2014 NORTH DAKOTA STATE

AVIATION SYSTEM PLAN

TECHNICAL PLAN

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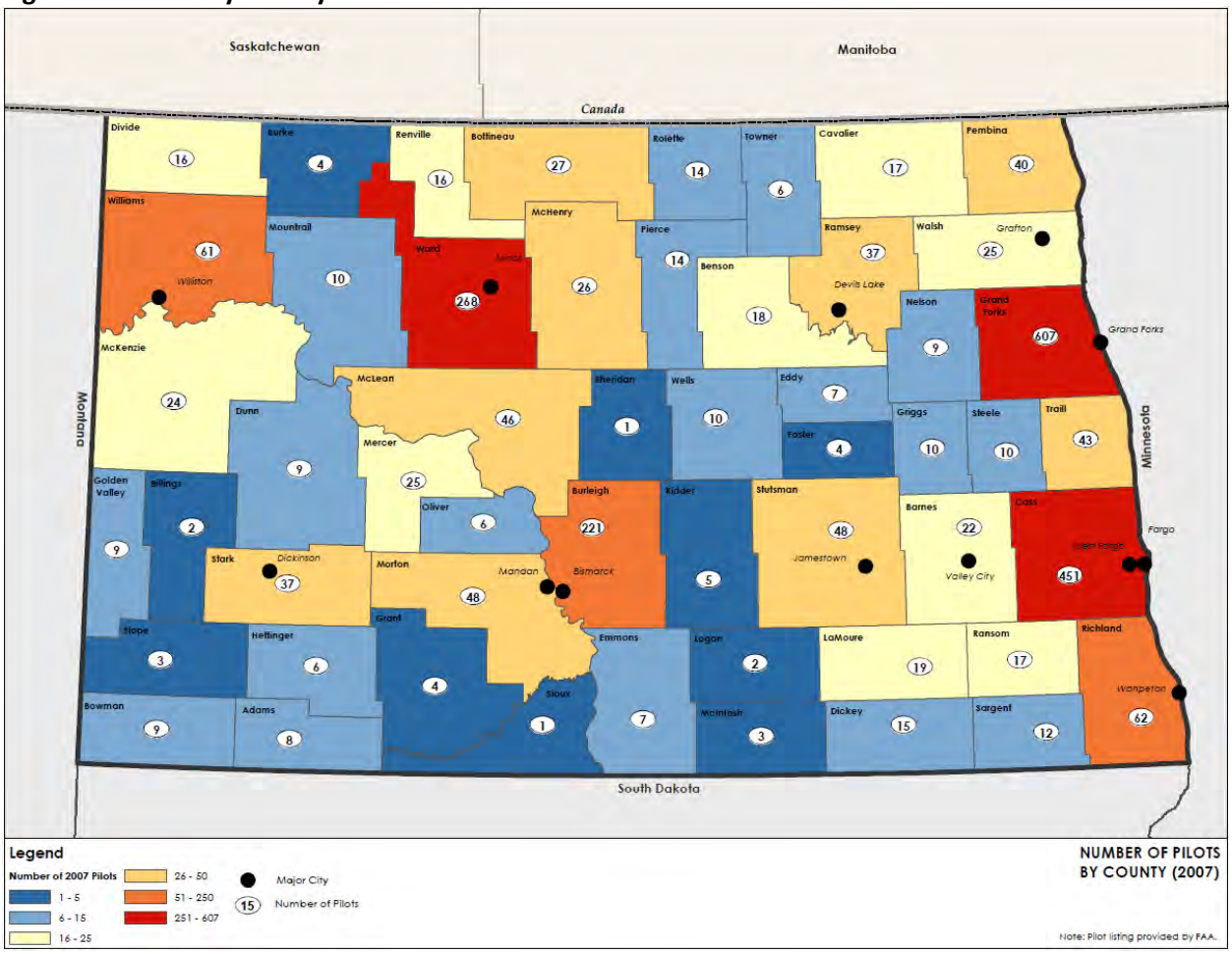
CHAPTER 1 – INTRODUCTION

North Dakota's aviation system of 89 public use airports has proven a vital resource to what is currently the most prolific state economy in the nation. No other region has recently seen such a jump in economic standing, like these communities within the 70,000 square miles that make up the Peace Garden State. North Dakota's long-time staple exports, such as sunflowers, wheat, soybeans, corn, livestock, heavy mechanical equipment, and transmission of electricity by coal-fired lignite, have now been joined by petroleum products, such as crude oil, biodiesel, natural gas, and ethanol. The demand for infrastructure from these industries is exponential.

Airports are no exception to these demands. Statewide, airports have seen a tremendous increase in passenger enplanements, and corporate, general aviation (GA) and agricultural operations. Since the last system plan update in 2007, an additional 380 aircraft have been registered in the state (an increase of 23%) according to the North Dakota Aeronautics Commission's (NDAC's) official record and the total number of licensed pilots in North Dakota has increased to nearly 3,600 total (an increase of 48%) according to the Federal Aviation Administration's (FAA's) official record. Although the overall increase is around 1,200, a cross-reference between the official pilot listing from 2007 and 2014 identified the true number of new pilots to be more than 2,400. This indicates that between 2007 and 2014, about 2,400 new pilots were registered in the state, while 1,200 pilots left or stopped flying.

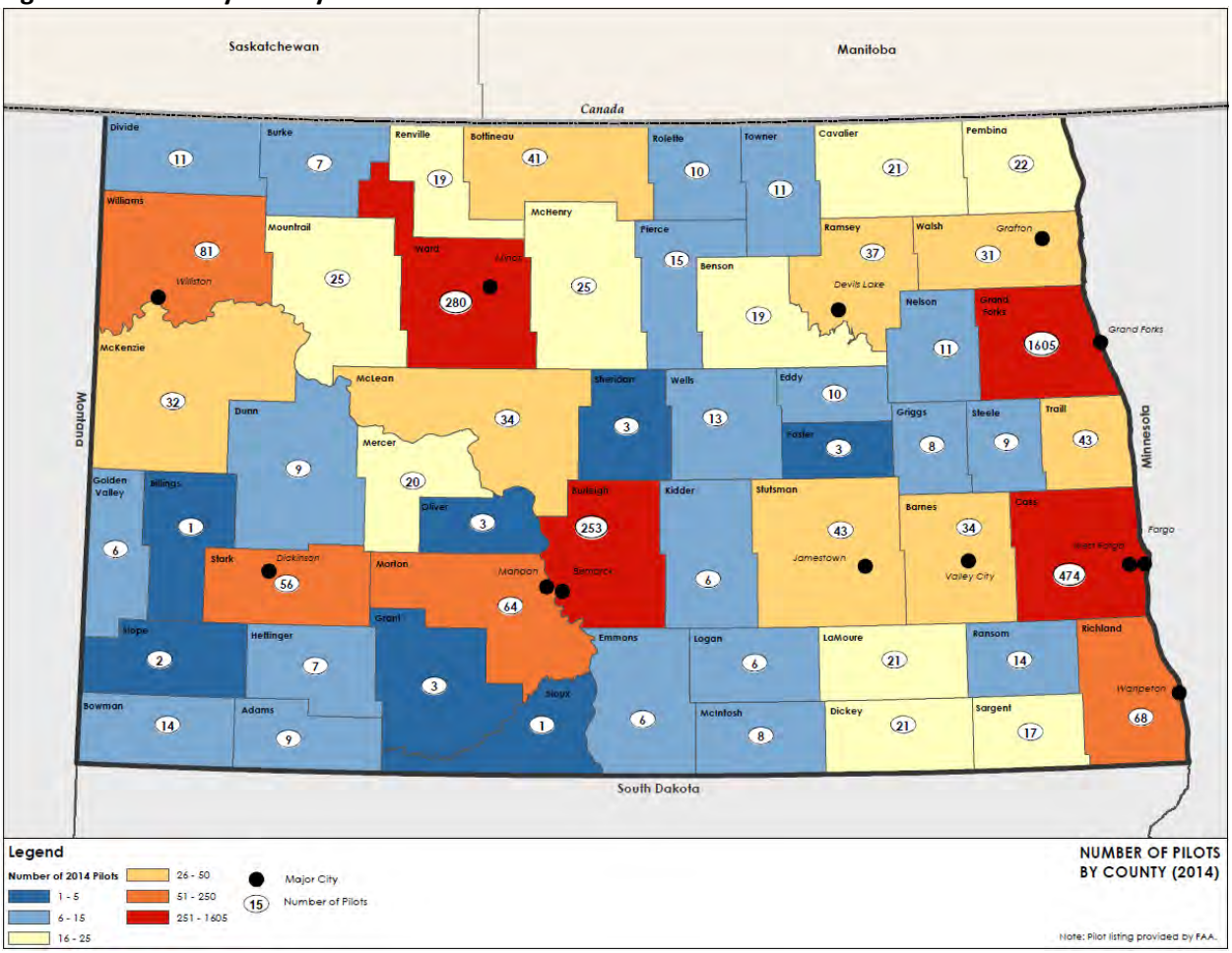
Figure 1.1 illustrates the number of pilots by county in 2007, while **Figure 1.2** illustrates the number of pilots by county in 2014. **Figure 1.3** shows the true increase in pilots by county between 2007 and 2014 (being around 2,400).

Figure 1.1: Pilots by County in 2007



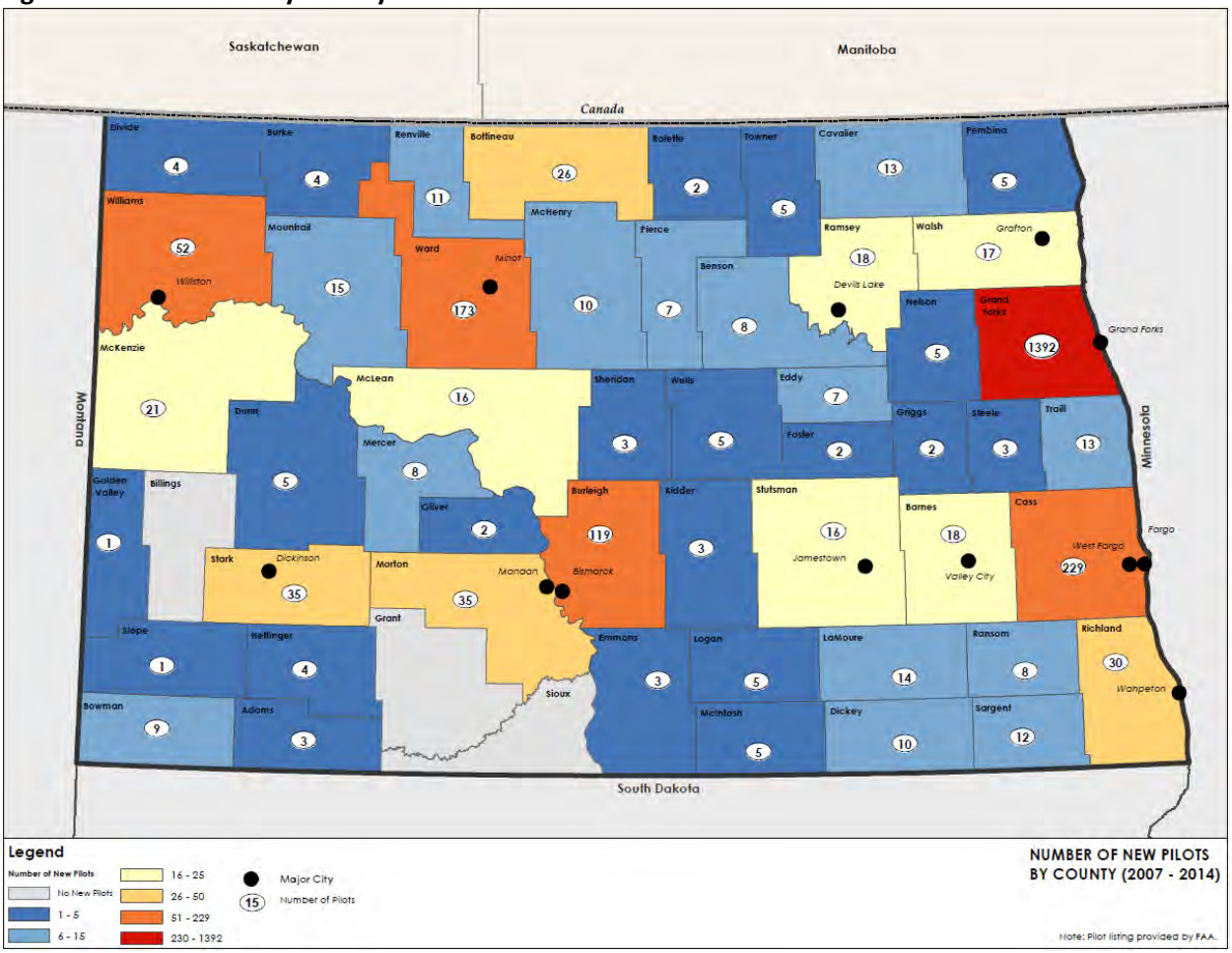
Source: FAA Pilot Listing, mapped by Mead & Hunt, Inc.

Figure 1.2: Pilots by County in 2014



Source: FAA Pilot Listing, mapped by Mead & Hunt, Inc.

Figure 1.3: New Pilots by County 2007-2014



Source: FAA Pilot Listing, mapped by Mead & Hunt, Inc.

As illustrated in **Figure 1.3**, the largest increase in pilots (1,392) between 2007 and 2014 occurred in Grand Forks County, which is due in part to the increased pilot training at the University of North Dakota (UND). UND's flight program attracts a large number of national and international students each year. Of the 1,605 pilots registered in Grand Forks County in 2014, more than 950 are foreign. The economic impact of UND at the local and state level is enhanced by these international students for the three to five years they spend in the Grand Forks area. Often the international pilots return to their homes after graduation from UND; however, the economic impact remains steady as additional international students arrive at UND to begin their education.

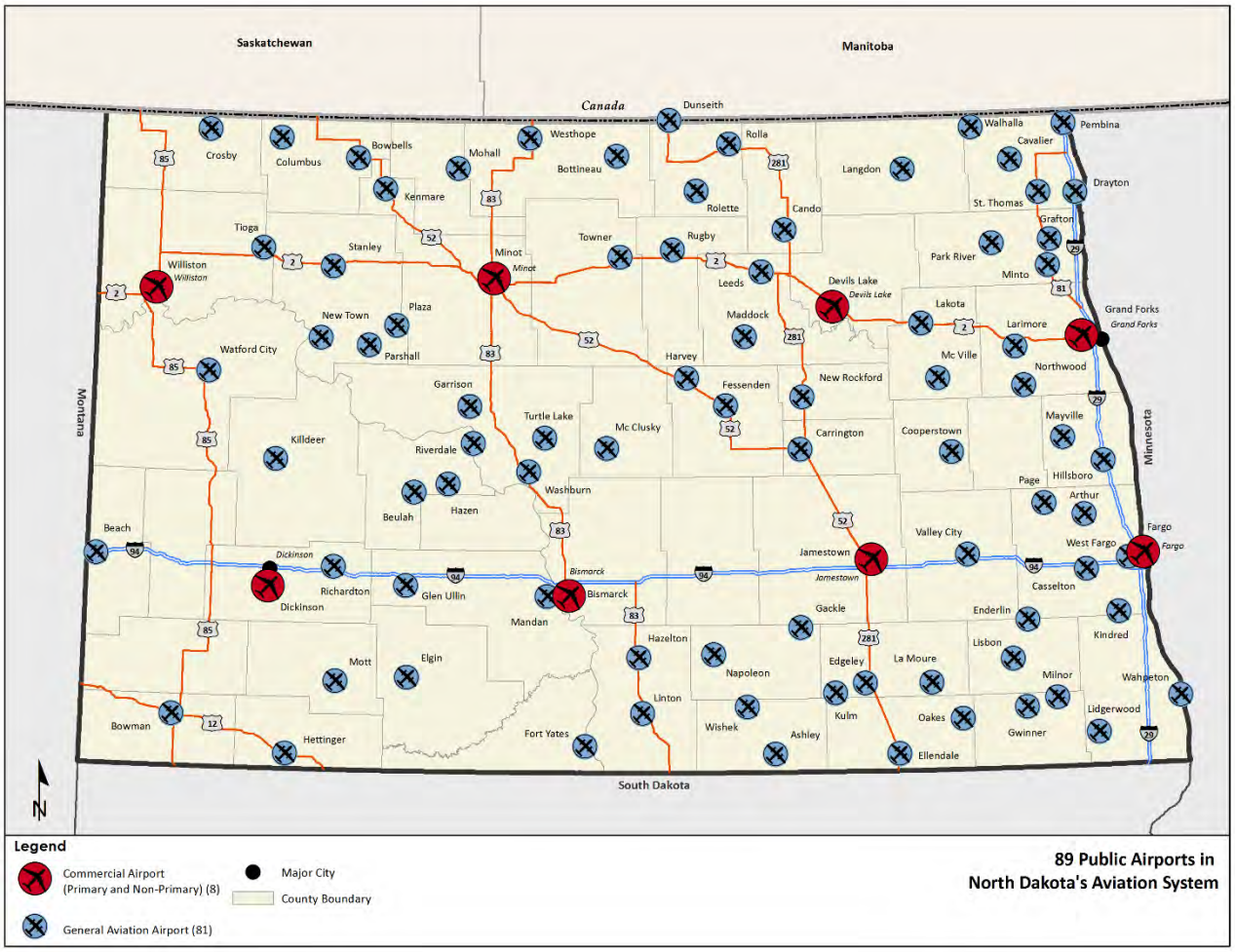
The goal of the 2014 North Dakota State Aviation System Plan (NDSASP) is to provide the necessary guidance to manage this growth and prioritize safe development, while preserving the rich heritage of aviation in North Dakota.

1.1 Purpose of Airport System Planning

The North Dakota Aeronautics Commission (NDAC) has undertaken an update to the 2007 North Dakota State Aviation System Plan Update due to the changing aeronautical conditions and rapid growth the state's aviation system is experiencing. The 2014 NDSASP (this document) takes a renewed look at the needs of the State as a whole. This plan provides a tool to assess, manage, and develop the State's aviation system (shown in **Figure 1.4**), while providing an added resource for the FAA, the North Dakota Aeronautics Commission, the State Legislature, the North Dakota Aviation Council, local agencies, and airport sponsors. The goal of system planning is to identify the needs of the State as a whole, and develop a roadmap for the allocation of available resources to meet these needs in a responsible manner. Typically, a system plan will cover a time frame of 20 years; however, updates are prudent if changing aeronautical conditions arise.

The FAA requires all states to produce a state system plan that addresses their aviation needs to obtain federal dollars to meet these needs. The information provided in a system plan is helpful in the FAA's formation of funding schedules and for addressing aviation needs at a nationwide level. This information is also used by the FAA in recommending airports for inclusion in the National Plan of Integrated Airport Systems (NPIAS) (see Section 1.3) and classification of GA airports in FAA's ASSET Study (see Chapter 2, Section 2.2). Advisory Circular (AC) 150/5070-7, *The Airport System Planning Process,* outlines the FAA-required content of system plans. This AC has been followed throughout the development of the 2014 NDSASP.

Figure 1.4: Public Use Airports within North Dakota



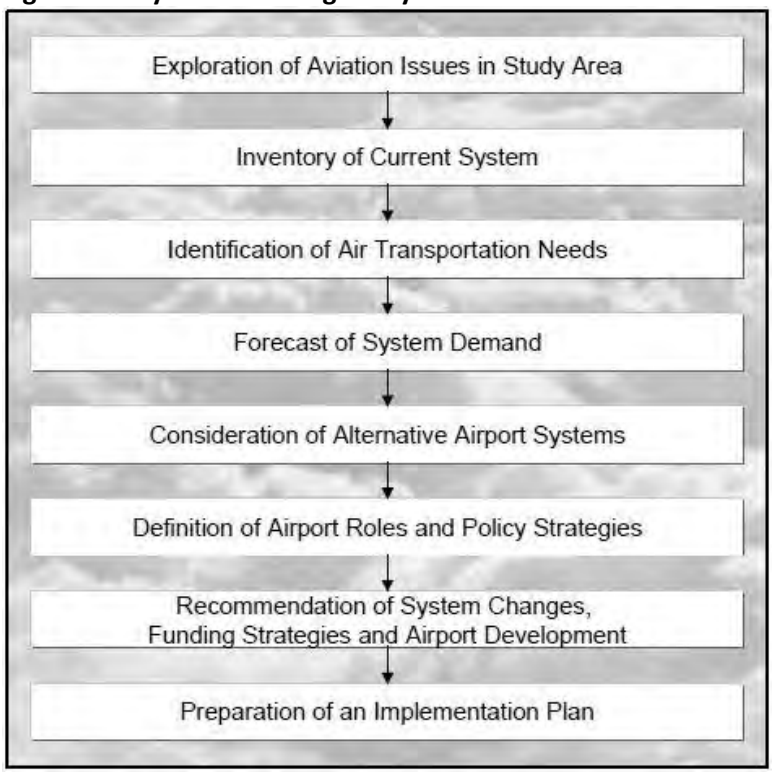
Source: Mead & Hunt, Inc.

1.2 Plan Components and Processes

AC 150/5070-7 establishes a general process for aviation system plan development (see **Figure 1.5**). While it is imperative that these elements be included in every system plan, it is also important that each plan address key state-wide impacts and be tailored to the varying needs of specific system users. The needs of these users can differ drastically from state to state depending upon locale and major industries, among other factors. Therefore, emphasis on key industries such as petroleum, lignite, agriculture, tourism, and other influential elements within North Dakota, have been placed throughout this document. Chapters in this 2014 plan include:

Chapter 1 – Introduction
Chapter 2 – System Goals & Airport Classifications
Chapter 3 – Inventory
Chapter 4 – Forecasts
Chapter 5 – System Analysis
Chapter 6 – Trends & Technology
Chapter 7 – Recommendations
Chapter 8 – CIP Summary/Funding

Figure 1.5: System Planning Study Process



Source: FAA Advisory Circular 150/5070-7 *The Airport System Planning Process*

1.3 National Plan of Integrated Airport Systems

At the national level, the FAA is responsible for overseeing the development of the aviation system in the U.S. The National Plan of Integrated Airport Systems (NPIAS) is the program through which the FAA conducts national planning efforts and produces an annual plan for more than 3,300 airports included in the system. This plan is derived from a compilation of local, regional, and state system planning studies (such as this 2014 update of the NDSASP), and provides an evaluation of the national aviation system as a whole.

To be included in the NPIAS, an airport must meet certain criteria. Only those airports that are included in the NPIAS are eligible for federal funding through a program called the Airport Improvement Program (AIP). As such, it is important that recommendations of the NDSASP are coordinated with airports included in (or removed from) the NPIAS, since funding is often required to implement system planning recommendations.

Of the 89 public-use airports (see **Figure 1.4**) in North Dakota (eight commercial service and 81 GA), 53 (60%) are included in the NPIAS. The NPIAS classifies these airports into one of four roles: Primary Commercial Service, Non-Primary Commercial Service, Reliever, and General Aviation facilities. **Table 1.1** provides a summary of the 89 airports in the State, including NPIAS classifications, while **Figure 1.6** illustrates the locations of these NPIAS airports within North Dakota.

Table 1.1: North Dakota Airports by NPIAS Classifications

Airport	Associated City	Identifier	Public/ Private	NPIAS	NPIAS Classification
Arthur Airport	Arthur	1A2	PU	No	
Ashley Municipal	Ashley	ASY	PU	No	
Beach	Beach	20U	PU	Yes	General Aviation
Beulah Municipal Airport	Beulah	95D	PU	No	
Bismarck Municipal	Bismarck	BIS	PU	Yes	Primary Commercial Service
Bottineau Municipal	Bottineau	D09	PU	Yes	General Aviation
Bowbells Municipal	Bowbells	5B4	PU	No	
Bowman Municipal	Bowman	BPP	PU	Yes	General Aviation
Cando Municipal	Cando	9D7	PU	Yes	General Aviation
Carrington Municipal	Carrington	46D	PU	Yes	General Aviation
Casselton Robert Miller Regional	Casselton	5N8	PU	Yes	General Aviation
Cavalier Municipal	Cavalier	2C8	PU	Yes	General Aviation
Columbus Municipal	Columbus	D49	PU	No	
Cooperstown Municipal	Cooperstown	S32	PU	Yes	General Aviation
Crosby Municipal	Crosby	D50	PU	Yes	General Aviation
Devils Lake Regional	Devils Lake	DVL	PU	Yes	Non-Primary Commercial Service
Dickinson-Roosevelt Regional	Dickinson	DIK	PU	Yes	Primary Commercial Service
Drayton Municipal	Drayton	D29	PU	No	
Intl Peace Garden	Dunseith	S28	PU	Yes	General Aviation
Edgeley Municipal	Edgeley	51D	PU	Yes	General Aviation
Elgin Municipal	Elgin	Y71	PU	No	
Ellendale Municipal	Ellendale	4E7	PU	Yes	General Aviation
Sky Haven Airport	Enderlin	5N4	PU	No	
Hector Intl'l	Fargo	FAR	PU	Yes	Primary Commercial Service
Fessenden-Streibel Municipal	Fessenden	D24	PU	No	
Standing Rock	Fort Yates	Y27	PU	Yes	General Aviation
Gackle Municipal	Gackle	9G9	PU	No	
Garrison Municipal	Garrison	D05	PU	Yes	General Aviation
Glen Ullin Regional	Glen Ullin	D57	PU	Yes	General Aviation
Hutson Field	Grafton	GAF	PU	Yes	General Aviation
Grand Forks International	Grand Forks	GFK	PU	Yes	Primary Commercial Service
Gwinner-Roger Melroe Field	Gwinner	GWR	PU	Yes	General Aviation
Harvey Municipal	Harvey	5H4	PU	Yes	General Aviation
Hazelton Municipal	Hazelton	6H8	PU	No	
Mercer County Regional	Hazen	HZE	PU	Yes	General Aviation
Hettinger Municipal	Hettinger	HEI	PU	Yes	General Aviation
Hillsboro Municipal	Hillsboro	3H4	PU	Yes	General Aviation
Jamestown Regional	Jamestown	JMS	PU	Yes	Non-Primary Commercial Service
Kenmare Municipal	Kenmare	7K5	PU	Yes	General Aviation
Weydahl Field	Killdeer	9Y1	PU	No	
Robert Odegaard Field	Kindred	K74	PU	Yes	General Aviation
Pruetz Municipal	Kulm	D03	PU	No	
La Moure Rott Municipal	La Moure	4F9	PR	Yes	General Aviation
Lakota Municipal	Lakota	5L0	PU	Yes	General Aviation
Robertson Field	Langdon	D55	PU	Yes	General Aviation

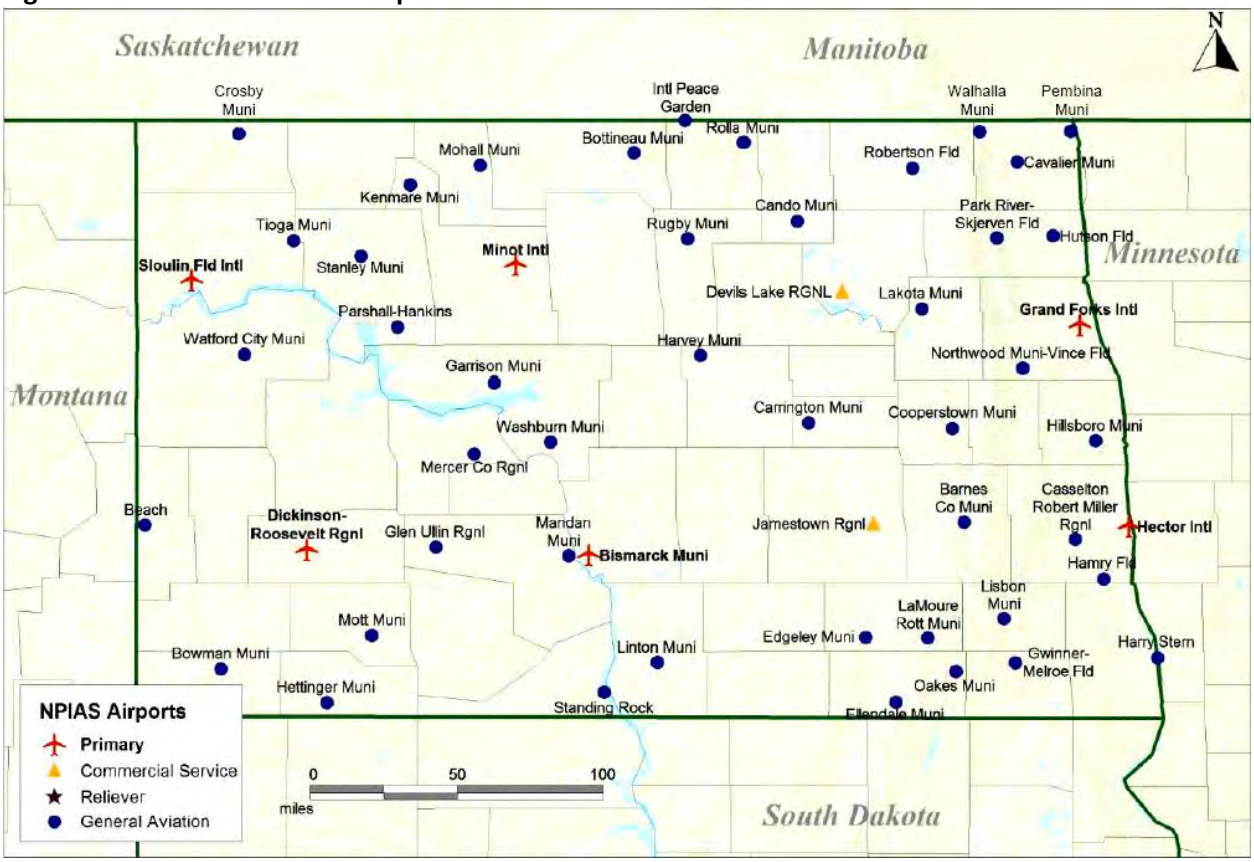
Table 1.1: North Dakota Airports by NPIAS Classifications

