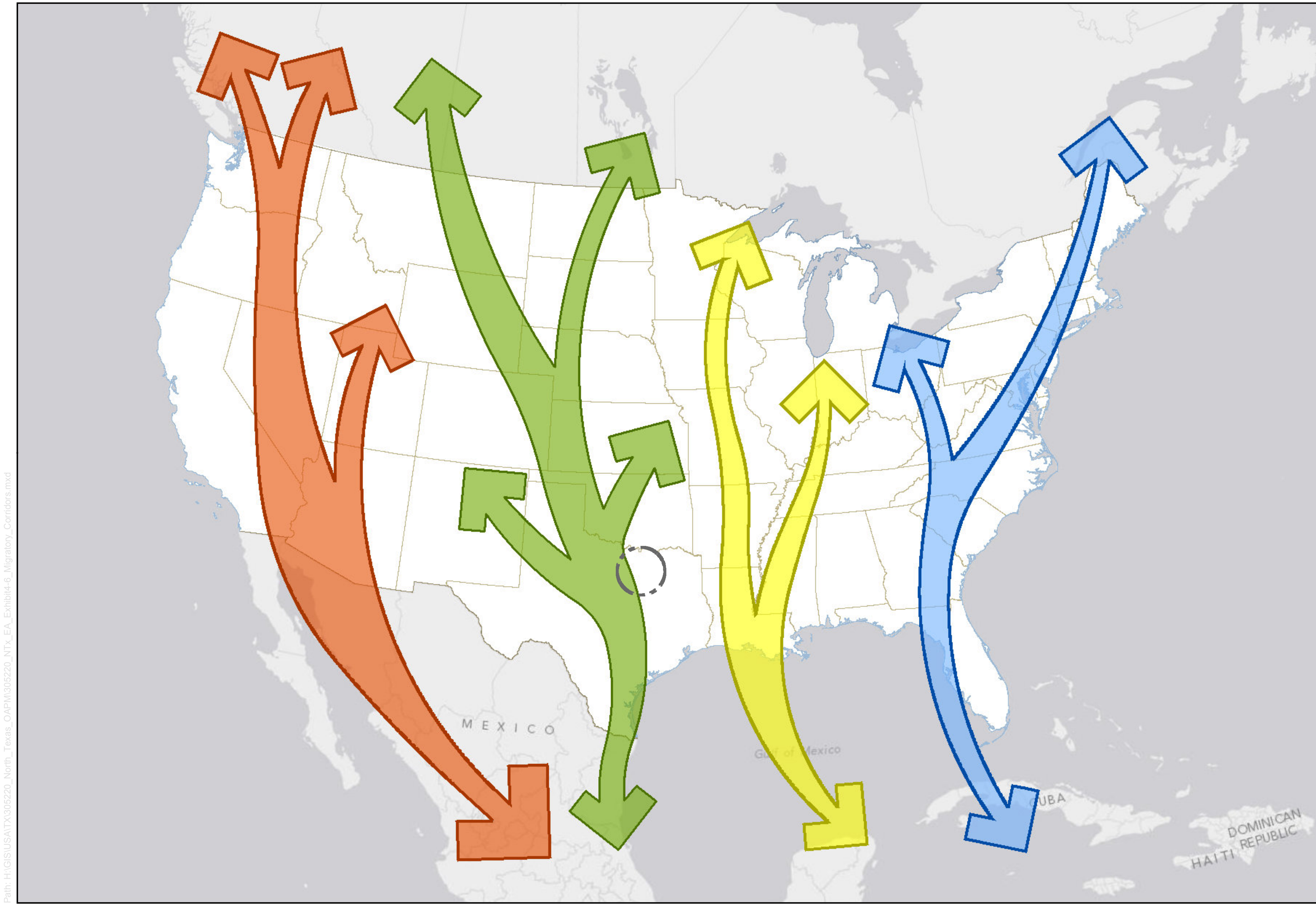
The Migratory Bird Treaty Act of 1918 (MBTA) prohibits, without permit issued by the USFWS, the taking of any migratory bird and any part, nest, or egg of any such bird. Take under the MBTA is defined as the action or attempt to “pursue, hunt, shoot, capture, collect, or kill.” Migratory birds listed under the ESA are managed by the agency staff members who handle compliance with Section 7 of ESA; management of all other migratory birds is overseen by the Migratory Bird Division of ESA. Numerous migratory birds occur in, or migrate through, the GSA.

Migration routes may be defined as the various lanes birds travel from their breeding ground to their winter quarters. The actual routes followed by a given migratory bird species differ by variables such as distance traveled, time of starting, flight speed, geographic position and latitude of the breeding, and wintering grounds.

Birds migrate along four main routes or flyways in North America: the Atlantic, the Central, the Mississippi, and the Pacific flyways, which are loosely delineated in these geographic regions and are depicted in **Exhibit 4-6.** These flyways are not specific lanes 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. Therefore, the lanes of heavier concentration in the GSA follow principal river valleys and mountain ranges.

[42] http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/txendangered/ [accessed September 19, 2012]

[43] http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Buteo+nitidus [accessed September 19, 2012]



LEGEND

- General Study Area
- Atlantic Biological Migration Route
- Mississippi Biological Migration Route
- Central Biological Migration Route
- Pacific Biological Migration Route
- State Boundary

Notes:
These Routes Are Generalized Depictions of Migration

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N

Data Source: Environmental Systems Research Institute, Inc. (State/County Boundaries, Roads, Airport Boundaries), May 03, 2012; Ducks Unlimited (Migratory Bird Corridors), September 24, 2012
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-6

Migratory Bird Corridors

Exhibit 4-6 also specifies the USFWS Migratory Bird Flyway Management Program administrative districts. The USFWS utilizes a number of different species lists for the management and protection of migratory birds and those programs are implemented through the Regional Flyway Districts. One central focus of migratory bird management is administering waterfowl hunting programs and monitoring their harvests in accordance with bird conservation laws.

The GSA is located within the Central Biological Migration Route, commonly referred to as the Central Flyway as depicted in **Exhibit 4-6**. The Central Flyway primarily includes the central-western section of the country from Texas and New Mexico in the south up to Montana and Idaho in the north. The Central Flyway includes two to three primary migration routes and is largely distinct from the other three major flyways within the continental U.S.

Avian and bat species of concern for the GSA are shown in **Table 4-5.**

Table 4-5 Threatened or Endangered Avian Species Potentially in the General Study Area

Status			Species	
FEDERAL	**TX**	**OK**		**Type**
	T		Bald Eagle (*Haliaeetus leucocephalus*)	Avian
E	E		Black-capped Vireo (*Vireo atricapilla*)	Avian
E	E		Golden-cheeked warbler (*Dendroica chrysoparia*)	Avian
E	E		Least tern (*Sterna antillarum*) – interior population	Avian
E,T	T		Piping plover (*Charadrius melodus*)	Avian
E, EXPN	E		Whooping crane (*Grus Americana*)	Avian

Legend: T – Threatened; E – Endangered;
Note: Bats were also considered but there are no bats species listed as threatened or endangered under Federal or State laws in the general study area

Sources: US Fish and Wildlife Service, http://www.fws.gov/endangered/ Accessed September 12 2012., Texas Wildlife and Parks Department http://www.tpwd.state.tx.us/huntwild/wild/wildlife_diversity/texas_rare_species/listed_species/, Accessed September 19 2012, Oklahoma Wildlife Department, http://www.wildlifedepartment.com/wildlifemgmt/endangeredspecies.htm, Accessed September 19, 2012.
Prepared by: Harris Miller Miller & Hanson Inc., September 2012

Existing Wildlife Strikes

Media attention to wildlife strikes with aircraft has increased over time. For example, there was substantial media coverage of the emergency forced landing of US Airways Flight 1549 in the Hudson River on January 15, 2009. This emergency landing was due to Canada geese being ingested into both of the aircraft's engines and demonstrates to the public that wildlife strikes are a serious but manageable aviation safety issue. The civil and military aviation communities have long recognized that the threat of aircraft collisions with wildlife is real and increasing. Globally, wildlife strikes have killed more than 229 people and destroyed over 210 aircraft since 1988. Factors that contribute to this threat are an increase in the populations of large birds as well as an increase in air traffic operations by quieter, turbofan-powered aircraft.

Table 4-6 provides a summary of wildlife and avian/bat strikes nationwide between 1990 and 2010.The number of strikes reported annually has increased more than five-fold from the 1,793 strikes in 1990 to 9,622 in 2010 (109,107 for 1990-2010). Prior to the emergency landing of US Airways Flight 1549, there was an average of 20 reported wildlife strikes per landing of US Airways Flight 1549, there was an average of 20 reported wildlife strikes per day between 2004 and 2008. This increased to an average of 26 reported strikes per day in 2009; a 25-percent increase from 2008. This trend continued through 2010. Birds were involved in 97.2 percent of the strikes, terrestrial mammals in 2.3 percent, bats in 0.4 percent, and reptiles in 0.1 percent. Although the number of reported strikes has steadily increased, the number of reported damaging strikes has actually declined from 765 in 2000 to 573 in 2010

Table 4-6 1990-2011 National Wildlife and Avian/Bat Strike Summary

Year	Strikes		
	Avian/Bat	Other Wildlife	Total
1990	1,741	52	1,793
1991	2,255	54	2,309
1992	2,353	74	2,427
1993	2,409	67	2,476
1994	2,468	83	2,551
1995	2,679	92	2,771
1996	2,848	94	2,942
1997	3,351	109	3,460
1998	3,656	118	3,774
1999	5,007	97	5,104
2000	5,879	127	6,006
2001	5,644	146	5,790
2002	6,065	134	6,199
2003	5,869	132	6,001
2004	6,428	134	6,562
2005	7,103	139	7,242
2006	7,085	153	7,238
2007	7,569	183	7,752
2008	7,416	189	7,605
2009	9,239	244	9,483
2010	9,363	259	9,622
2011	9,869	214	10,083
Total	117, 402	2,894	120,296

Sources: Wildlife Strikes to Civil Aircraft in the United States, 1990–2011, Serial Report Number 18, US Department of Transportation, Federal Aviation Administration, 2012
Prepared by: Harris Miller Miller & Hanson Inc., September 2012

The FAA National Wildlife Strike Database states that for commercial and GA aircraft, 72 and 76 percent of bird strikes, respectively, occurred at or below 500 ft. AGL.[44] Above 500 ft. AGL, the number of strikes declined by 33 percent for each 1,000-foot gain in height for commercial aircraft, and by 41 percent for GA aircraft.[45]

[44] Id.

[45] Id.

The FAA National Wildlife Strike Database[46] was accessed to obtain wildlife strike reports for each study airport. A total of 4,488 strikes have been reported from the 22 airports in the GSA between 1993 and June 30, 2012. For 2011, 458 strikes were reported which included 454 birds, 1 bat, and 3 other. The GSA airports combined to report 4.5% of the 2011 national wildlife strike total and 4.6% of the avian/bat 2011 national strike total. A summary of the individual study airport data is reported in **Table 4-7.**

Table 4-7 General study area Airports Wildlife and Avian/Bat Strike Summary 2011

Airport*	Strikes		
	Avian/Bat	Other Wildlife	Total
Addison (ADS)	3	0	3
Arlington (GKY)	1	0	1
Cleburne (CPT)	0	0	0
Collin County (TKI)	7	0	7
Dallas Executive (RBD)	0	0	0
Dallas Love (DAL)	53	0	53
Dallas-Ft Worth (DFW)	362	2	364
Denton (DTO)	0	0	0
Fort Worth Alliance (AFW)	9	0	9
Fort Worth Spinks (FWS)	5	0	5
Fort Worth Meacham (FTW)	16	1	17
Lancaster Regional (LNC)	0	0	0
Mesquite Metro (HQZ)	0	0	0
NAS JRB Ft Worth (NFW)	0	0	0
Total	456	3	459

** The following airports in the general study area have not reported any wildlife strikes between 1990 and 2012: Bourland (50F), Decatur (LUD), Ennis (F41), Grand Prairie (GPM), Kenneth Copeland (4T2), Mid-way (JWY), Parker (WEA), and Rockwall (F46),*

Source: US Department of Transportation, Federal Aviation Administration, *Wildlife Strike Database* http://wildlife-mitigation.tc.faa.gov/wildlife/database.aspx, Accessed August, 2012
Prepared by: Harris Miller Miller & Hanson Inc., September 2012

4.3.6 Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks – Environmental Justice Sub-Category

FAA Order 1050.1E, Appendix A, paragraph 16.2b states, “Environmental health risks and safety risks include risks to health or to safety that are attributable to products or substances that a child is likely to come in contact with or ingest, such as air, food, drinking water, recreational waters, soil, or products they might use or be exposed to.” Paragraph 16.2c states, “The principal social impacts to be considered are those associated with relocation or other community disruption, transportation, planned development, and

[46] US Department of Transportation, Federal Aviation Administration, Wildlife Strike Database http://wildlife-mitigation.tc.faa.gov/wildlife/database.aspx

employment." As indicated in Section 4.2, the Proposed Action does not include land acquisition or ground disturbing activities. In addition, the Proposed Action would not result in an increase in operations that would result in greater emissions that could potentially exacerbate health issues such as asthma in children. This section is limited to a discussion of Environmental Justice as it would pertain to potential aircraft over flight and resultant noise impacts within the airspace of the GSA.

Environmental justice analysis considers the potential of the proposed project alternatives to cause disproportionate and adverse effects on low-income or minority populations. The analysis of environmental justice impacts and associated mitigation ensures that no low income or minority population bears a disproportionate burden of effects resulting from the implementation of the preferred alternative.

To help describe environmental justice, this EA relies on the following definition from the U.S. EPA Office of Environmental Justice:

> "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. Fair treatment means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies. Meaningful involvement means that:
>
> (1) people have an opportunity to participate in decisions about activities that may affect their environment and/or health;
>
> (2) the public's contribution can influence the regulatory agency's decision;
>
> (3) their concerns will be considered in the decision making process; and,
>
> (4) the decision-makers seek out and facilitate the involvement of those potentially affected."[47]

The socioeconomic and racial characteristics of the population within the GSA are based on data from the 2010 U.S. Census. This data was provided for geographical units called census tracts which include over 500 types of demographic information including number of households, number of inhabitants, and percentage of households below the federal poverty level. Census tracts with no populations were not included in the analysis. Because some census tracts were only partially located within the GSA, only a portion of the population based on the amount of area within the GSA was included. This methodology was used because census tracts are composed of census blocks, which are used by the NIRS noise model to calculate noise impact at the centroid, or geometric center of the block.

