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

Volume I – Main Document

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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."

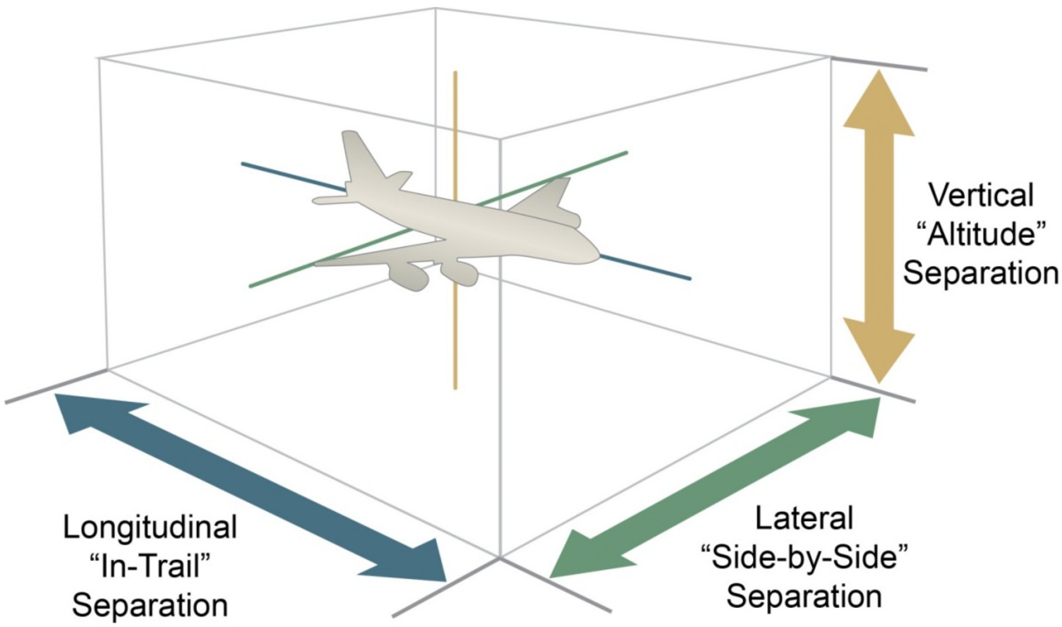
[15] 14 C.F.R. § 91.135.

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

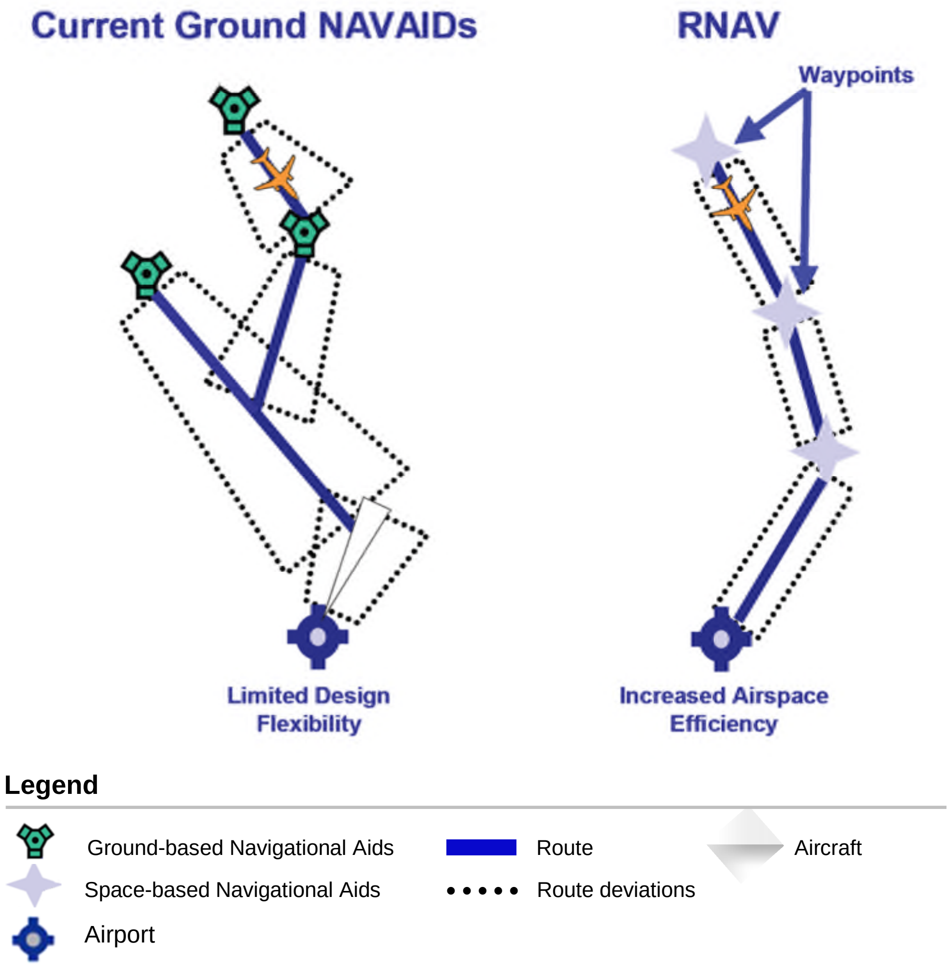
to an overflying aircraft, or if they are based on verbal instructions from an air traffic controller.