Airport	Associated City	Identifier	Public/ Private	NPIAS	NPIAS Classification
Larimore Municipal	Larimore	2L1	PU	No	
Leeds Municipal	Leeds	D31	PU	No	
Lidgerwood Municipal	Lidgerwood	4N4	PU	No	
Linton Municipal	Linton	7L2	PU	Yes	General Aviation
Lisbon Municipal	Lisbon	6L3	PU	Yes	General Aviation
Maddock Municipal	Maddock	6D3	PU	No	
Mandan Municipal	Mandan	Y19	PU	Yes	General Aviation
Mayville Municipal	Mayville	D56	PU	No	
McClusky Municipal	McClusky	7G2	PU	No	
McVille Municipal	McVille	8M6	PU	No	
Milnor Municipal	Milnor	4R6	PU	No	
Minot International	Minot	MOT	PU	Yes	Primary Commercial Service
Minto Municipal	Minto	D06	PU	No	
Mohall Municipal	Mohall	HBC	PU	Yes	General Aviation
Mott Municipal	Mott	3P3	PU	Yes	General Aviation
Napoleon Municipal	Napoleon	5B5	PU	No	
Tomlinson Field	New Rockford	8J7	PU	No	
New Town Municipal	New Town	05D	PU	No	
Northwood Muni-Vince Field	Northwood	4V4	PU	Yes	General Aviation
Oakes Municipal	Oakes	2D5	PU	Yes	General Aviation
Page Regional	Page	64G	PU	No	
Park River - W C Skjerven Field	Park River	Y37	PU	Yes	General Aviation
Parshall-Hankins	Parshall	Y74	PU	Yes	General Aviation
Pembina Municipal	Pembina	PMB	PU	Yes	General Aviation
Trulson Field Airport	Plaza	Y99	PU	No	
Richardton Airport	Richardton	4E8	PU	No	
Garrison Dam Recreational Airpark	Riverdale	37N	PU	No	
Rolette Airport	Rolette	2H9	PU	No	
Rolla Municipal	Rolla	06D	PU	Yes	General Aviation
Rugby Municipal	Rugby	RUG	PU	Yes	General Aviation
St. Thomas Municipal	St. Thomas	4S5	PU	No	
Stanley Municipal	Stanley	08D	PU	Yes	General Aviation
Tioga Municipal	Tioga	D60	PU	Yes	General Aviation
Towner Municipal	Towner	D61	PU	No	
Turtle Lake Municipal	Turtle Lake	91N	PU	No	
Barnes County Municipal	Valley City	BAC	PU	Yes	General Aviation
Harry Stern	Wahpeton	BWP	PU	Yes	General Aviation
Walhalla Municipal	Walhalla	96D	PU	Yes	General Aviation
Washburn Municipal	Washburn	5C8	PU	Yes	General Aviation
Watford City Municipal	Watford City	S25	PU	Yes	General Aviation
West Fargo Municipal	West Fargo	D54	PU	No	
Westhope Municipal	Westhope	D64	PU	No	
Sloulin Field International	Williston	ISN	PU	Yes	Primary Commercial Service
Wishek Municipal	Wishek	6L5	PU	No	

Source: *National Plan of Integrated Airport Systems (2013-2017)*

The 36 remaining airports are still included in North Dakota's aviation system; however, they do not qualify for federal AIP aid. These non-NPIAS airports are often municipally-owned and receive some support from their local community. They may also be eligible for limited state funds, and the United States Department of Agriculture (USDA) Rural Development program on a case-by-case basis. Regardless of the inclusion in the NPIAS, all 89 airports in North Dakota's aviation system constitute an important air transportation resource that should be protected. Consequently, the NDSASP takes into account each of the 89 public-use airports within the State to ensure an adequate, efficient, and accessible system for aviation users in North Dakota.

Figure 1.6: Location of NPIAS Airports



Source: *National Plan of Integrated Airport Systems (2013-2017)*

1.4 Importance of Aviation to the State of North Dakota

Due to the vast size of the state and limited rural transit options to move people and goods around, aviation continues to be a critical method of transportation in North Dakota. Many industries rely on air transportation in the state, whether for the transport of employees and materials for businesses, the transport of patients and medical supplies for life-saving operations, the spraying of crops to yield large harvests, flight training, weather research and modification, just-in-time air cargo deliveries of parts for oil drilling machinery, the protection of our country's northern border, or testing of state-of-the-art unmanned aerial vehicles (UAVs). In 2010, North Dakota's aviation system generated $1.1 billion of economic activity and supported 9,792 jobs according to the *North Dakota Economic Impact of Aviation 2010.* Establishing common goals for aviation in North Dakota at the federal, state, and local level will help protect this invaluable asset.

Unprecedented Growth = Infrastructure Strain and Enhanced Commercial Service Markets

Bismarck, Minot, Williston, and Dickinson are all seeing unprecedented growth due to the oil activity in the Bakken region. Annual increases in enplanements charted at these airports have been exponential. While this growth will likely flatten over the next 20 years, passenger enplanements are far exceeding the projections for necessary infrastructure in most instances, leaving airports with facilities that are not meeting current needs. Governor Jack Dalrymple said in a statement to the press "Airports in western North Dakota are experiencing record increases in boardings and activity, requiring additional investment in new and expanded terminals, runways and other maintenance needs."(Airport Improvement Magazine – November/December 2013)

Prior to the mass drilling of oil in the Bakken region, Dickinson and Williston only had service through the United States Department of Transportation (USDOT) Essential Air Service (EAS) program. Now, both airports provide expanded air service options and are no longer part of the EAS program. As a result, Dickinson and Williston have needed to leverage additional funding sources to help support the continuation of expanded air service offered at each airport.

1.4.1 Commercial Service

The aviation system in North Dakota supports eight commercial service airports. These eight airports link the state's 750,000+ people to destinations across the country. These destinations span to both coasts and south to Texas, including six major airline hubs, as shown in **Figure 1.8**. Today, North Dakota passengers can quickly reach destinations across the country and the international aviation system.

Commercial service in North Dakota has grown significantly since the last system plan was completed in 2007. At that time, the State was averaging 52 airline departures per day to five

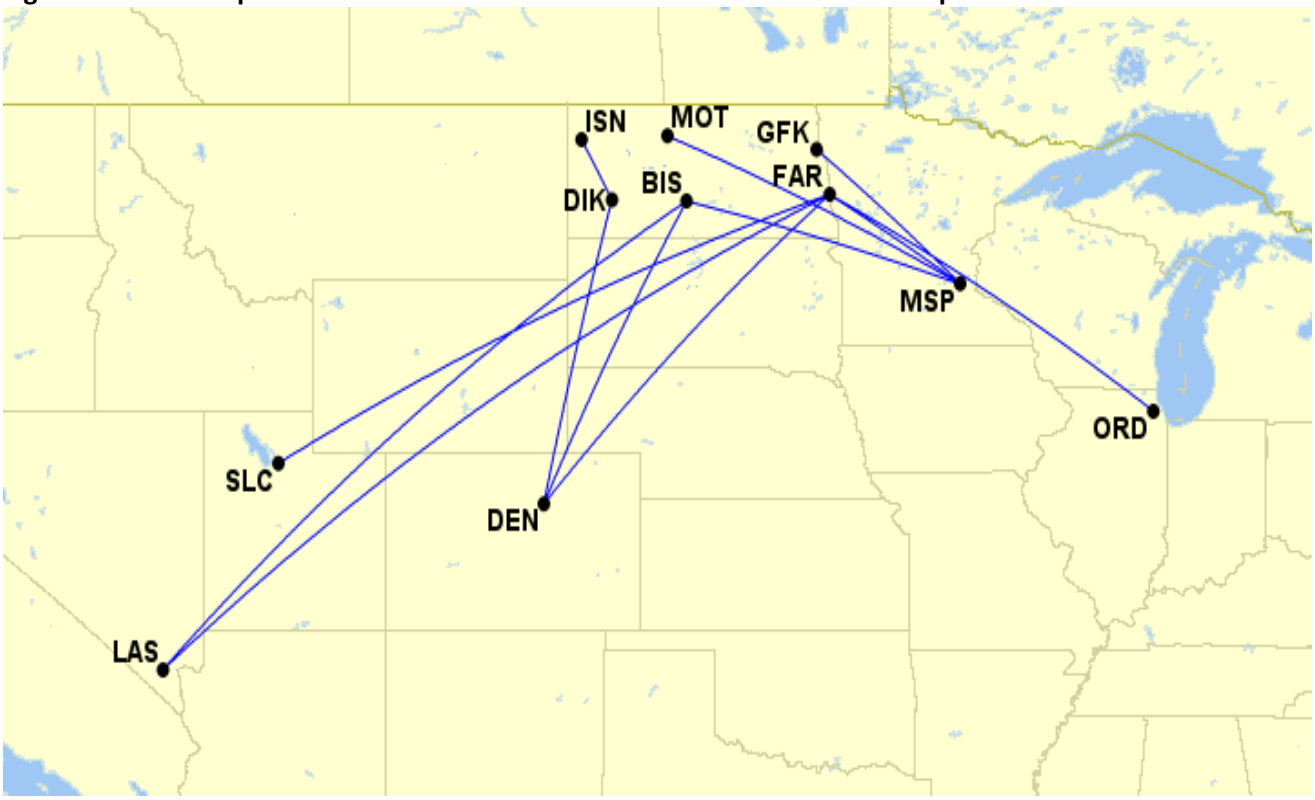
major destinations (shown in **Table 1.2** and **Figure 1.7**). Currently, the State is averaging 75 airline departures per day to 12 different destinations (shown in **Table 1.2** and **Figure 1.8**).

Table 1.2: Commercial Service Destinations from North Dakota Airports

Non-stop Commercial Service Offered in 2007	
• Minneapolis, Minnesota • Denver, Colorado • Salt Lake City, Utah	• Las Vegas, Nevada • Chicago, Illinois
Non-stop Commercial Service Offered as of March 2014	
• Minneapolis, Minnesota • Chicago, Illinois • Denver, Colorado • Atlanta, Georgia • Salt Lake City, Utah • Tampa, Florida	• Houston, Texas • Dallas/Fort Worth, Texas • Orlando, Florida • Las Vegas, Nevada • Phoenix, Arizona • Los Angeles, California

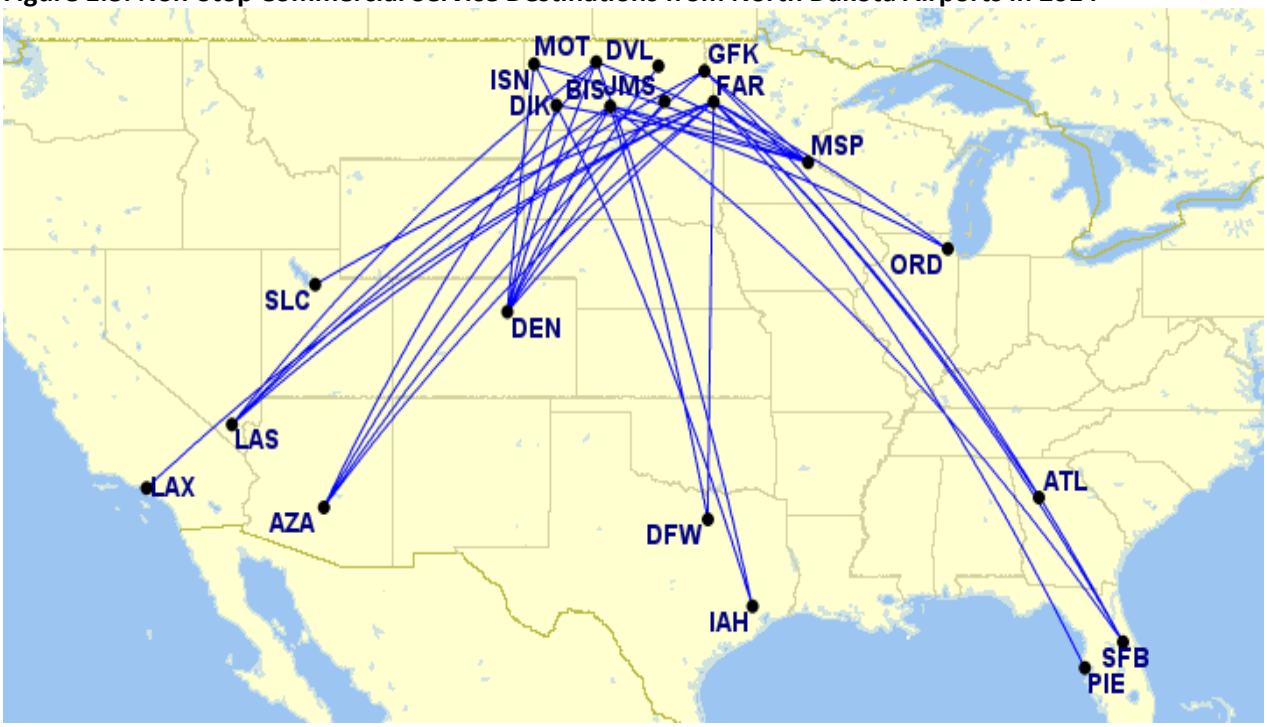
Source: Airport websites as of March 2014

Figure 1.7: Non-Stop Commercial Service Destinations from North Dakota Airports in 2007



Note: Jamestown and Devils Lake had service to MSP, however it was not non-stop and therefore is not shown on this map.
Source: 2007 North Dakota State Aviation System Plan Update and Great Circle Mapper

Figure 1.8: Non-Stop Commercial Service Destinations from North Dakota Airports in 2014



Source: Airport websites as of December 2014 and Great Circle Mapper

Hector International Airport (FAR) in Fargo provides the largest number of non-stop destinations with 11. Bismarck Municipal Airport (BIS) serves the state's capitol and its regional residents, while Grand Forks International Airport (GFK) serves the northeastern region of North Dakota and upper northwest Minnesota.

Minot International Airport (MOT) serves North Dakota's north central and north western population (and south central Canada), and has experienced rapid growth in passenger boardings, due in part to the location near the Bakken region. Sloulin Field International Airport (ISN) in Williston and Dickinson Theodore Roosevelt Regional Airport (DIK) in Dickinson serve western North Dakota and eastern Montana, and have also experienced rapid growth due to their proximity to the heart of the Bakken region.

The more central areas of the state are served by Jamestown Regional Airport (JMS) and Devils Lake Regional Airport (DVL) that offer commercial service through the USDOT EAS Program. A listing of the non-stop destinations offered at each of the eight commercial service airports is provided in **Table 1.3**.

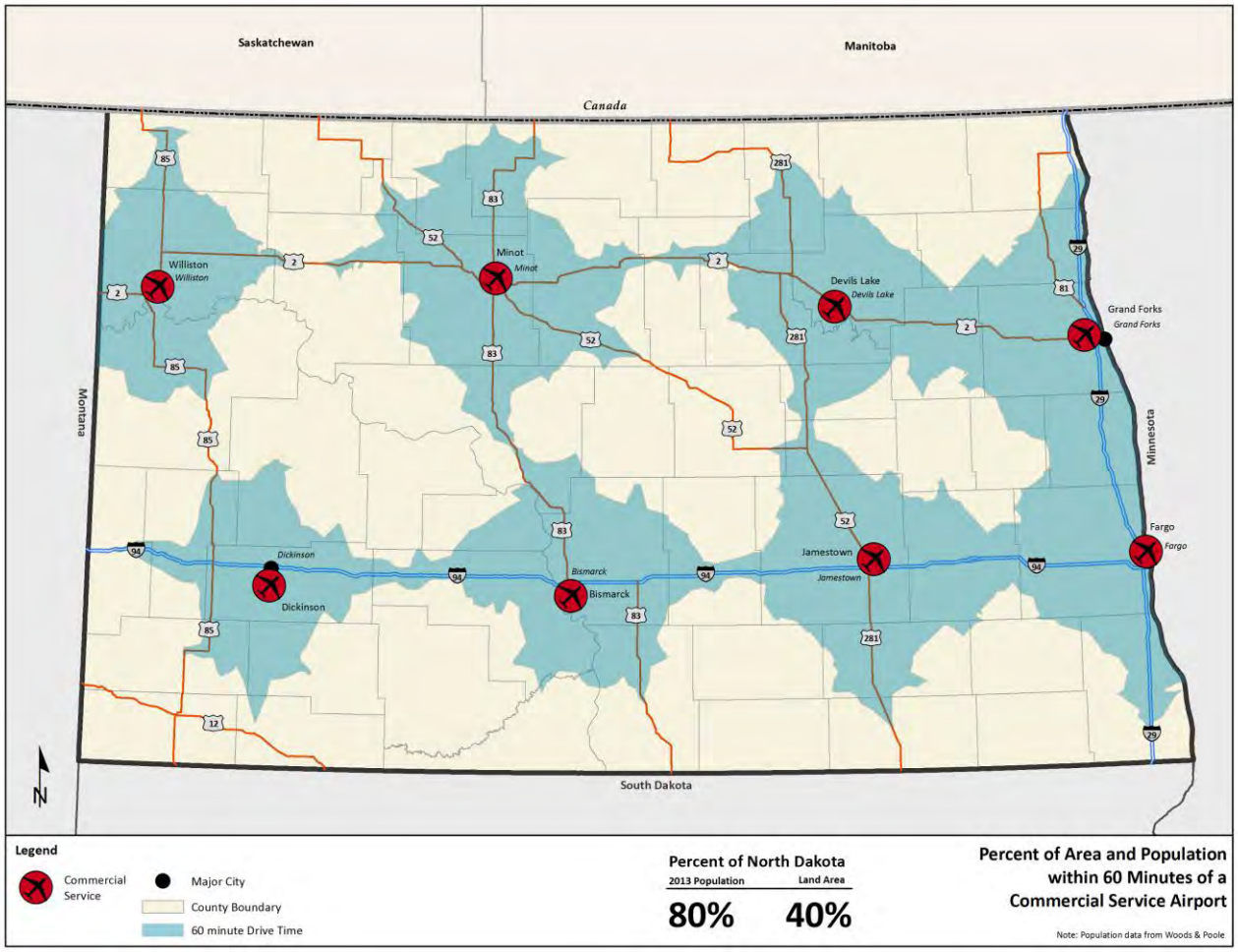
Table 1.3: Non-Stop Destinations by Airport

Airport	City	Destinations
Bismarck Municipal Airport	Bismarck	Denver, Colorado (DEN) Minneapolis, Minnesota (MSP) Las Vegas, Nevada (LAS) Phoenix, Arizona (AZA) Orlando, Florida (SFB) Dallas/Fort Worth, Texas (DFW) Chicago, Illinois (ORD)
Devils Lake Regional Airport	Devils Lake	Denver, Colorado (DEN)
Dickinson Theodore Roosevelt Regional Airport	Dickinson	Denver, Colorado (DEN) Minneapolis, Minnesota (MSP)
Grand Forks International Airport	Grand Forks	Minneapolis, Minnesota (MSP) Las Vegas, Nevada (LAS) Phoenix, Arizona (AZA) Orlando, Florida (SFB)
Hector International Airport	Fargo	Denver, Colorado (DEN) Minneapolis, Minnesota (MSP) Las Vegas, Nevada (LAS) Phoenix, Arizona (AZA) Orlando, Florida (SFB) Chicago, Illinois (ORD) Dallas/Fort Worth, Texas (DFW) Atlanta, Georgia (ATL) Las Angeles, California (LAX) Salt Lake City, Nevada (SLC) Tampa, Florida (PIE)
Jamestown Regional Airport	Jamestown	Denver, Colorado (DEN)
Minot International Airport	Minot	Denver, Colorado (DEN) Minneapolis, Minnesota (MSP) Las Vegas, Nevada (LAS) Phoenix, Arizona (AZA) Houston, Texas (IAH)
Sloulin Field International Airport	Williston	Denver, Colorado (DEN) Minneapolis, Minnesota (MSP) Houston, Texas (IAH)

Source: Airport websites as of March 2014

Airports that support commercial service are critical to the overall aviation system within North Dakota, because they serve a variety of operations including scheduled passenger service, corporate, international, and cargo, and support the state's new number one industry – oil production. Whether it's flying corporate staff, technical support from other states, tourists, temporary employees, or local residents looking for a vacation, the State's eight commercial service airports provide access to all major commercial airline routes and destinations. The locations of these airports across the state are within a reasonable drive time (60 minutes or less from commercial service airports) for the majority of North Dakotans, as shown in **Figure 1.9**.

Figure 1.9: Drive Time Coverage of Commercial Service Airports



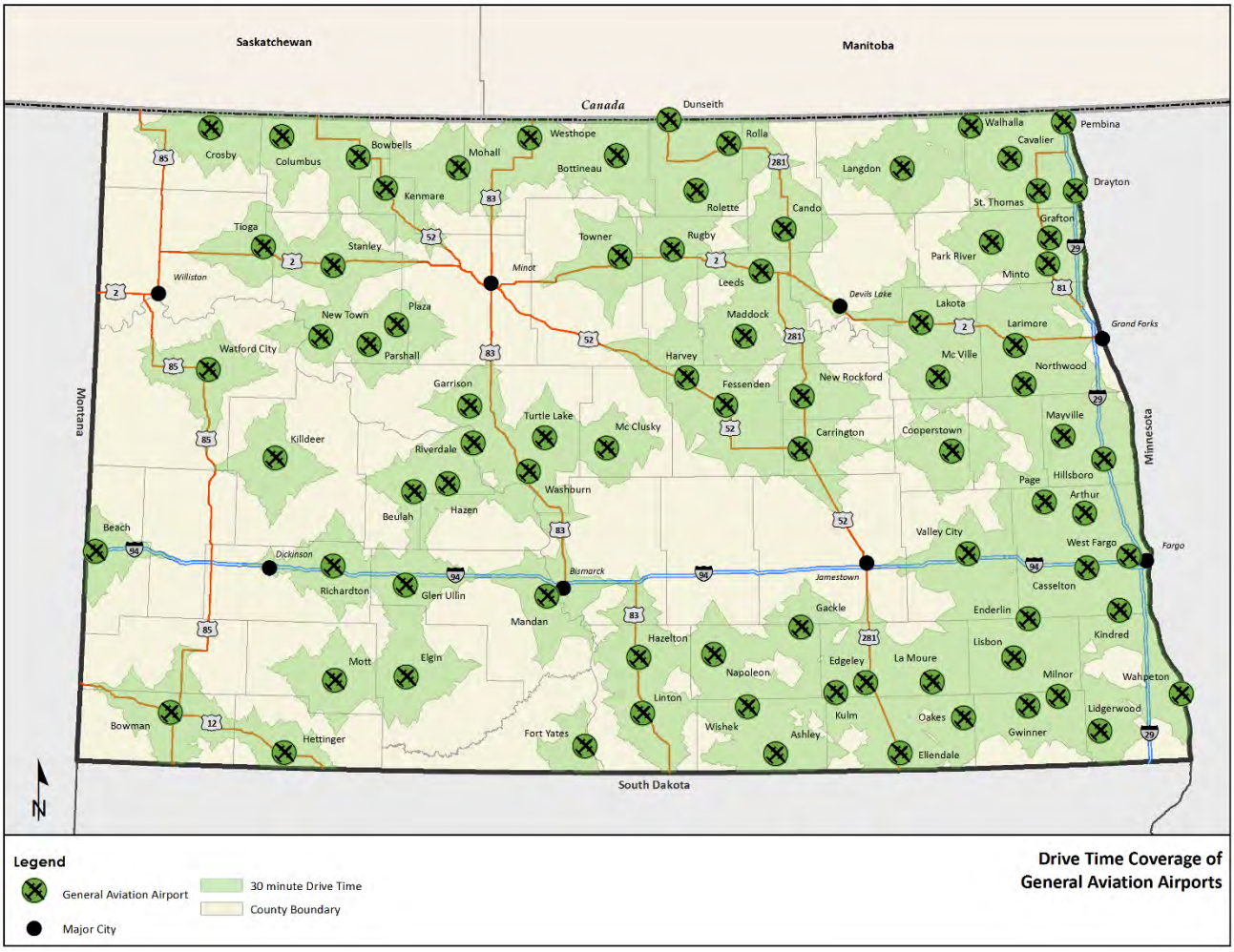
Source: Mead & Hunt, Inc.

1.4.2 General Aviation

All 89 airports included in North Dakota's aviation system have a strong GA presence, including the eight commercial service airports. These GA airports support a variety of different operations, including agricultural spraying, flight training, emergency medical operations, aerial photography, weather research and modification, corporate and cargo operations, and many others. The 81 GA airports in the system provide vital access to more rural regions of the state for health care, and allow significant time savings for intrastate transit. **Figure 1.10** shows the area that is accessible within an estimated drive time of 30 minutes or less from all 81 GA airports. This map illustrates the majority of the State with the largest population is within a reasonable drive time of these airports. By comparison, **Figure 1.11** shows the 30 minute drive time for all 89 public use airports within the North Dakota aviation system.

Airports in the state have served agricultural spraying activities for many years, supporting the 30,000+ farms throughout the state, and the agricultural industry, which historically has been one of the State's largest industries. Nearly 25% of the State's working population is employed in agricultural-related business. GA airports provide farmers with an efficient way to meet agricultural production needs that ground-only operations are not able to meet. Numerous airports in the system serve agricultural operations, which is critical for the industry's survival, with approximately 225 aircraft operated by 110 companies in 2013.

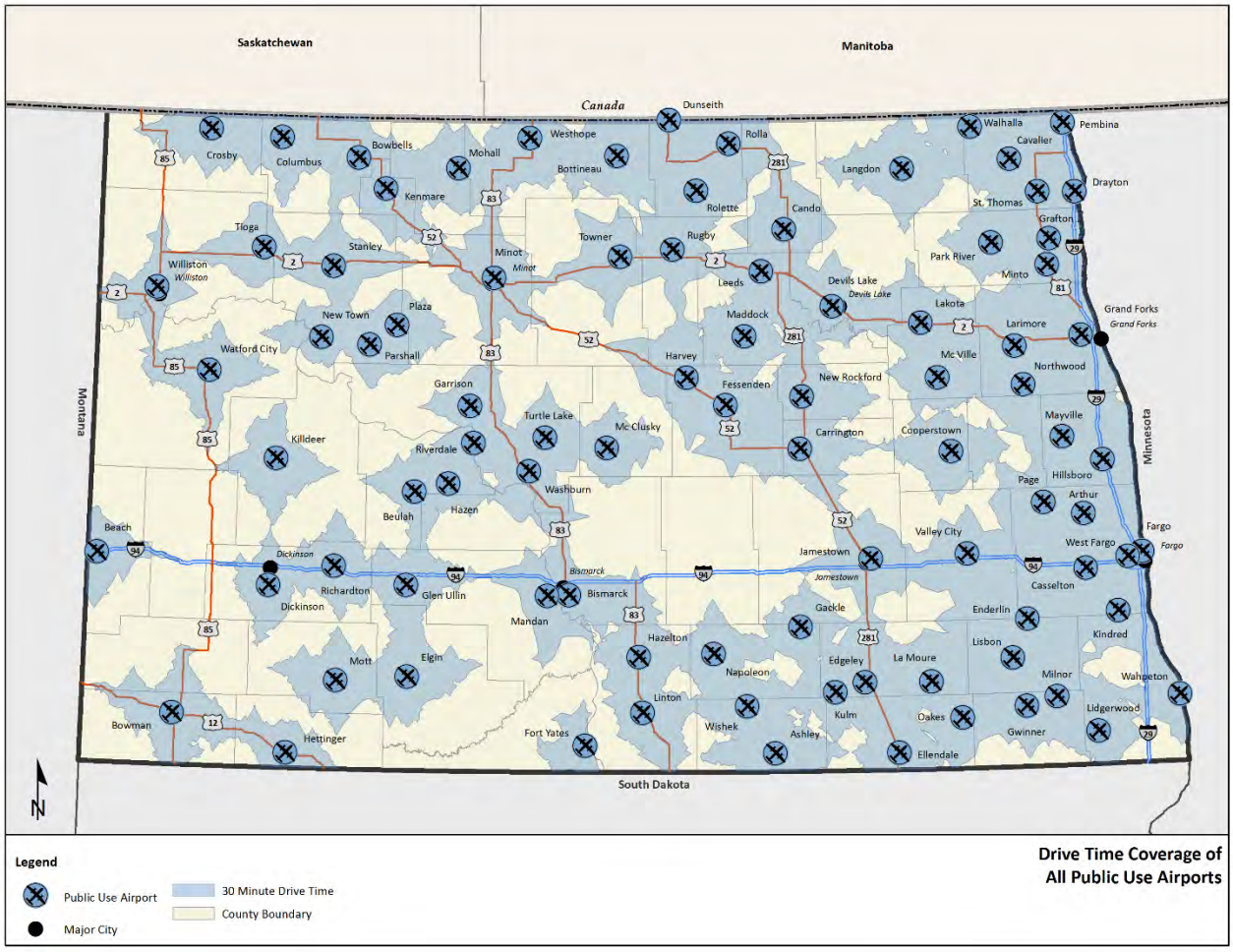
Figure 1.10: Drive Time Coverage (30 minutes) of General Aviation Airports



Source: Mead & Hunt, Inc.