Minority and low-income populations were identified using Geographic Information System (GIS) based on information for each census tract within the GSA. For the purposes of this

[47] U.S. Environmental Protection Agency, Environmental Justice: Basic Information,

(http://www.epa.gov/compliance/environmentaljustice/index.html, accessed August 2012.)

environmental justice analysis, minority population census tracts and low- income population census tracts were defined and identified as follows:

- A minority census tract is defined as a tract having a minority population percentage greater than the average minority population percentage of the GSA. Based on the 2010 census data, the average percentage of minority population residing in the GSA was 43 percent. Therefore, every census tract with a percentage of minority population greater than 43 percent was identified as a census tract of environmental justice concern. Exhibit 4-7 depicts those areas exceeding the average minority population percentage within the GSA
- A low-income population census tract is defined as a tract having a greater percentage of low-income population than the average percentage of low-income population residing in the GSA. Based on the 2010 Poverty Guidelines identified by the Department of Health and Human Services (HHS), the poverty threshold for a household of three persons was set at $18,310 for the 48 contiguous states, and therefore is applicable to the GSA. For the purposes of identifying low-income population census tracts, the HHS threshold of $18,310 was used. Based on the 2010 data, the average percentage of low-income population residing in the GSA was 15.1 percent. Therefore, every census tract with a percentage of low-income population greater than 15.1 percent was identified as a census tract of environmental justice concern. Exhibit 4-8 depicts the census tracts with above average populations of low-income households within the GSA.

Census tracts of environmental justice concern are defined as those tracts in which the percentage of minority population and/or the percentage of low-income population are higher than their respective averages of the GSA. The combined low income households and minority population data is represented in **Exhibit 4-9** as areas of environmental justice concern. **Table 4-8** shows the 2010 census data for total population, minority population, and low income population for the GSA.

Table 4-8 Selected Populations in the General Study Area

Minority Population	TOTAL		TEXAS		OKLAHOMA	
	Population	%	Population	%	Population	%
Total Population	6,805,343	100.0%	6,793,841	100.0%	11,502	100.0%
Hispanic	1,810,818	26.6%	1,809,936	26.6%	882	7.7%
Black or African American	960,182	14.1%	960,100	14.1%	82	0.7%
American Indian and Alaska Native	29,057	0.4%	28,079	0.4%	978	8.5%
Asian American	339,908	5.0%	339,885	5.0%	23	0.2%
Native Hawaiian and Other Pacific Islander	5,917	0.1%	5,917	0.1%	0	0.0%
Other or Two or More Races	114,835	1.7%	114,306	1.7%	529	4.6%
Total Minority Population	**3,260,717**	**47.9%**	**3,258,223**	**48.0%**	**2,494**	**21.7%**

Low-Income Households	TOTAL		TEXAS		OKLAHOMA	
	Households	%	Households	%	Households	%
Total Number of Households	2,369,868	100.0%	2,365,664	100.0%	4,204	100.0%
Number of Households with Annual Income Below $20,000	**357,187**	**15.1%**	**356,357**	**15.0%**	**830**	**19.7%**

Source: US Census Bureau PL 94-171 Census Tracts – 2010; US Census Bureau 2010 Census Table SF-1 (Population Counts); and, US Census Bureau American Community Survey Selected Economic Characteristics, 2010

Prepared by: Harris Miller Miller & Hanson Inc., September 2011

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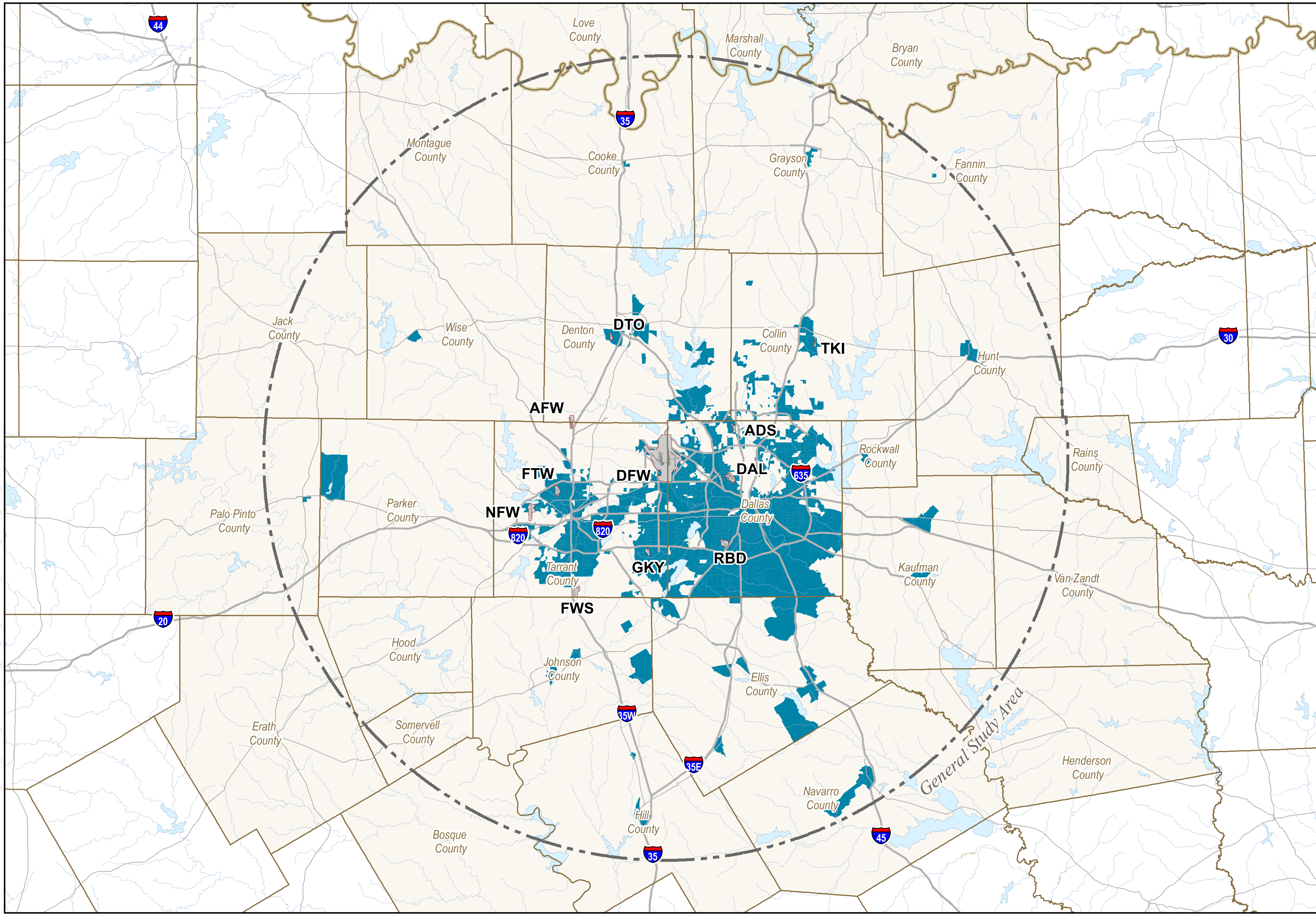

LEGEND

- General Study Area
- Study Airport Boundary
- Areas of Minority Population by Census Block Group
- State Boundary
- County Boundary
- Interstate Highway
- Highways
- Water
- River/Stream

Notes:
ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

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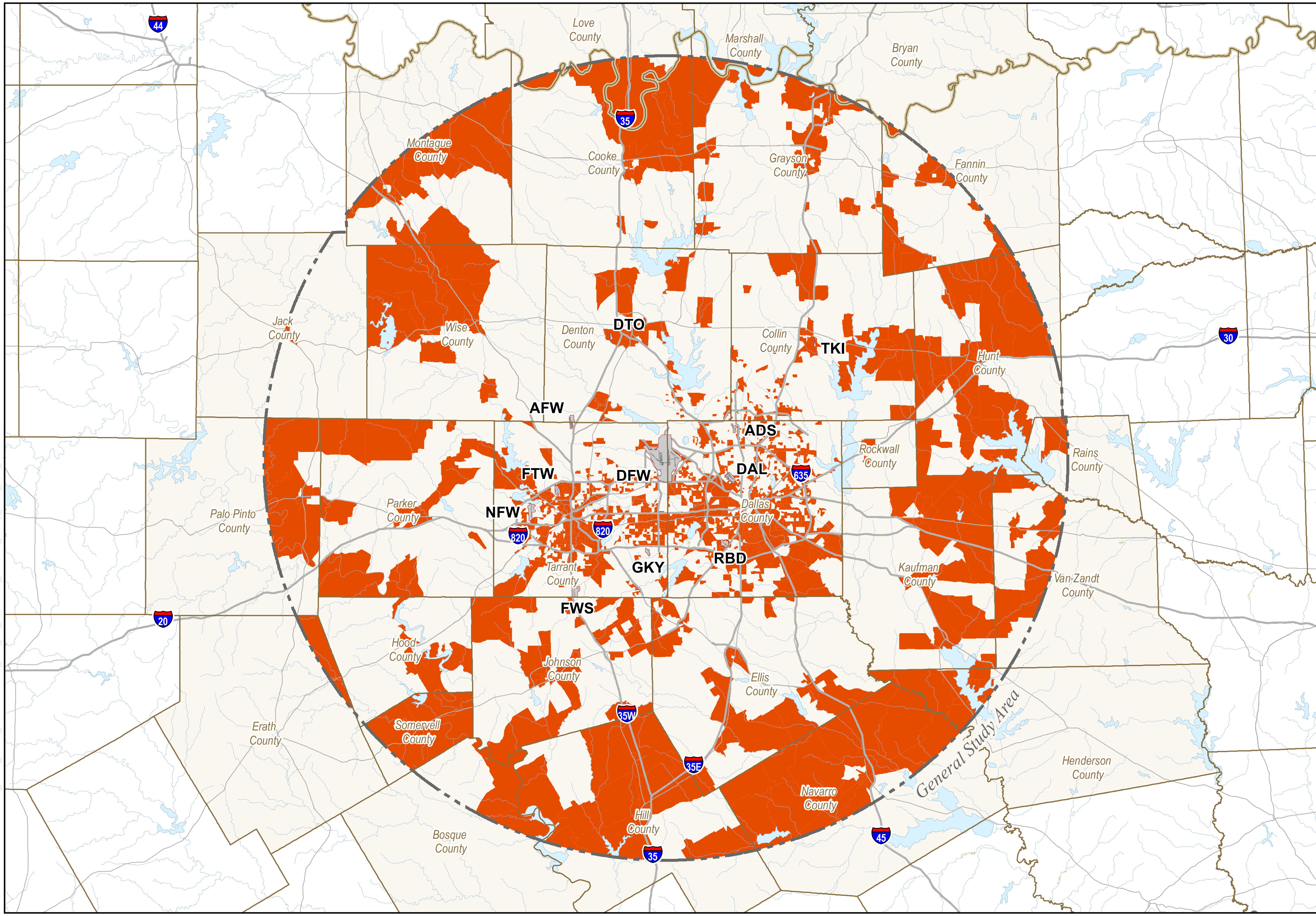
Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012; United States Census (Census Block Groups), September 27, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-7

Minority Population within the General Study Area



LEGEND

- General Study Area
- Study Airport Boundary
- Areas of Low Income by Census Block Group
- State Boundary
- County Boundary
- Interstate Highway
- Highways
- Water
- River/Stream

Notes:
ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

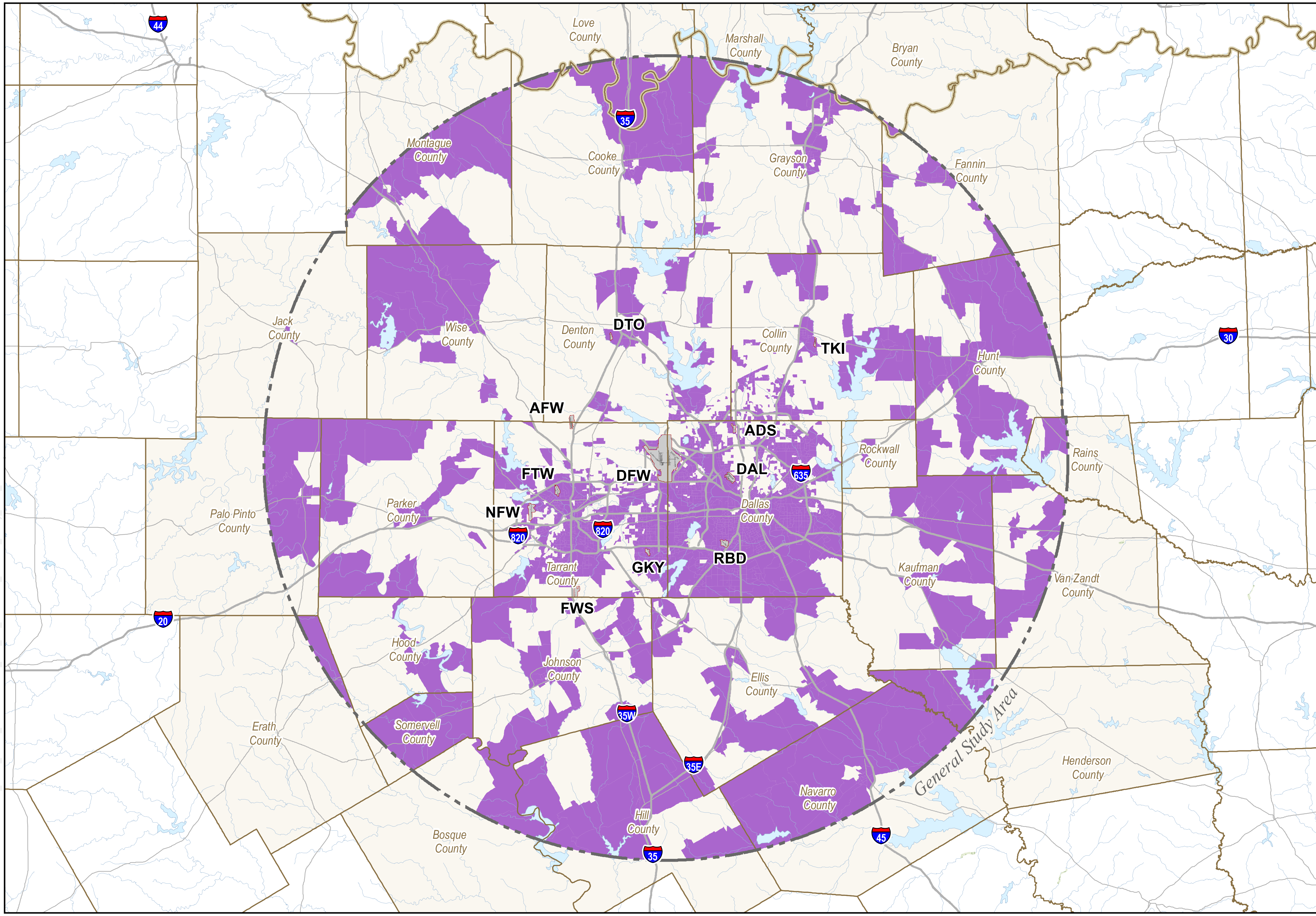
0 30nm

N

Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012; United States Census (Census Block Groups), September 27, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-8

Low Income within the General Study Area



LEGEND

- General Study Area
- Study Airport Boundary
- Areas of Environmental Justice Concern by Census Block Group
- State Boundary
- County Boundary
- Interstate Highway
- Highways
- Water
- River/Stream

Notes:
ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
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0 30nm

N

Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012; United States Census (Census Block Groups), September 27, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-9

Areas of Environmental Justice Concern within the General Study Area

4.3.7 Energy Supply (Aircraft Fuel)

This section describes fuel consumption by IFR aircraft arriving at and departing from the Study Airports. Using the NIRS model, aircraft fuel burn was calculated to estimate aircraft fuel consumption associated with air traffic flows under 2011 existing conditions. NIRS calculates fuel burn using the same input used for calculating noise (See Section 4.3.1.1 for a discussion of NIRS model inputs.) Based on the NIRS calculation, on an annual average day basis, approximately 2,953,757 kilograms (or 2,954, metric tons) of fuel were burned by IFR aircraft arriving at and departing from the study airports.