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.

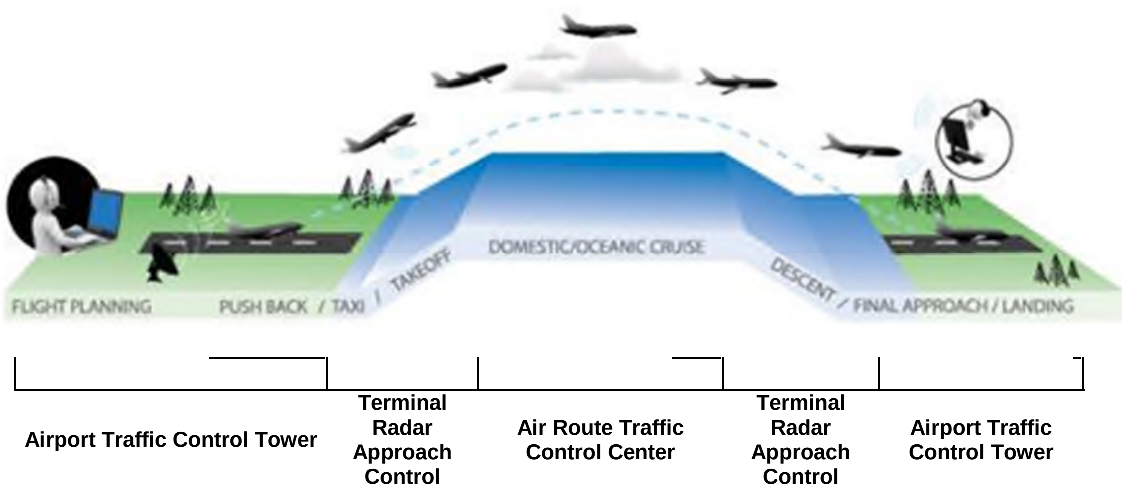
1.2.3 Aircraft Flow within the National Airspace System