The GA airports located throughout the State offer various levels of service and facilities. Some of the smaller airfields in the State, however, are host to some of the most important operations such as medical flights and border surveillance. As such, airports of all sizes and types need to be maintained in a similar manner to continue safe, modern, and efficient operations.

Figure 1.11: Drive Time Coverage (30 minutes) of All Public Use Airports

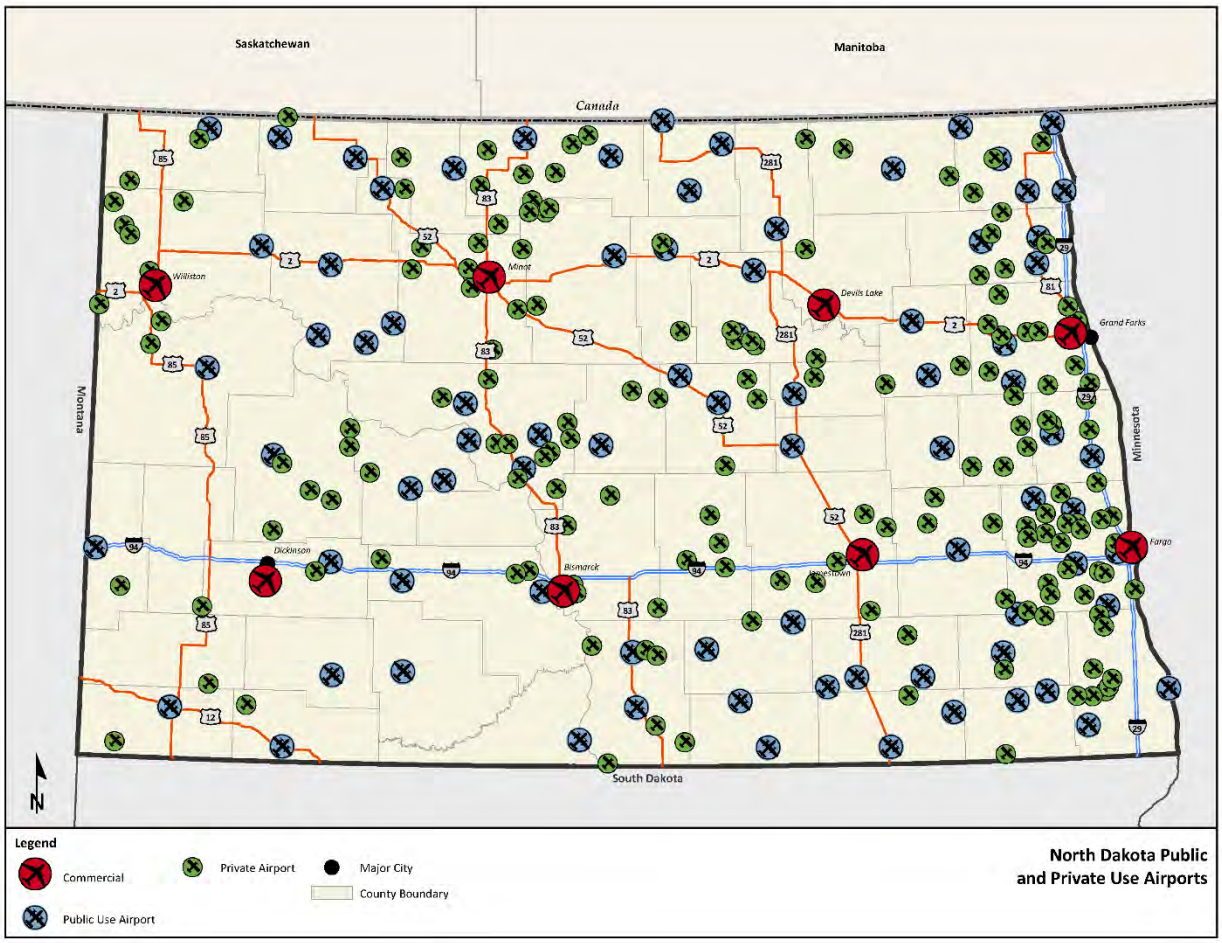


Source: Mead & Hunt, Inc.

1.4.3 Private Airstrips

There are 167 private-use facilities across North Dakota that vary in size and type of use. These facilities do not receive funding assistance from the FAA or the state since they are private-use airports. The maintenance and operation of these facilities is solely the responsibility of the owner. Although not included in the state's public aviation system, they have been mapped (shown in **Figure 1.12**) to show their proximity to the 89 public airports included in the system. Understanding the proximity of these facilities to system airports can be beneficial when planning for long term development and changes to the operational characteristics of these airports. A survey was distributed to all 167 private-use airports in the state, and 41 surveys were returned showing a combined total of over 50 based aircraft at these facilities. This suggests that there is approximately one or more aircraft per private use facility, resulting in an estimated 167 additional aircraft that are using the system that were not catalogued at the 89 public use airports.

Figure1.12: Location of Private Airstrips and System Airports



1.5 Summary

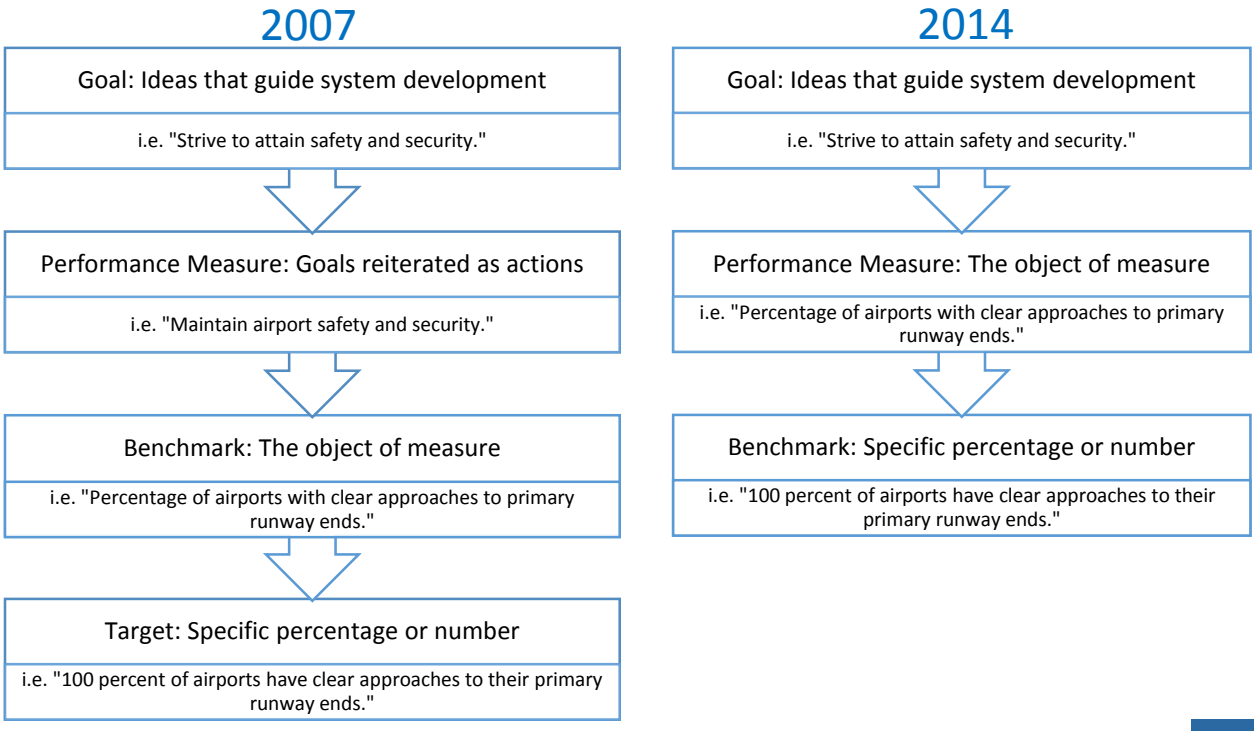
The aviation system in North Dakota serves a major role in State's entire transportation system, providing efficient, timely, and safe transportation of goods and people. Aviation also boosts State, regional, and local economies. This 2014 NDSASP update provides a roadmap to prioritize and coordinate funding and development needs for the airports included in the North Dakota aviation system. As demand and FAA airport design standards continue to change, infrastructure and facility needs will change as well. New technologies that enhance airport access to all weather flying, such as NextGen (satellite-based air navigation system) will also impact airport needs into the future. This document provides stakeholders with the information needed to guide the dynamic evolution of North Dakota's aviation system moving forward.

CHAPTER 2 – SYSTEM GOALS & AIRPORT CLASSIFICATIONS

A critical step in the system planning process is the development of goals and performance measures upon which the plan will be built and success, measured. System goals and performance measures establish a guide for future system development and progress. Typically, several performance measures developed for each goal provide narrower areas of focus and can be measured.

For this system plan update, the North Dakota Aeronautics Commission (NDAC) elected to maintain the same goals, performance measures, and benchmarks that were established in the 2007 system plan, with the inclusion of a few additional performance measures. By doing so, a true evaluation of system progress can be made by comparing the success of the system plan in meeting these goals, performance measures, and benchmarks in 2007 and in 2014 as a part of this system plan update. It is important to note that a slight change in terminology has been made from what was presented in the last system plan. In 2007, the plan included "goals," which were reiterated as "performance measures." There were also "benchmarks," which were measurable and provided a specific area of focus. To remove repetition, this 2014 update includes the same goals, but what were once called "benchmarks" are now called "performance measures." The "benchmark" term is still used in this plan, but it is used in Chapter 5 – System Evaluation to define specific measures of success for each performance measure. **Figure 2.1** illustrates the relationship of goals, performance measures, and benchmarks. Each of these are discussed in greater detail in this chapter.

Figure 2.1: Comparison of Goal System in 2007 and 2014



In addition to developing goals and performance measures for the system plan, it is important to organize and classify system airports into groups, based on their role within North Dakota's aviation system. These classifications help identify system successes and shortfalls, as no two airports are the same, and expectations of airports change from one classification to the next. The airport classifications chosen for this 2014 system plan update are discussed in this chapter, as well as the classification-specific objectives associated with each.

The following sections include detailed information on system goals and airport roles:

2.1 Goals

The goals established for this system plan update are directly related to the mission of the NDAC, and include the following:

- Strive to attain safety and security
- Accommodate accessibility needs
- Enhance air access to airports
- Support North Dakota's economy
- Enhance quality of life
- Preserve North Dakota airport assets

NDAC Mission

The North Dakota Aeronautics Commission was established by the State Legislature in 1947 to serve the public by providing economic and technical assistance for the aviation community while ensuring the safe and cost effective advancement of aviation in North Dakota.

As previously mentioned, the benchmarks that were established as a part of the 2007 North Dakota State Aviation System Plan (NDSASP) have been carried forward as performance measures into this 2014 update to evaluate system performance and progress. Each goal and measure is discussed in detail below, in no particular order. Benchmarks for each performance measure are presented in Chapter 5 – System Analysis.

Performance measures that are marked with an asterisk (*) are either new measures established for the 2014 NDSASP, or they have been changed slightly from the ones included in the 2007 NDSASP.

- **Goal: Strive to Attain Safety and Security**

  Maintaining an airport system that is both safe and secure is critically important to the continued operation of North Dakota's airports. By protecting existing facilities and the area surrounding each airport, airports can continue to function while maintaining the safety of passengers, nearby residents, and aircraft. The following performance measures are aimed at preserving safety and security at system airports:

  - Percent of airports with clear approaches to primary runway ends
  - Percent of airports with no wetlands and/or structures in the runway protection zones (RPZs)
  - Percent of airports that control RPZs through fee simple ownership, or easements
  - Percent of airports that have a wildlife management plan*

- **Goal: Accommodate Accessibility Needs**

  Due to the size and geography of the state, it is essential to provide North Dakotans access to the aviation system so they are able to reach destinations (including remote locations) in a timely manner. By providing and maintaining access to airports within 30, or 60 minutes (depending on the airport classification) for residents and visitors, North Dakota's aviation system is accessible in a reasonable timeframe. The performance measures noted below are designed to evaluate and maintain ground accessibility:

  - Percent of area and population within 60 minutes of a Commercial Service airports*
  - Percent of population within 30 minutes of an airport classified as Local or larger*
  - Percent of population within 30 minutes of a NPIAS airport
  - Percent of population within 30 minutes of any public airport
  - Percent of area within 30 minutes of an airport serving an aerial applicator

- **Goal: Enhance Air Access to Airports**

  Similar to providing ground access to the aviation system, it is also critical to provide accessibility to North Dakota's airports from the air. Facilities and services offered at an airport can greatly increase the utility of an airport. For example, if an airport has navigational aids and more precise approaches, it can be used in times of reduced visibility or adverse weather conditions because their instrumentation provides the guidance pilots need in these scenarios. Adequate terminal facilities and weather reporting can make an airport more appealing to passengers and pilots traveling through or to the nearby area. The following performance measures are intended to enhance the accessibility and usability of system airports:

  - Percent of area and population within 30 nautical miles of an airport with on-site weather reporting (AWOS/ASOS)
  - Percent of area and population within 30 nautical miles of an airport with a non-precision approach
  - Percent of area and population within 30 nautical miles of an airport with a vertically-guided approach*
  - Percent of Airports with adequate terminal capacity to support passenger demand*

- **Goal: Support North Dakota's Economy**

  North Dakota's aviation system is a significant contributor to the state's economy, and regional and local economies. The *North Dakota Economic Impact of Aviation 2010* notes that the aviation system generated $1.1 billion of economic activity and supported nearly 1,000 jobs in 2010. With the increase in oil and natural gas mining in the Bakken region, aviation activity (both commercial and GA) has grown significantly in the state, resulting in an even larger economic impact. By providing airports that have the services and facilities that are needed to support this increase in activity, the system will continue to be a significant contributor to the economy. The performance measures below are targeted at enhancing the aviation system in order to accommodate additional use:

  - Percent of area and population within 30 minutes of Jet A fuel
  - Percent of area and population within 30 minutes of 100 LL fuel
  - Percent of population within 30 minutes of a large aircraft runway (5,000 feet+)
  - Percent of airports with ground transportation services*
  - Percent of population within 30 minutes of airports that can meet the needs of King Air aircraft*

- **Goal: Enhance Quality of Life**

  Providing access to medical care for residents and visitors in the state through the use of aviation is an important goal of the NDAC. It is especially important for remote communities that are hard to reach in a timely fashion, and communities without local medical facilities. By providing airports that can support the use of medical aircraft (for transport of doctors, patients, medical supplies, etc.), the system enhances the quality of life for North Dakotans. The following performance measures are aimed at enhancing medical support through the aviation system:

  - Percent of communities in North Dakota with a hospital and/or clinic served by an airport
  - Percent of population within 30 minutes of an airport that is capable of supporting fixed-wing emergency operations*

- **Goal: Preserve North Dakota Airport Assets**

  There is a great need for the development of additional infrastructure at airports across the state to support the significant increase in operations that has been occurring over the last few years. Since the need is so large, it is impossible for all infrastructure requests to be addressed at one time. As such, it is critical that airports maintain their existing infrastructure to the best of their ability so that they can continue to serve existing and future users.

  By meeting or exceeding state pavement condition index (PCI) thresholds, keeping updated development plans, and complying with applicable Federal Aviation Administration (FAA) design standards, airports are in the best position to continue serving their users with the infrastructure already in place. Airports that have local revenue sources (mill levy and non-mill levy) are typically better positioned to meet the local match requirements for federal grants that fund the development of new airport infrastructure. The performance measures below are designed to preserve existing airport infrastructure, as well as support the development of additional infrastructure as needed:

  - Percent of airports with a local mill levy
  - Percent of airports with a county-wide mill levy
  - Percent of airports with non-mill levy revenue*
  - Percent of airports meeting state PCI thresholds on primary runways (60+)
  - Percent of airports with an Airport Layout Plan (ALP) approved in the last ten years
  - Percent of airports that have height zoning following Part 77 guidelines adopted by a local zoning board
  - Percent of airports that are meeting FAA design standards for current operations*

2.2 Airport Classifications

No two airports within North Dakota's aviation system are the same, and as a result, it is important to classify airports according to their role within the overall system. There are a multitude of ways to classify airports, such as by the types of users an airport supports, the size of the airport, the facilities and services an airport provides, the geographic location of an airport, a combination of these criteria, etc. In the 2007 plan, airports were organized into seven classifications based on a variety of factors. Two of those classifications applied to commercial service airports, and the other five applied to the GA airports.

This 2014 update of the NDSASP uses a completely new classification system that aligns with classification efforts at the federal level – the NPIAS and the FAA's recently released ASSET reports. Each of these programs are discussed in more detail in the following two sections, while Section 2.3.3 includes a complete listing of the new 2014 NDSASP airport classifications.

2.2.1 National Plan of Integrated Airport Systems (NPIAS)

As noted in Chapter 1, the FAA plans for the development of the national aviation system through the NPIAS program. Over 3,300 airports that the FAA considers important to the national air transportation network are included in the NPIAS today. Those airports are categorized into one of the following four classifications:

Primary Commercial Service – Airports that experience more than 10,000 annual airline passenger enplanements.

Non Primary Commercial Service – Airports that experience at least 2,500 annual airline passenger enplanements, but less than 10,000.

Reliever – Airports that are labeled by the FAA as providing congestion relief for non-commercial traffic to a congested primary commercial service airport.

General Aviation – Airports that do not fall into any of the above categories are considered general aviation airports.

Of the 89 airports in the system, 53 are included in the NPIAS. Of the 53, six are classified as Primary Commercial Service, two are classified as Non-Primary Commercial Service, and 45 are classified as General Aviation (see Chapter 1 for a complete listing of NPIAS classifications).

2.2.2 General Aviation Airports: A National Asset (ASSET)

In May 2012, the FAA published the "General Aviation Airports: A National Asset" report (known as the ASSET Study), followed by the release of the ASSET 2 report in March 2014. In these reports, the FAA produced a categorization system for all airports in the NPIAS that are not classified as Primary Commercial Service (and therefore mostly serve GA operations). The ASSET Study reviews the important role that Non-Primary Commercial Service, Relievers, and GA airports play in the national aviation system, including their impact on the economy and quality of life. The report details four new categories for these airports (based on their existing activity levels), and provides the following descriptions:

National – "Supports the national and state system by providing communities with access to national and international markets in multiple states and throughout the United States."

Regional – "Supports regional economies by connecting communities to statewide and interstate markets."

Local – "Supplements local communities by providing access primarily to intrastate and some interstate markets."

Basic – "Supports general aviation activities such as emergency service, charter or critical passenger service, cargo operations, flight training, and personal flying."

Each of the four categories established in the ASSET Study has unique criteria that airports must meet to be classified. **Table 2.1** outlines the criteria for each category, while **Table 2.2** lists each of the 47 facilities in North Dakota's aviation system in their respective ASSET classifications. It is important to note that six commercial service airports (FAR, GFK, MOT, ISN, DIK, BIS) are not included in this table, as they are classified as Primary Commercial Service airports in the NPIAS, and 36 GA airports are not included in this table, as they are not in the NPIAS and therefore not classified by the FAA in their ASSET Study.

Table 2.1: ASSET Classifications and Criteria

National	Regional	Local	Basic
• 5,000+ instrument operations, 11+ based jets, 20+ international flights, or 500+ interstate departures; or • 10,000+ enplanements and at least 1 charter enplanement by a large certificated air carrier, or • 500+ million pounds of landed cargo weight	• Metropolitan Statistical Area (Metro or Micro) and 10+ domestic flights over 500 miles, 1,000+ instrument operations, 1+ based jet, or 100+ based aircraft; or • The airport is located in a metropolitan or micropolitan statistical area, and the airport meets the definition of commercial service	• 10+ instrument operations and 15+ based aircraft; or • 2,500+ passenger enplanements	• 10+ based aircraft; or • 4+ based helicopters; or • The airport is located 30+ miles from the nearest NPIAS airport; or • The airport is identified and used by the U.S. Forest Service, or U.S. Marshals, or U.S. Customs and Border Protection (designated, international, or landing rights), or U.S. Postal Service (air stops), or has Essential Air Service; or • The airport is a new or replacement facility activated after January 1, 2001; and • Publicly owned or privately owned and designated as a reliever with a minimum of 90 based aircraft

Source: *FAA General Aviation Airports: A National Asset, 2012*.

Table 2.2: ASSET Classifications for NPIAS Airports in North Dakota

Airport	Associated City	Identifier	ASSET Classification
Beach	Beach	20U	Basic
Bottineau Muni	Bottineau	D09	Local
Bowman Muni	Bowman	BPP	Local
Cando Muni	Cando	9D7	Basic
Carrington Muni	Carrington	46D	Basic
Casselton Robert Miller Rgnl	Casselton	5N8	Local
Cavalier Muni	Cavalier	2C8	Local
Cooperstown Muni	Cooperstown	S32	Local
Crosby Muni	Crosby	D50	Basic
Devils Lake Rgnl	Devils Lake	DVL	Local*
Intl Peace Garden	Dunseith	S28	Basic
Edgeley Muni	Edgeley	51D	Basic
Ellendale Muni	Ellendale	4E7	Basic
Standing Rock	Fort Yates	Y27	Basic
Garrison Muni	Garrison	D05	Local
Glen Ullin Rgnl	Glen Ullin	D57	Basic
Hutson Field	Grafton	GAF	Local
Gwinner-Roger Melroe Field	Gwinner	GWR	Basic
Harvey Muni	Harvey	5H4	Basic
Mercer County Rgnl	Hazen	HZE	Basic
Hettinger Muni	Hettinger	HEI	Local
Hillsboro Muni	Hillsboro	3H4	Local
Jamestown Rgnl	Jamestown	JMS	Regional*
Kenmare Muni	Kenmare	7K5	Local
Robert Odegaard Field	Kindred	K74	Local
La Moure Rott Muni	La Moure	4F9	Unclassified**
Lakota Muni	Lakota	5L0	Basic
Robertson Field	Langdon	D55	Basic
Linton Muni	Linton	7L2	Local

Table 2.2: ASSET Classifications for NPIAS Airports in North Dakota

Airport	Associated City	Identifier	ASSET Classification
Lisbon Muni	Lisbon	6L3	Basic
Mandan Muni	Mandan	Y19	Local
Mohall Muni	Mohall	HBC	Local
Mott Muni	Mott	3P3	Basic
Northwood Muni-Vince Field	Northwood	4V4	Basic
Oakes Muni	Oakes	2D5	Local
Park River - W C Skjerven Field	Park River	Y37	Basic
Parshall-Hankins	Parshall	Y74	Basic
Pembina Muni	Pembina	PMB	Basic
Rolla Muni	Rolla	06D	Basic
Rugby Muni	Rugby	RUG	Basic
Stanley Muni	Stanley	08D	Basic
Tioga Muni	Tioga	D60	Local
Barnes County Muni	Valley City	BAC	Local
Harry Stern	Wahpeton	BWP	Local
Walhalla Muni	Walhalla	96D	Basic
Washburn Muni	Washburn	5C8	Basic
Watford City Mu	Watford City	S25	Local

*Serves commercial service and classified as Non-Primary Commercial Service airports in the NPIAS
** Unclassified in the ASSET reports.
Source: *FAA General Aviation Airports: A National Asset, 2012* and *ASSET 2: In-Depth Review of 497 Unclassified Airports, 2014.*

2.2.3 NDSASP Airport Classification

Historically, system plans have included airport classifications that were determined by individual state aviation agencies since no national classification system for GA airports had been established. As a result, many of the classifications used in system plans to date vary from state to state. With the release of the ASSET reports, GA airports have been classified according to the same criteria from coast to coast for the very first time.

For this 2014 update of the NDSASP, the NDAC elected to use the same classifications and criteria used in the ASSET reports to classify North Dakota's GA airports at the state level. Classification of airports serving commercial air service is based upon their categorization in the NPIAS as Primary or Non-Primary, while classification of GA airports in the system is based upon ASSET criteria. The integration of the ASSET and NPIAS classifications and criteria into the NDSASP allows for consistency at the federal and state level.

For the 36 airports in North Dakota's aviation system that are not included in the NPIAS, the same criteria was applied to classify them into one of the four ASSET classifications – National, Regional, Local, or Basic. Airports that did not meet the criteria for inclusion in these classifications were categorized into one of two additional classifications developed by NDAC – Community Paved (for

airports with paved runways) and Community Turf (for airports with turf/gravel runways). A total of eight classifications are used in this NDSASP update, illustrated in **Figure 2.2.**

Figure 2.2: NDSASP Airport Classification System

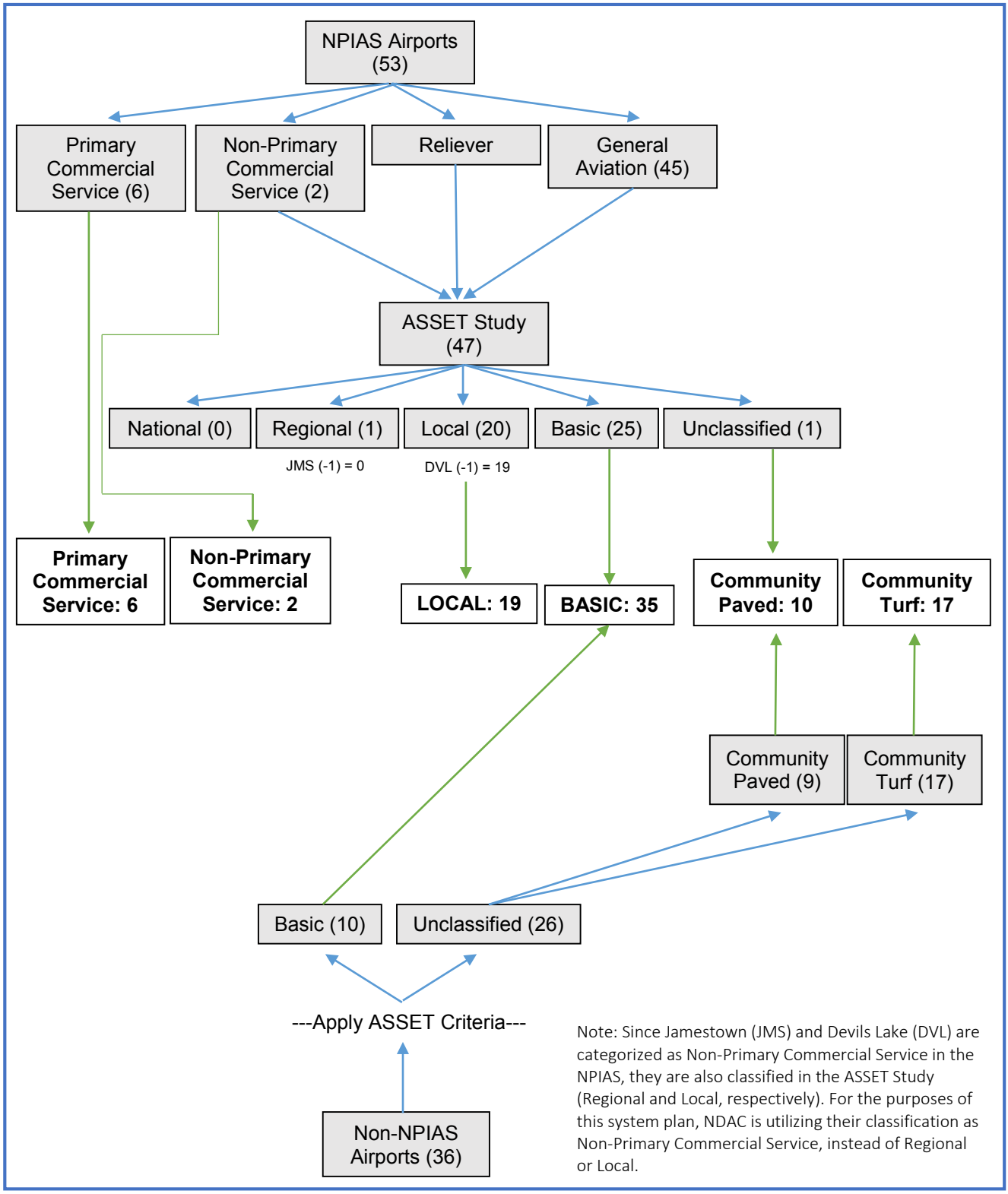


Table 2.3 includes the classifications for all 89 airports within North Dakota's aviation system organized alphabetically by airport, while **Table 2.4** includes airport classifications organized by classification group. These classifications are used throughout the NDSASP to organize the system, set airport objectives, measure system performance, establish new benchmarks, and prioritize system recommendations. A map of the system airports with classifications is provided in **Figure 2.3**.