4.3.8 Air Quality

This section describes the air quality conditions within the GSA. In the United States, air quality is generally monitored and managed at the county or regional levels. The U.S. EPA, pursuant to mandates of the Federal-Clean Air Act Amendments (CAAA) of 1977, as amended, has established National Ambient Air Quality Standards (NAAQS) to protect public health, the environment, and the quality of life from the detrimental effects of air pollution. Standards have been established for the following criteria pollutants: carbon monoxide (CO), lead (Pb), oxides of nitrogen (NOx), ozone (O3), particulate matter (PM), and sulfur dioxide (SO2). PM standards have been established for inhalable coarse particles ranging in diameter from 2.5 to 10 micrometers (µm) (PM10) and fine particles less than 2.5 µm (PM2.5) in diameter.

In accordance with the CAAA, counties and some sub-county geographical areas are classified by the U.S. EPA with regard to their compliance with the NAAQS based on air monitoring data compiled by U.S. EPA and local air quality agencies. An area with air quality better than the NAAQS is designated as an attainment area. An area with air quality worse than the NAAQS is designated as a nonattainment area. Nonattainment areas are further classified as extreme, severe, serious, moderate, and marginal by the extent the NAAQS are exceeded. Areas that have been reclassified from nonattainment to attainment are identified as maintenance areas. An area may be designated as unclassifiable when there is a temporary lack of data on which to base its attainment status.

Portions of the GSA have been designated as being in non-attainment for the 1997 and 2008 ozone standard as well as for the 2008 lead standard as shown in **Table 4-9, Exhibit 4-10** and **Exhibit 4-11**. In addition, as shown in **Exhibit 4-12**, part of one county (Collin) has been designated as maintenance for the 1978 lead standard. The remaining counties in the GSA are in attainment of the NAAQSs for all criteria pollutants (i.e., carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), PM_{10}/$PM_{2.5}$, lead and ozone). A general description of these two criteria pollutants follows.

- **Ozone (O_3):** Ozone is found in two regions of the Earth's atmosphere – at ground level and in the upper regions of the atmosphere. Both types of ozone have the same chemical composition (O_3). While upper atmospheric ozone protects the earth from the sun's harmful rays, ground level ozone is the main component of smog. Tropospheric, or ground level ozone, is not emitted directly into the air, but is created by chemical reactions between ozone precursors, including oxides of nitrogen (NOx) and volatile organic compounds (VOCs). Ozone is likely to reach unhealthy levels on hot sunny days in urban environments. Ozone can also be transported long distances by wind. For this reason, even rural areas can experience high ozone levels.

- **Lead**: Lead is a naturally found metal in the environment as well as in manufactured products. Major sources of lead emissions have historically been from fuels in on-road vehicles using leaded gasoline along with industrial sources. EPA's regulatory efforts have dramatically reduced lead emissions from on-road vehicles by 95 percent between 1980 and 1999[48]. Major sources of lead emissions today are from lead smelters, ore and metals processing and piston engine aircraft operating on leaded aviation gasoline (i.e. avgas).

Table 4-9 NAAQS Criteria Pollutants in Non-Attainment or Maintenance in the General Study Area

Ozone Non-Attainment

State	County	Pollutant	Designated Attainment Status
Texas	Collin	Ozone 8-hour (1997)[1] Ozone 8-hour (2008)[2]	Non-attainment Non-attainment
	Dallas	Ozone 8-hour (1997)[1] Ozone 8-hour (2008)[2]	Non-attainment Non-attainment
	Denton	Ozone 8-hour (1998)[1] Ozone 8-hour (2008)[2]	Non-attainment Non-attainment
	Ellis	Ozone 8-hour (1998)[1] Ozone 8-hour (2008)[2]	Non-attainment Non-attainment
	Johnson	Ozone 8-hour (1997)[1] Ozone 8-hour (2008)[2]	Non-attainment Non-attainment
	Kaufman	Ozone 8-hour (1998)[1] Ozone 8-hour (2008)[2]	Non-attainment Non-attainment
	Parker	Ozone 8-hour (1997)[1] Ozone 8-hour (2008)[2]	Non-attainment Non-attainment
	Rockwall	Ozone 8-hour (1997)[1] Ozone 8-hour (2008)[2]	Non-attainment Non-attainment
	Tarrant	Ozone 8-hour (1997)[1] Ozone 8-hour (2008)[2]	Non-attainment Non-attainment
	Wise	Ozone 8-hour (2008)[2]	Non-attainment

Lead Non-Attainment/Maintenance

State	County	Pollutant	Designated Attainment Status
Texas	Collin	Lead (1978)3 Lead (2008)4	Maintenance (portion of county) Non-attainment (portion of county)

Notes:

1/ Ozone 8-hour (1997) denotes attainment status with the 1997 standard.

2/ Ozone 8-hour (2008) denotes attainment status with the 2008 standard.

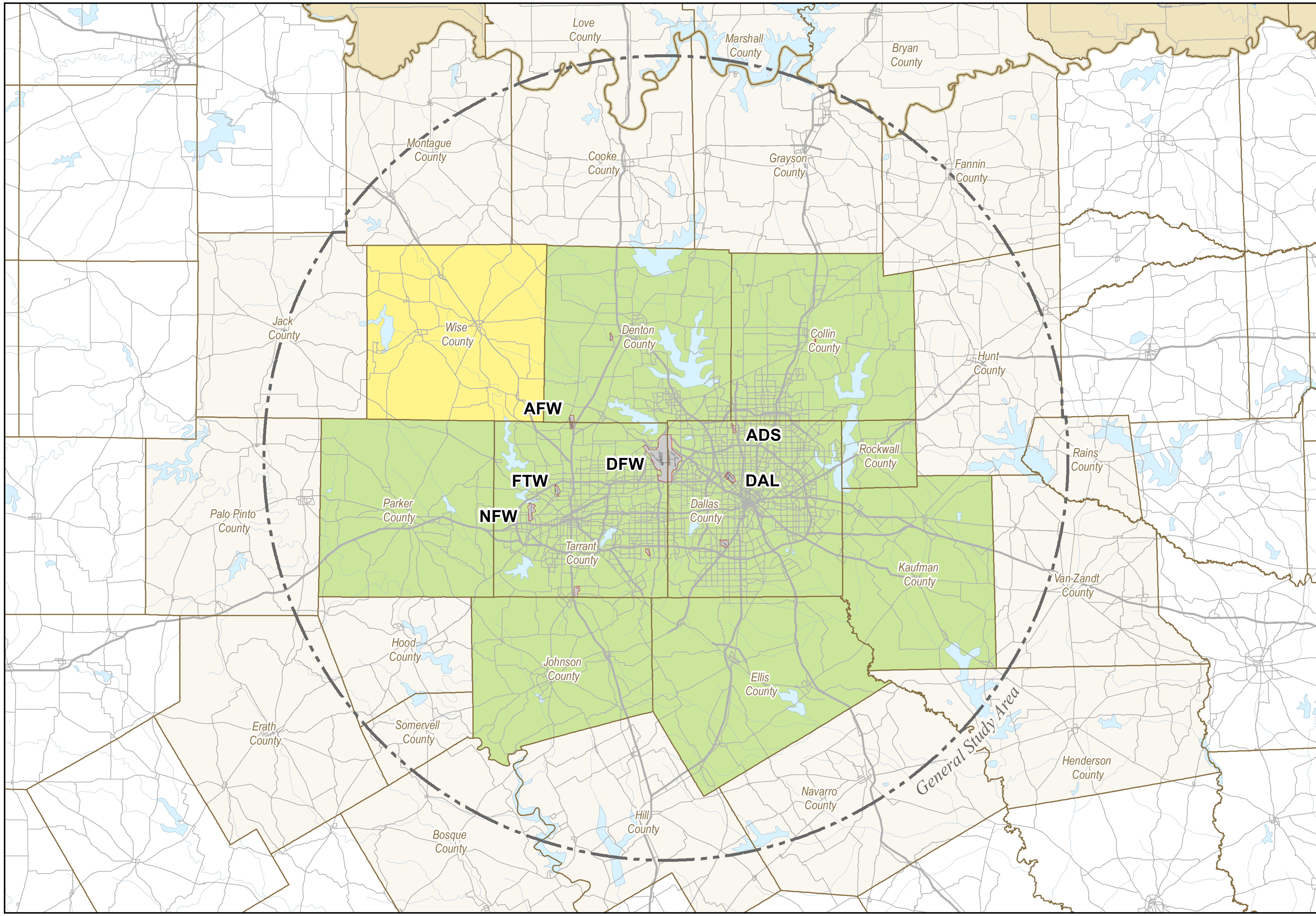
3/ Lead (1978) denotes attainment status with the 1978 standard

4/ Lead (2008) denotes attainment status with the 2008 standard.

Sources: US Environmental Protection Agency Green Book http://www.epa.gov/oaqps001/greenbk/. Accessed August, 2012

Prepared by: Harris Miller Miller & Hanson Inc., September 2012

48 http://www.epa.gov/airquality/lead/



LEGEND

- General Study Area
- Study Airport Boundary
- Non-attainment with 1997 & 2008 Ozone Standard
- Non-attainment with 2008 Ozone Standard Only
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
ADS - Addison Airport
AFW - Fort Worth Alliance Airport
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DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

0 30nm

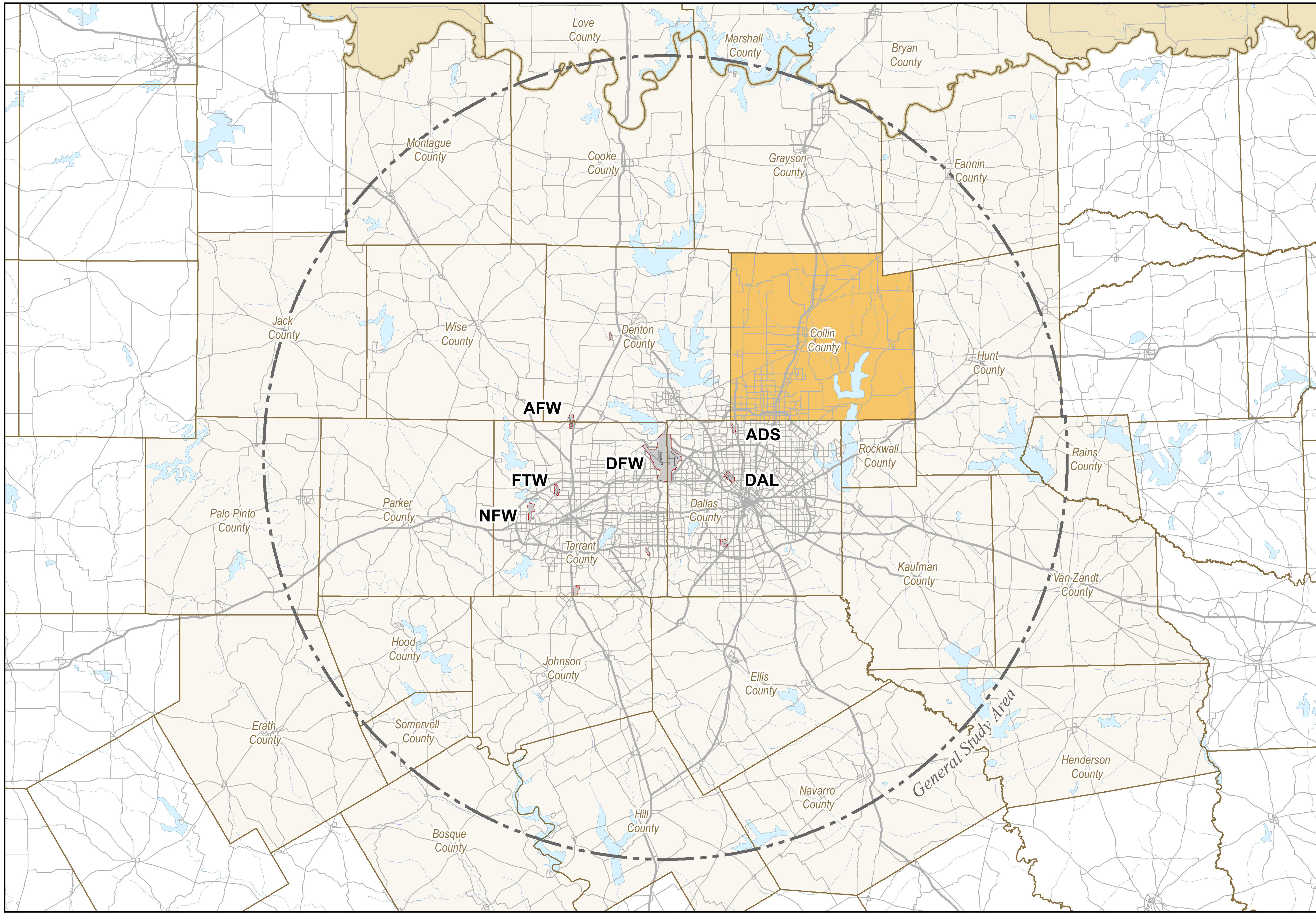
N

Path: H:\GIS\USA\TX305220_North_Texas_OAPM\305220_NTX_EA_Exhibit4-10_General_Study_AQ_Ozone_Non-Attainment.mxd

Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-10

Areas of Ozone Non-Attainment in the General Study Area per 1997 and 2008 Standard



LEGEND

- General Study Area
- Study Airport Boundary
- Portion of Collin County Lead Non-attainment Area, 2008 Standard (See Note)
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
Lead Non-attainment area:
Collin County (part): The area immediately surrounding the Exide Technologies battery recycling plant in Frisco, bounded to the north by latitude 33.153 North, to the East by longitude 96.822 West, to the South by latitude 33.131 North, and to the West by longitude 96.837 West.