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

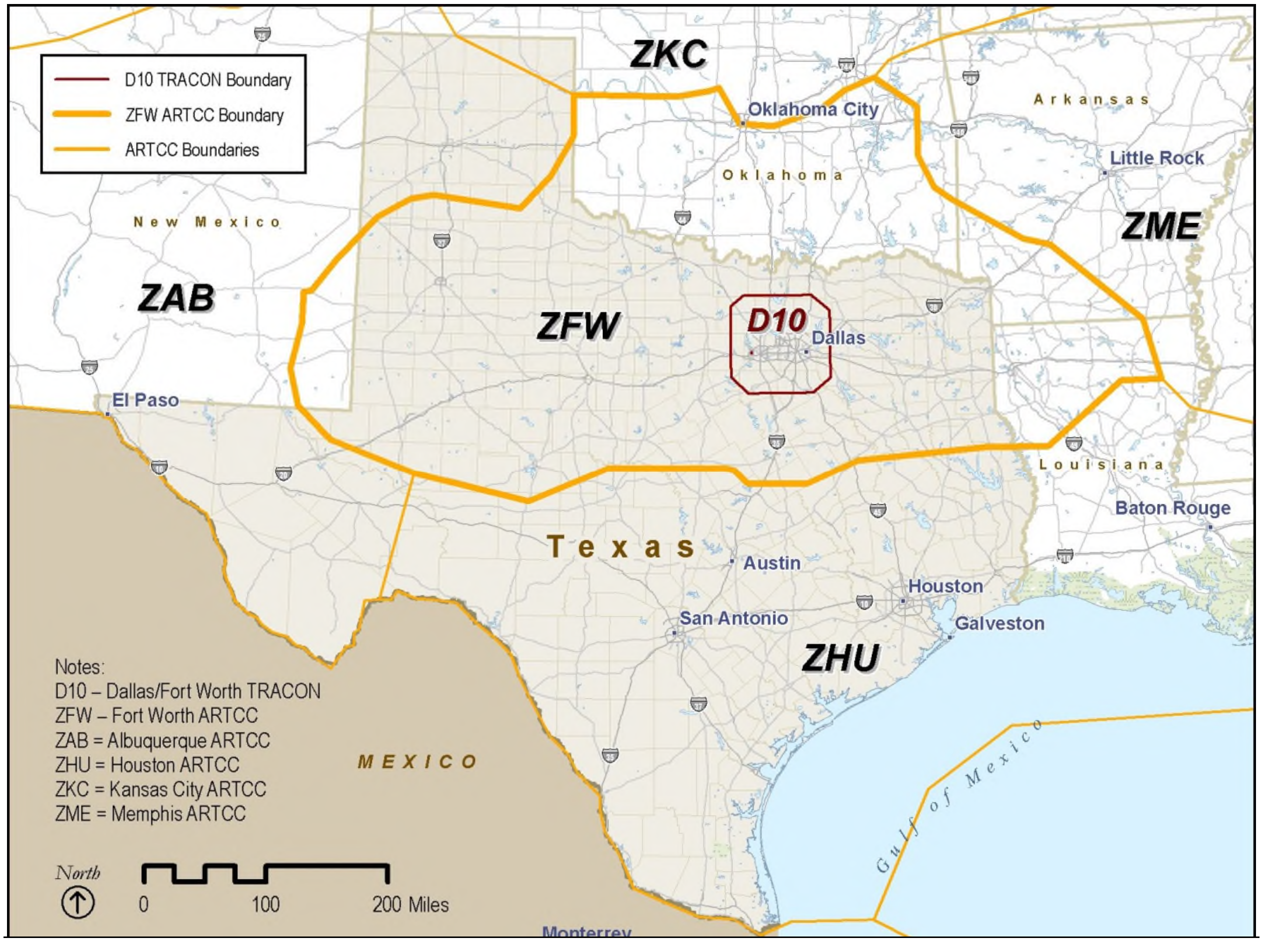
As an aircraft operating under IFR departs a runway and follows its assigned heading, it moves from the ATCT airspace, through the terminal airspace, and into en route airspace where it proceeds on a specific route or airway. Once on an airway, an aircraft flies along the route until it nears its destination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