Table 2.3: 2014 NDSASP Airport Classifications in Alphabetical Order

Airport	Associated City	Identifier	Airport Classification
Arthur Airport	Arthur	1A2	Community Turf
Ashley Municipal	Ashley	ASY	Basic[1]
Beach	Beach	20U	Basic
Beulah Municipal Airport	Beulah	95D	Basic[1]
Bismarck Municipal	Bismarck	BIS	Primary Commercial Service
Bottineau Muni	Bottineau	D09	Local
Bowbells Municipal	Bowbells	5B4	Community Turf
Bowman Muni	Bowman	BPP	Local
Cando Muni	Cando	9D7	Basic
Carrington Muni	Carrington	46D	Basic
Casselton Robert Miller Rgnl	Casselton	5N8	Local
Cavalier Muni	Cavalier	2C8	Local
Columbus Municipal	Columbus	D49	Community Turf
Cooperstown Muni	Cooperstown	S32	Local
Crosby Muni	Crosby	D50	Basic
Devils Lake Rgnl	Devils Lake	DVL	Non-Primary Commercial Service[4]
Dickinson-Roosevelt Rgnl	Dickinson	DIK	Primary Commercial Service
Drayton Municipal	Drayton	D29	Community Paved
Intl Peace Garden	Dunseith	S28	Basic
Edgeley Muni	Edgeley	51D	Basic
Elgin Municipal	Elgin	Y71	Community Turf
Ellendale Muni	Ellendale	4E7	Basic
Sky Haven Airport	Enderlin	5N4	Basic[1]
Hector Intl'l	Fargo	FAR	Primary Commercial Service
Fessenden-Streibel Municipal	Fessenden	D24	Community Turf
Standing Rock	Fort Yates	Y27	Basic
Gackle Municpal	Gackle	9G9	Community Turf
Garrison Muni	Garrison	D05	Local
Glen Ullin Rgnl	Glen Ullin	D57	Basic
Hutson Field	Grafton	GAF	Local
Grand Forks Int'l	Grand Forks	GFK	Primary Commercial Service
Gwinner-Roger Melroe Field	Gwinner	GWR	Basic
Harvey Muni	Harvey	5H4	Basic
Hazelton Municipal	Hazelton	6H8	Community Turf
Mercer County Rgnl	Hazen	HZE	Basic
Hettinger Muni	Hettinger	HEI	Local
Hillsboro Muni	Hillsboro	3H4	Local
Jamestown Rgnl	Jamestown	JMS	Non-Primary Commercial Service[5]
Kenmare Muni	Kenmare	7K5	Local
Weydahl Field	Killdeer	9Y1	Basic[1]
Robert Odegaard Field	Kindred	K74	Local
Pruetz Municipal	Kulm	D03	Community Turf
La Moure Rott Muni	La Moure	4F9	Community Paved[2]

Table 2.3: 2014 NDSASP Airport Classifications in Alphabetical Order

Airport	Associated City	Identifier	Airport Classification
Lakota Muni	Lakota	5L0	Basic
Robertson Field	Langdon	D55	Basic
Larimore Municipal	Larimore	2L1	Basic[1]
Leeds Municipal	Leeds	D31	Community Paved
Lidgerwood Municipal	Lidgerwood	4N4	Community Turf
Linton Muni	Linton	7L2	Local
Lisbon Muni	Lisbon	6L3	Basic
Maddock Municipal	Maddock	6D3	Community Paved
Mandan Muni	Mandan	Y19	Local
Mayville Municipal	Mayville	D56	Community Paved
McClusky Municipal	McClusky	7G2	Community Turf
McVille Municipal	McVille	8M6	Community Turf
Milnor Municipal	Milnor	4R6	Community Turf
Minot Int'l	Minot	MOT	Primary Commercial Service
Minto Municipal	Minto	D06	Community Paved[3]
Mohall Muni	Mohall	HBC	Local
Mott Muni	Mott	3P3	Basic
Napoleon Municipal	Napoleon	5B5	Basic[1]
Tomlinson Field	New Rockford	8J7	Community Paved
New Town Municipal	New Town	05D	Community Paved
Northwood Muni-Vince Field	Northwood	4V4	Basic
Oakes Muni	Oakes	2D5	Local
Page Regional	Page	64G	Basic[1]
Park River - W C Skjerven Field	Park River	Y37	Basic
Parshall-Hankins	Parshall	Y74	Basic
Pembina Muni	Pembina	PMB	Basic
Trulson Field Airport	Plaza	Y99	Community Turf
Richardton Airport	Richardton	4E8	Community Turf
Garrison Dam Recreational Airpark	Riverdale	37N	Community Turf
Rolette Airport	Rolette	2H9	Community Paved
Rolla Muni	Rolla	06D	Basic
Rugby Muni	Rugby	RUG	Basic
St. Thomas Municipal	St. Thomas	4S5	Community Paved
Stanley Muni	Stanley	08D	Basic
Tioga Muni	Tioga	D60	Local
Towner Municipal	Towner	D61	Community Turf
Turtle Lake Municipal	Turtle Lake	91N	Community Turf
Barnes County Muni	Valley City	BAC	Local
Harry Stern	Wahpeton	BWP	Local
Walhalla Muni	Walhalla	96D	Basic
Washburn Muni	Washburn	5C8	Basic
Watford City Muni	Watford City	S25	Local
West Fargo Municipal	West Fargo	D54	Basic[1]
Westhope Municipal	Westhope	D64	Basic[1]
Sloulin Field Int'l	Williston	ISN	Primary Commercial Service
Wishek Municipal	Wishek	6L5	Basic[1]

[1] Not included in the NPIAS but classified by ASSET criteria

[2] Included in the NPIAS, but unclassified in the FAA's ASSET reports - therefore classified as Community Paved.

[3] Paved runway is non-standard with a width of 20'. A total width of 100' exists when including the turf area of the runway.

[4] Also classified as Local in the FAA's ASSET reports

[5] Also classified as Regional in the FAA's ASSET reports

Source: *FAA General Aviation Airports: A National Asset, 2012* and *ASSET 2: In-Depth Review of 497 Unclassified Airports, 2014*. *National Plan of Integrated Airport Systems (2013-2017)*

Table 2.4: 2014 NDSASP Airport Classifications by Classification Group

Airport	Associated City	Identifier	Airport Classification
Bismarck Municipal	Bismarck	BIS	Primary Commercial Service
Dickinson-Roosevelt Rgnl	Dickinson	DIK	Primary Commercial Service
Hector Intl'l	Fargo	FAR	Primary Commercial Service
Grand Forks Int'l	Grand Forks	GFK	Primary Commercial Service
Minot Int'l	Minot	MOT	Primary Commercial Service
Sloulin Field Int'l	Williston	ISN	Primary Commercial Service
Devils Lake Rgnl	Devils Lake	DVL	Non-Primary Commercial Service[4]
Jamestown Rgnl	Jamestown	JMS	Non-Primary Commercial Service[5]
Bottineau Muni	Bottineau	D09	Local
Bowman Muni	Bowman	BPP	Local
Casselton Robert Miller Rgnl	Casselton	5N8	Local
Cavalier Muni	Cavalier	2C8	Local
Cooperstown Muni	Cooperstown	S32	Local
Garrison Muni	Garrison	D05	Local
Hutson Field	Grafton	GAF	Local
Hettinger Muni	Hettinger	HEI	Local
Hillsboro Muni	Hillsboro	3H4	Local
Kenmare Muni	Kenmare	7K5	Local
Robert Odegaard Field	Kindred	K74	Local
Linton Muni	Linton	7L2	Local
Mandan Muni	Mandan	Y19	Local
Mohall Muni	Mohall	HBC	Local
Oakes Muni	Oakes	2D5	Local
Tioga Muni	Tioga	D60	Local
Barnes County Muni	Valley City	BAC	Local
Harry Stern	Wahpeton	BWP	Local
Watford City Muni	Watford City	S25	Local
Beach	Beach	20U	Basic
Cando Muni	Cando	9D7	Basic
Carrington Muni	Carrington	46D	Basic
Crosby Muni	Crosby	D50	Basic
Intl Peace Garden	Dunseith	S28	Basic
Edgeley Muni	Edgeley	51D	Basic
Ellendale Muni	Ellendale	4E7	Basic
Standing Rock	Fort Yates	Y27	Basic
Glen Ullin Rgnl	Glen Ullin	D57	Basic
Gwinner-Roger Melroe Field	Gwinner	GWR	Basic
Harvey Muni	Harvey	5H4	Basic
Mercer County Rgnl	Hazen	HZE	Basic
Lakota Muni	Lakota	5L0	Basic
Robertson Field	Langdon	D55	Basic
Lisbon Muni	Lisbon	6L3	Basic
Mott Muni	Mott	3P3	Basic
Northwood Muni-Vince Field	Northwood	4V4	Basic
Park River - W C Skjerven Field	Park River	Y37	Basic
Parshall-Hankins	Parshall	Y74	Basic
Pembina Muni	Pembina	PMB	Basic
Rolla Muni	Rolla	06D	Basic
Rugby Muni	Rugby	RUG	Basic
Stanley Muni	Stanley	08D	Basic
Walhalla Muni	Walhalla	96D	Basic
Washburn Muni	Washburn	5C8	Basic
Ashley Municipal	Ashley	ASY	Basic[1]

Table 2.4: 2014 NDSASP Airport Classifications by Classification Group

Airport	Associated City	Identifier	Airport Classification
Beulah Municipal Airport	Beulah	95D	Basic[1]
Sky Haven Airport	Enderlin	5N4	Basic[1]
Weydahl Field	Killdeer	9Y1	Basic[1]
Larimore Municipal	Larimore	2L1	Basic[1]
Napoleon Municipal	Napoleon	5B5	Basic[1]
Page Regional	Page	64G	Basic[1]
West Fargo Municipal	West Fargo	D54	Basic[1]
Westhope Municipal	Westhope	D64	Basic[1]
Wishek Municipal	Wishek	6L5	Basic[1]
Drayton Municipal	Drayton	D29	Community Paved
Leeds Municipal	Leeds	D31	Community Paved
Maddock Municipal	Maddock	6D3	Community Paved
Mayville Municipal	Mayville	D56	Community Paved
Tomlinson Field	New Rockford	8J7	Community Paved
New Town Municipal	New Town	05D	Community Paved
Rolette Airport	Rolette	2H9	Community Paved
St. Thomas Municipal	St. Thomas	4S5	Community Paved
La Moure Rott Muni	La Moure	4F9	Community Paved[2]
Minto Municipal	Minto	D06	Community Paved[3]
Arthur Airport	Arthur	1A2	Community Turf
Bowbells Municipal	Bowbells	5B4	Community Turf
Columbus Municipal	Columbus	D49	Community Turf
Elgin Municipal	Elgin	Y71	Community Turf
Fessenden-Streibel Municipal	Fessenden	D24	Community Turf
Gackle Municpal	Gackle	9G9	Community Turf
Hazelton Municipal	Hazelton	6H8	Community Turf
Pruetz Municipal	Kulm	D03	Community Turf
Lidgerwood Municipal	Lidgerwood	4N4	Community Turf
McClusky Municipal	McClusky	7G2	Community Turf
McVille Municipal	McVille	8M6	Community Turf
Milnor Municipal	Milnor	4R6	Community Turf
Trulson Field Airport	Plaza	Y99	Community Turf
Richardton Airport	Richardton	4E8	Community Turf
Garrison Dam Recreational Airpark	Riverdale	37N	Community Turf
Towner Municipal	Towner	D61	Community Turf
Turtle Lake Municipal	Turtle Lake	91N	Community Turf

[1] Not included in the NPIAS but classified by ASSET criteria

[2] Included in the NPIAS, but unclassified in the FAA's ASSET reports - therefore classified as Community Paved.

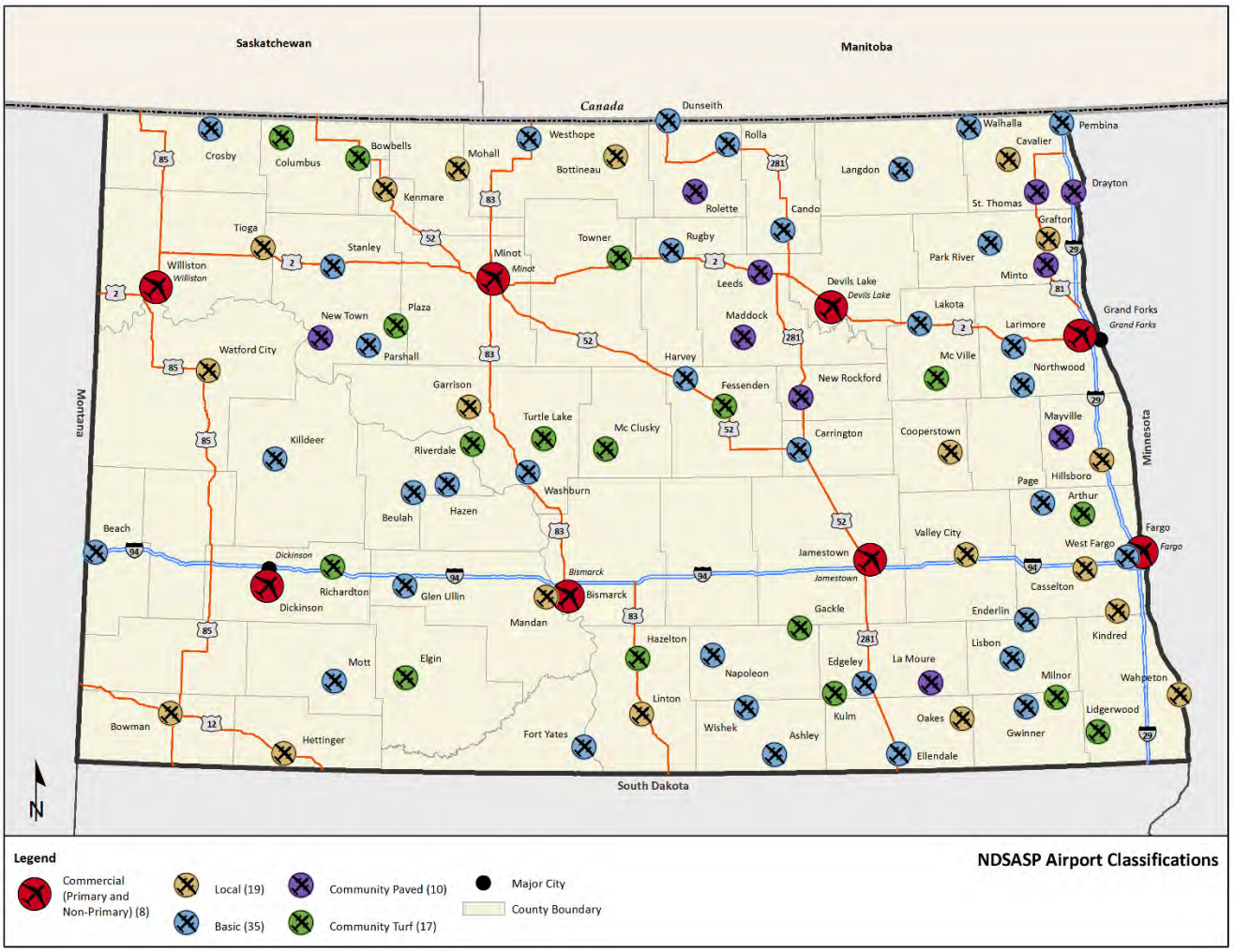
[3] Paved runway is non-standard with a width of 20'. A total width of 100' exists when including the turf area of the runway.

[4] Also classified as Local in the FAA's ASSET reports

[5] Also classified as Regional in the FAA's ASSET reports

Source: *FAA General Aviation Airports: A National Asset, 2012 and ASSET 2: In-Depth Review of 497 Unclassified Airports, 2014. National Plan of Integrated Airport Systems (2013-2017)*

Figure 2.3: NDSASP Airport Classifications Map



2.3 Objectives by Airport Classification

In addition to the performance measures and benchmarks established system-wide, the NDAC has developed a set of facility and service objectives for each GA airport classification in the NDSASP (National, Regional, Local, Basic, Community Paved, and Community Turf). These objectives are tailored toward the various roles that airports in each classification fill. For example, the services and facility objectives for airports classified as National are very different from those established for airports classified as Community Turf, since these airports serve different user bases and support varying types of operations.

Similar to what was done in the 2007 plan, objectives were not developed for airports that support commercial service and are classified as Primary Commercial Service or Non-Primary Commercial Service. NDAC works with these eight airports to define objectives for each based on their current planning efforts.

The facility and service objectives shown in **Table 2.5** are targets that each airport should work toward as the system evolves. These objectives are not required for inclusion in any airport classification, but serve as targets for each airport to meet as they are able. NDAC will use these objectives, in addition to the system performance measures and benchmarks, to assist airports in planning site-specific improvements in the future. **Appendix D** includes a one-page summary sheet for each airport that identifies the objectives that are not being met as of the writing of this NDSASP update.

Table 2.5: NDSASP Airport Objectives

	National*	Regional*	Local	Basic	Community (Paved/Turf)
Airside Facilities					
Primary Runway Length	5,000 feet or greater	3,800 feet or greater	3,300 feet or greater	3,000 feet or greater	2,500 feet or longer (paved) or Turf – Maintain existing length
Primary Runway Width	75 feet	75 feet	60 feet	NPIAS – 60 feet; Non-NPIAS - Maintain existing	NPIAS - 120 feet; Non-NPIAS - Maintain existing 80 feet
Taxiway Type	Full Parallel	Partial Parallel	Connecting Taxiways	Connecting Taxiways	Connecting Taxiways
Approach Type	Non-Precision with Vertical Guidance (LPV)	Non-Precision with Vertical Guidance (LPV)	Non-Precision (GPS)	Non-Precision (GPS)	Visual
Lighting	MIRL and MITL	MIRL and MITL	MIRL	LIRL	LIRL (for paved)
Visual Aids	Rotating Beacon, Lighted Wind Indicator, Segmented Circle	Rotating Beacon, Lighted Wind Indicator, Segmented Circle	Lighted Wind Indicator, Segmented Circle	Wind Indicator	Wind Indicator
NAVAIDS	REILs, ODALs, VGSI (VASIs/PAPIs)	REILs, VGSI (VASIs/PAPIs)	VGSI (VASIs/PAPIs) if GPS IFR procedures	Non Required	Not an Objective
Weather	ASOS or AWOS	ASOS or AWOS	ASOS or AWOS	Not an Objective	Not an Objective
Perimeter Fencing	Full Perimeter Fencing	Full Perimeter Fencing	Partial Perimeter Fencing	Partial Perimeter Fencing	Partial Perimeter Fencing
Landside Facilities					
Hangar Spaces	75% of based aircraft	75% of based aircraft	75% of based aircraft	50% of based aircraft	50% of based aircraft
Hangars for Transient Aircraft	Yes	Yes	Yes	Yes	Not an Objective
Terminal/ Administration Bldg	1,000 square feet	750 square feet	500 square feet	500 square feet	400 square feet
Aircraft Maintenance Facility	Yes	Yes	Not an Objective	Not an Objective	Not an Objective

Table 2.5: NDSASP Airport Objectives

	National*	Regional*	Local	Basic	Community (Paved/Turf)
Landside Services					
FBO Office	Yes	Yes	Yes	Not an Objective	Not an Objective
Agricultural Spraying	Yes	Yes	Yes	Yes	Yes
Aircraft Maintenance Staff	Based	Based	On-Call	Not an Objective	Not an Objective
Fuel	Jet A and 100LL (Both credit card)	100LL, Jet A as needed (Both credit card)	100LL (credit card)	100LL	Private emergency sales
Terminal/Pilot's Lounge	Phone, Restrooms, Flight Planning/Lounge	Phone, Restrooms, Flight Planning/Lounge	Phone and Restrooms	Phone and Restrooms (desired)	Phone and Restrooms (desired)
Ground Transportation Services	Yes	Yes	Yes	Not an Objective	Not an Objective
Security	Terminal and Ramp Lighting, Controlled Airfield Access, and Police Patrol	Terminal and Ramp Lighting, Controlled Airfield Access, and Police Patrol	Terminal and Ramp Lighting, and Controlled Airfield Access	Appropriate Access Restrictions	Appropriate Access Restrictions
Signage	Adequate signage to locate airport from access road & welcoming signage	Adequate signage to locate airport from access road & welcoming signage	Adequate signage to locate airport from access road & welcoming signage	Adequate signage to locate airport from access road & welcoming signage	Not an Objective
Snow Removal Equipment	Yes	Yes	Yes	Yes	Not an Objective

*As of 2014 no airports are classified in this category.

MIRL = Medium Intensity Runway Lighting
LIRL = Low Intensity Runway Lighting
MITL = Medium Intensity Taxiway Lighting
ASOS = Automated Surface Observing Systems
AWOS = Automated Weather Observing Systems
REILs = Runway End Identifier Lights
ODALs = Omni-Directional Approach Lights
VGSI = Visual Guidance Slope Indicators
VASIs = Visual Approach Slope Indicators
PAPIs = Precision Approach Path Indicators

2.4 Summary

Some of the initial building blocks of system planning include the development of system goals and performance measures, and objectives that airports can work toward in the future as the system evolves. By moving forward with the same goals and similar performance measures established in the 2007 plan, a true evaluation of system progress is possible. Chapter 5 includes the evaluation of the system at the state-wide level against established benchmarks, and evaluations of each airport in meeting their classification-specific objectives. The goals, performance measures, benchmarks, and objectives of the 2014 NDSASP align with the mission of the NDAC to provide economic and technical assistance for the aviation community to ensure the safe and cost-effective advancement of aviation in North Dakota.

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CHAPTER 3 – INVENTORY

A critical step in the system planning process is the creation of an inventory to document the infrastructure and facilities that currently exist at the 89 airports in North Dakota's aviation system. This information establishes the base on which the system will be evaluated, when compared to the system goals and performance measures (See Chapter 5 – System Evaluation).

Several data sources were used during the inventory process to obtain the necessary information for each airport. For example, the Airport Master Record (FAA 5010 Form) for each airport was reviewed for information relating to runways, taxiways, navigational aids (NAVAIDS), based aircraft, annual operations, and more. Once the available data was collected, it was used to pre-populate individual surveys for each of the 89 airport managers to complete. These surveys included nearly 20 pages of information and questions for the airport managers to respond to (see **Appendix A** for a sample survey). After the survey collection period ended, North Dakota Aeronautics Commission (NDAC) staff provided additional information (where available) to complete missing data that was not provided by the airport managers. In instances where the information could not be found, a line item has been included in the appropriate tables that indicates the number and percentage of airports without responses. As a result, the percentages of airports shown in this chapter with a particular inventory item may actually be greater, as the airports in the "no response" category are not considered to have or not have that particular inventory item. Tables with detailed inventory information are provided in **Appendix B** and are referenced throughout this chapter. Several maps are included in this chapter that illustrate the availability of select inventory items at airports in the system. A larger version of each map is provided in **Appendix C** for reference.

Since airports are constantly changing for various reasons, such as the completion of capital improvement projects and the addition/loss of various airport users, the information gathered and documented in the inventory effort and presented in this chapter is valid as of May 2014, with major project updates included through October 2014. The major inventory data that was collected for this task is organized and presented in the following 12 sections:

3.1 General Airport Information

General information about each airport was gathered as a part of the inventory effort. Data included in this section includes a breakdown of airports by airport classification (discussed in Chapter 2), inclusion of system airports in the National Plan of Integrated Airport Systems (NPIAS), and Airport Reference Codes (ARCs).

3.1.1 Federal Aviation Administration Airport Identifier

An airport may be identified in one of three ways: airport name, city where the airport is located or airport identifier (three letter airport identification code assigned by the FAA). An airport may be referred to by these identifiers interchangeably; for example, Hector International Airport is also referred to as Fargo or FAR. See **Table B.1** in **Appendix B** for a listing of each airport's three letter identifier.

3.1.2 NDSASP Airport Classification

Each of the 89 airports in North Dakota's aviation system has been classified according to several criteria, detailed in the previous chapter. This criteria is largely based on the conditions used by the FAA in an effort to classify general aviation (GA) airports included in the NPIAS at the national level. For more information on the airport classification process completed for the system plan, see Chapter 2. **Table 3.1** summarizes airport classifications within the NDSASP, while **Table B.1** in **Appendix B** includes the classifications of each of 89 airports in the system.

Table 3.1: NDSASP Airport Classifications

Airport Classification	Number of System Airports	Percentage of System Airports
Primary Commercial Service	6	6.7%
Non-Primary Commercial Service*	2	2.2%
National	0	0.0%
Regional	0	0.0%
Local	19	21.3%
Basic	35	39.3%
Community Paved	10	11.2%
Community Turf	17	19.1%
Total System Airports	**89**	**100.0%**

*Jamestown Regional and Devil's Lake Regional are classified as Non-Primary Commercial Service Airports in the NPIAS. Jamestown Regional and Devil's Lake Regional are also classified in the FAA's ASSET Study as Regional and Local Airports, respectively. For the purposes of this system plan, these two airports are being classified as Non-Primary Commercial Service airports.

3.1.3 National Plan of Integrated Airport Systems

The NPIAS is the national aviation system that includes airports that are integral to a safe and efficient air transportation network. To be included in the NPIAS, an airport must meet a set of criteria, such as based aircraft counts and locational requirements. Airports included in the NPIAS

are eligible for development grants under the FAA's Airport Improvement Program (AIP). Of the 19,786 airports in the United States, 5,171 are publicly owned, and of those, only 3,355 are included in the NPIAS as of 2013, according to the *National Plan of Integrated Airport Systems (NPIAS) 2013-2017*. In North Dakota, 60% of the system airports are included in the NPIAS. **Table 3.2** summarizes the distribution of NPIAS and non-NPIAS airports in the State, and **Table B.1** in **Appendix B** shows NPIAS inclusion for each system airport.

Table 3.2: NDSASP Airport Inclusion in the NPIAS

NPIAS	Number of System Airports	Percentage of System Airports
Included in the NPIAS	53	60%
Not Included in the NPIAS	36	40%
Total System Airports	**89**	**100%**

Source: *National Plan of Integrated Airport Systems (NPIAS) 2013-2017*

3.1.4 Airport Reference Codes

FAA Advisory Circular (AC) 150/5300-13A – *Airport Design* includes an airport classification system known as ARC. These codes are based on the operational and physical characteristics of aircraft using an airport and are used to apply airport design standards to airport infrastructure. The standards allow development to accommodate the most demanding aircraft conducting 500 or more annual itinerant operations at an airport (often called the design aircraft or critical aircraft). The ARC includes two components – Aircraft Approach Category (AAC) and Airplane Design Group (ADG). The AAC is designated by a letter (A-E) and correlates to the operational approach speed of an aircraft, with "A" being the slowest and "E" being the fastest. The ADG is designated by Roman numeral (I-VI) and correlates to the wingspan of the aircraft, with "I" being the smallest and "VI" being the largest. **Figure 3.1** includes the reference code system.

Figure 3.1: Airport Reference Codes

Aircraft Approach Category (AAC)

Category A:	Speed less than 91 knots
Category B:	Speed 91 knots or more but less than 121 knots.
Category C:	Speed 121 knots or more but less than 141 knots.
Category D:	Speed 141 knots or more but less than 166 knots.
Category E:	Aircraft approach speed 166 knots or more.