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GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

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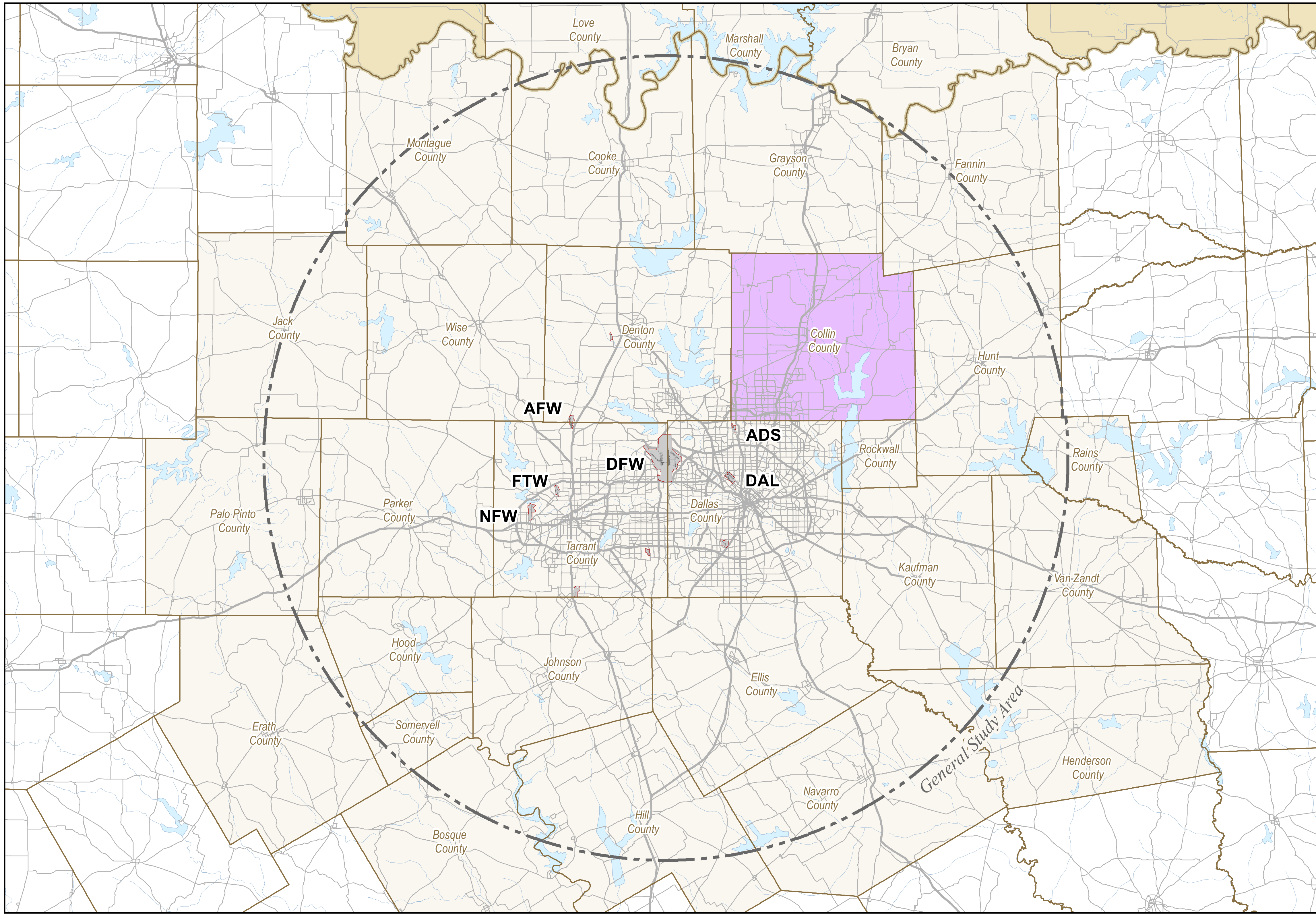
Path: H:\GIS\USA\TX\305220_North_Texas_OAPM\305220_NTx_EA_Exhibit4-11_General_Study_AQ_Lead_Non-Attainment.mxd

Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-11

Areas of Lead Non-Attainment in the General Study Area per 2008 Standard



LEGEND

- General Study Area
- Study Airport Boundary
- Portion of Collin County Lead Maintenance Area, 1978 Standard (See Note)
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
Lead Maintenance Area:
Eastside: Starting at the intersection of south Fifth St. and the fence line approximately 1000' south of the GNB property line going north to the intersection of south Fifth St. and Eubanks St.; Northside: Proceeding west on Eubanks to the Burlington Railroad tracks; Westside: Along Burlington Railroad tracks to the fence line approximately 1000' south of the GNB property line; Southside: Fence line approximately 1000' south of the GNB property line.

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FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

0 30nm

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Path: H:\GIS\USA\TX\305220_North_Texas_OAPM\305220_NTx_EA_Exhibit4-12_General_Study_AQ_Lead_Maint.mxd

Data Source: National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, City Points, Roads, Airport Boundaries), May 03, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 4-12

Areas of Lead Maintenance in the General Study Area per 1978 Standard

4.3.9 Greenhouse Gasses and Climate Change

Greenhouse gases (GHGs) are naturally occurring and man-made gases that trap heat in the earth's atmosphere. These gases include CO_2, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). In 2009, based on data provided by the EPA, the General Accounting Office (GAO) reported that domestic aviation contributed approximately three percent of total national carbon dioxide emissions.[49] Similarly, in its 2010 Environmental Report, the International Civil Aviation Organization (ICAO) estimated that aviation accounted for approximately three percent of all global CO_2 emissions resulting from human activity.[50] In October 2010, the CEQ issued the *Federal GHG Accounting and Reporting Guidance* (Guidance) establishing requirements for federal agencies to calculate and report GHG emissions associated with agency operations. The federal guidance also established a single metric for reporting all GHGs in metric tons (MT) of CO_2 equivalent (CO_2e) or $MTCO_2e$.

For purposes of this EA, total $MTCO_2e$ were calculated using the amount of fuel burned by IFR aircraft arriving and departing from the Study Airports in the GSA as estimated by the NIRS model. Fuel burn calculations are discussed in Section 4.3.7, *Energy Supply*. The calculated fuel burn was used to estimate the total MT of CO_2, reported here as $MTCO_2e$. **Table 4-10** presents the total estimated $MTCO_2e$ along with estimates of all national and global emissions of $MTCO_2e$.

Table 4-10 GHG Summary for General Study Area

Fuel Burn Impact	Fuel (kg)	MT CO2e
Existing Conditions	2,953,757	9,319

Sources: Harris Miller Miller & Hanson Inc., August 2013; U.S. EPA, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011 (EPA 430-R-13-001), April 12, 2013; United Nations Environment Programme, The Emissions Gap Report 2012, November 2012.
Prepared by: Harris Miller Miller & Hanson Inc., August 2013

4.3.10 Light Emissions and Visual Impacts

The GSA includes approximately 14,978 square statute miles of developed and undeveloped areas in a GSA consisting of portions of Texas and Oklahoma, including major urbanized regions. A large number of aircraft operations currently occur and numerous aircraft are visible within the GSA airspace, flying at various altitudes. Aircraft operations consist of aircraft arrivals, departures, and overflights. According to Federal Aviation Regulation (FAR), Section 91.209, all aircraft are required to operate with position lights during the period between sunset and sunrise. These position lights are intended for the safe movement of aircraft and do not produce significant light emissions; however, these lights are often visible from the ground.

[49] United States Congress, U.S. Government Accountability Office, Aviation and Climate Change. GAO Report to Congressional Committees, (2009).(http://www.gao.gov/new.items/d09554.pdf).

[50] Alan Melrose, "European ATM and Climate Adaptation: A Scoping Study," in ICAO Environmental Report. (2010).

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5 Environmental Consequences

This chapter of the Environmental Assessment (EA) discusses the potential environmental impacts that could result from implementation of the Proposed Action and the No Action Alternative on all relevant environmental resource categories described in Appendix A of Federal Aviation Administration (FAA) Order 1050.1E, Change 1 (FAA Order 1050.1E). Both the Proposed Action and No Action Alternative were evaluated under forecasted 2014 conditions, the first year of implementation for the Proposed Action, and under forecasted 2019 conditions, five years after the expected implementation of the Proposed Action. This impact evaluation includes consideration of the direct, indirect, and cumulative effects associated with the Proposed Action and No Action Alternative, as required under FAA Order 1050.1E.

Potential environmental impacts are identified for the environmental resource categories described in Section 4.3. Neither the Proposed Action nor the No Action Alternative would involve land acquisition; physical changes to the environment resulting from ground disturbance or construction activities; changes in patterns of population movement or growth, increases in public service demands, or business and economic activity; or generation, disturbance, transportation, or treatment of hazardous materials. Therefore, neither alternative would be expected to result in impacts to certain environmental resource categories (please see Section 4.2. for a list of excluded categories). The excluded environmental resource categories are not discussed any further in this chapter.

Table 5-1 identifies the environmental impact categories analyzed in this EA, the thresholds of significance used to determine the potential for impacts, and a side-by-side comparative summary of the potential environmental impacts resulting from implementation of the Proposed Action and No Action Alternative

Table 5-1 Summary of Potential Environmental Impacts of Implementing the Proposed Action (2014 and 2019)

Environmental Impact Category	2014	2019
Noise	Proposed Action would not result in a DNL increase of 1.5 dB or more in noise sensitive areas exposed to aircraft noise at or above DNL 65 dB. No significant impact. Furthermore, the Proposed Action would not result in any reportable noise impacts per the criteria(s) shown in Table 5-2 below.	Same as 2014
Compatible Land Use	Proposed Action would not directly affect land use and would not result in aircraft noise exposure exceeding the FAA's significance threshold for noise. No significant impact.	Same as 2014
Department of Transportation Act, Section 4(f)	Proposed Action would not use any resources protected under Section 4(f). No significant impact.	Same as 2014
Historical, Architectural, Archaeological, and Cultural Resources	Proposed Action would not adversely affect the historical or cultural characteristics of Tribal Lands or historic resources. No significant impact.	Same as 2014
Fish, Wildlife, and Plants	Proposed Action would not increase the probability of aircraft strikes to migratory birds, nor would it result in an increase in noise that would have the potential to adversely affect the long-term survival of any species. No significant impact.	Same as 2014

Environmental Impact Category	2014	2019
Environmental Justice	The Proposed Action would not result in disproportionately high and adverse human health or environmental effects on minority and low income populations. No significant impact.	Same as 2014
Energy Supply (Aircraft Fuel)	Proposed Action would not result in depletion of local supplies of energy. No significant impact.	Same as 2014
Air Quality	Proposed Action would result in less fuel burned and, therefore, a reduction in air emissions. Accordingly, is presumed to conform to Texas State Implementation Plans (SIP). No significant impact.	Same as 2014
Greenhouse Gases and Climate Change	Proposed action would result in decreased fuel burn. No significant impact.	Same as 2014
Light Emissions and Visual Impacts	Proposed Action would not cause aircraft to be more visually intrusive to normal activities on the ground surface. No significant impact.	Same as 2014

Source: FAA Order 1050.1E, Chg 1, Appendix A; Harris Miller Miller & Hanson Inc, April 2013
Prepared by: Harris Miller Miller & Hanson Inc., August 2013

The following sections describe the impact findings for each environmental resource category, followed by a discussion of potential cumulative impacts. In summary, no significant impacts to any environmental resource category have been identified.

5.1 Noise

This section provides a summary of the NIRS calculations of future noise exposure in 2014 and 2019 resulting from the Proposed Action and the No Action Alternative, as required by FAA Order 1050.1E. Additionally, this section identifies the differences in noise exposure between the two alternatives in order to determine if implementation of the Proposed Action would result in significant or reportable noise impacts. The Noise Modeling Technical Report (available on the OAPM website) provides additional information on this analysis. Section 4.3.1 presents a discussion of existing aircraft noise exposure in the General Study Area (GSA).

5.1.1 Summary of Impacts

Aircraft noise exposure was modeled for both the Proposed Action and the No Action Alternative under 2014 and 2019 conditions. Implementation of the Proposed Action would not result in a DNL increase of 1.5 dB or more in noise sensitive areas exposed to aircraft noise at or above DNL 65 dB when compared with the No Action Alternative. Therefore, in accordance with the FAA Order 1050.1E significant noise impact threshold, no significant noise impacts would occur with implementation of the proposed project.

5.1.2 Methodology

The noise analysis evaluated noise exposure to communities within the Study Area generated by aircraft forecasted to be operating under Instrument Flight Rules (IFR) filed flight plans in areas from ground level to 10,000 ft. AGL. The analysis forecasted IFR-filed aircraft activity for the years 2014 and 2019, which was then used to model conditions under both the Proposed Action and the No Action Alternative. Noise modeling was conducted using the NIRS Version 7.0b.3, the FAA's noise model for projects involving air traffic changes over broad geographic areas.

If the Proposed Action is approved, the FAA expects to begin implementation in 2014. Therefore, aircraft noise was modeled for 2014 and five (5) years later (2019), as required by FAA Order 1050.1E. Noise exposure levels for future years modeled for the Proposed Action and the No Action Alternative were compared to determine whether there is a potential for noise impacts.

The Proposed Action is not expected to cause additional growth in operations. Furthermore, the number of operations and aircraft types is the same for the Proposed Action and the No Action Alternatives in 2014; similarly the number of operations and aircraft types is the same for the two Alternatives in 2019. Therefore, the noise analysis compares the change in noise exposure between the Proposed Action and the No Action Alternative for each study year.

Detailed information on IFR-filed aircraft operations within the Study Area was assembled for input into NIRS using the following types of data:

Average Annual Day IFR-Filed Aircraft Flight Schedules: The IFR-filed aircraft flight schedules identify arrival and departure times, aircraft types, and origin/destination information for an average annual day (AAD) in 2014 and in 2019. For the 2014 and 2019 forecast years, the data was based on the FAA's 2012 Terminal Area Forecast (TAF),[51] which was supplemented with additional details such as arrival/departure times, aircraft types, and origin/destination information (for additional details please refer to the Average Annual Day Flight Schedules Technical Report, available on the North Texas OAPM EA website, http://oapmenvironmental.com/ntx_metroplex/ntx_docs.html).