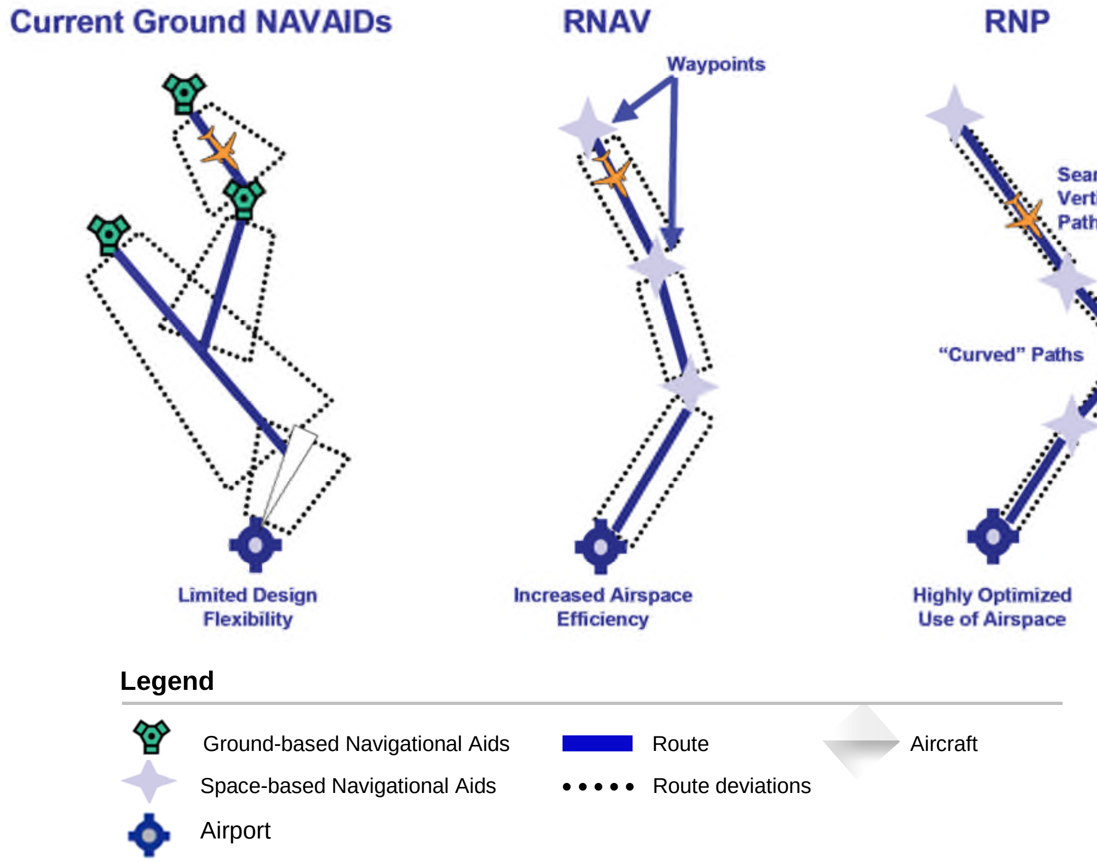
Ground-based NAVAID routing is often limited by issues such as line-of-sight and signal reception accuracy. Ground-based NAVAIDs such as, Very High Frequency (VHF) Omnidirectional Range (VOR) are affected by terrain and other obstructions that can limit their signal accuracy. Consequently, due to signal 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