Airplane Design Group (ADG)

Group I:	Wingspan up to but not including 49 feet.
Group II:	Wingspan 49 feet up to but not including 79 feet.
Group III:	Wingspan 79 feet up to but not including 118 feet.
Group IV:	Wingspan 118 feet up to but not including 171 feet.
Group V:	Wingspan 171 feet up to but not including 214 feet.
Group VI:	Wingspan greater than 214 feet.

Source: FAA AC 150/5300-13A *Airport Design*

The airports in North Dakota's aviation system represent a spectrum of ARC categories and range from airports capable of supporting large aircraft with high approach speeds to airports well suited for the operations of smaller aircraft with low approach speeds. **Table 3.3** presents the distribution of ARC classifications within the state. Over half of the airports within the system (64%) support aircraft categorized as B-I. The ARC for each individual airport in the system is available in **Table B.1** in **Appendix B**.

Table 3.3: NDSASP Airport Reference Codes (ARCs

Airport Reference Codes	Number of System Airports	Percentage of System Airports
A-I	10	11.2%
B-I	57	64.0%
B-II	17	19.1%
C-III	2	2.2%
C-IV	1	1.1%
D-IV	1	1.1%
D-V	1	1.1%
Total System Airports	89	**100.0%**

Source: Airport Layout Plans, and evaluation of design characteristics per FAA AC 150/530-13A

3.2 Runways

Runways are rectangular surfaces at an airport used for the take-off and landing of aircraft. Runways are designed and constructed to accommodate the design aircraft (see Section 3.1 *Airport Reference Codes*) based on standards found in AC 150/5300-13A *Airport Design.* Often, airports have more than one runway. Typically the primary runway is the longest of an airport's runways capable of meeting the takeoff and landing requirements of the design aircraft. For this inventory item, the length, width, surface type, Pavement Condition Index (PCI) and runway edge lighting of only the primary runway at each system airport was tabulated. **Table B.2, Table B.3** and **Table B.4** in **Appendix B** contain more information about each primary runway, as well as additional runways that are not counted in this section.

3.2.1 Primary Runway Length

Runway length is based on characteristics of the design aircraft (see Section 3.1.4 *Airport Reference Codes*). Information from aircraft manufacturers and FAA AC 150/5325-4 *Runway Length Requirements for Airport Design* provide guidance for calculating the appropriate length of a runway.

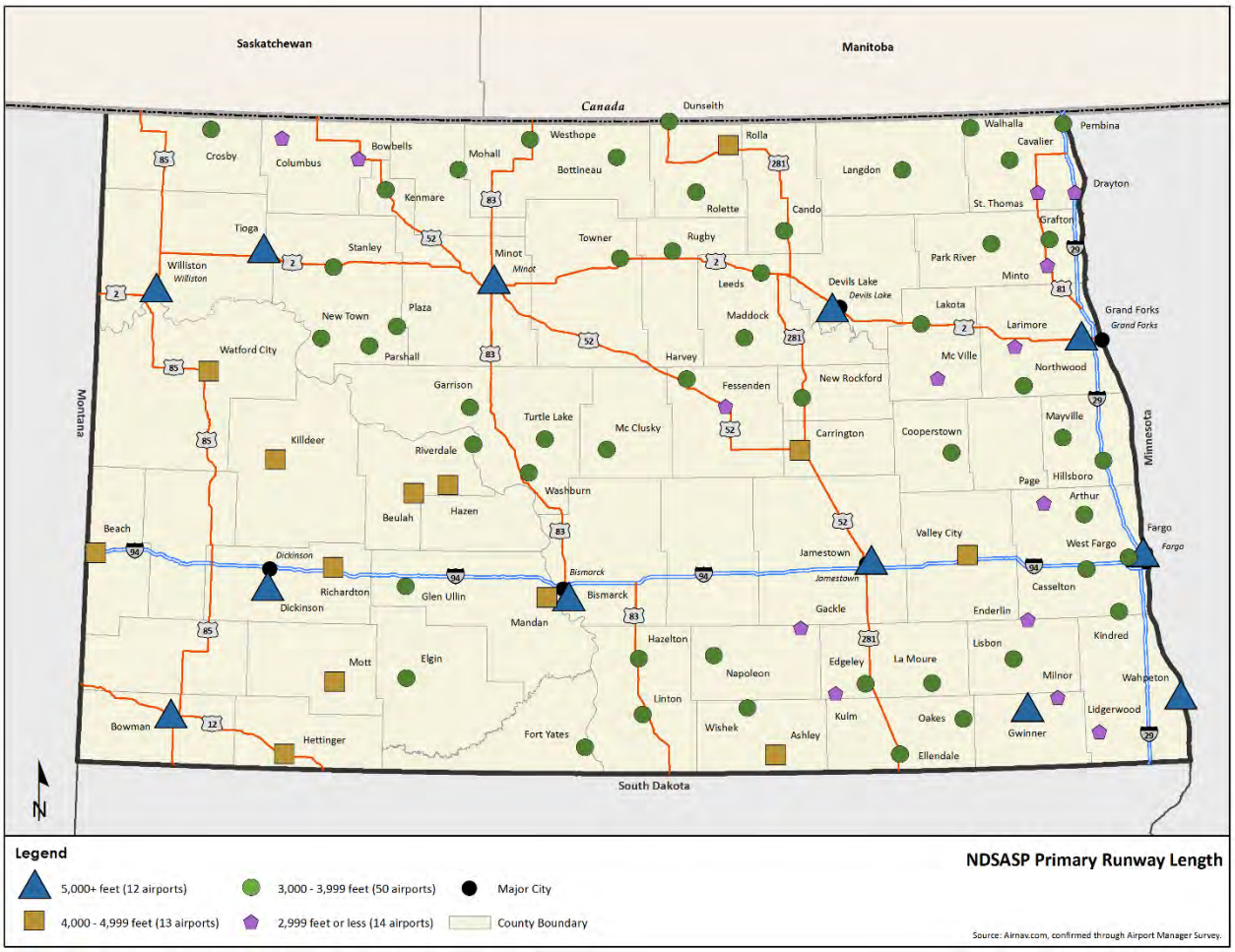
Table 3.4 summarizes the lengths of primary runways at each of the system airports, while **Figure 3.2** illustrates the primary runway lengths at system airports across the State. The majority of airports in the system have a runway between 3,000 feet and 4,000 feet long. **Table B.2** in **Appendix B** catalogs the individual lengths of each primary runway in the system.

Table 3.4: NDSASP Primary Runway Lengths

Primary Runway Lengths	Number of System Airports	Percentage of System Airports
5,000+ feet	12	14%
4,000-4,999 feet	13	14%
3,000-3,999 feet	50	56%
2,999 feet or less	14	16%
Total System Airports	**89**	**100%**

Source: Airnav.com, confirmed through Airport Manager Survey

Figure 3.2: NDSASP Primary Runway Lengths Map



Source: Airnav.com, confirmed through Airport Manager Survey

3.2.2 Primary Runway Width

Runway width is based on characteristics of the design aircraft (wingspan and approach speed, see Section 3.1.4 *Airport Reference Codes*) and criteria from FAA AC 150/5300-13A *Airport Design.* A margin of safety based on landing gear configuration of the most critical design aircraft is allowed to provide more runway surface in the event of a loss of lateral control. It is important to note that turf runways are typically designed to be much wider than paved runways to provide an

additional margin of safety because these surfaces often make it more difficult for a pilot to maintain lateral control.

Table 3.5 summarizes the primary runway widths for system airports. The majority of system airports have runways that are at least 60 feet wide. **Table B.2** in **Appendix B** lists all primary runway widths.

Table 3.5: NDSASP Primary Runway Widths

Primary Runway Width	Number of System Airports	Percentage of System Airports
200 Feet	1	1%
150 Feet	4	5%
120 Feet	4	5%
100 Feet	10	11%
90 Feet	2	2%
85 Feet	1	1%
80 Feet	1	1%
75 Feet	13	15%
74 Feet	1	1%
60 Feet	43	48%
50 Feet	6	7%
40 Feet	2	2%
30 Feet	1	1%
Total System Airports	**89**	**100%**

Source: Airnav.com, confirmed through Airport Manager Survey

3.2.3 Primary Runway Surface

There are some airports in the NDSASP that have gravel or turf primary runways. These runways are subject to the same design criteria as paved runways, and as noted above, they are often wider to improve lateral control on these surfaces. **Table 3.6** provides information about the number of paved and turf primary runways in the system. While there are 17 turf primary runways and ten concrete primary runways in the system, the majority of the primary runways are paved in asphalt.

Table 3.6: NDSASP Primary Runway Surfaces

Primary Runway Surface	Number of System Airports	Percentage of System Airports
Asphalt	62	70%
Concrete	10	11%
Turf	17	19%
Total System Airports	**89**	**100%**

Source: Airnav.com, confirmed through Airport Manager Survey

3.2.4 Pavement Condition Index of Primary Runways

The PCI rating system is used to assess the condition of pavement surfaces at airports (including runways, taxiways and aprons) and assigns a score ranging from zero to 100. Pavements with higher PCIs are in better condition than those with lower PCIs. Often, pavements with PCIs of less than 70 are in need of repair or replacement. **Table 3.7** summarizes the PCI of each primary runway within the system. Over 70% of the paved primary runways have a PCI of 70 or better. **Table B.3** in **Appendix B** lists the individual PCI ratings for each of the primary runways in the system. It is important to note that turf and gravel runways are not given a PCI score, and therefore are removed from this calculation.

Table 3.7: NDSASP Primary Runway Pavement Conditions

PCI on Primary Runways*	Number of System Airports	Percentage of System Airports
86-100	29	40.8%
71-85	23	32.4%
56-70	15	21.1%
41-55	2	2.8%
26-40	1	1.4%
11-25	2	2.8%
0-10	0	0%
Total Paved Runways	**72**	**100%**
Not Applicable (un-paved runways)	*17*	
Total System Airports	**89**	

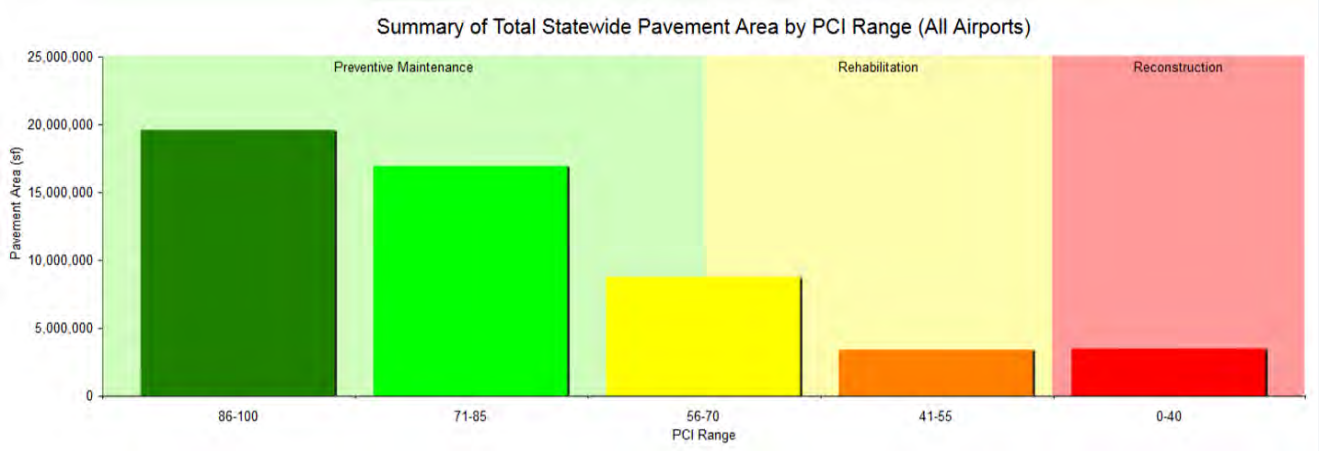
*Lowest values were used when a range was listed.
Source: North Dakota Aeronautics Commission 2012 Pavement Condition Index (PCI) Study

System Pavement

The North Dakota Aeronautics Commission completes a Pavement Condition Index (PCI) Study every three years. This study allows for a visual inspection and inventory of all of the pavement at the North Dakota Airports and helps to provide information on where dollars are recommended to be appropriated to provide the most cost beneficial result. The last study was completed in 2012 and the results can be found on the Aeronautics Commission website at: http://www.nd.gov/ndaero/airport/idea/index.html

How much pavement is there? Approximately 52 million square feet of pavement exists at system airports.
Where is the pavement at? 72% of the pavement exists at the airports outside of the oil-producing counties and 28% exists within the oil-producing counties.

In general terms, pavements above a PCI of 70 that are not exhibiting significant load-related distress will benefit from preventive maintenance actions, such as crack sealing and surface treatments. Pavements with a PCI of 40 to 70 may require major rehabilitation, such as an overlay. Often, when the PCI is less than 40, reconstruction is the only viable alternative due to the substantial damage to the pavement structure.



3.2.5 Runway Edge Lighting on Primary Runways

Runway lighting delineates the edges of a runway during nighttime and low visibility conditions. Runway lighting may also provide a pilot with information about the amount of runway remaining during takeoff and landing. There are three types of runway lighting systems based on illumination intensity: High Intensity Runway Lighting (HIRL), Medium Intensity Runway Lighting (MIRL) and Low Intensity Runway Lighting (LIRL). **Table 3.8** summarizes the primary runway lighting systems at the airports within the system and indicates that over 55% of airports in the system have at least MIRL systems. Seven system airports are equipped with non-standard lighting systems. **Table B.4** in **Appendix B** lists the lighting system present on the primary runway at each system airport.

Table 3.8: NDSASP Primary Runway Edge Lighting

Primary Runway Edge Lighting	Number of System Airports	Percentage of System Airports
HIRL	7	8%
MIRL	42	47%
LIRL	20	23%
Non Standard	7	8%
None	13	15%
Total System Airports	**89**	**100%**

Source: Airnav.com, confirmed through Airport Manager Survey

3.3 Runway Approaches

Runway approaches consist of equipment and procedures and provide vertical and horizontal guidance to pilots when landing. Approaches typically increase safety and accuracy when landing and allow landings to be conducted at nighttime, in reduced visibility or in inclement weather. The following sections describe and summarize the types and conditions of primary runway approaches at airports in the NDSASP.

3.3.1 Approach Type of Primary Runways

Information about runway approaches at system airports was collected from AirNav.com and confirmed by the airport managers through the airport manager survey. **Tables B.5-B.8** in **Appendix B** list the type(s) of approaches along with other detailed approach information, such as visibility minimums, for each runway in the system. The major approach types are described in the following sections. A summary of approach types is provided in **Table 3.9**, and **Figure 3.3** illustrates the primary runway approaches at system airports**.**

- **Precision Approaches** – A precision approach provides vertical and horizontal (lateral) guidance to aircraft, typically using an Instrument Landing System (ILS). Precision approaches allow landings to be conducted below a one-half-mile mile visibility and a 200 foot cloud ceiling height.

- **Non-Precision Approaches with Vertical Guidance** – A non-precision approach with vertical guidance uses satellite based Global Positioning Signals (GPS) and provides vertical and horizontal (lateral) guidance to aircraft. These approaches allow landings to be conducted as low as one-half-mile visibility and ceiling heights of 200 feet.

- **Non-Precision Approaches** - A non-precision approach is an instrument approach that provides horizontal (lateral) guidance only; it does not provide vertical guidance. Pilots utilize airport based equipment such as very high frequency omnidirectional radio range (VOR)

stations, distance measuring equipment (DME) and localizers and aircraft equipment when landing on a runway with a non-precision approach.

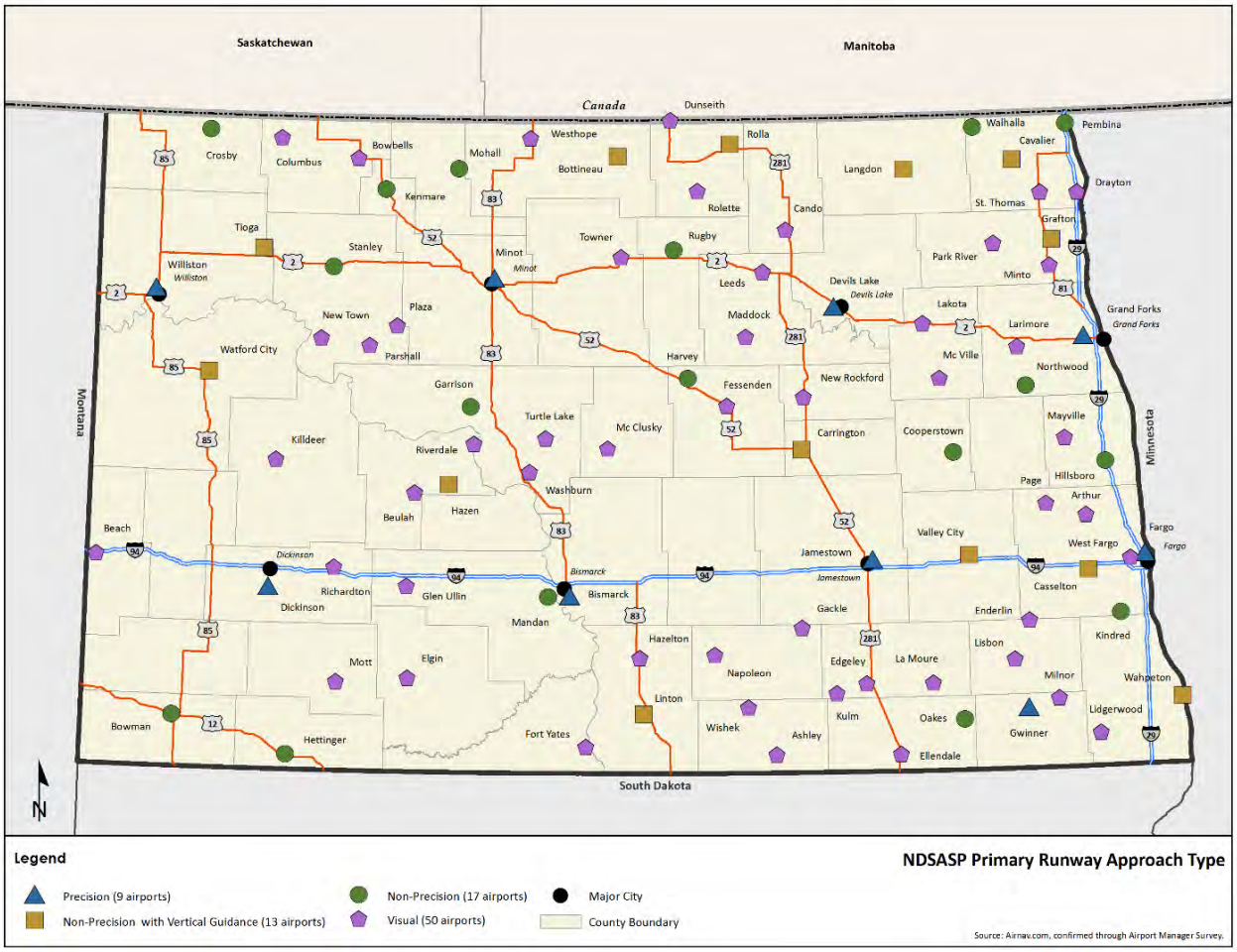
- **Visual Approaches –** A visual approach is an approach that does not have instrument guidance. Pilots conducting a visual approach rely on visual reference of the airport.

Table 3.9: NDSASP Primary Runway Approach Type

Primary Runway Approach	Number of System Airports	Percentage of System Airports
Precision	9	10%
Non Precision with Vertical Guidance	13	15%
Non Precision	17	19%
Visual	50	56%
Total System Airports	**89**	**100%**

Source: Airnav.com, confirmed through Airport Manager Survey

Figure 3.3: NDSASP Primary Runway Approach Type Map



Source: Airnav.com, confirmed through Airport Manager Survey

3.3.2 Clear Approaches to Primary Runway Ends

Maintaining clear runway approaches increases safety of aircraft and people on the ground. A clear approach is free of obstructions such as trees, poles, buildings and other objects. The approaches to the end of each airport's primary runway were evaluated as a part of this inventory by cross-referencing the Airport Layout Plan (ALP) for each airport (if available) with approach and obstruction data found on the Airport Master Records (FAA 5010 Forms). **Table 3.10** summarizes the distribution of system airports that have clear approaches to each end of their primary runway. Nearly 60% of system airports have clear approaches to both ends of their primary runway; however, nearly 30% of system airports have only one clear approach to their primary runway and 11 airports in the system have obstructions in their approaches on both runway ends. **Table B.8** in **Appendix B** lists the status of the primary runway approach at each airport in the system.

Table 3.10: NDSASP Primary Runway Approach Obstructions

Clear Approaches to Primary Runway Ends	Number of System Airports	Percentage of System Airports
Clear Approaches to Both Primary Runway Ends	52	58.4%
Clear Approach to Only One End of their Primary Runway	26	29.2%
Neither Approach Clear to Primary Runway	11	12.4%
Total System Airports	**89**	**100%**

Source: Airport Layout Plans and Airport Master Records (FAA 5010 Forms)

3.3.3 Runway Protection Zone

The Runway Protection Zone (RPZ) is a two-dimensional area off each runway end intended to protect people and property on the ground in the event of an aircraft overrun or undershoot. Airport Cooperative Research Program (ACRP) Report 27 *Enhancing Airport Land Use Compatibility* found that nearly 25% of landing accidents and approximately 17% of takeoff accidents between 1970 and 1995 occurred within 1,640 feet of a runway end. This area had the most landing and takeoff accidents for those included in the analysis. As such, it is critical that RPZs are clear of incompatible objects and activities. The dimensions of an RPZ are dependent on the ARC (See Section 3.1.4) and approach minimums associated with the runway. The following sections discuss the presence of incompatible uses, such as wetlands, residences, structures, and roads, within system airport RPZs and legal control over these safety areas.

3.3.4 Clear RPZs

Table 3.11 summarizes the presence of wetlands, structures, and roads in RPZs at airports in the NDSASP. **Table B.9** in **Appendix B** lists the detailed RPZ information for each system airport. The following paragraphs explain the concern with each use.

- **Wetlands -** Wetlands can provide habitat (food, protection, etc.) for wildlife, such as birds and mammals. Wetlands within an RPZ may increase the probability of a wildlife strike as aircraft operate at low elevations within this zone. As such, it is not ideal for a wetland to be located within an RPZ.

- **Structures -** Structures are three-dimensional objects, such as buildings, light poles, telephone poles and towers, cranes and lifts, ventilation or exhaust stacks (for example, at manufacturing facilities), water tanks, etc. Structures located within an RPZ can pose an obstruction to flight and therefore are not desirable.

- **Roads –** Roads are used by vehicles to transport people and cargo and can be dangerous if located within an RPZ in the event of an accident, due to the height of vehicles on the roadway that may impede air travel.

Table 3.11: NDSASP Airport Clear RPZs

Clear RPZs	Number of System Airports	Percentage of System Airports
Clear RPZs on all Runways*	4	5%
At Least 1 Wetland in an RPZ	47	53%
At Least 1 Structure in an RPZ	14	16%
At Least 1 Road in an RPZ	80	90%

*Clear RPZs = no wetlands, structures or roads in any of the RPZs
Note: Some airports had two or all three of these uses in their RPZs; therefore, the total number of system airports does not equal 89 as airports were counted multiple times across the categories, if applicable.
Source: Airport Layout Plans and aerial photography

3.3.5 Control of RPZs

It is ideal for an airport to have control over property located within their RPZs to protect people and property in proximity to their runways. Airports may control this land through easements or using fee simple acquisition. An easement gives the airport the right to control the use of another party's land, such as limiting the height of trees and structures on the property. Land controlled using fee simple acquisition is purchased by the airport and includes all the rights associated with ownership. **Table 3.12** summarizes the control status of RPZ land at airports within the system according to airport manager survey responses. Nearly 80% of system airports have control over their RPZs, while 20% are not controlling their RPZs in fee simple or by easement.

Table 3.12: NDSASP Airport Control of RPZs

Controlled RPZs	Number of System Airports	Percentage of System Airports
Controlling RPZs using Combination of Fee and Easements	16	18%
Controlling RPZs using Fee Acquisition	9	10%
Controlling RPZs using Easements	17	19%
Not Controlling RPZs	18	20%
No Response	29	33%
Total System Airports	**89**	**100%**

Source: Airport Manager Survey

3.4 NAVAIDs

NAVAIDs are used by pilots to determine their position and course information, such as the location of an airport, runway threshold, and runway approaches for landing. There are several types of NAVAID equipment including Visual Guidance Slope Indicators systems (VGSIs), Runway End Identifier Lights (REILs), rotating beacons, wind indicators, segmented circles, Long Range Radar (LRR) and more. The following sections provide details about specific NAVAIDs found at airports in North Dakota's aviation system. Airport-specific NAVAID information can be found in **Tables B.10** and **B.11** in **Appendix B**.

3.4.1 Visual Guidance Slope Indicators for Primary Runways

VGSIs are lighting systems which assist pilots in aligning their aircraft with the correct and safe glide path for approach for landing at an airport. VGSIs include angled red and white lights in different patterns that indicate the angle of the approach glide path. Visual Approach Slope Indicators (VASIs) and Precision Approach Path Indicators (PAPIs) are the most common VGSI systems. A short description of these two systems along with two additional VGSIs found at system airports are including in the following paragraphs and summarized in **Table 3.13**.

- **Visual Approach Slope Indicators (VASIs)** - A VASI is used primarily under Visual Flight Rules (VFR) conditions. A VASI provides vertical visual guidance to a pilot during approach for landing by displaying a pattern of high-intensity red and white lights that indicate whether the aircraft is on the approach, too high or too low. VASIs may be configured in a 2-box (two bars with two light units) or a 4-box (two bars with four light units) arrangement.

- **Precision Approach Path Indicators (PAPI)** – A PAPI provides visual glide path guidance through the use of lights that indicate to a pilot the aircraft's position relative to the safe path for landing. PAPIs may be configured in a 2-box (single row of two light units) or a 4-box (single row of four light units) arrangement. Two-box PAPIs are typically installed on runways without electronic guidance, on non-Part 139 airports, or when an aircraft's descent below the normal approach angle presents a serious hazard. Four-box PAPIs are typically installed at airports with jet operations.

- **Pulsating VASI (PLASI) –** PLASIs consist of a bright light that emits a flashing strobe appearance if an aircraft is above or below the glide path, and a steady white light if an aircraft is on the correct glide path.

- **Simplified Abbreviated VASI (SAVASI)** – SAVASI is a simplified, low-cost, VFR approach aid. SAVASI consists of two boxes with a single light in each. SAVASIs are recommended for utility airports having limited power, for glide slope reference above hazardous objects, for environments where visual reference information is lacking or deceptive, and to effect a reduction in the probability of undershoots and overshoots.

Table 3.13 summarizes the VGSI systems found on primary runways at system airports. Approximately half (51%) of the system airports do not have a VGSI system on their primary runway. Of the airports that do have a VGSI system, the majority have 2-box PAPIs.

Table 3.13: NDSASP Primary Runway VGSIs

Primary Runway Visual Guidance Slope Indicators (VGSIs)	Number of Runway Ends	Percentage of System Runways
VASI - 4 Box	3	1.7%
VASI - 2 Box	1	0.6%
PAPI - 4 Box	12	6.7%
PAPI - 2 Box	69	38.8%
PLASI	2	1.1%
SAVASI	1	0.6%
None	90	50.6%
Total Primary Runway Ends	**178**	**100.0%**

Source: Airnav.com, confirmed through Airport Manager Survey

3.4.2 Runway End Identifier Lights on Primary Runways

REILs enable pilots to identify the runway threshold during approach for landing. REILs consist of flashing white high-intensity lights installed at each end corner of a runway. REILs are particularly helpful during times of reduced visibility and in urban environments (with an abundance of other lighting near the airfield). **Table 3.14** summarizes the REIL systems on primary runways ends (178 of them) at NDSASP airports and indicates the majority of airports in the system do not have REILs on their primary runway.

Table 3.14: NDSASP Primary Runway REILs

Primary Runway End Identifier Lights (REILs)	Number of Runway Ends	Percentage of System Runways
REILs Installed	23	13%
No REILs	155	87%
Total Primary Runway Ends	**178**	**100%**

Source: Airnav.com, confirmed through Airport Manager Survey

3.4.3 Rotating Beacons

Rotating beacons identify the location and type of an airport and consist of a rotating light with a specific pattern of colored flashes. Rotating beacons for civilian airports have alternating single green and white flashes; military airports have one green flash followed by two white flashes. Pilots may use rotating beacons to identify an airport's location on approach or when way finding. **Table 3.15** summarizes the availability of rotating beacons at system airports and indicates the majority of airports within the system have a rotating beacon (61%).