Flight Tracks: The modeled flight tracks were based on radar data collected for the existing conditions (2011) noise analysis and information provided by FAA ATC personnel. Aircraft routings under both the Proposed Action and the No Action Alternative are depicted on Exhibits 3-15 through 3-32 in Chapter 3, *Alternatives*. For the Proposed Action, flight tracks were developed from the aircraft procedures created by the North Texas OAPM D&I Team using the *Terminal Area Route Generation, Evaluation, Traffic and Simulation (TARGETS)* program. The modeled flight tracks for the No Action Alternative are based on the existing conditions noise analysis.

Runway Use: Runway use percentages[52] were identified for all runways at the Study Airports. Forecasted aircraft operations were assigned to particular runways representing operating conditions at the Study Airports under Proposed Action and No Action Alternative conditions.

More detail related to the development of the NIRS model input files is provided in the *Noise Modeling Technical Report* (available on the North Texas OAPM EA website, http://oapmenvironmental.com/ntx_metroplex/ntx_docs.html).

As discussed in Section 4.3.1.1, the NIRS model was used to compute DNL values for 2014 and 2019 Proposed Action and No Action Alternative conditions for three sets of data points throughout the GSA:

[51] Federal Aviation Administration, Terminal Area Forecast (2012) (https://aspm.faa.gov/main/taf.asp)(Accessed March 2013.)

[52] 2011 PDARS Data

- 98,297 census (2010) block centroids representing 6,745,544 people,
- 42,998 uniform grid points, including 28,490 grid points at 0.5 NM intervals and 14,508 grid points at 1.0 NM intervals on a uniform grid covering the Study Area and used to calculate DNL values at potential DOT Act, Section 4(f) resources and historic sites,
- 1,208 grid points representing sites of interest too small to be captured in the uniform grid.

As also discussed in Section 4.3.1.1, FAA Order 1050.1E requires analysis of aircraft noise using the DNL metric. **Table 5-2** provides the criteria used to assess the changes in aircraft noise exposure attributable to the Proposed Action compared with the No Action Alternative. FAA Order 1050.1E describes a significant impact as a DNL increase of 1.5 dB at a noise sensitive land use location (e.g., residences, schools, etc.) exposed to aircraft noise of DNL 65 dB or higher under the Proposed Action.[53]

Additionally, in response to a recommendation made in 1992 by the Federal Interagency Committee on Noise (FICON), FAA Order 1050.1E recommends that – when DNL increases of 1.5 dB or more occur at noise sensitive locations in areas exposed to aircraft noise of DNL 65 dB and higher – noise increases of DNL 3 dB or more should also be evaluated and disclosed in noise sensitive areas exposed to aircraft noise between DNL 60 dB and 65 dB.

As stated in section 4.3.1.1. for air traffic actions where the study area is larger than the immediate vicinity of the airport, incorporates more than one airport, or includes actions above 3000 ft. AGL, FAA Order 1050.1E also states that NIRS will be used to produce change-of-exposure tables and maps at population centroids using the following screening criteria: changes of 5.0 dB or greater for DNL 45-60 and changes of 3.0 dB or greater for DNL 60-65.

Table 5-2 Criteria for Determining Impact of Changes in Aircraft Noise

DNL Noise Exposure Level	Increase in DNL with Proposed Action	Aircraft Noise Exposure Change Consideration
DNL 65 and higher	DNL 1.5 dB or greater[1]	Exceeds Threshold of Significance
DNL 60 to 65	DNL 3.0 dB or greater[2]	Considered When Evaluating Air Traffic Actions
DNL 45 to 60	DNL 5.0 dB or greater[3]	Information Disclosed When Evaluating Air Traffic Actions

Notes:

1/ Source FAA, Order 1050.1E, Appendix A, Paragraph 14.3; Title 14 C.F.R. Part 150.21 (2) (d); and Federal Interagency Committee on Noise, Federal Agency Review of Selected Airport Noise Issues, August 1992.

2/ Source FAA Order 1050.1E, Appendix A, Paragraphs 14.4c and 14.5e; and Federal Interagency Committee on Noise, Federal Agency Review of Selected Airport Noise Issues, August 1992.

3/ Source FAA Order 1050.1E, Appendix A, Paragraph 14.5e.

Source: FAA Order 1050.1E, Appendix A, June 8, 2004
Prepared by: Harris Miller Miller & Hanson Inc., August 2013

[53] FAA, Order 1050.1E, Appendix A, Paragraph 14.3.

5.1.3 Potential 2014 Impacts

Table 5-3 summarizes the results of the noise change analysis conducted to determine the significance of the changes in noise exposure associated with the Proposed Action compared with the No Action Alternative under 2014 conditions. As depicted in **Exhibit 5-1**, under the Proposed Action, no population would experience increases in aircraft noise exposure that would be considered significant (i.e., an increase in DNL of 1.5 dB or greater in an area exposed to aircraft noise of DNL 65 dB).

In addition, no population would be exposed to reportable noise increases (3 dB or more) between DNL 60 dB and 65 dB due to the Proposed Action, and no population would experience a DNL 5 dB increase between DNL 45 dB to 60 dB in 2014 due to the Proposed Action.

In summary, these results indicate that the Proposed Action would not result in any significant or reportable noise exposure under the Proposed Action.

Table 5-3 Change in Potential Population Exposed to Aircraft Noise – 2014

DNL Noise Exposure Level Under the Proposed Action	Increase in DNL with the Proposed Action	Population Exposed to Noise that Exceeds the Threshold
DNL 65 and higher	DNL 1.5 dB or greater	0
DNL 60 to 65	DNL 3.0 dB or greater	0
DNL 45 to 60	DNL 5.0 dB or greater	0

Source: 2010 U.S. Census (population centroid data), August 2012; Harris Miller Miller & Hanson Inc., April 2013 (NIRS modeling results)
Prepared By: Harris Miller Miller & Hanson Inc., April 2013

5.1.4 Potential 2019 Impacts

Potential impacts were also evaluated under 2019 conditions for both the Proposed Action and No Action Alternative using the same methodology and criteria employed to analyze impacts under 2014 conditions.

Table 5-4 summarizes the results of a noise change analysis conducted to determine the significance of the changes in noise exposure associated with the Proposed Action compared with the No Action Alternative under 2019 conditions. As depicted in **Exhibit 5-2** under the Proposed Action, no population would experience increases in aircraft noise exposure that would be considered significant (i.e., an increase in DNL of 1.5 dB or greater in an area exposed to aircraft noise of DNL 65 dB).

In addition, no population would be exposed to reportable noise increases (3 dB or more) between DNL 60 dB and 65 dB due to the Proposed Action, and no population would experience a DNL 5 dB increase between DNL 45 dB to 60 dB in 2019 due to the Proposed Action.

In summary, these results indicate that the Proposed Action would not result in any significant or reportable noise exposure under the Proposed Action.

Table 5-4 Change in Potential Population Exposed to Aircraft Noise – 2019

DNL Noise Exposure Level Under the Proposed Action	Increase in DNL with the Proposed Action	Population Exposed to Noise that Exceeds the Threshold
DNL 65 and higher	DNL 1.5 dB or greater	0
DNL 60 to 65	DNL 3.0 dB or greater	0
DNL 45 to 60	DNL 5.0 dB or greater	0

Source: 2010 U.S. Census (population centroid data), August 2012; Harris Miller Miller & Hanson Inc., April 2013 (NIRS modeling results)
Prepared By: Harris Miller Miller & Hanson Inc., April 2013

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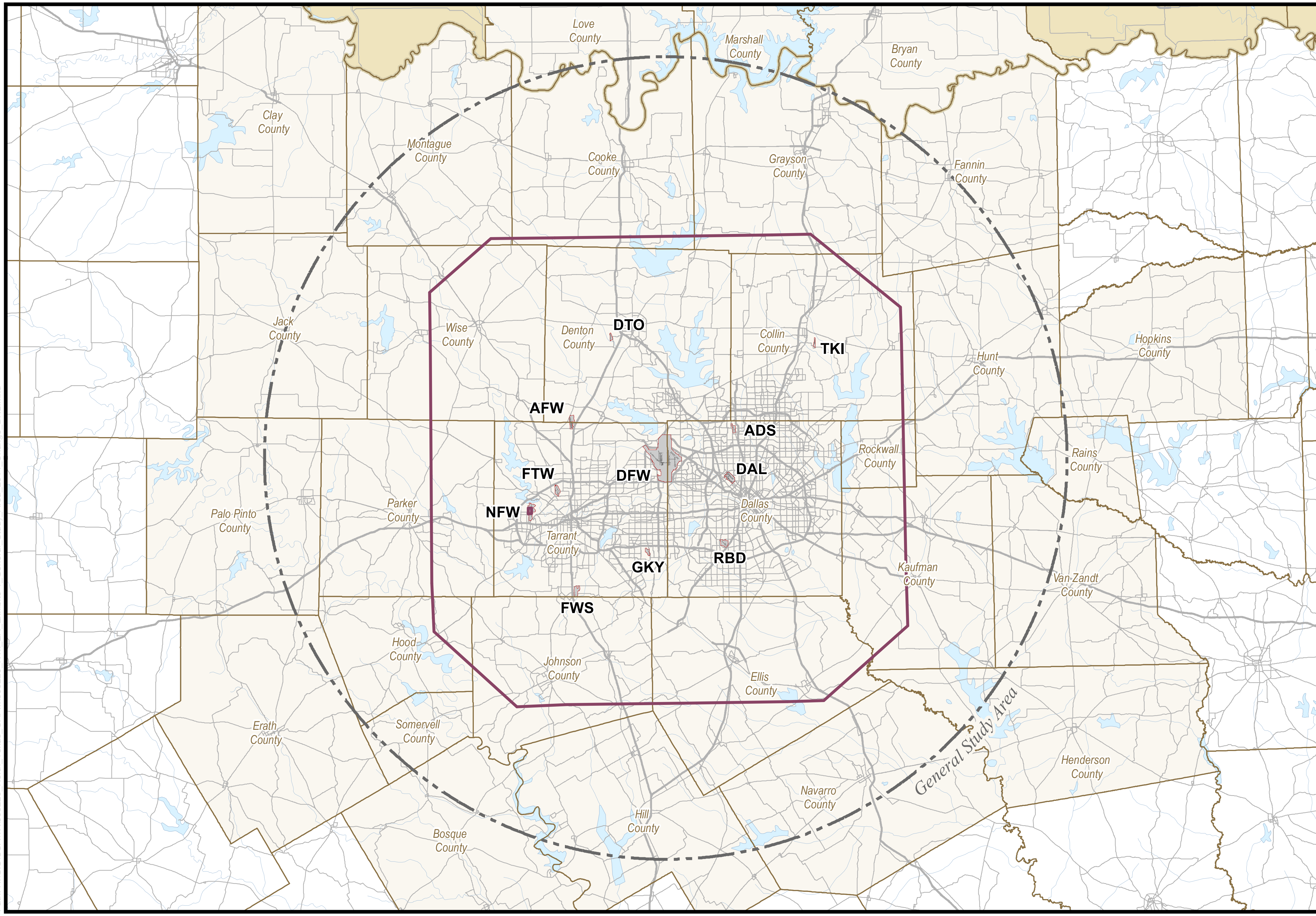


LEGEND

- General Study Area
- Study Airport Boundary
- TRACON Boundary

2014 Change in Noise DNL Levels

Noise Increases

- 1.5 dB or greater for location with a Proposed Action DNL >= 65 dB
- 3.0 dB or greater for location with a Proposed Action DNL >= 60 dB and < 65 dB
- 5.0 dB or greater for location with a Proposed Action DNL >= 45 dB and < 60 dB
- New to DNL 65 dB, but no 1.5 dB increase

Noise Decrease

- 1.5 dB for location with a No Action DNL >= 65 dB
- 3.0 dB for location with a No Action DNL >= 60 dB and < 65 dB
- 5.0 dB for location with a No Action DNL >= 45 dB and < 60 dB
- Removed from DNL 65 dB, but no 1.5 dB decrease

- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

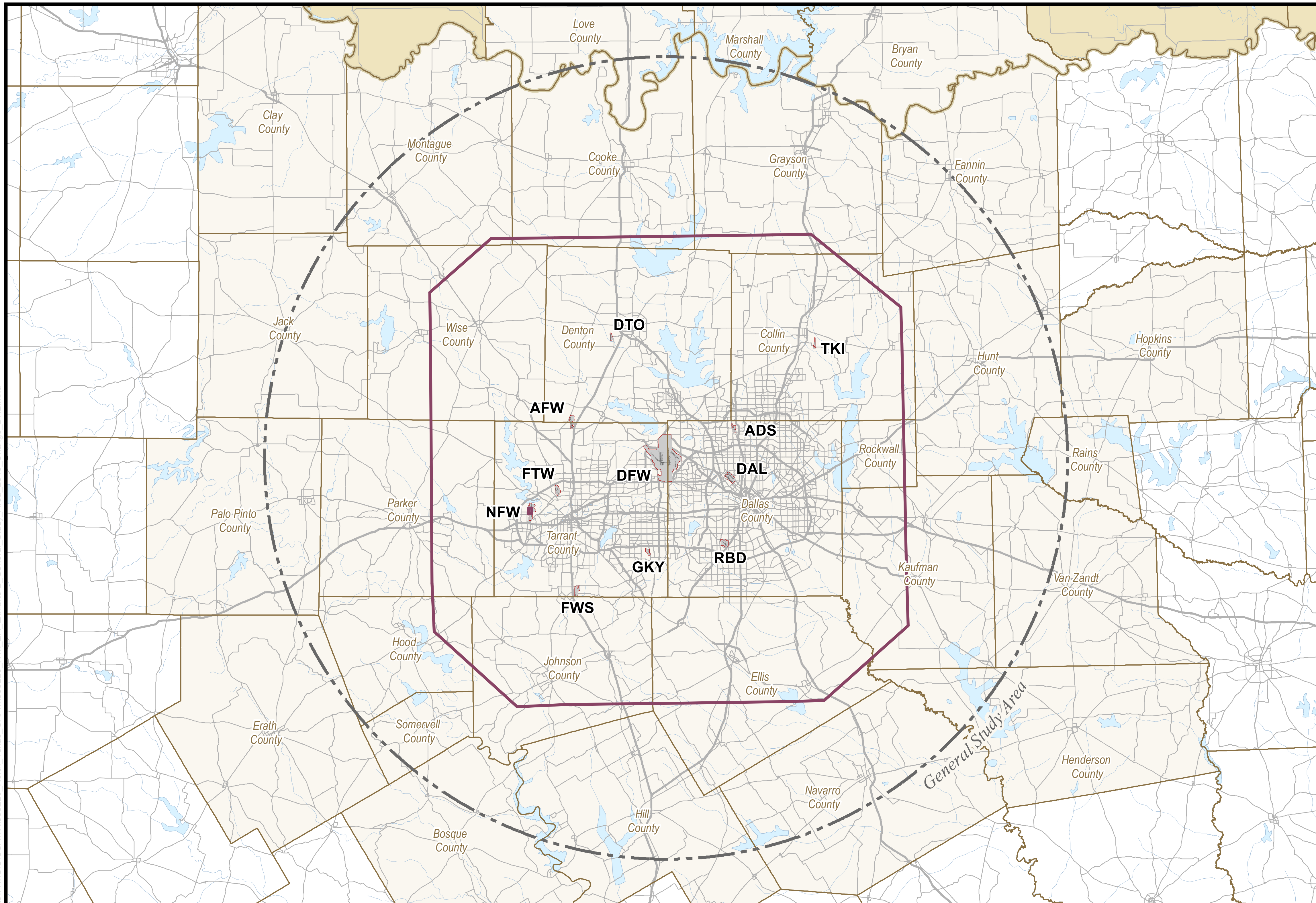
0 30nm

N

Data Source: MITRE (TRACON Boundary), August 22, 2012; National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, Roads, Airport Boundaries), May 03, 2012; United States Census (Census Block Centroids), July 24, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 5-1