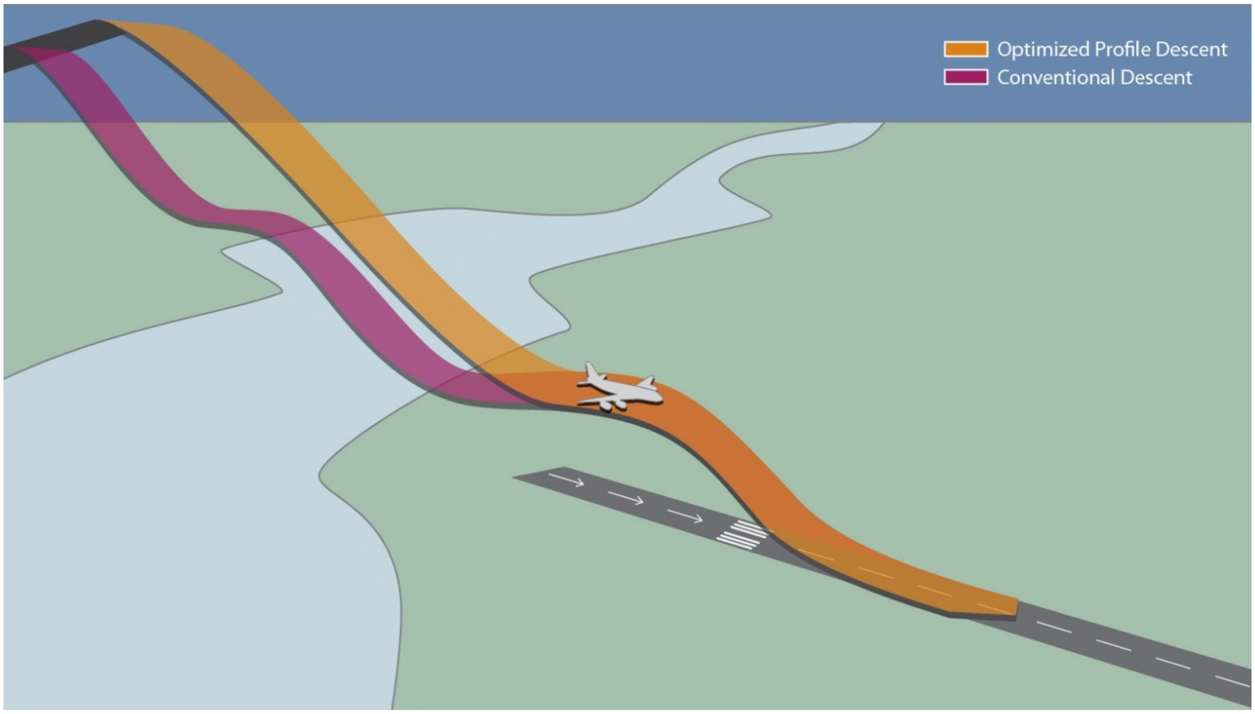
1.2.6.2 Optimized Profile Descent

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

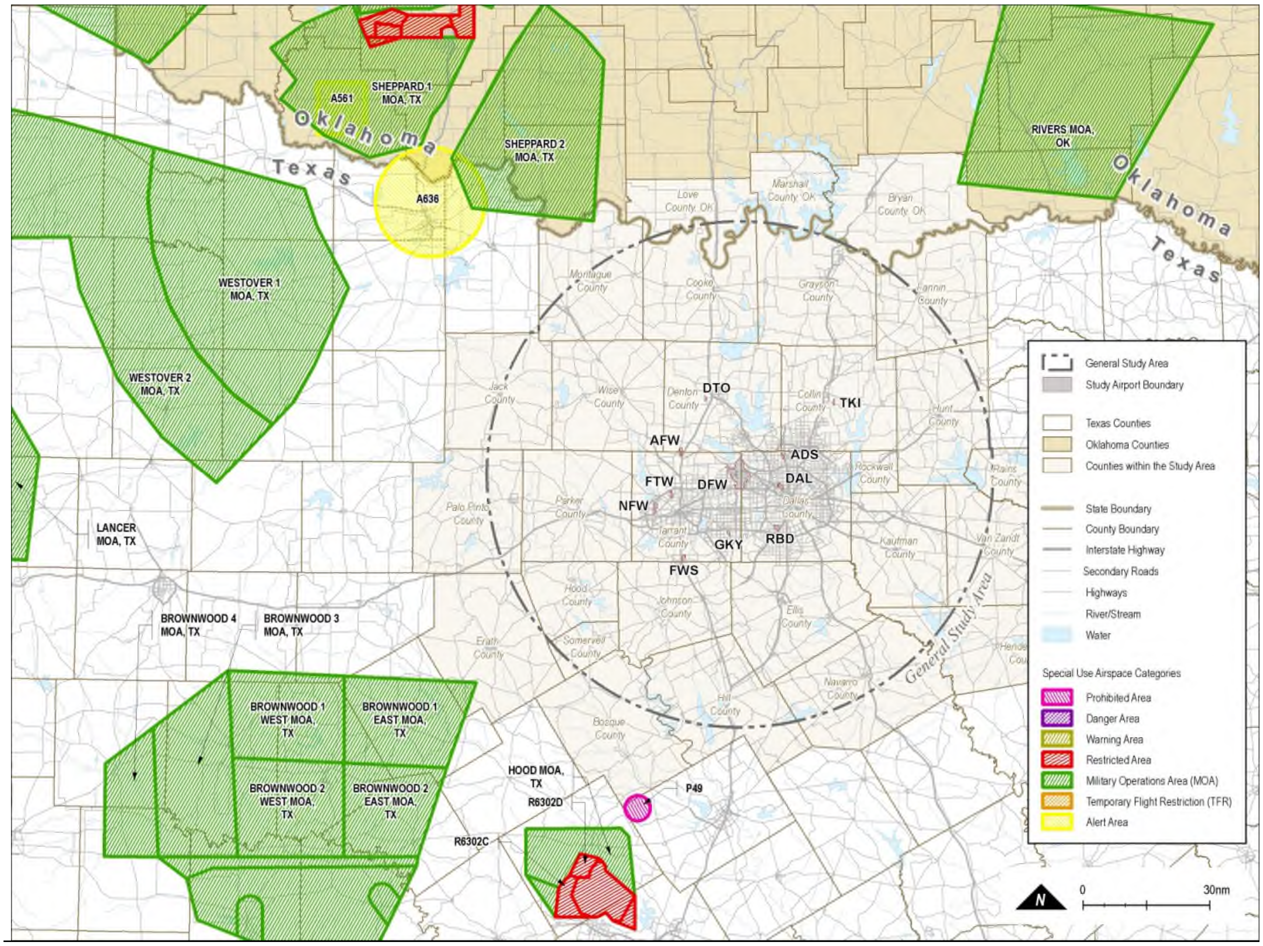
Exhibit 1-4 depicts part of the airspace structure in the North Texas Metroplex. Air traffic controllers in the D10 TRACON facility control a portion of airspace designated as D10 that is located within the Dallas/Fort Worth ARTCC (ZFW) airspace. Surrounding ARTCC airspace includes Kansas City (ZKC),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