Table 3.15: NDSASP Airport Rotating Beacons

Rotating Beacons	Number of System Airports	Percentage of System Airports
Rotating Beacon	54	61%
No Rotating Beacon	34	38%
Beacon Turned Off	1	1%
Total System Airports	**89**	**100%**

Source: Airnav.com, confirmed through Airport Manager Survey

3.4.4 Wind Indicators

Wind indicators provide information about airfield wind direction and intensity to pilots for their use in course adjustment prior to landing or after takeoff. Wind indicators, such as wind cones or wind socks, are free rotating hollow fabric shapes installed near runway ends; they are often lighted to allow their use at night or in other times of reduced visibility. **Table 3.16** provides a summary of the wind indicators at system airports. More than 75% of system airports have a lighted wind indicator.

Table 3.16: NDSASP Airport Wind Indicators

Wind Indicators	Number of System Airports	Percentage of System Airports
Lighted Wind Indicator	69	78%
Wind Indicator	19	21%
No Wind Indicator	1	1%
Total System Airports	**89**	**100%**

Source: Airnav.com, confirmed through Airport Manager Survey

3.5 Taxiways

Taxiways are surfaces used to connect airfield infrastructure such as runways and aprons, allowing aircraft to access different parts of an airport. Taxiways may also be used by security, snow removal and rescue vehicles. Taxiways can increase safety by limiting the amount of time an aircraft or vehicle is on the runway surface. Taxiways are designed based on the ARC of the design aircraft using standards presented in FAA AC 150/5300-13A *Airport Design*.

3.5.1 Primary Runway Taxiway Type

There are a few types of airport taxiways and the particular type depends on the needs of the airport users. Common taxiway types include:

- **Full Parallel Taxiway** – A full parallel taxiway extends parallel along the entire length of the runway, providing access to each runway end.

- **Partial Parallel Taxiway** – A partial parallel taxiway extends parallel along a portion of the runway, typically from a ramp or apron to a single runway end.

- **Connector Taxiway** – A connector taxiway may connect an airport apron area and the runway with no parallel geometry. This taxiway may be paved or turf depending on the surface type of the runway and apron/aircraft parking area. For example, a connector taxiway would be paved if connecting an apron to a paved runway, but would be turf if connecting a turf tie-down area to a turf runway. As long as an airport had a clearly defined path from the apron/aircraft parking area to the runway, it was considered to have a connector taxiway.

Table 3.17 summarizes the types of taxiways for primary runways at system airports. Nearly 90% of system airports have a taxiway for their primary runway. **Table B.12** in **Appendix B** lists the taxiway system at each airport in the NDSASP.

Table 3.17: NDSASP Primary Runway Taxiway Types

Primary Runway Parallel Taxiway Type	Number of System Airports	Percentage of System Airports
Full Parallel Taxiway	12	13.5%
Partial Parallel Taxiway	6	6.7%
Connecting Taxiway	61	68.5%
Does not have Taxiway	10	11.2%
Total System Airports	**89**	**100.0%**

Source: Airport Layout Plans and aerial photography, confirmed through Airport Manager Survey

3.5.2 Taxiway Edge Lighting

Due to the incomplete data that was provided on the airport manager survey regarding taxiway lighting, a summation of the taxiway lighting present at airports in the system is not provided in this inventory.

3.6 Aircraft Storage

Airports may offer storage for aircraft in a variety of forms. Enclosed structures, such as hangars, provide protection from weather and theft, while paved apron areas offer open space for parking, servicing, and loading/unloading of passengers and cargo. Requirements and dimensions of aircraft storage

infrastructure vary by airport, based on the aircraft using the storage and frequency of use. **Table B.13** in **Appendix B** lists storage facilities present at each airport in the system.

3.6.1 Hangar Spaces

A hangar is an enclosed building which provides aircraft with protection from the elements, damage, and theft and may provide space for aircraft maintenance and flight planning. **Table 3.18** summarizes the availability of hangar space at airports within the NDSASP, and illustrates that the majority of airports have between one and ten hangar spaces. **Table B.13** in **Appendix B** lists the number of hangar spaces for each airport.

Table 3.18: NDSASP Airport Hangar Spaces

Hangar Spaces	Number of System Airports	Percentage of System Airports
100+	1	1.1%
91-100	1	1.1%
81-90	1	1.1%
71-80	0	0.0%
61-70	0	0.0%
51-60	2	2.2%
41-50	1	1.1%
31-40	5	5.6%
21-30	10	11.2%
11-20	18	20.2%
1-10	29	32.6%
No Hangar Spaces	11	12.4%
No Response	10	11.2%
Total System Airports	**89**	**100%**

Source: Airport Manager Survey

3.6.2 Tie-Downs

Aircraft tie-downs are used to secure parked aircraft outside, usually on paved areas, such as aprons or in turf areas. **Table 3.19** summarizes the availability of paved and turf tie-downs at system airports. The majority of system airports that responded to the survey indicated that they have between one and ten paved tie-downs (52%), and no turf tie-downs (nearly 68%). **Table B.13** in **Appendix B** includes tie-down information for each system airport.

Table 3.19: NDSASP Airport Tie-Downs (Paved and Turf)

Number of Paved Tie-Downs	Number of System Airports	Percentage of System Airports
50+	2	2%
41-50	3	3%
31-40	0	0%
21-30	1	1%
11-20	5	6%
1-10	46	52%
No Paved Tie-Downs	27	30%
No Response	5	6%
Total System Airports	**89**	**100%**
Number of Turf Tie-Downs	**Number of System Airports**	**Percentage of System Airports**
11-20	1	1.1%
1-10	26	29.2%
No Turf Tie-Downs	60	67.4%
No Response	2	2.2%
Total System Airports	**89**	**100%**

Source: Airport Manager Survey

3.7 Terminal Building Facilities

Terminal buildings provide a connection between landside facilities and airside facilities and house essential services for passengers and flight crews. Terminals also provide administrative space for airport, airline, security and other personnel. The size of a terminal, as well as the services it offers, can vary based on the size, operations and type of airport (GA and commercial service). A discussion of the terminal capacity (both GA terminals and commercial service terminals) available at airports within the system is provided below. A listing of airport-specific GA terminal facility amenities is provided in **Tables B.14**, **B.15** and **B.16** in **Appendix B**.

3.7.1 Adequate GA Terminal Capacity to Support Passenger Demand

GA terminals can often provide space for GA activities such as traveler services, food and beverage service, computer/internet access, restrooms, flight planning, flight crew lounges, sleeping rooms, and more. The managers of airports in the NDSASP were asked to evaluate the capacity of their GA terminals compared to current passenger demand. This was a personal judgment on behalf of the manager; no specific analysis was completed to evaluate this issue. **Table 3.20** summarizes their responses and shows that about half of the system airports reported having adequate GA terminal capacity to meet demand and about half do not. General aviation airports without a GA terminal were included in **Table 3.20** as not having adequate capacity. **Table B.14** in **Appendix B** lists the status of each airport with regard to their evaluation of GA terminal capacity versus demand.

Table 3.20: NDSASP General Aviation Terminal Capacity

Adequate GA Terminal Capacity	Number of System Airports	Percentage of System Airports
Adequate Terminal Capacity	48	54%
Inadequate Terminal Capacity*	41	46%
Total System Airports	**89**	**100%**

*GA airports without GA terminals are counted as not having adequate terminal capacity.
Source: Airport Manager Survey

3.7.2 Adequate Commercial Service Terminal Capacity to Support Passenger Demand

Commercial service terminals provide space for commercial aviation activities, such as ticket sales, security screening, passenger hold areas, food and beverage service, computer/internet access, restrooms, frequent flyer club lounges, flight planning and crew lounges and other facilities and rental car counters, public transportation and parking areas. The managers of the eight commercial service airports in NDSASP were asked to evaluate the capacity of their commercial terminals compared to current passenger demand. Again, this was a subjective assessment by the managers; no specific analysis was completed to evaluate this issue. **Table 3.21** summarizes their responses; two of the eight commercial airports in the system do not have adequate terminal capacity to meet current demand. **Table B.16** in **Appendix B** lists the status of each airport with regard to their evaluation of commercial terminal capacity versus demand.

Table 3.21: NDSASP Commercial Service Terminal Capacities

Adequate Commercial Terminal Capacity	Number of System Airports	Percentage of System Airports
Adequate Terminal Capacity	6	75%
Inadequate Terminal Capacity	2	25%
Total System Airports	**8**	**100%**

Source: Airport Manager Survey

3.7.3 Ground Transportation Services

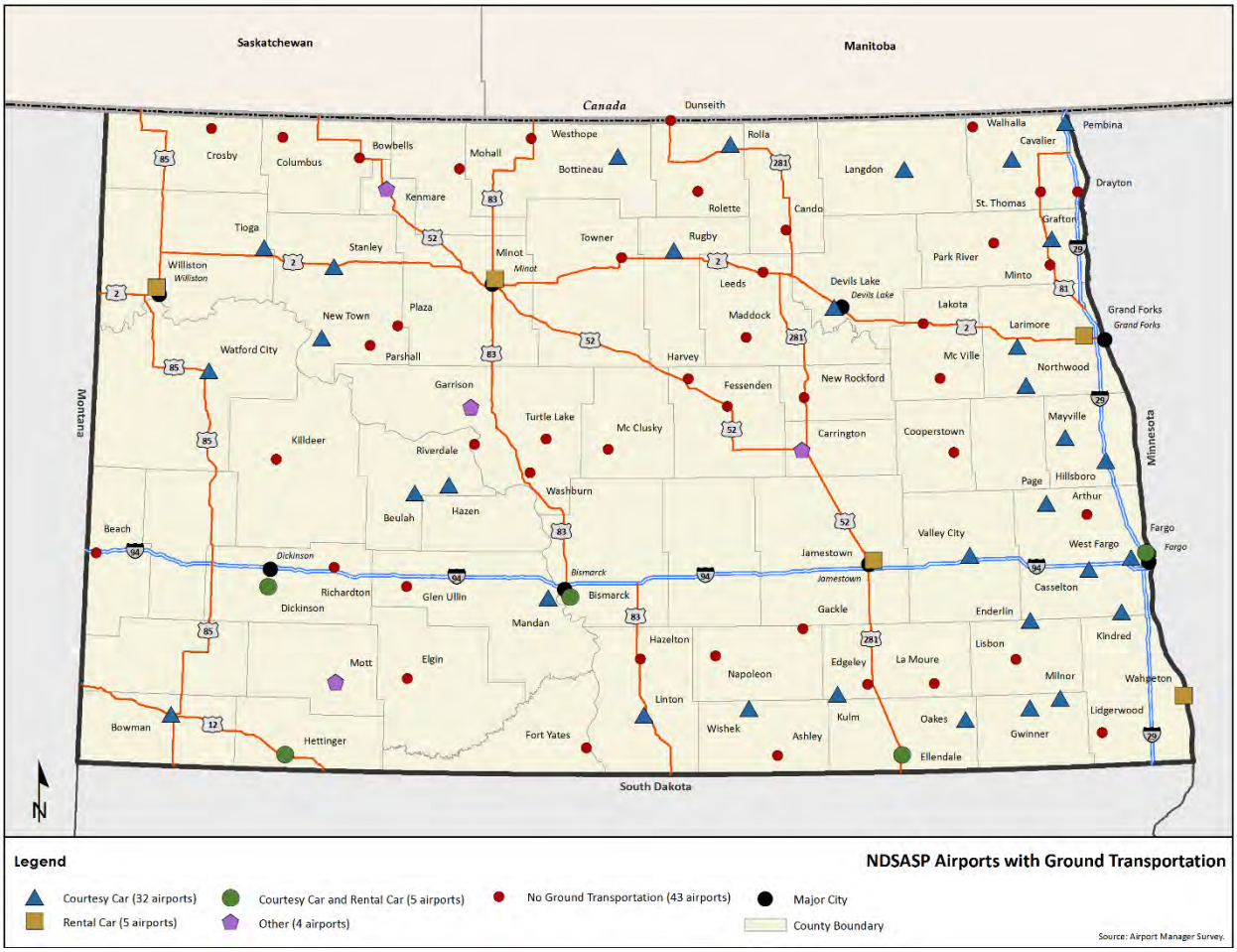
The aviation system in North Dakota is dependent on its integration with other modes of transportation for the efficient movement of people and goods. Ground transportation allows passengers and cargo to reach their final destination after they land at an airport and to access the airport for travel to another location. **Table 3.22** and **Figure 3.4** summarize the availability of rental and courtesy cars at airports within the system. Over half of the system airports (nearly 52%) offer some form of ground transportation. **Table B.15** in **Appendix B** lists specific ground transportation options available at each system airport.

Table 3.22: NDSASP Airport Ground Transportation

Ground Transportation	Number of System Airports	Percentage of System Airports
Courtesy Car	32	35.9%
Rental Car	5	5.6%
Courtesy Car and Rental Car	5	5.6%
Other	4	4.5%
No Ground Transportation	43	48.3%
Total System Airports	**89**	**100.0%**

Source: Airport Manager Survey

Figure 3.4: NDSASP Airport Ground Transportation Map



Source: Airport Manager Survey

3.7.4 GA Terminal Amenities

Table 3.23 summarizes the availability of GA terminal amenities found at airports within the system. This table includes amenities that are typically found at GA terminals and is not necessarily an exhaustive list. Therefore there may be additional amenities at these airports which are not included in this table. **Figure 3.5** illustrates the availability of one of these amenities – pilot lounges – which can be a major factor for users in deciding whether to use a particular airport or not. **Table B.15** in **Appendix B** lists specific amenities available at each system airport in their GA terminals.

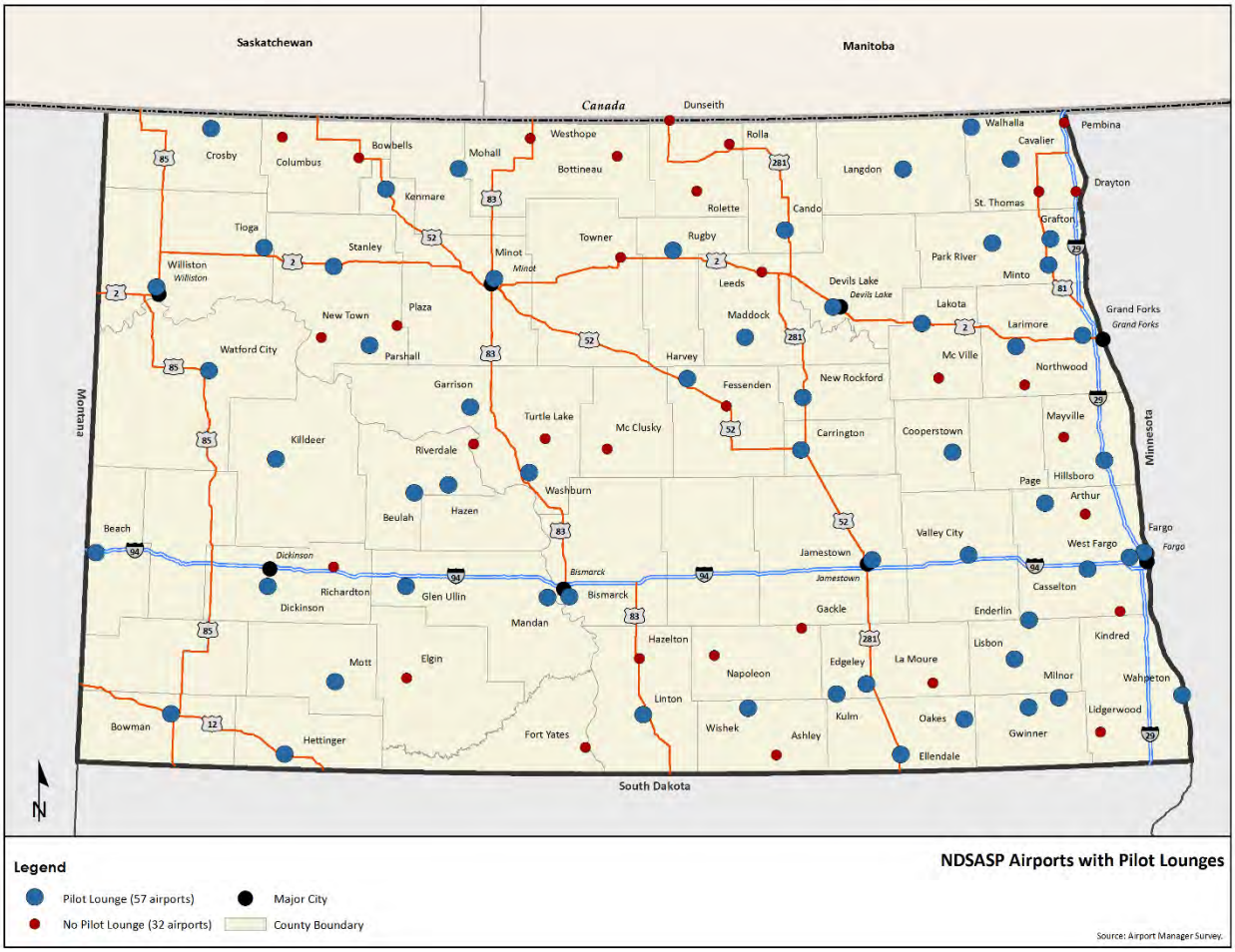
- Food/vending
- FBO Office
- Pilot lounge
- Airport Manager Office
- Conference Room
- Wi-Fi
- Flight Planning Room/Area
- Restrooms
- Waiting Area
- 24-Hour Access for Pilots
- Public Phone
- Public Computer Access
- Weather Display

Table 3.23: NDSASP General Aviation Terminal Amenities

General Aviation Terminal Amenities	Number of System Airports	Percentage of System Airports
Food/Vending	25	28%
FBO Office	22	25%
Pilot Lounge	57	64%
Airport Manager Office	21	24%
Conference Room	31	35%
Wi-Fi	34	38%
Flight Planning Room/Area	44	49%
Restroom	58	65%
Waiting Area	53	60%
24 Hour Access for Pilots	56	63%
Public Phone	43	48%
Public Computer Access	30	34%
Weather Display	40	45%

Source: Airport Manager Survey

Figure 3.5: NDSASP Airport Pilot Lounge Map



Source: Airport Manager Survey

3.8 Services

The North Dakota State Aviation System offers a range of services to pilots and aircraft. The availability of services varies based on the role of each airport, activity levels and user needs. Typically, airports serving the business community or a larger population center offer a greater variety of services to meet user needs. For this inventory, data was collected on services considered essential to meet the needs of the system users. **Tables B.17** and **B.18** in **Appendix B** list the availability of fuel, weather reporting, aircraft maintenance, charter aircraft, flight instruction, rental aircraft, snow removal equipment and airports that support aerial applicators, business aircraft and emergency and medical operations.

3.8.1 Fuel Type Availability

Aircraft fueling is an essential service for pilots since the availability of fuel can be a significant factor in flight planning decisions. The two most common types of aircraft fuel are 100 low-lead (100LL) and Jet A. **Table 3.24** and **Figure 3.6** summarize the availability each type of fuel at airports

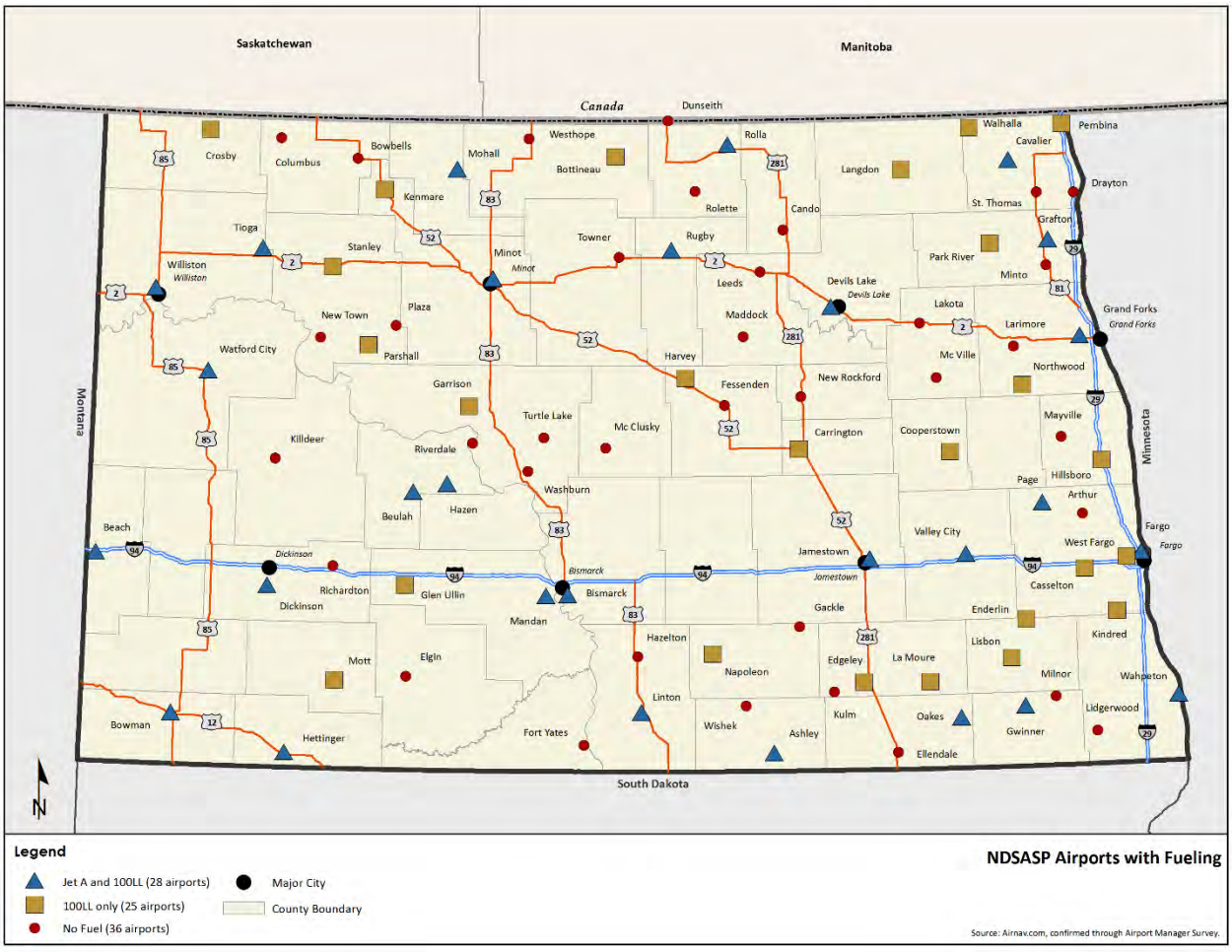
within the NDSASP. Forty percent of system airports do not offer either type of fuel, while 28% offer only 100LL and 32% offer both types. **Table B.17** in **Appendix B** lists the fuel type(s) available at each airport in the system.

Table 3.24: NDSASP Airport Fuel Availability

Jet A & 100LL Fuel	Number of System Airports	Percentage of System Airports
Both Jet A & 100LL	28	32%
100LL Only	25	28%
No Fuel	36	40%
Total System Airports	**89**	**100%**

Source: Airnav.com, confirmed through Airport Manager Survey

Figure 3.6: NDSASP Airport Fuel Availability Map



Source: Airnav.com, confirmed through Airport Manager Survey

3.8.2 Weather Reporting

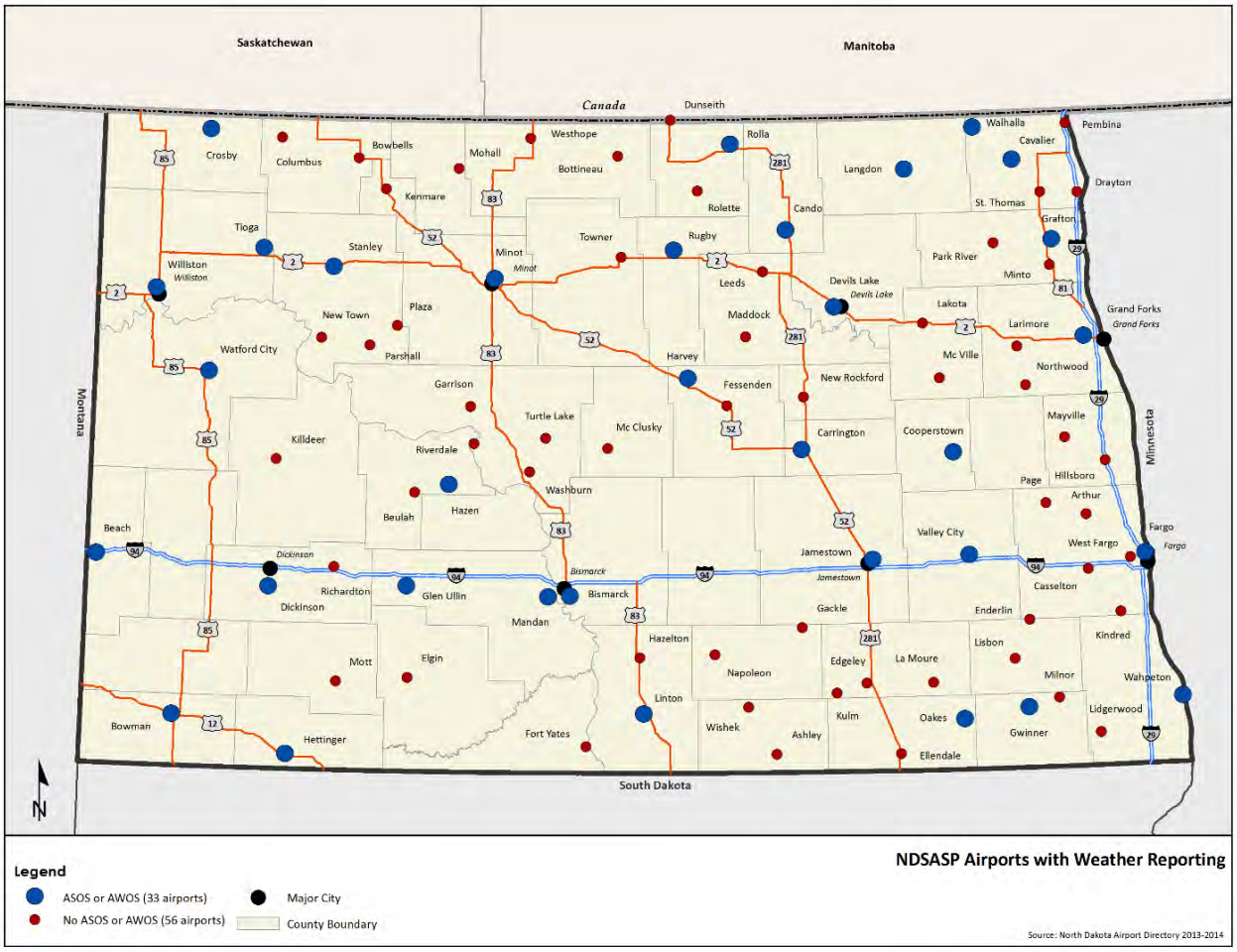
Weather reporting systems can provide essential information about on-site airfield conditions, such as visibility, ceiling height, atmospheric conditions, wind speed and direction, and barometric pressure, to pilots preparing for flight and traveling en route. Automated Surface Observing Systems (ASOS) and Automated Weather Observing Systems (AWOS) are two types of weather reporting systems. Only 37% of airports within North Dakota's aviation system have an ASOS or AWOS. **Table 3.25** and **Figure 3.7** summarize the number of airports with weather reporting systems and **Table B.18** in **Appendix B** catalogs availability of either ASOS or AWOS at each system airport.