2014 Change of Potential Population Exposed to Aircraft Noise Proposed Action vs. No Action



LEGEND

- General Study Area
- Study Airport Boundary
- TRACON Boundary

2019 Change in Noise DNL Levels

Noise Increases

- 1.5 dB or greater for location with a Proposed Action DNL >= 65 dB
- 3.0 dB or greater for location with a Proposed Action DNL >= 60 dB and < 65 dB
- 5.0 dB or greater for location with a Proposed Action DNL >= 45 dB and < 60 dB
- New to DNL 65 dB, but no 1.5 dB increase

Noise Decrease

- 1.5 dB for location with a No Action DNL >= 65 dB
- 3.0 dB for location with a No Action DNL >= 60 dB and < 65 dB
- 5.0 dB for location with a No Action DNL >= 45 dB and < 60 dB
- Removed from DNL 65 dB, but no 1.5 dB decrease

- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
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FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

0 30nm

N

Data Source: MITRE (TRACON Boundary), August 22, 2012; National Atlas(Lakes/Rivers), September 10, (Updated); Environmental Systems Research Institute, Inc. (State/County Boundaries, Roads, Airport Boundaries), May 03, 2012; United States Census (Census Block Centroids), July 24, 2012;
Prepared By: Harris Miller Miller & Hanson Inc., October, 2012

Exhibit 5-2

2019 Change of Potential Population Exposed to Aircraft Noise Proposed Action vs. No Action

5.2 Compatible Land Use

This section presents a summary of the potential impacts to Compatible Land Use under the Proposed Action, as compared to the No Action Alternative.

5.2.1 Summary of Impacts

Under both the Proposed Action and No Action Alternative, there would be no changes in aircraft noise exposure that would exceed the FAA's significance thresholds for noise impacts on people. Therefore, neither the Proposed Action nor the No Action Alternative would result in compatible land use impacts.

5.2.2 Methodology

The analysis of potential impacts to compatible land use was focused on changes in aircraft noise exposure resulting from implementation of the Proposed Action. FAA Order 1050.1E states, "The compatibility of existing and planned land uses in the vicinity of an airport is usually associated with the extent of the airport's noise impacts.… If the noise analysis… concludes that there is no significant impact, a similar conclusion usually may be drawn with respect to compatible land use." (FAA Order 1050.1E, Appendix A, Sec, 4.1a.) Accordingly, the compatible land use analysis relies on changes in aircraft noise exposure between the Proposed Action and the No Action Alternative (discussed in Section 5.1) as the basis for determining compatible land use impacts within the GSA.

5.2.3 Potential Impacts – 2014 and 2019

As stated in Section 5.1, the Proposed Action, when compared with the No Action Alternative, would not result in changes in aircraft noise exposure in 2014 or 2019 that would exceed the criteria for significant or reportable noise increases. Therefore, the Proposed Action would not result in significant compatible land use impacts.

Under the No Action Alternative, there would be no changes to air traffic routing in the GSA and no changes in aircraft noise exposure would be anticipated to occur in either 2014 or 2019. Therefore, the No Action Alternative would not result in significant compatible land use impacts.

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

This section presents a summary of the analysis of potential impacts to Section 4(f) resources under the Proposed Action and No Action alternatives. Section 4(f) resources discussed in this section and present within the GSA are described in Section 4.3.3, and are depicted on **Exhibit 4-4**.

5.3.1 Summary of Impacts

Because the Proposed Action would not result in any construction on the ground or direct use of 4(f) resources, the analysis of potential impacts to Section 4(f) resources focused on the potential for constructive use of Section 4(f) resources based on changes in aircraft noise exposure resulting from implementation of the Proposed Action. Under the Proposed Action, the aircraft noise exposure analysis indicates that the Proposed Action would not significantly change (no DNL increase of 1.5 dB or more at or above DNL 65 dB) the noise environment at any Section 4(f) resource identified within the GSA when compared with the

No Action Alternative. The Proposed Action would not cause any reportable increases in noise exposure to potential Section 4(f) resources below DNL 65 dB. Therefore, no substantial impairment and no constructive use of a Section 4(f) resource associated with the Proposed Action would occur. No significant impacts would be anticipated under the Proposed Action.

Under the No Action Alternative, no changes in air traffic routes in the GSA would occur; therefore, no changes to aircraft noise exposure or aircraft overflight patterns would occur over Section 4(f) resources and no constructive use or significant impacts would be anticipated.

Furthermore, the FAA on May24th 2013 received a letter from the National Park Service (NPS) in response to early outreach efforts. In the letter the NPS requested that the FAA treat all NNLs as well as NHLs within the GSA as sensitive noise areas and as such apply Airspace Circular 91-36. Following the recommendation of the NPS, the FAA reviewed criteria set forth in AC 91-36 and determined that the specific AC would not be applicable to this project as no changes under either of the alternatives require aircraft to fly lower than what is done currently. Specifically, the AC refers to aircraft operations during Visual Flight Rule (VFR) conditions as well as recommends having a minimum 2000' flying altitude above any NNL or NHL environment. As proposed, neither alternative changes the recommended flying altitudes over any NPS property, continuing to keep the aircraft well above the recommended 2000' nor does this project modify any VFR operations for any Aircraft.

The FAA also measured impacts against criteria set forth in **Table 5-2** and determined that neither the Proposed Action nor the No Action alternative will have any significant or reportable impacts in 2014 and 2019 to any NNLs or NHLs identified within the GSA. For further information please refer to Appendix A section A.1.2 for more information.

5.3.2 Methodology

The FAA evaluates potential effects on Section 4(f) resources in terms of both direct impacts (physical use) and indirect impacts (constructive use). A direct impact would occur as a result of land acquisition, construction, or other ground disturbance activities that would result in physical use of all or a portion of a Section 4(f) property. As land acquisition, construction, or other ground disturbance activities would not occur under either the Proposed Action or the No Action Alternative, neither alternative would have the potential to cause a direct impact to a Section 4(f) resource. Therefore, analysis of potential impacts to Section 4(f) resources is limited to identifying indirect impacts resulting from "constructive use." A constructive use of a Section 4(f) resource would occur if there is a substantial impairment of the resource to the degree that the activities, features, or attributes of the site that contribute to its significance or enjoyment are substantially diminished. This could occur as a result of both visual and noise impacts. Visual Impacts are further discussed in Section 5.10. As regards aircraft noise, a constructive use would occur should noise levels substantially impair the resource.

Noise exposure levels were calculated for grid points placed at Section 4(f) properties. The grid points used are further discussed in Section 5.1.2.

Pursuant to FAA Order 1050.1E, the analysis of noise impacts of a project at a Section 4(f) resource would involve further evaluation if the Proposed Action compared to the No Action

Alternative would produce changes in noise exposure levels at noise sensitive locations at or greater than:

- DNL 1.5 dB in areas exposed aircraft noise of DNL 65 and higher,
- DNL 3.0 dB in areas exposed to aircraft noise from DNL 60 to 65, or
- DNL 5.0 dB in areas exposed to aircraft noise from DNL 45 to 60.

If a change in predicted noise exposure meeting the above criteria were identified, the potential Section 4(f) resource would be evaluated further to determine whether the effects from implementation of the Proposed Action would rise to a level of being a constructive use. Further evaluation may include confirming that a property is in fact a Section 4(f) resource as well as identifying the specific attributes for which a property is managed (e.g., for traditional recreational uses or where other noise is very low and a quiet setting is a generally recognized purpose and attribute).

With regard to Land and Water Conservation Fund (LWCF) resources, FAA Order 1050.1E states that replacement satisfactory to the Secretary of the Interior is specifically required for recreation lands aided by the Department of Interior's LWCF in cases where such a resource is "used" by a transportation project. Therefore, these resources are considered as a part of the Section 4(f) impact analysis process

5.3.3 Potential Impacts – 2014 and 2019

The FAA conducted noise modeling for the potential Section 4(f) resources discussed in Section 4.3.3.1. The modeling showed that the Proposed Action would not result in a significant noise increase (i.e., a DNL increase of 1.5 dB or more at or above DNL 65 dB) at any potential Section 4(f) resource for both 2014 and 2019. In addition, there are no potential Section 4(f) resources that would experience reportable noise increases (i.e., a DNL increase of 5 dB or more between DNL 45 dB and 60 dB, or a DNL increase of 3 dB or more between DNL 60 dB and 65 dB). Appendix F lists those potential Section 4(f) resources that the FAA modeled for noise analysis and provides a comparison of noise exposure between the No Action Alternative and Proposed Action based on grid points associated with potential Section 4(f) resources.

As described in Section 5.11, the Proposed Action would not involve changes to ground-based light sources and the potential visual effects would be substantially the same as any aircraft overflight, i.e., visual sight of aircraft, contrails, or aircraft lights at night. These effects would not be materially differ from those occurring under the No Action Alternative, and therefore would not result in a constructive use of potential Section 4(f) resources in 2014 and 2019 under the Proposed Action.

The No Action Alternative would not change air traffic routes in the GSA and the FAA anticipates no effects related to changes in aircraft noise exposure or visual intrusion. Therefore, the No Action Alternative would not result in a use of potential Section 4(f) resources.

5.4 Historical, Architectural, Archeological, and Cultural Resources

This section discusses the analysis of impacts to historic resources and tribal lands under the Proposed Action and the No Action Alternative. Additional information on historic resources and tribal lands within the GSA is provided in Section 4.3.4. The FAA initiated consultation with the appropriate State Historic Preservation Officers (SHPOs) and Tribal Historic Preservation Officer (THPOs), as well as relevant local agencies, in accordance with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. § 470 et seq.) and the implementing regulations at 36 C.F.R. Part 800. Additionally, as discussed in section 4.3.4 and section 5.3.1, per the request of the NPS, the FAA also applied Historic Sites Act of 1935 (Public Law 74-292) (16 U.S.C. 461 et seq.) as it related to NHLs and NNLs in the GSA.

5.4.1 Summary of Impacts

The aircraft noise exposure analysis indicates that there would be no adverse effects to any historic resource, tribal land, NHL or NNL as a result of noise under the Proposed Action compared with the No Action Alternative. Furthermore, any changes in aircraft traffic patterns are expected to occur at altitudes and distances from viewers that would not substantially impair the view or setting of historic resources, tribal lands, NHLs or NNLs. Therefore, no adverse indirect effects to historic resources or tribal lands under the Proposed Action would be anticipated for 2014 or 2019. Furthermore, because the airspace changes do not involve any changes on the ground, there would no adverse direct effects to historic resources under the Proposed Action would be anticipated for 2014 or 2019. .

Under the No Action Alternative no changes to air traffic routes in the North Texas Metroplex would occur in either 2014 or 2019 and no changes to aircraft noise exposure or changes in aircraft overflight patterns over historic resources, tribal lands, NHLs or NNLs would be anticipated. Therefore, historic resources, tribal lands, NHLs or NNLs would not be affected by aircraft noise nor would viewers at historic resources or tribal lands experience visual impacts under the No Action Alternative.

5.4.2 Methodology

The National Historic Preservation Act of 1966 requires federal agencies to consider the effects of its undertakings on properties listed or eligible for listing in the NRHP. In assessing whether an undertaking, such as the Proposed Action, affects a property listed or eligible for listing on the NRHP, FAA must consider both direct and indirect effects. Direct effects include the physical removal or alteration of an historic resource. Indirect effects include changes in the environment of the historic resource that could substantially alter the characteristics that made it eligible for listing on the National Register. Such changes could include changes in noise exposure and visual impacts. Visual Impacts are further discussed in Section 5.10.

To assess the potential indirect effects of the Proposed Action on historic resources, an area of potential effect (APE) was defined. Federal regulations define the APE as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, should any such properties exist. The definition of the APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking. For purposes of this analysis, the APE was defined as being contiguous with the GSA. Potential historic resources were identified within the GSA and their locations are shown on Exhibit 1-1**Exhibit 4-5** in Section 4.3.4. No Indian reservations or tribal lands were identified within the GSA. For purposes of determining potential adverse effects, noise exposure levels were calculated at points representing these properties.

The analysis of potential impacts to historic resources considers whether these properties would experience a significant or reportable noise increase, when comparing the Proposed Action with the No Action Alternative, using the applicable criteria shown in **Table 5-2**.

Noise sensitive areas exposed to DNL 65 dB or higher under the Proposed Action and an increase of DNL 1.5 dB or higher would be significantly impacted and may be considered to be potentially adversely effected by the project.

If reportable increases in noise are detected for properties exposed between DNL 45 dB and lower than 65 dB, further research and/or survey on the subject property may be conducted to determine if the reportable increase would diminish the integrity of the property's setting for which the setting contributes to the property's historical or cultural significance.

5.4.3 Potential Impacts – 2014 and 2019

Neither the Proposed Action nor the No Action Alternative would include any ground disturbance, construction, or land acquisition; therefore, neither alternative would physically destroy or alter any historic, architectural, or cultural resources, including any on Tribal Lands. The FAA also assessed noise levels at historic properties within the APE to determine if the Proposed Action would result in any noise increases that would diminish the integrity of a property's setting for those properties for which their setting contributes to historical or cultural significance.