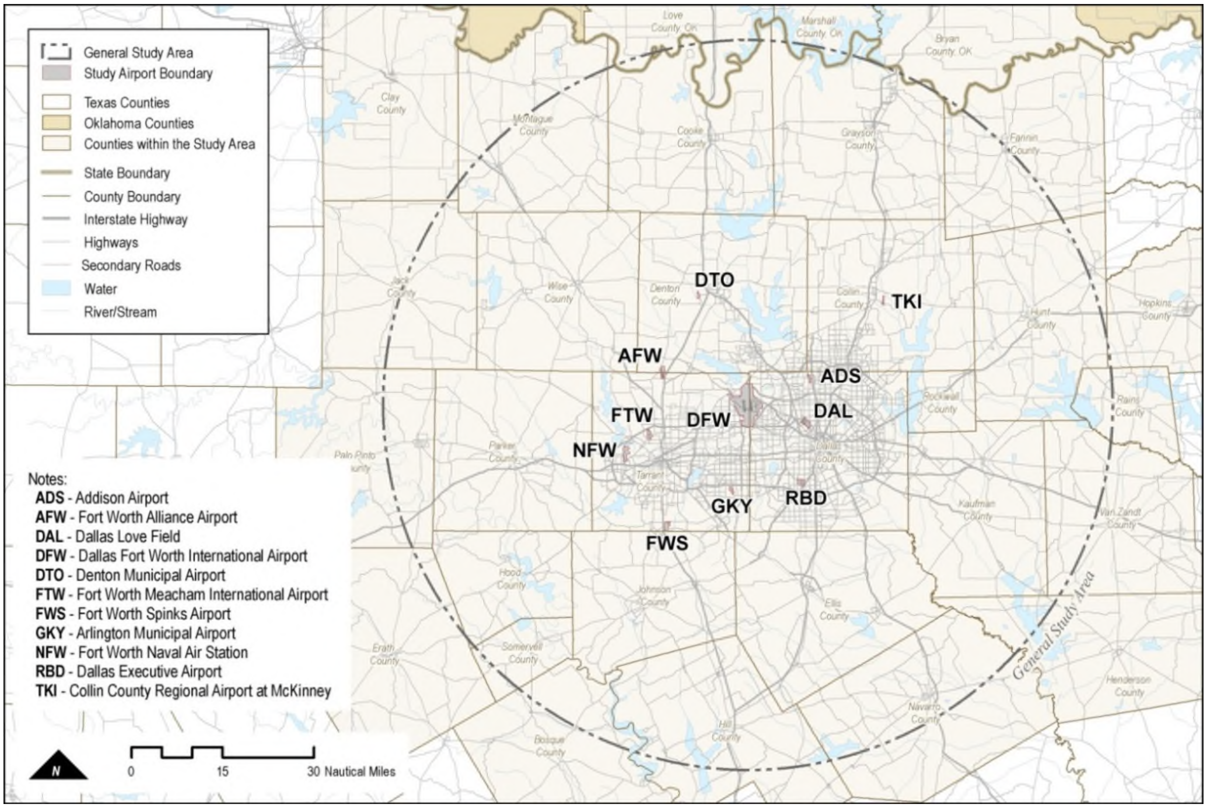
Table 1-1 North Texas Metroplex EA Study Airports