Table 3.25: NDSASP Airport Weather Reporting

ASOS or AWOS	Number of System Airports	Percentage of System Airports
ASOS or AWOS	33	37%
No ASOS or AWOS	56	63%
Total System Airports	**89**	**100%**

Source: 2013-2014 North Dakota Airport Directory

Figure 3.7: NDSASP Airport Weather Reporting Map



Source: North Dakota Airport Directory 2013-2014

3.8.3 Aerial Applicators

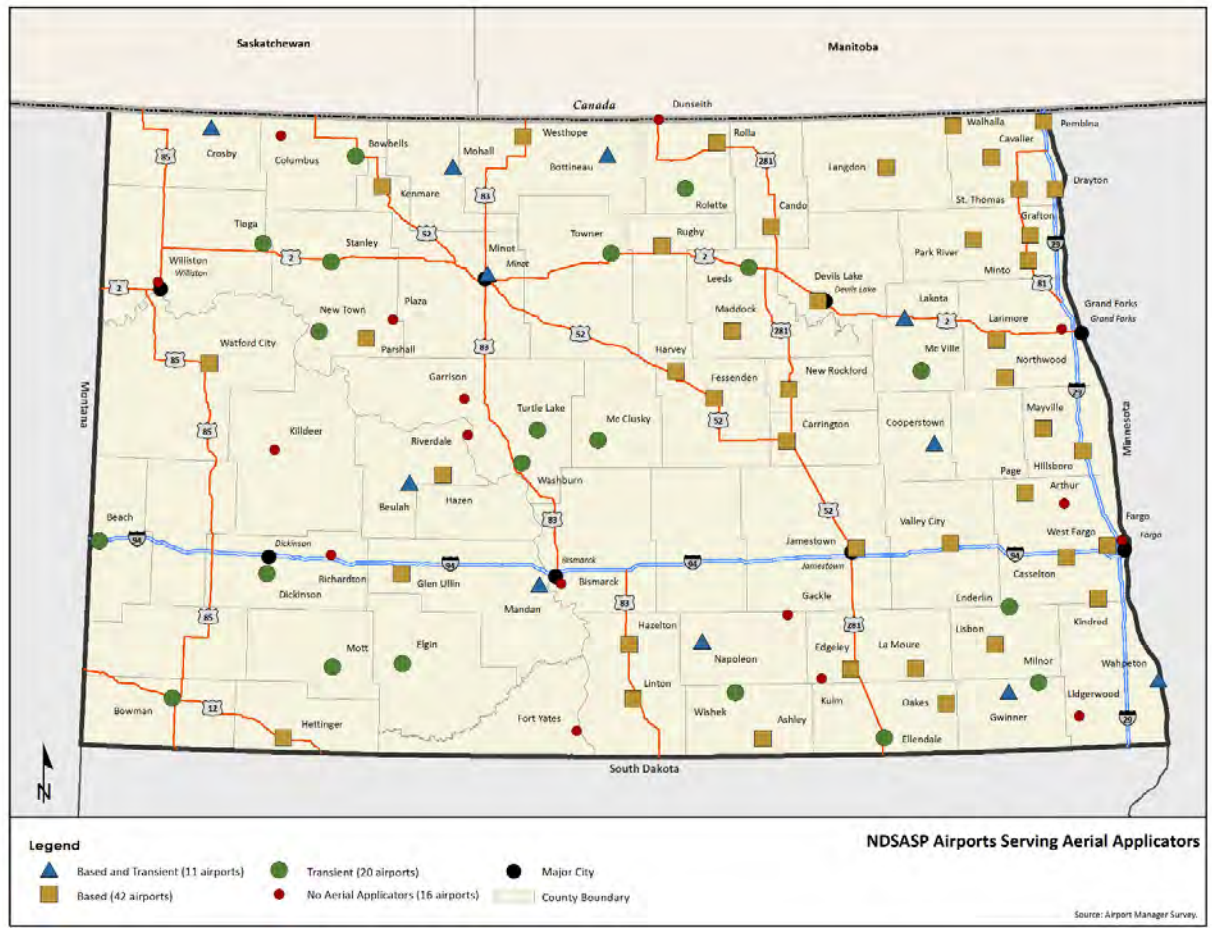
Agriculture is very important to the state economy; it is one of the largest industries and employs nearly 25% of the working population. Aerial application is the practice of spraying crops with protective chemicals, such as herbicides or insecticides, from a specialty aircraft. Aerial application is essential to the agricultural industry in North Dakota. **Table 3.26** and **Figure 3.8** indicate the distribution of airports that have aerial applicators based at their facility or that serve transient aerial applicators. More than 80% of the airports within the NDSASP serve aerial applicators, and the majority of these have aerial applicators based at their facility.

Table 3.26: Aerial Applicators Availability at NDSASP Airports

Aerial Applicators	Number of System Airports	Percentage of System Airports
Based and Transient	11	12%
Based	42	47%
Transient	20	23%
No Aerial Applicators	16	18%
Total System Airports	**89**	**100%**

Source: Airport Manager Survey

Figure 3.8: Aerial Applicators Availability at NDSASP Airports Map



Source: Airport Manager Survey

3.8.4 Aircraft Maintenance

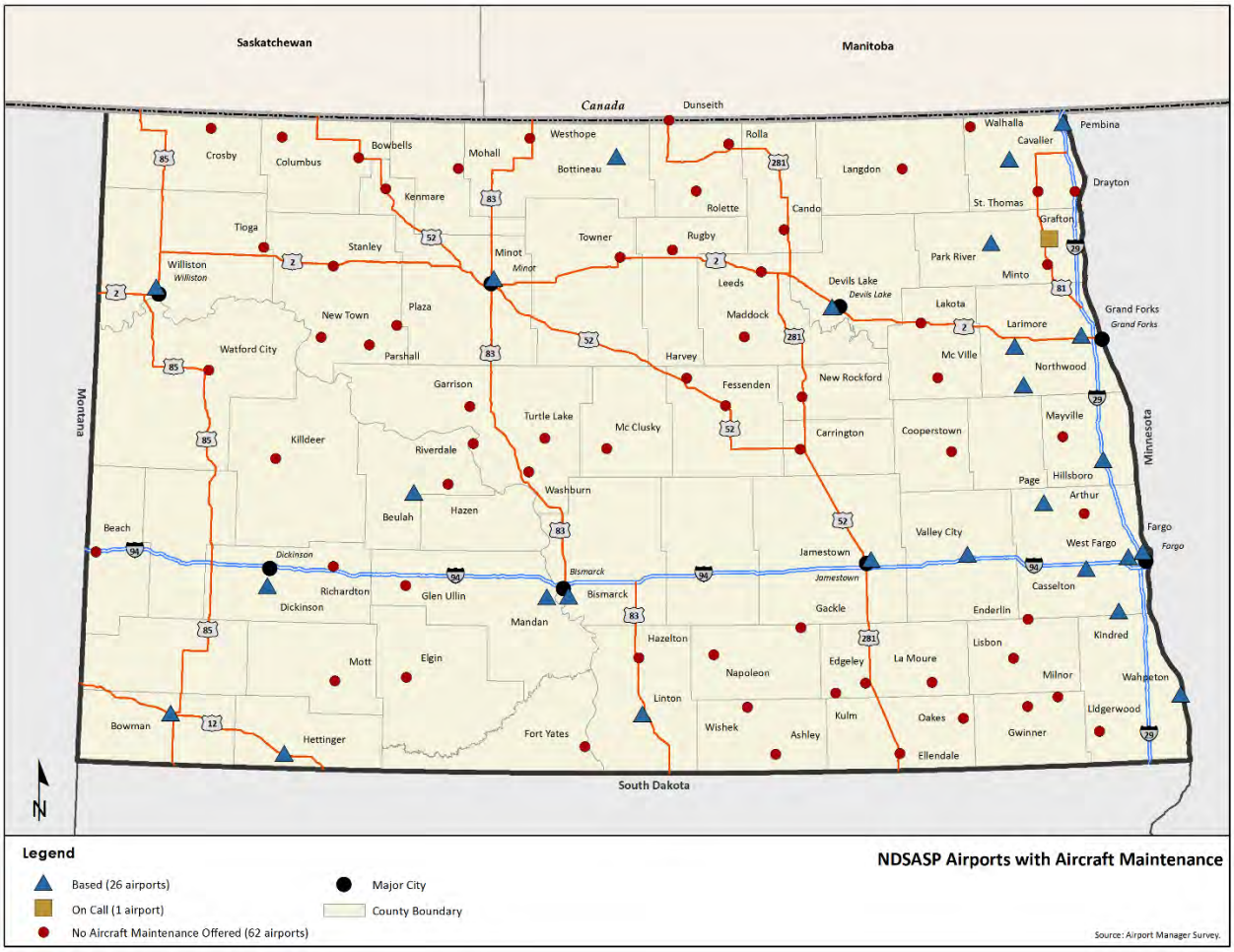
Aircraft maintenance and repair services, from minor services to major overhauls, keep aircraft airworthy for operation. Airports that offer aircraft maintenance and repair services provide a necessary service for based and itinerant aircraft. **Table 3.27** and **Figure 3.9** summarize the availability of aircraft maintenance and repair services at system airports. The majority do not offer aircraft maintenance services (nearly 70%). Of the airports that indicated they do provide maintenance service, the majority offer based service. **Table B.17** in **Appendix B** lists the airports that offer maintenance and repair services.

Table 3.27: Aircraft Maintenance Availability at NDSASP Airports

Aircraft Maintenance	Number of System Airports	Percentage of System Airports
Based	26	29%
On-Call	1	1%
Not Offered	62	70%
Total System Airports	**89**	**100.0%**

Source: Airport Manager Survey

Figure 3.9: Aircraft Maintenance Availability at NDSASP Airports Map



Source: Airport Manager Survey

3.8.5 Charter

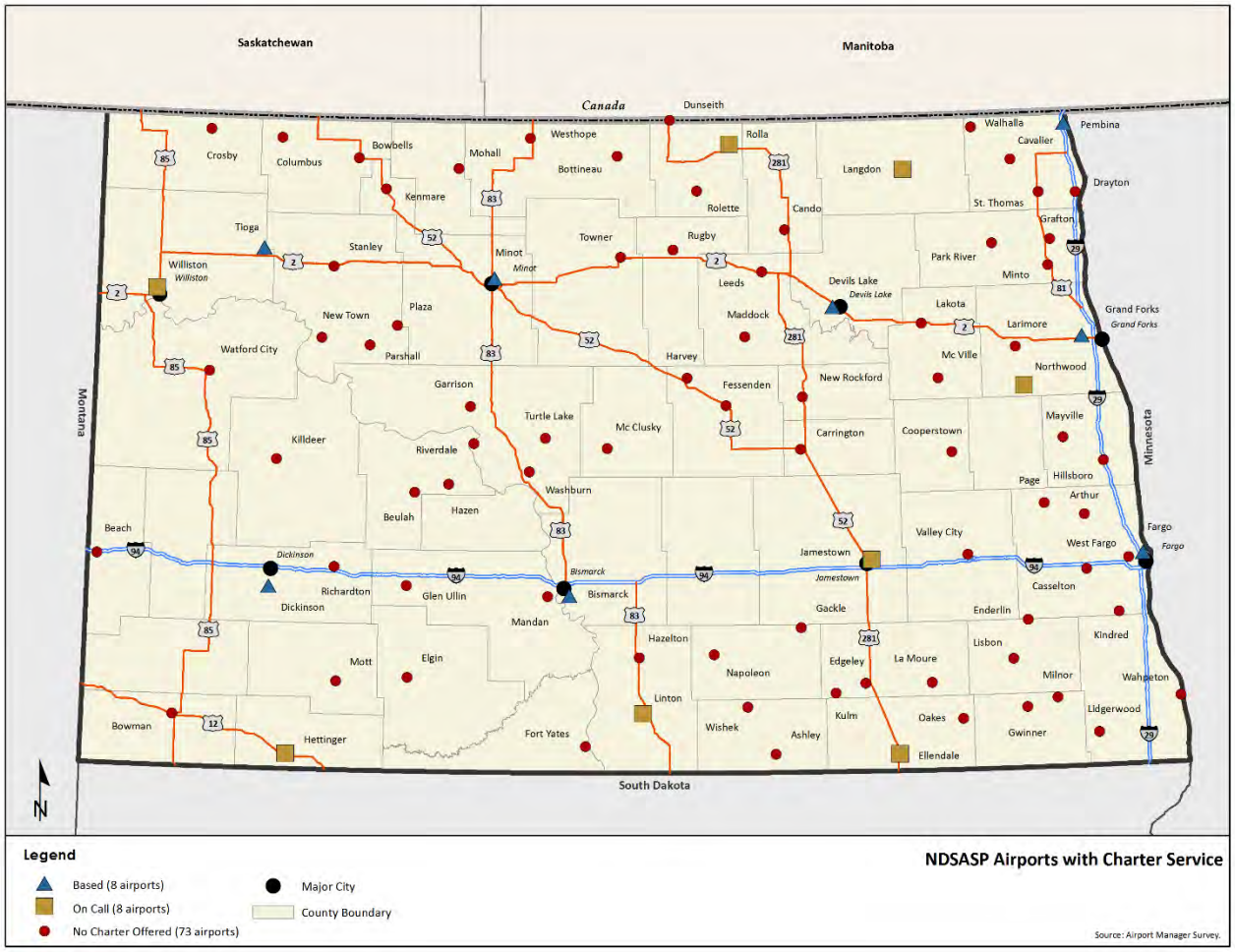
Charter service offers on-demand transportation options for businesses, individuals and cargo not using commercial carriers. **Table 3.28** and **Figure 3.10** show the distribution of charter service availability and indicate that the majority of system airports do not offer charter service. **Table B.17** in **Appendix B** lists charter service availability at system airports.

Table 3.28: Aircraft Charter Availability at NDSASP Airports

Aircraft Charter	Number of System Airports	Percentage of System Airports
Based	8	9%
On-Call	8	9%
Not Offered	73	82%
Total System Airports	**89**	**100%**

Source: Airport Manager Survey

Figure 3.10: Aircraft Charter Availability at NDSASP Airports Map



Source: Airport Manager Survey

3.8.6 Flight Instruction

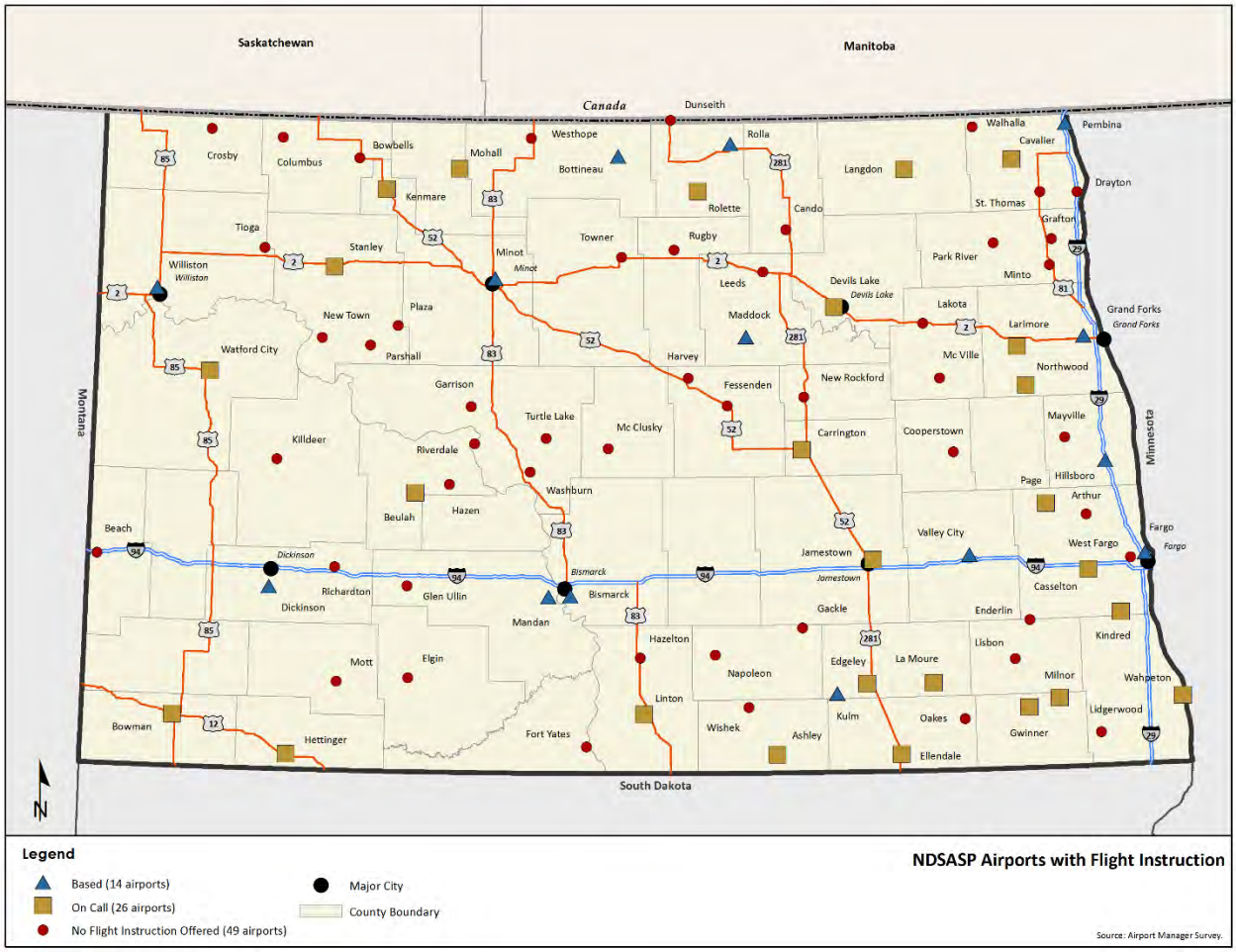
Flight instruction feeds the growth of the aviation community by educating and training new recreational and professional pilots. The availability of flight instruction is summarized in **Table 3.29** and **Figure 3.11**. Forty system airports offer flight instruction (based or on-call) and 49 system airports do not offer instruction. **Table B.17** in **Appendix B** identifies airports that offer flight instruction.

Table 3.29: Flight Instruction Availability at NDSASP Airports

Flight Instruction	Number of System Airports	Percentage of System Airports
Based	14	16%
On-Call	26	29%
Not Offered	49	55%
Total System Airports	**89**	**100%**

Source: Airport Manager Survey

Figure 3.11: Flight Instruction Availability at NDSASP Airports Map



Source: Airport Manager Survey

3.8.7 Rental Aircraft

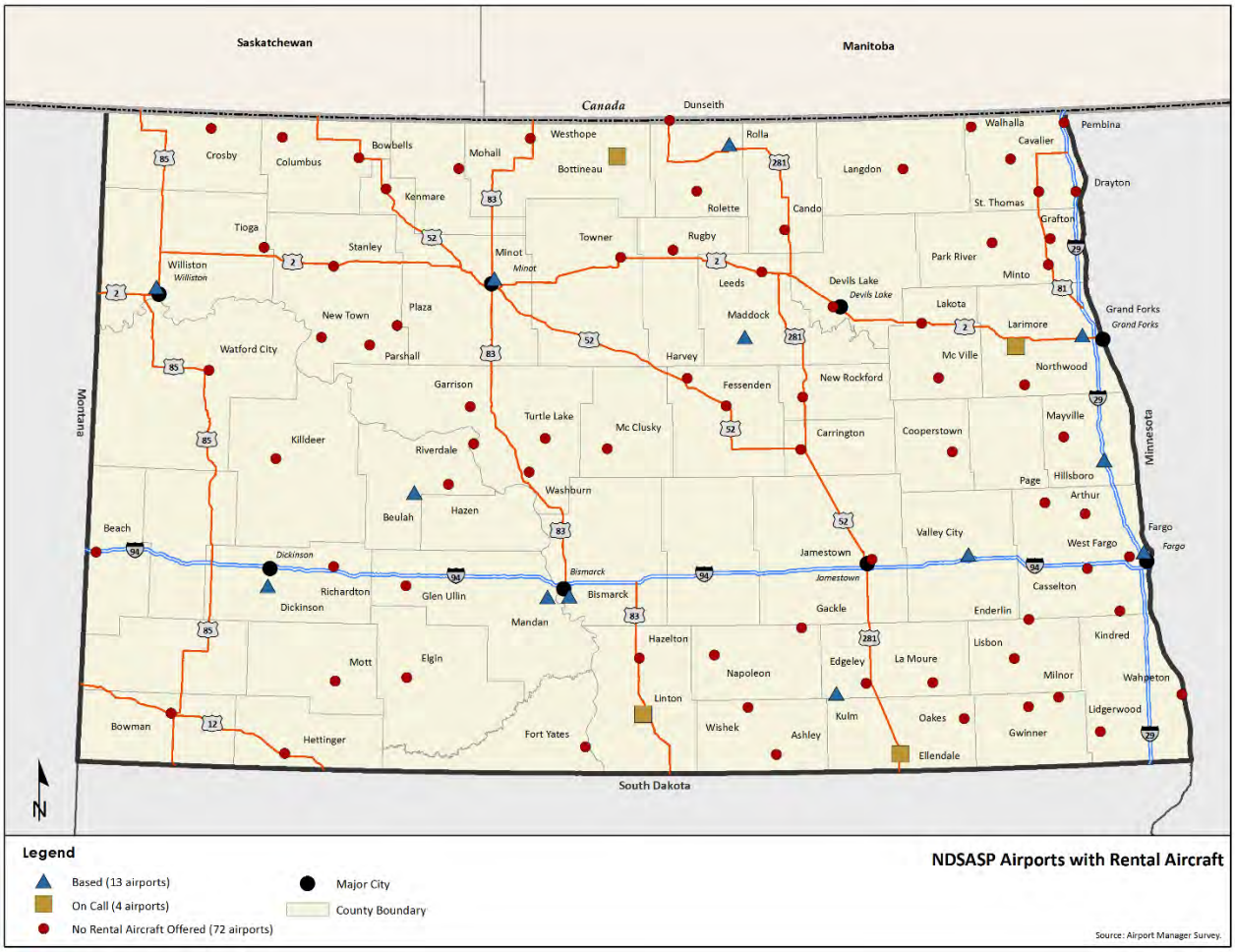
Since aircraft are costly to purchase, pilots may choose to rent aircraft instead. Airports which rent aircraft provide access for pilots who do not own their own aircraft and to students receiving flight instruction. **Table 3.30** and **Figure 3.12** summarize the availability of rental aircraft at system airports. Seventeen system airports offer rental aircraft; however, the majority of system airports do not offer aircraft for rent. The availability of rental aircraft at each system airport is listed in **Table B.17** in **Appendix B**.

Table 3.30: Rental Aircraft Availability at NDSASP Airports

Rental Aircraft	Number of System Airports	Percentage of System Airports
Based	13	14.6%
On-Call	4	4.5%
Not Offered	72	80.9%
Total System Airports	**89**	**100.0%**

Source: Airport Manager Survey

Figure 3.12: Rental Aircraft Availability at NDSASP Airports Map



Source: Airport Manager Survey

3.8.8 Snow Removal Equipment

North Dakota winters typically include snowy weather, and in some cases, extreme amounts of snow. Snow removal equipment (SRE) and the capacity of personnel to clear runways and other airport pavements are critical to maintaining accessibility to system airports during the winter. **Table 3.31** summarizes SRE availability at system airports. More than half of the system airports have SRE. **Table B.17** in **Appendix B** lists specifically the airports with SRE.

Table 3.31: SRE Availability at NDSASP Airports

Snow Removal Equipment	Number of System Airports	Percentage of System Airports
Snow Removal Equipment	53	60%
No Snow Removal Equipment	36	40%
Total System Airports	**89**	**100%**

Source: Airport Manager Survey

3.8.9 Meet Needs of King Air Aircraft

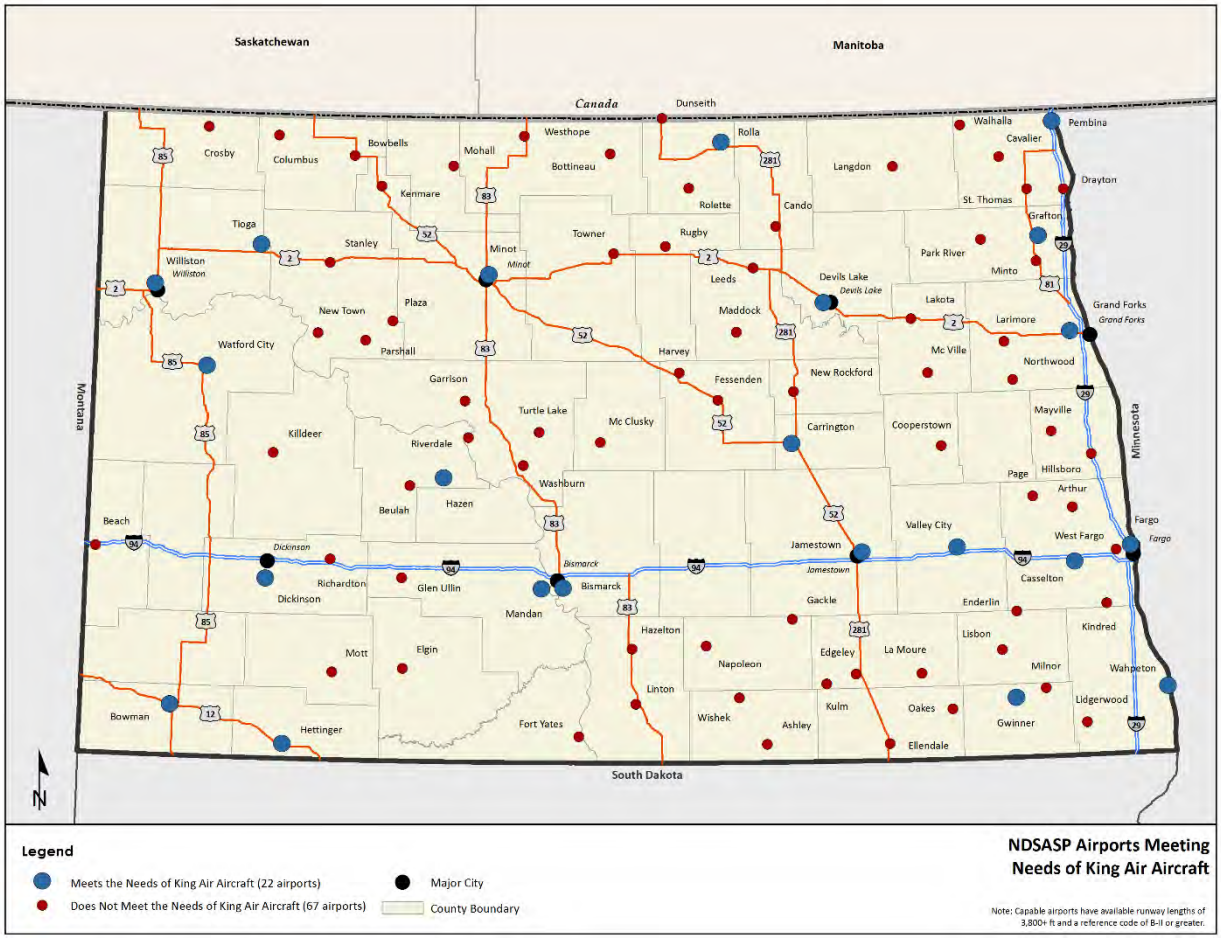
Beechcraft King Air aircraft are considered to be representative of typical business aircraft and are classified as B-II aircraft (see Section 3.1.4 Airport Reference Code). Airports that can support operations by business aircraft (3,800 feet of available runway length or more and an ARC of B-II or greater) support their area's business community, which benefits the local, regional, and state economy. **Table 3.32** and **Figure 3.13** indicate nearly 25% of system airports can meet the needs of King Air Aircraft. **Table B.18** in **Appendix B** lists specifically the airports that are capable of supporting King Air (and other similar aircraft) use.

Table 3.32: NDSASP Airports Meeting Needs of King Air Aircraft

Meet Needs of King Air Aircraft*	Number of System Airports	Percentage of System Airports
Meet the Needs of King Air Aircraft	22	25%
Does Not Meet the Needs of King Air Aircraft	67	75%
Total System Airports	**89**	**100%**

*Based on available runway length of 3,800+ feet and an ARC of B-II or greater.

Figure 3.13: NDSASP Airports Meeting Needs of King Air Aircraft Map



Note: Based on available runway length of 3,800+ feet and an ARC of B-II or greater.

3.8.10 Support Fixed-Wing Emergency Operations

To collect information about the role of system airports in the emergency response network, the largest medical service providers in the state were contacted. They provided information about the types of fixed-wing aircraft in use for emergency transport of patients, physicians, and supplies in North Dakota. The responses from this query were used to develop evaluation criteria to determine which system airports can support fixed wing emergency operations. The types of aircraft being used include Pilatus, King Air, and Lear Jets (rotary-wing aircraft [helicopters] were also mentioned). Airports with a runway at least 3,500 feet long and at least a non-precision approach were categorized as supporting fixed-wing emergency operations. Conversely, airports not meeting these criteria were categorized as not supporting fixed-wing emergency operations. **Table 3.33** summarizes the distribution of airports supporting such operations compared to airports that are not. Nearly 40% of the system airports can support fixed-wing emergency operations while the rest do not. **Table B.18** in **Appendix B** lists the airports capable of supporting fixed-wing emergency operations.

Table 3.33: NDSASP Airports Supporting Fixed-Wing Emergency Operations

Capable of Supporting Fixed-Wing Emergency Operations*	Number of System Airports	Percentage of System Airports
Supports Fixed-Wing Emergency Operations	33	37%
Does Not Support Fixed-Wing Emergency Operations	56	63%
Total System Airports	**89**	**100%**

*Based on available runway length of 3,500+ feet and a non-precision approach.