The modeling showed that the Proposed Action would not result in a significant noise increase (i.e., a DNL increase of 1.5 dB or more at or above DNL 65 dB) at any historic resource or tribal lands for both 2014 and 2019. In addition, there are no historic resources or tribal lands that would experience reportable noise increases (i.e., a DNL increase of 5 dB or more between DNL 45 dB and 60 dB, or a DNL increase of 3 dB or more between DNL 60 dB and 65 dB).

Appendix G, *Inventory of Historic Resources and Noise Exposure* provides the predicted noise exposure information for both the Proposed Action and the No Action Alternative for all historic resources identified in the GSA.

As described in Section 5.10, the Proposed Action would not involve changes to ground-based light sources. Therefore, it would not have an adverse effect on a historical, architectural, archaeological, or cultural resource through introduction of a visual feature that would diminish the integrity of the setting for those properties where setting contributes to the property's historic, architectural, archaeological, or cultural significance. The FAA initiated consultation with the THC and OHS in spring of 2013. With the publication of this EA, the FAA is seeking concurrence from that agency with this finding.

Under the No Action Alternative, air traffic routes in the North Texas area would not change. Therefore, no effects would occur related to changes in aircraft noise exposure or visual effects.

Furthermore, implementation of the No Action Alternative would present no change to the noise environment or visual setting and thus would have no effect on Historic and Cultural Resources. Formal consultation with the appropriate SHPO/THPO is being conducted to confirm the determination.

5.5 Wildlife (Avian and Bat Species)

This section presents a summary of the analysis of potential impacts to avian and bat species under the Proposed Action and the No Action Alternative.

5.5.1 Summary of Impacts

The greatest potential for impacts to wildlife species would result from wildlife strikes on avian and bat species at altitudes below 2,500 ft. AGL. Changes to air traffic flows under the Proposed Action would primarily occur above 3,000 ft. AGL and any changes to air traffic flows under the Proposed Action that would occur below 3,000 ft. AGL are overlays to existing procedures thereby not altering current flight paths (for additional information please refer to Chapter 3). Furthermore, levels of operation would remain the same as the No Action Alternative; therefore, there would be no significant impacts to avian and bat species under the Proposed Action compared with the No Action Alternative.

The No Action Alternative would not involve changes to air traffic flows, land acquisition, construction, or other ground disturbance activities.

The FAA initiated informal consultation with the U.S. Fish and Wildlife Service (FWS) in May 2013 for this project and is seeking concurrence with the FAA's finding.

5.5.2 Methodology

The FAA's Wildlife Strike Database is the best information source available for assessing potential impacts of aircraft on wildlife. Strike reports over the past 22 years, aggregated nationally as well as for individual airports, are available from the database to analyze existing conditions.

The analysis for this project involved a review of arrival and departure flight tracks for the Study Airports, for both the Proposed Action and the No Action Alternative. Additionally, flight tracks with altitudes both above and below 2,500 ft. AGL were reviewed, because research has documented that 88 percent of all wildlife strikes nationwide occur below 2,500 ft. AGL.[54] The FAA compared modifications in flight procedures to the occurrence of species and populations of concern to assess if existing wildlife strike reports might change under the Proposed Action.

5.5.3 Potential Impacts – 2014 and 2019

Since 1990, the FAA has compiled reports of wildlife strikes with aircraft. The information is available to the public through the FAA Wildlife Strikes Database and its annual report.[55] The Wildlife Strike Database reported 119,917 wildlife strikes nationally for the 22-year period between 1990 and 2011. Birds represent 97.1 percent of all strikes. Of those, 88 percent of bird strikes affecting commercial civil aircraft occurred below 2,500 ft. AGL, and 92 percent occurred below 3,500 ft. AGL. The Wildlife Strike Database reports that gulls have the highest occurrence of strikes (16%), followed by doves/pigeons (15%).

The Wildlife Strike Database provides strike information that is reportable by airport, including species struck, height of strike, and type and extent of aircraft damage. **Table 5-5**

[54] Wildlife strike data is available in 1,000ft increments starting at 500ft AGL (500', 1,500', 2,500', etc.); altitude of 2,500ft AGL was used to approximate potential impacts below 3,000ft AGL

[55] www.faa.go -

provides a summary of wildlife strikes reported by Study Airport between 1990 and March 2013. The Wildlife Strike Database reports 4,765 strikes at the Study Airports. One of the limitations of the data is that not all reports provide the full complement of available information. For example, 47 percent of the recorded bird strikes for the Study Airports from 1990 through March 2013 did not identify the affected species. However, 623 strikes were reported at the Study Airports that include species identification and are available for analysis.

Sixty-four (64) percent of all wildlife strike reports included strike altitude data. **Table 5-5** provides a summary of wildlife strikes by altitude for the Study Airports for data available from 1990 through March 2013. Eighty-six (86) percent of the strikes associated with the Study Airports occurred below 2,500 ft. of which bats were responsible for less than 0.5 percent.

The Migratory Bird Treaty Act protects all the bird species identified in these reports. Furthermore, state and federal laws protect listed endangered and threatened species. The only two species identified in the database that are listed for protection under Federal or state endangered species laws are the Bald Eagle (one report) and the Least Tern (two reports).

The changes to altitudes and flight paths that would be implemented under the Proposed Action would not vary between 2014 and 2019. However, the levels of operations would increase as a result of previously forecast growth. The operations counts as noted previously would be the same and would occur under the No Action Alternative. Therefore, the effects anticipated would be similar to the Proposed Action in 2014 and 2019. Based on the strikes of known species (3,055 reports), the Proposed Action is not likely to adversely affect avian and bat wildlife compared with the No Action Alternative. Therefore, the Proposed Action is not likely to adversely affect federal/state listed species or their critical habitat. As stated previously, the FAA initiated informal consultation with the FWS in May 2013. The FAA sent a copy of this draft EA to the FWS for comment and to request concurrence with the FAA's finding.

Table 5-5 FAA Wildlife Strike Database Records for Study Airports by Altitude (1990 – March 2013)

Type of Strike[1]	2,500 ft. AGL or less	>2,500 ft. AGL to <= 10,000 ft. AGL	Greater than 10,000 ft. AGL	Total
Identified Bird	1,101	31	2	2,498
Bats	4	0	0	4
Unknown Bird (avian)	38	9	1	48
Unknown Bird (avian) – Large	26	15	1	42
Unknown Bird (avian) – Medium	582	155	31	768
Unknown Bird (avian) – Small	843	172	18	1,033
Identified Non Avian	26	0	0	26
Total[2]	2,620	382	53	1,387
Percent[3]	86%	12%	2%	100%

Notes:

1/ Includes total number of strikes, even if species was unknown. Uses data for KADS, KAFW, KCPT, KDAL, KDFW, KDTO, KFTW, KFWS, KGKY, KHQZ, KLNC, KNFW, KRBD, and KTKI. No strikes reported for KGPM, 4T2, 50F, KLUD, F46, F41, KWEA, and KJWY. This table presents strike data for all 22 airports affected by the Proposed Action.

2/ One thousand seven-hundred ten (1,710) reported strikes did not include altitude information and are not included in this table.

3/ Percentages may not add to 100% due to rounding.

Source: U.S. Department of Transportation, Federal Aviation Administration, FAA Wildlife Strike Database (http://wildlife.faa.gov/)
Prepared by: Harris Miller Miller & Hanson Inc., August 2013

5.6 Environmental Justice

This section presents a summary of the analysis of environmental justice under the Proposed Action and the No Action Alternative.

5.6.1 Summary of Impacts

Neither the Proposed Action nor the No Action Alternative would displace people or businesses; therefore, implementation of the Proposed Action and No Action Alternative would not result in direct impacts in this category.

No areas within the GSA would experience a significant or reportable noise impact associated with a change in DNL exposure to people (refer to Section 5.1); therefore, no disproportionately high or adverse effects to children, minority populations, or low-income populations would occur under either the Proposed Action or the No Action Alternative.

5.6.2 Methodology

Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires that federal agencies include environmental justice as part of their mission by identifying and addressing, as appropriate, the potential for disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations, low-income populations, and Native American tribes. Environmental justice applies to all environmental resources. Therefore, a disproportionately high and adverse human health or environmental effect on minority and low-income populations may represent a significant impact.

5.6.3 Potential Impacts – 2014 and 2019

Under the Proposed Action, neither people nor businesses would be displaced. As discussed in Section 5.1, under the Proposed Action, no census block centroids in the GSA would experience a change in noise exposure in 2014 or 2019 that exceeds any of FAA's criteria for significant or reportable noise impacts on people. Therefore, no adverse direct or indirect effects would occur to any environmental justice populations within the GSA under the Proposed Action for 2014 and 2019.

Under the No Action Alternative, neither people nor businesses would be displaced. Furthermore, air traffic routes would not change and there would be no change in aircraft noise exposure in 2014 or 2019 that could result in an indirect impact. Therefore, the No Action Alternative would not result in disproportionately high and adverse human health or environmental effects on minority and low- income populations.

5.7 Energy Supply (Aircraft Fuel)

This section discusses whether changes in the movement of aircraft would result in measurable effects on local energy supplies under the Proposed Action and the No Action Alternative.

5.7.1 Summary of Impacts

The Proposed Action would involve changes to air traffic flows. However, the optimized air traffic routes under the Proposed Action would improve route efficiency where possible and would be expected to reduce aircraft fuel consumption overall. Therefore, the Proposed Action would not result in the depletion of local supplies of energy.

The No Action Alternative would not involve changes to air traffic flows, construction, or other ground disturbance activities. Therefore, the No Action Alternative would not result in the depletion of local energy supplies.

5.7.2 Methodology

The Proposed Action would not change the number of aircraft operations relative to the No Action Alternative, but it would involve changes to air traffic flows during the departure, descent, and approach phases of flight. These changes affect both the route an aircraft may follow as well as its climb-out and descent profiles. This in turn may directly affect aircraft fuel burn (or fuel expended). Aircraft fuel burn is considered a proxy for determining whether the Proposed Action would have a measurable effect on local energy supplies when compared with the No Action Alternative.

In addition to calculating aircraft noise exposure, the FAA NIRS model calculates aircraft-related fuel burn. The same data used is in the noise analysis (e.g., AAD flight schedules, flight tracks, and runway use) is also used to estimate aircraft-related fuel burn.

Determining the difference in fuel burn between alternatives can be used as an indicator of changes in fuel consumption resulting from implementation of the Proposed Action when compared with the No Action Alternative.

5.7.3 Potential Impacts – 2014 and 2019

Table 5-6 presents the results of the fuel burn analysis for the Proposed Action and No Action Alternative. Compared with the No Action Alternative, the Proposed Action would result in a decrease in total metric tons of aircraft fuel burned: 229.1 metric tons (MT) less in 2014 and 254.7 MT less in 2019. Therefore, there would be no significant adverse impact to energy supply.

Table 5-6 Energy Consumption Comparison

	2014		2019	
	No Action	**Proposed Action**	**No Action**	**Proposed Action**
Fuel Burn (MT)	3,106.50	3,095.9	3,497.1	3,484.9
Volume Change (MT) (Proposed Action – No Action)		-10.6		-12.2
Percent Change from No Action		--0.34%		-0.35%

Source: Harris Miller Miller & Hanson Inc., June 2013 (NIRS modeling results)
Prepared By: Harris Miller Miller & Hanson Inc., June 2013

5.8 Air Quality

This section discusses the analysis of air quality impacts under the Proposed Action and the No Action Alternative.

5.8.1 Summary of Impacts

The Proposed Action when compared to the No Action Alternative would result in a decrease in emissions due to a reduction in fuel burn. Accordingly, implementation of the Proposed Action would not have a significant impact on air quality and is presumed to conform to the State Implementation Plan (SIP) for Texas.

The No Action Alternative would not result in a change in the number of aircraft operations or air traffic routes. Therefore, no impacts to air quality would be anticipated.

5.8.2 Methodology

Typically, significant air quality impacts would be identified if an action would result in the exceedance of one or more of the National Ambient Air Quality Standards (NAAQS) for any time period analyzed.[56] Section 176(c) of The Clean Air Act (CAA) requires that federal actions conform to the appropriate SIP in order to attain the air quality goals identified in the CAA. However, a conformity determination is not required if the emissions caused by a federal action would be less than [the] de minimis levels established in regulations issued by EPA.[57] FAA Order 1050.1E provides that further analysis for NEPA purposes is normally

[56] FAA Order 1050.1E, Chg.1, App. A, sec. 2.3.

[57] 40 C.F.R. § 93.153(b).

not required where emissions do not exceed EPA's de minimis thresholds.[58] The EPA regulations[59] identify certain actions that would not exceed these thresholds, including ATC activities and adoption of approach, departure, and en route procedures for aircraft operations above the mixing height specified in the applicable SIP (or 3,000 ft. AGL in places without an established mixing height). In addition, the EPA regulations allow federal agencies to identify specific actions as "presumed to conform" (PTC) to the applicable SIP.[60] In a notice published in the Federal Register, the FAA has identified several actions that "will not exceed the applicable de minimis emissions levels" and are therefore presumed to conform, including ATC activities and adoption of approach, departure, and en route procedures for air operations.[61] The FAA's PTC notice explains that aircraft emissions above the mixing height do not have an effect on pollution concentrations at ground level. The notice also specifically notes that changes in air traffic procedures above 1,500 ft. AGL and below the mixing height "would have little if any effect on emissions and ground concentrations.[62]

5.8.3 Potential Impacts – 2014 and 2019

Under the Proposed Action a decrease in fuel burn would be anticipated compared to the No Action Alternative. Therefore, no further air quality analysis is necessary and a conformity determination is not required.

The No Action Alternative would not result in a change in the number of aircraft operations or air traffic routes; therefore, no impacts to air quality would be anticipated.

5.9 Climate

This section discusses greenhouse gas (GHG) emissions and effects to the climate as they relate to the Proposed Action and the No Action Alternative.

5.9.1 Summary of Impacts

Fuel burn would decrease under the Proposed Action compared to the No Action Alternative (see Section 5.8). Therefore, no significant project-related effects on climate would be anticipated.

5.9.2 Methodology

In accordance with FAA guidance, estimated CO_2 emissions were calculated from the amount of fuel burned under the No Action Alternative and the decreased fuel burn projected for the Proposed Action in 2014 and 2019 (see Section 5.8). The resulting CO_2 emissions were then calculated as CO_2e.

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[58] FAA Order 1050.1E, Chg. 1, App. A, sec. 2.1c.

[59] Title 40, Section 93.153(c) xxi

[60] Id at 93.153(f).

[61] U.S. National Archives and Records Administration, "Federal Presumed to Conform Actions Under General

Conformity," Federal Register 72, no. 145 (July 20, 2007): 41565-41580.