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

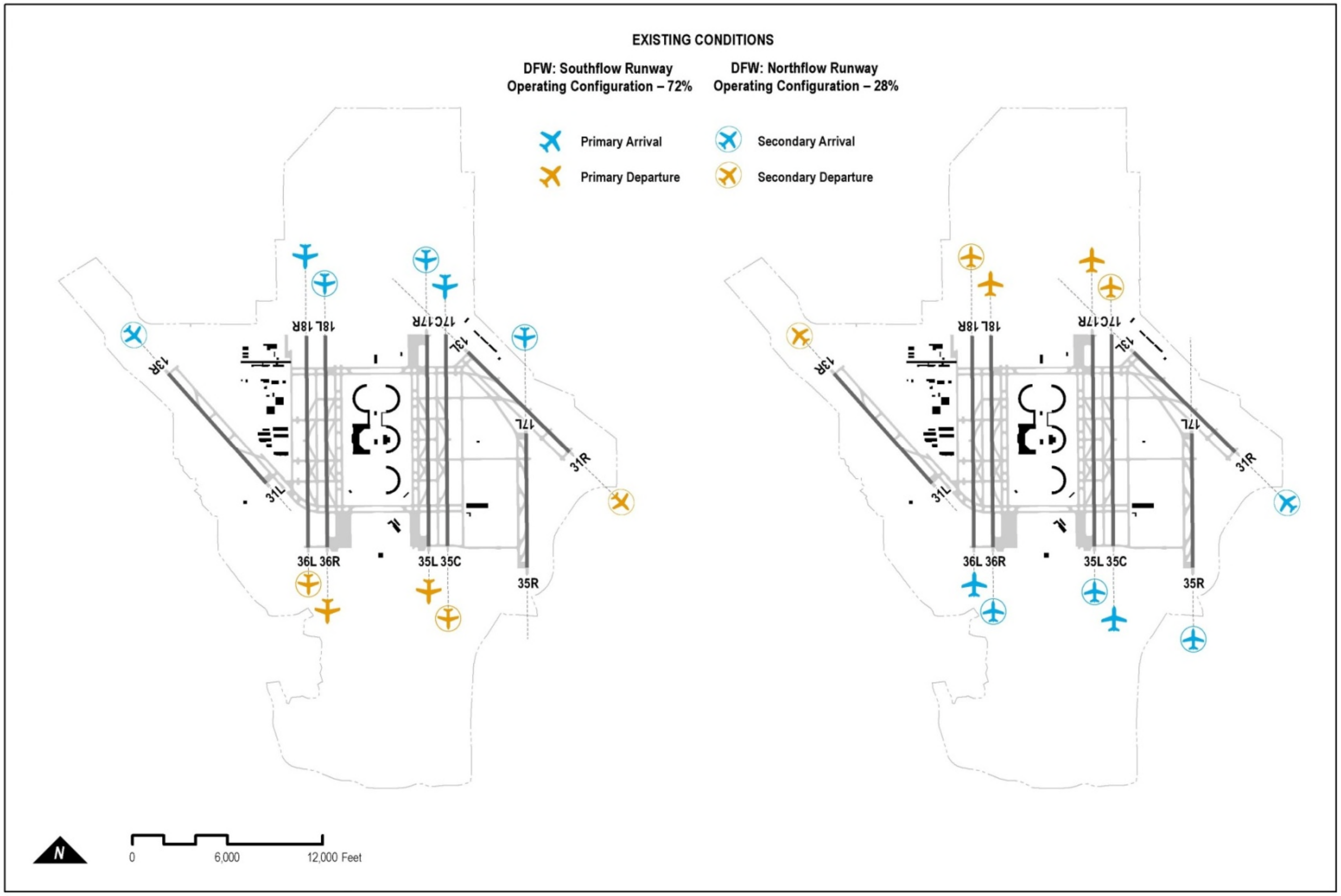
1.4.2 Major Study Airport Runway Operating Configurations

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.

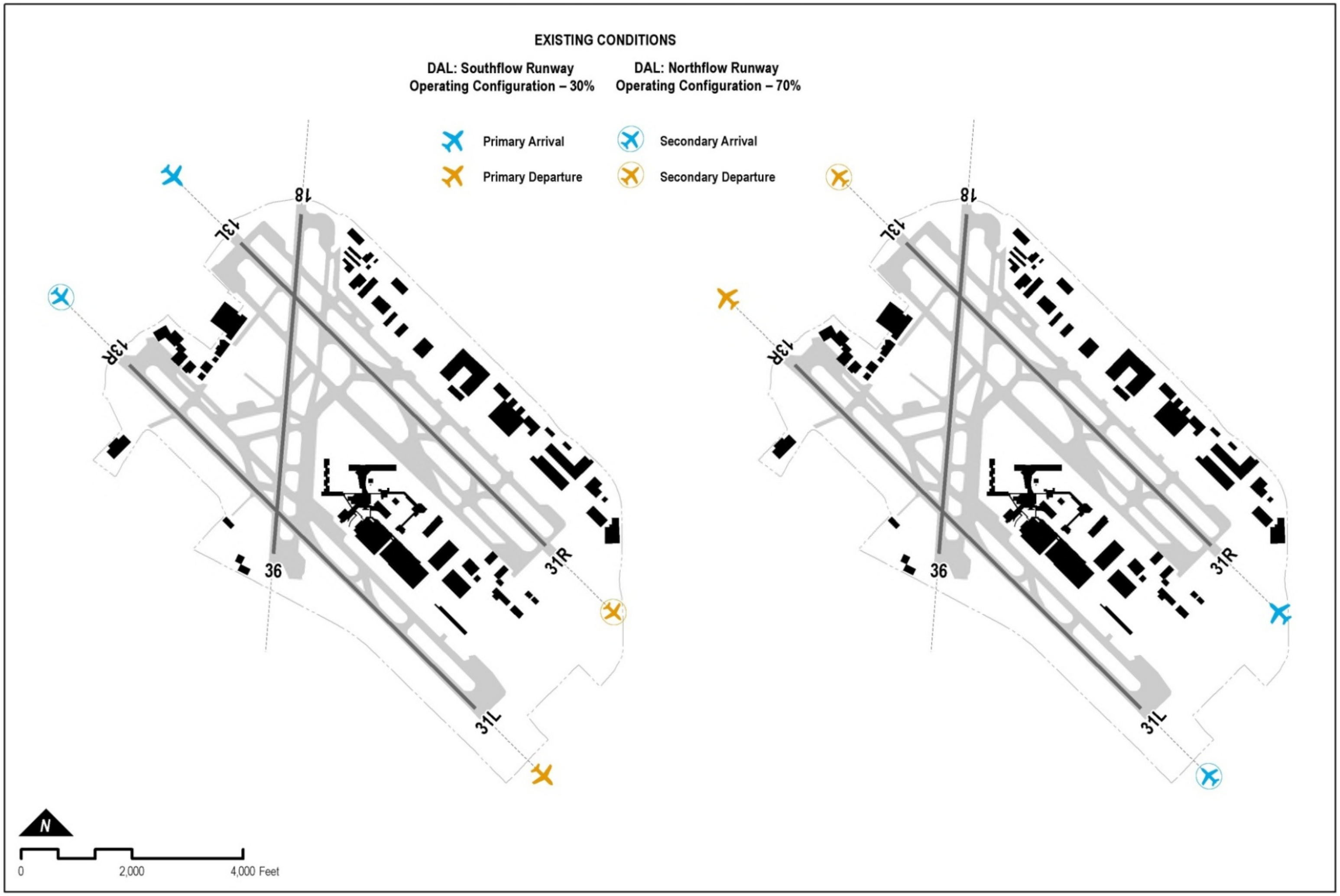
[27] Department of Transportation, Federal Aviation Administration. Digital-Terminal Procedures. April 5, 2012 (http://aeronav.faa.gov/index.asp?xml=aeronav/applications/d_tpp; accessed June 7, 2012).

Exhibit 1-9 DFW Operating Configurations



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

Exhibit 1-10 DAL Operating Configurations



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