[62] U.S. National Archives and Records Administration, "Federal Presumed to Conform Actions Under General Conformity," Federal Register 72, no. 145 (July 20, 2007): 41565.

5.9.3 Potential Impacts – 2014 and 2019

Table 5-7 shows project-related CO2e emissions: 33.6 MT63 less in 2014 and 38.5 MT less in 2019. In 2014, CO_2 emissions under the Proposed Action would be 9,767.5 MT of CO_2e (0.34 percent lower than the No Action Alternative). In 2019, CO_2 emissions under the Proposed Action would be 10,994.8 MT of CO_2e (0.35 percent lower than the No Action Alternative). In sum, the Proposed Action would reduce fuel burn in comparison with the No Action Alternative and, thus, reduce MT of CO_2e emissions. Therefore, no increase in GHGs would result from implementation of the Proposed Action when compared to the No Action Alternative and no impacts would be anticipated.

Table 5-7 CO2e Emissions – 2014 and 2019

	2014		2019	
	No Action	**Proposed Action**	**No Action**	**Proposed Action**
CO_2e Emissions (MT)	9,801.1	9,767.5	11,033.3	10,994.8
Volume Change (MT)		-33.6		-38.5
(Proposed Action – No Action)		-0.34%		-0.35%

Notes: MT = Metric tons of CO_2 equivalent

Source: Harris Miller Miller & Hanson Inc., June 2013 (NIRS modeling results)
Prepared By: Harris Miller Miller & Hanson Inc., June 2013

5.10 Visual Impacts

This section presents a summary of the analysis of light emissions and visual impacts under the Proposed Action and the No Action Alternative.

5.10.1 Summary of Impacts

As stated in Section 5.1, implementation of the Proposed Action would not increase the number of aircraft operations at the Study Airports compared with the No Action Alternative. Changes in aircraft traffic patterns under the Proposed Action are expected to be at altitudes and distances sufficiently removed from viewers that visual impacts would not be anticipated. Under the No Action Alternative, no changes in air traffic routes would occur and no changes in aircraft overflight patterns would be expected. Therefore, the No Action Alternative would not result in visual impacts.

5.10.2 Methodology

As discussed in FAA Order 1050.1E, Appendix A, Section 12.2b, visual, or aesthetic, impacts are difficult to define and evaluate because of the subjectivity involved. Aesthetic impacts deal more broadly with the extent that the project contrasts with the existing environment and whether the difference is considered objectionable by the agency responsible for the location in which the proposed project is set. Visual impacts are

[63] From section 4.3.9 "The federal guidance also established a single metric for reporting all GHGs in metric tons (MT) of CO_2 equivalent (CO_2e) or MTCO_2e".

normally related to the disturbance of the aesthetic integrity of an area caused by development, construction, or demolition, and thus, do not typically apply to airspace changes.

To evaluate the potential for indirect impacts resulting from changes in aircraft routings and visual intrusion, the general altitudes at which aircraft route changes occur beyond the immediate airport environs, which experience overflights on a routine basis, are considered to evaluate the potential for visual impacts.

5.10.3 Potential Impacts – 2014 and 2019

According to FAA Order 1050.1E, Appendix A, the visual sight of aircraft, aircraft contrails, or aircraft lights at night, particularly at a distance that is not normally intrusive, should not be assumed to constitute an adverse impact. Changes in aircraft routes associated with the Proposed Action would generally occur at altitudes above 3,000 ft. AGL; therefore, the visual sight of aircraft and aircraft lights would not be considered intrusive. Consequently, the Proposed Action would not result in significant visual impacts. Air traffic routes under the No Action Alternative would not change, and therefore, would not result in changes in light emissions to people on the ground, so no significant impacts relating to light emissions would occur. Accordingly, significant visual impacts resulting from the Proposed Action or the No Action Alternative would not be anticipated.

5.11 Cumulative Impacts

Consideration of cumulative impacts applies to the impacts resulting from the implementation of the Proposed Action, in conjunction with those from other actions. Council on Environmental Quality (CEQ) regulations define "cumulative impact" as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.”[64] The period of time that is generally considered under cumulative impacts is 3-5 years in the past and 3-5 years into the future.

5.11.1 Summary of Impacts

The implementation of the Proposed Action, when considered with other past, present, and reasonably foreseeable future actions, would not be expected to result in significant cumulative impacts.

5.11.2 Methodology

Projects within the vicinity of the Study Airports were reviewed to evaluate the potential for cumulative impacts. A list of potential projects proposed on or near the Study Airports is provided in **Table 5-8**. Due to the nature of the resources affected by the Proposed Action, only projects with direct or indirect effects on aviation within the General Study Area were considered.

Potential impacts related to implementation of the Proposed Action, although demonstrated to not be significant in the preceding sections of this chapter fell into one category:

[64] 40 CFR, Sec. 1508.7

- **Aircraft Noise -** Effects related to changes in aircraft noise exposure, including potential impacts on populations in the Study Area, compatible land use, potential Section 4(f) resources, historic and cultural resources.

Other categories of impacts considered in this EA, but demonstrated to not affect the resource, include:

- **Fuel Burn** - The Proposed Action results in lower quantities of fuel burned and correspondingly lower amounts air pollutants and greenhouse gases emitted; therefore, the Proposed Action would not cumulatively contribute to potential effects on energy use, air pollutants emitted, and greenhouse gases emitted of other past, present, and reasonably foreseeable future projects.
- **Avian and Bat Species -** The Proposed Action is not expected to result in a change in the occurrence of wildlife strikes; therefore, the Proposed Action would not cumulatively contribute to potential effects on avian and bat species of other past, present, and reasonably foreseeable future projects.
- **Other Categories** - As the Proposed Action would not involve land acquisition or other shifts in population or communities, physical changes such as ground disturbance or facility development, or construction activities, it would not affect the other environmental resource categories specified in FAA Order 1050.1E, as listed in the introduction to this Chapter.

Therefore, only other past, present, and reasonably foreseeable proposed projects with the potential for impacts related to changes in aircraft noise exposure were considered. The projects identified in **Table 5-8** were evaluated for their potential to collectively, with the Proposed Action, contribute to significant noise impacts affecting population, Section 4(f) resources, and historic and cultural properties.

5.11.3 Potential 2014 and 2019 Impacts

For each of the relevant past, present, and reasonably foreseeable future projects identified by the FAA, **Table 5-8** presents a summary of the potential for cumulative effects. Additional discussion of potential cumulative impacts, by environmental resource category, follows the table.

Table 5-8 Potential for Cumulative Impacts from the Proposed Action and Other Past, Present, and Reasonably Foreseeable Future Actions

Projects at North Texas OAPM Airports

Project	Description	Potential for Cumulative Effects
Dallas Love Field (DAL) Taxiway "M"	FAA has received signed agreement and funding to review the City's plans and specifications. The FAA provided general support for the City's design and the project is continuing.	Proposed flight operations activity levels for the North Texas OAPM Proposed Action and No Action were modeled using TAF data, which included best available information on future planned operations levels. There is no indication that this project would alter aircraft operations levels in the TAF. No significant impacts are expected in conjunction with implementation of the Proposed Action.
DFW - End-Around Taxiway Project (NE	DFW has completed the end around taxiway Southeast (SE) quadrant project and continues	Proposed flight operations activity levels for the North Texas OAPM Proposed Action

Projects at North Texas OAPM Airports

Project	Description	Potential for Cumulative Effects
Quadrant)	airport improvements with the end-around taxiway Northeast (NE) quadrant project. The following facilities will be impacted: 17L/17C Touchdown RVR, 17L/17C Midfield RVR, 17R Glide Slope(GS), 17C GS, 35L Localizer (LOC), 35C LOC / 17C Far Field Monitor (FFM) / 17C Inner Marker (IM)/ Northeast Fiber Optics Transmission System (FOTS), 17R Medium-Intensity Approach Lighting System with Runway Alignment Indicator (MALSR), 17R Precision Approach Path Indicator (PAPI), 17R Touchdown RVR, 17R Midfield RVR, 17C PAPI, 17C Approach Lighting System With Sequenced Flashing Lights (ALSF), 31R Roll-Out RVR, 31R LOC, 31R DME, 13L PAPI, 13L Runway End Identification Lights (REIL).	and No Action were modeled using TAF data, which included best available information on future planned operations levels. There is no indication that this project would alter aircraft operations levels in the TAF. No significant impacts are expected in conjunction with implementation of the Proposed Action.
Fort Worth Alliance Runway Extensions (AFW)	The FAA Airport Improvement Program (AIP) grant will pay for continued work to extend each of Alliance's two runways to 11,000 ft. The project has been underway for several years and involves extensive work to relocate a nearby state highway and a railroad to make way for the longer runways.[65]	Proposed flight operations activity levels for the North Texas OAPM Proposed Action and No Action were modeled using TAF data, which included best available information on future planned operations levels. There is no indication that this project would alter aircraft operations levels in the TAF. The runway extensions were modeled as part of the 2019 No Action and Proposed Action modeling. No significant impacts are expected in conjunction with implementation of the Proposed Action.
Collin County Regional Airport (TKI) – Runway Relocation	The runway was relocated to the east and renamed 18-36 (previously 17-35).	Proposed flight operations activity levels for the North Texas OAPM Proposed Action and No Action were modeled using TAF data, which included best available information on future planned operations levels. There is no indication that this project would alter aircraft operations levels in the TAF. The shift in the runway location was incorporated into all of the 2014 and 2019 noise modeling. No significant impacts are expected in conjunction with implementation of the Proposed Action.
Addison Airport (ADS) – Runway Safety Area Implementation	Insufficient open land beyond the runway was available to implement required runway safety area. 610 ft. of runway length was allocated as a result to comply with regulations. There are new (shorter) runway 15-33 declared distances.	Proposed flight operations activity levels for the North Texas OAPM Proposed Action and No Action were modeled using TAF data, which included best available information on future planned operations levels. There is no indication that this project would alter aircraft operations levels in the TAF. This project does not alter the runway threshold locations so no changes were made in the 2014 and 2019 modeling. No significant impacts are expected in conjunction with implementation of the Proposed Action.

[65] FAA Press Release http://www.faa.gov/news/press_releases/news_story.cfm?newsId=13855, Sept 2012

Regional Airspace Projects

Project	Description	Potential for Cumulative Effects
Houston OAPM	The Houston OAPM project would optimize air traffic operations in the Houston, Texas metroplex airspace.	FAA has undertaken a separate NEPA analysis to characterize impacts arising from implementation. Points of boundary interface where potential Houston OAPM changes to IFPs abut or coincide with North Texas OAPM IFP changes were included in modeling for noise and air quality impacts for the North Texas OAPM. No significant cumulative impacts are expected with the Proposed Action.

Surface Transportation Projects

Project	Description	Potential for Cumulative Effects
The "Tex" Rail and DART Rail	The TEX Rail commuter rail is designed to serve Southwest Fort Worth to DFW Airport terminal areas, while the Dallas Area Rapid Transit (DART) rail is designed to serve the DFW, Irving, and Las Colinas areas to DFW Airport terminal areas.	Separate NEPA analysis would be undertaken by TxDOT and the Federal Highway Administration FHWA) to characterize impacts arising from construction and roadway use activities. No significant cumulative impacts are expected with the Proposed Action.
LBJ Express	There are significant highway expansion and improvements to I635 and I35E in the vicinity of DFW, DAL and environs. The expected outcomes are traffic relief, improved mobility and economic stimulation.	Separate NEPA analysis would be undertaken by TxDOT and the Federal Highway Administration FHWA) to characterize impacts arising from construction and roadway use activities. No significant cumulative impacts are expected with the Proposed Action.
Resurface Roadway	SH183 (Airport Freeway): Tarrant County line to Loop 12	Separate NEPA analysis would be undertaken by TxDOT and the Federal Highway Administration FHWA) to characterize impacts arising from construction and roadway use activities. No significant cumulative impacts are expected with the Proposed Action.
Construct New Lanes	SH161: FromSH183 to Belt Line Rd	Separate NEPA analysis would be undertaken by TxDOT and the Federal Highway Administration FHWA) to characterize impacts arising from construction and roadway use activities. No significant cumulative impacts are expected with the Proposed Action.
Resurface Roadway	IH638: From Beltline Rd to IH35E	Separate NEPA analysis would be undertaken by TxDOT and the Federal Highway Administration FHWA) to characterize impacts arising from construction and roadway use activities. No significant cumulative impacts are expected with the Proposed Action.
Construct New Toll Road	IH35E/SH183 to US175/SH130 (Trinity Pkwy)	Separate NEPA analysis would be undertaken by TxDOT and the Federal Highway Administration FHWA) to characterize impacts arising from construction and roadway use activities. No significant cumulative impacts are expected with the Proposed Action.
Resurface Roadway	SH183: From Trinity River Bridge to IH35E	Separate NEPA analysis would be undertaken by TxDOT and the Federal Highway Administration FHWA) to characterize impacts arising from construction and roadway use activities. No significant cumulative impacts are expected with the Proposed Action.

Surface Transportation Projects

Project	Description	Potential for Cumulative Effects
Resurface Roadway	US67: From Wheatland Rd to IH35E	Separate NEPA analysis would be undertaken by TxDOT and the Federal Highway Administration FHWA) to characterize impacts arising from construction and roadway use activities. No significant cumulative impacts are expected with the Proposed Action.

Source: HMMH memo "Cumulative Effects Analysis" November 2012
Prepared By: Harris Miller Miller & Hanson Inc., June 2013

5.11.3.1 Potential for Cumulative Noise Impacts

Noise and noise-related impacts include changes in noise exposure for populations, Tribal Lands, compatible land use, potential Section 4(f) resources, and historic properties.

Implementation of the Proposed Action would not result in significant changes in noise exposure, as discussed in this chapter. Three of the categories of past, present, and reasonably foreseeable projects have the potential to contribute cumulatively to the noise impacts of the Proposed Action:

- **Projects at North Texas OAPM Airports**: As discussed in **Table 5-8**, these projects would not be expected to have a significant cumulative noise impact.
- **Regional Airspace Projects**: Since the grid points having a value of DNL 65 dB or greater are concentrated in the vicinity of the study airports, the combination of the regional airspace actions with the Proposed Action would not be expected to have significant cumulative noise impacts. Project-specific analysis is presented in **Table 5-8.**
- **Surface Transportation Projects**: In general and when viewed in aggregate, the proposed surface transportation project corridor rights-of-way are typically at sufficient distances from airports such that the noise from the linear corridors and the noise in the vicinity of airports ordinarily would not overlap. Thus, no significant cumulative noise impacts are expected.

In summary, based on the review of past, present, and reasonably foreseeable projects, the FAA does not expect the Proposed Action to contribute to changes in noise exposure that would cumulatively result in significant impacts.