3.8.11 Serve Hospital/Clinic

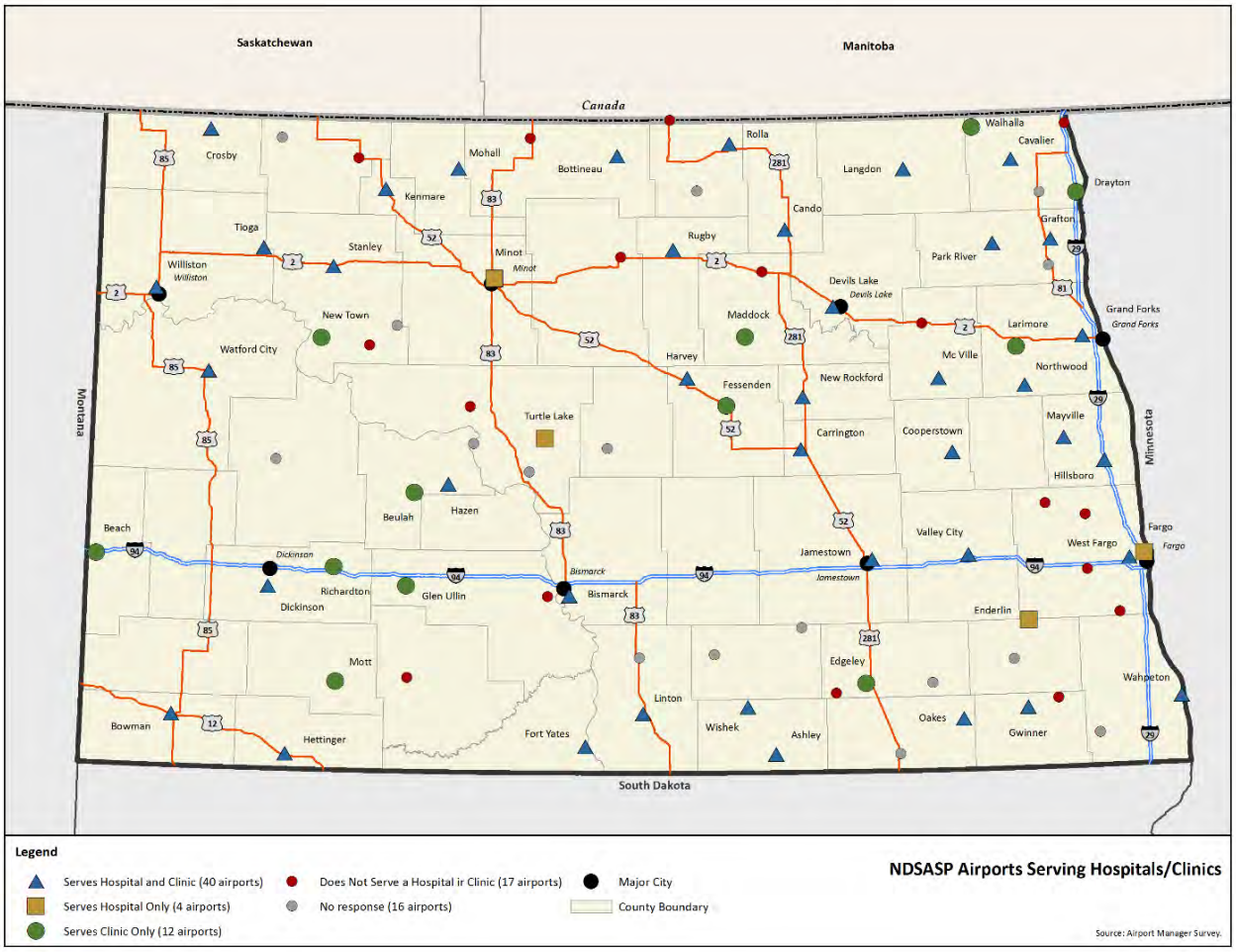
Hospitals and medical clinics may rely on airports to support life-saving operations and provide access to medical care for residents. **Table 3.34** and **Figure 3.14** summarize the number of system airports that serve hospitals and/or clinics, according to a survey of airport managers, with the vast majority of system airports serving these facilities. The information provided in **Table 3.34** is based purely on responses of airport managers as to whether they serve these facilities, and is not dependent upon an airport meeting certain facility requirements (like a minimum runway length, etc.). **Table B.18** in **Appendix B** lists the specific airports that are serving hospitals and/or clinics.

Table 3.34: NDSASP Airports Serving Hospitals/Clinics

Serve Hospital/Clinic	Number of System Airports	Percentage of System Airports
Serves Hospital and Clinic	40	44.9%
Serves Hospital Only	4	4.5%
Serves Clinic Only	12	13.5%
Does Not Serve a Hospital or Clinic	17	19.1%
No Response	16	18.0%
Total System Airports	**89**	**100.0%**

Source: Airport Manager Survey

Figure 3.14: NDSASP Airports Serving Hospitals/Clinics Map



Source: Airport Manager Survey

3.8.12 Serve Emergency/Medical/Physician Aircraft

Emergency, medical, and physician aircraft rely on airports to connect essential services with patients and communities. **Table 3.35** summarizes the distribution of airports within the system that serve emergency, medical, or physician aircraft, according to responses on the airport manager survey. Again, this information is based purely on responses of airport managers as to whether they serve emergency/medical/physician aircraft, and is not dependent upon an airport meeting certain facility requirements or serving a specific size/type of aircraft. **Table B.18** in **Appendix B** lists the airports that are serving emergency/medical/physician aircraft.

Table 3.35: NDSASP Airports Serving Emergency/Medical/Physician Aircraft

Serve Emergency/Medical/Physician Aircraft	Number of System Airports	Percentage of System Airports
Serves Emergency/Medical/Physician Aircraft	44	49.4%
Does Not Serve Emergency/Medical/Physician Aircraft	24	27.0%
No Response	21	23.6%
Total System Airports	**89**	**100.0%**

Source: Airport Manager Survey

3.9 Security

Airport security techniques and equipment protect passengers, flight crews, airport and other personnel, and aircraft. This section introduces airport security techniques and equipment and presents information about security improvements at airports within the NDSASP.

3.9.1 Security Improvements

Various security improvements were cataloged as a part of this inventory effort. **Table 3.36** summarizes the distribution of each of these security improvements at system airports. The four most common security improvements implemented by the airports are outdoor terminal lighting (58%), outdoor ramp lighting (52%), fire protection (47%) and emergency response plans (47%). **Table B.19** and **Table B.20** in **Appendix B** include a listing of security improvements available at each system airport.

- **Controlled Access** (to airfield, to aircraft) – Controlling access, typically through the use of fencing and gates, to the airfield and aircraft protects these resources from damage or tampering.
    - **Gates** (with electronic card access, lock and key, without locks, other) – Gates, including those secured by electronic card or lock and key, prevent unauthorized access to the airfield and other sensitive areas.
    - **Fencing** (terminal area fencing, perimeter fencing) – Terminal area fencing prevents unauthorized access to the terminal area while perimeter fencing prevents unauthorized access to other areas of the airport.
- **Interior Perimeter Road** – An interior perimeter road is a road within the boundaries of an airport that allows security personnel to patrol the airport and prevent or address unauthorized access to the airfield or other sensitive areas.

- **Lighting** (outdoor terminal and ramp) – Airfield lighting, for example, around a terminal and on the apron or ramp can deter malicious or dangerous behavior.

- **Surveillance Cameras** – Surveillance cameras are used by airports to monitor remote areas of the airport and to record suspicious or malicious behavior for further investigation.

- **Police Patrol** – Patrol of the airport by airport or local police can act as a deterrent to unauthorized access and unlawful behavior. Airport patrol may also discover evidence of such activities and prompt further investigation.

- **Fire Protection** – Fire protection systems protect people and property at an airport. Fire systems may detect smoke or other indicators of a fire, alert passengers and airport personnel (by alarm systems) and/or extinguish a fire.

- **Emergency Response Plan** – The first actions taken in the event of an emergency are critical to protect people and property. Emergency response plans allow airports to prepare for emergencies, such as fire, severe weather, terrorist attacks, aircraft accidents and more. An emergency response plan outlines the procedures for preventing, identifying, responding to and recovering from an emergency.

- **Airport Security Plan** – An airport security plan outlines the security measures an airport has implemented to protect people and property at their facility.

- **Security Signage** – Security signage is used to instruct visitors, passengers, flight crew, and airport and other personnel about acceptable behaviors and actions within an airport. For example, such signage may describe the passenger screening process, denote prohibited or limited access areas, and mark the airport boundary.

- **Hangar Numbers** – Numbering airport hangars and other buildings allows for quicker response in the event of an emergency. Building numbers allow emergency responders unfamiliar with the airport to locate airport facilities in a timely manner.

Table 3.36: NDSASP Airport Security Improvements

Security Improvements	Number of System Airports	Percentage of System Airports
Controlled Access to Airfield	17	19%
Terminal Area Fencing	24	27%
Electronic Card Access Gates	8	9%
Lock & Key Gates	12	14%
Gates without Locks	15	17%
Other Controlled Access Methods to Airfield	2	2%
Full Perimeter Fencing	15	17%
Partial Perimeter Fencing	13	15%
Interior Perimeter Road	7	8%
Outdoor Terminal Lighting	52	58%
Outdoor Ramp Lighting	46	52%
Surveillance Cameras	15	17%
Police Patrol	49	55%
Fire Protection	42	47%
Emergency Response Plan	42	47%
Controlled Access to Aircraft	37	42%
Security Signage	40	45%
Airport Security Plan	26	29%
Numbered Hangars for Emergency Response	11	12%

Source: Airport Manager Survey

3.10 Planning

Airport planning provides guidance for future development, enhances safety and security, protects infrastructure investment and promotes the longevity and growth of an airport. Airports that actively plan their activities and expenditures improve their ability to respond to wildlife, changes in operations and user demand, neighboring development and updates to federal and local requirements. Planning allows an airport to meet its users' needs and to continue to support the system as a strong transportation asset. This section introduces typical planning efforts and summarizes planning activity throughout the system.

3.10.1 Wildlife Management Plan

A wildlife management plan balances the needs of an airport with the needs of wildlife to maintain a safe operating environment. Wildlife can be hazardous to aircraft, likewise the airport environment may be unsafe for wild animals. Wildlife management strategies may include notices to airmen (NOTAM) regarding wildlife in the proximity of an airfield, airport fencing and wildlife monitoring, deterrents and relocation. **Table 3.37** summarizes the distribution of wildlife management plans at system airports, based on responses to the airport manager survey. The majority of system airports do not have wildlife management plans. Airports with wildlife management plans in progress were counted as having a plan. **Table B.21** in **Appendix B** lists the airports with a wildlife management plan.

Table 3.37: NDSASP Airport Wildlife Management Plans

Wildlife Management Plan*	Number of System Airports	Percentage of System Airports
Wildlife Management Plan	24	27%
No Wildlife Management Plan	65	73%
Total System Airports	**89**	**100%**

*Airports with Wildlife Management Plans in progress were counted as having a Wildlife Management Plan.
Source: Airport Manager Survey

3.10.2 Airport Layout Plan

Airport Layout Plans (ALPs) depict existing, future and ultimate development to meet existing and forecasted user demand. ALPs guide future development projects and prioritize spending. ALPs are used to coordinate land use, acquisition or release of land and budgets and other local resources, and to communicate with federal and local decision makers regarding development needs. **Table 3.38** summarizes the distribution of system airports with an ALP, according to airport manager survey responses and information from the FAA database. The majority of airports within the system have an ALP; this includes airports with ALPs in progress. **Table B.21** in **Appendix B** lists the airports which have an ALP.

Table 3.38: NDSASP Airport ALPs

Airport Layout Plan*	Number of System Airports	Percentage of System Airports
ALP	65	73%
No ALP	24	27%
Total System Airports	**89**	**100%**

*Airports with ALPs in progress were counted as having an ALP.
Source: Airport Layout Plans, FAA database, and Airport Manager Survey

3.10.3 FAR Part 77 Height Zoning

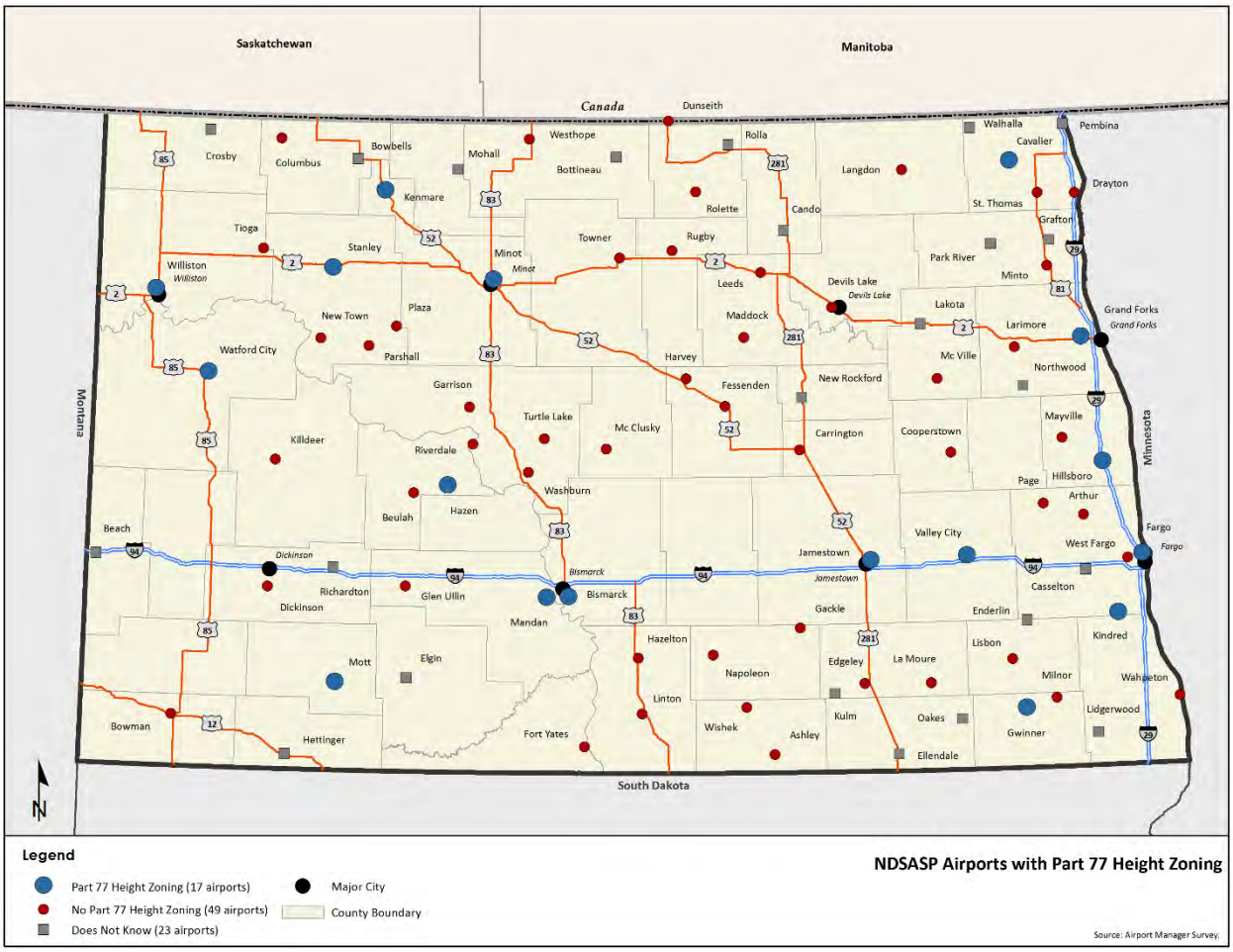
Airport coordination with local officials to develop, enact and enforce height zoning within proximity of an airport helps protect runway approaches from obstructions (as required by Code of Federal Regulations [CFR] Title 14 Part 77 – *Safe, Efficient Use and Preservation of the Navigable Airspace*, also called Part 77). Height zoning discourages the development of tall structures in the flight paths. **Table 3.39** and **Figure 3.15** summarize the status of height zoning at system airports, according to survey responses from airport managers. Nearly half of the system airports indicated that they do not have height zoning protecting their runway approaches. Airports with height zoning in progress were counted as having height zoning. **Table B.21** in **Appendix B** lists the system airports and the presence of height zoning at their facility.

Table 3.39: NDSASP Airport Part 77 Height Zoning

Part 77 Height Zoning*	Number of System Airports	Percentage of System Airports
Part 77 Height Zoning	17	19%
No Part 77 Height Zoning	49	55%
Does Not Know	23	26%
Total System Airports	**89**	**100%**

*Airports with height zoning in progress were counted as having height zoning.
Source: Airport Manager Survey

Figure 3.15: NDSASP Airport Part 77 Height Zoning Map



Source: Airport Manager Survey

3.10.4 Meeting FAA Design Standards

For the purposes of the NDSASP only, airports are considered to be meeting FAA design standards if the majority of their operations are conducted by aircraft classified with the ARC for which their runway was designed. Airports with significant operations (500 or more annually) by aircraft classified with a larger ARC than the runway was designed to accommodate are defined as not meeting FAA Design Standards. The determination of the aircraft use was left to the discretion of the airport manager as part of the survey. **Table 3.40** indicates that the majority of airports within

the NDSASP (94%) meet FAA Design Standards. **Table B.21** in **Appendix B** lists the airports which meet and do not meet the standards.

Table 3.40: NDSASP Airports Meeting FAA Design Standards

Meeting FAA Design Standards*	Number of System Airports	Percentage of System Airports
Meets FAA Design Standards	84	94%
Does Not Meet FAA Design Standards	5	6%
Total System Airports	**89**	**100%**

*Meeting design standards if an airport does not have aircraft making significant operations (500+ annually) by aircraft of a larger design classification than what the airport's infrastructure is designed for.
Source: Airport Layout Plans, Airport Manager Survey, and phone calls with Airport Managers.

3.11 Airport Revenue

Airports aim to be as self-sustaining as possible and may seek funding from sources, such as local or county levies. Often, the financial support airports receive from these sources helps fund capital improvement projects and the maintenance of existing infrastructure.

3.11.1 Local Mill Levy

A local government may use a mill levy to raise revenue for an airport based on the total value of property within the area. **Table 3.41** summarizes the airports that receive financial support from a local millage, according to airport manager survey responses. The majority of system airports have a local mill levy (approximately 67%). **Table B.22** in **Appendix B** lists the airports that have a local mill levy.

Table 3.41: NDSASP Airport Local Mill Levies

Local Mill Levy	Number of System Airports	Percentage of System Airports
Local Mill Levy	60	67%
No Local Mill Levy	22	25%
No Response	7	8%
Total System Airports	**89**	**100%**

Source: Airport Manager Survey

3.11.2 County-Wide Mill Levy

Airports may also receive financial support from a county-wide millage. **Table 3.42** summarizes the airports that receive financial support from a county-wide mill levy, according to airport manager survey responses. About half of the airports have a county-wide mill levy and about half do not. **Table B.22** in **Appendix B** lists the airports that have a county mill levy.

Table 3.42: NDSASP Airport County-Wide Mill Levies

County-Wide Mill Levy	Number of System Airports	Percentage of System Airports
County-Wide Mill Levy	42	47%
No County-Wide Mill Levy	40	45%
No Response	7	8%
Total System Airports	**89**	**100%**

Source: Airport Manager Survey

3.11.3 Non-Mill Levy Revenue

Airports can also generate revenue from other sources besides levies such as hangar rental charges, fuel surcharges, and landing fees. **Table 3.43** summarizes the airports that receive financial support from other sources, according to airport manager survey responses. Approximately 50% of system airports have other revenue sources, while under 30% do not. **Table B.22** in **Appendix B** lists the airports that have other revenue sources.

Table 3.43: NDSASP Airport Non-Mill Levy Revenue

Non-Mill Levy Revenue	Number of System Airports	Percentage of System Airports
Non-Mill Levy Revenue	45	51%
No Non-Mill Levy Revenue	25	28%
No Response	19	21%
Total System Airports	**89**	**100%**

Source: Airport Manager Survey

3.12 Energy

As discussed in Chapter 1 of this report, North Dakota is experiencing rapid growth due to increases in activity in the energy industry, such as drilling for oils in the Bakken Shale Oil Field. This growth has impacted system airports in several ways as discussed in the following subsections.

3.12.1 Airports That Have Experienced Energy Impacts

The increase in activity in the energy industry in North Dakota has increased use of many system airports. Some of these airports cannot meet user demand and are experiencing a shortage in available apron space and hangars, increased terminal building demand, fuel shortages, requests for better runway approaches, lower minimums and additional runway length, shortages in auto parking and other impacts. **Table 3.44** summarizes the impacts experienced by system airports as a result of the increased activity in the energy industry, as reported by airport managers. The top three impacts reported are shortages in available hangars (39%), increases in aircraft or passenger traffic (35%), and requests for additional runway length (26%). **Table B.23** in **Appendix B** catalogs the impacts reported by each system airport.

Table 3.44: NDSASP Airport Energy Impacts

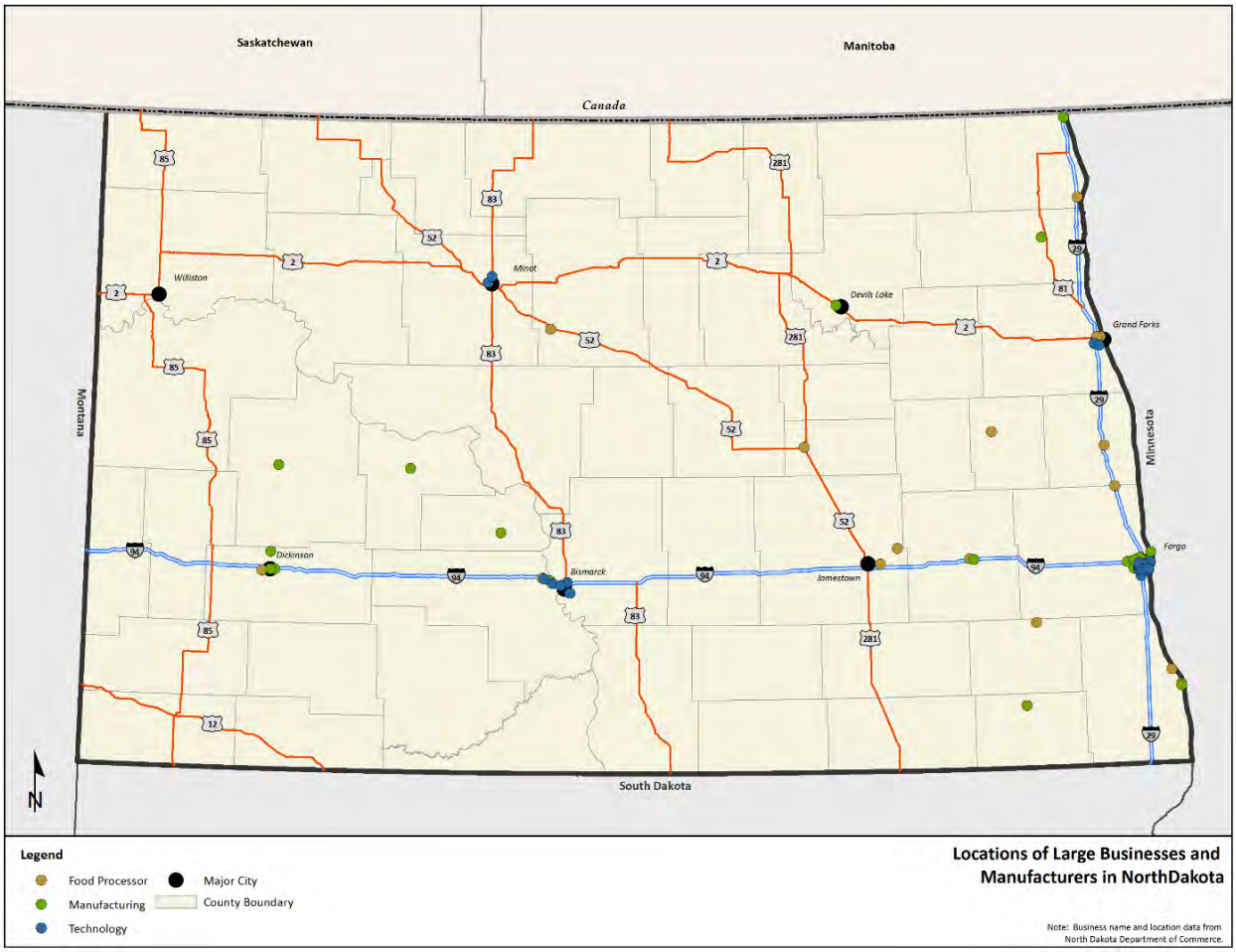
Experienced Energy Impacts	Number of System Airports	Percentage of System Airports
Increase in Aircraft or Passenger Traffic	31	35%
Shortage in Available Apron Space	22	25%
Shortage in Available Hangars	35	39%
Terminal Building Demand	22	25%
Fuel Shortage	10	11%
Requests for Better Approaches/Lower Minimums	20	23%
Shortage in Auto Parking	13	15%
Requests for Additional Runway Length	23	26%
Other	7	8%

Source: Airport Manager Survey

3.12.2 Locations of Large Businesses, Manufacturers, and Energy Related Plants

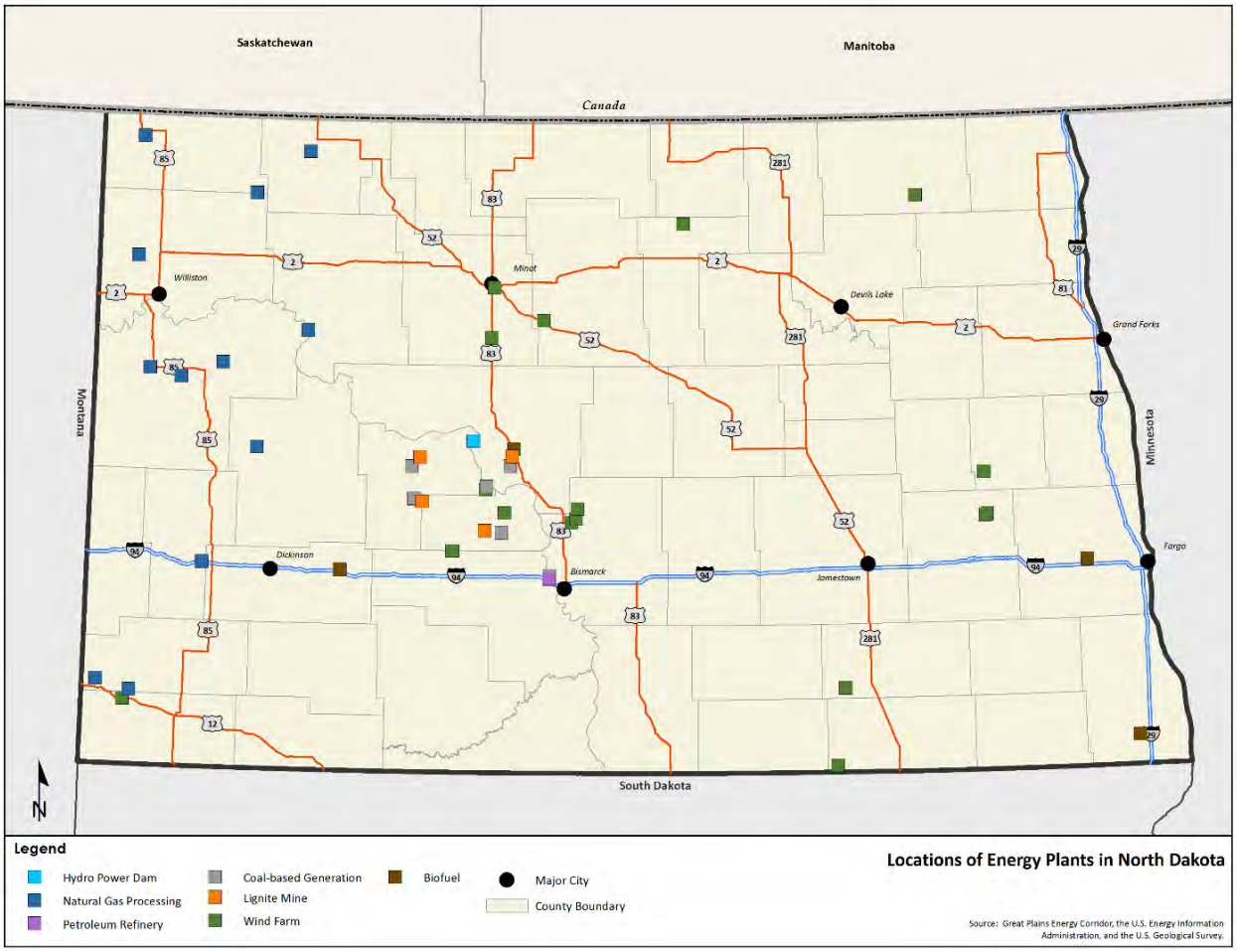
Airports within the North Dakota Aviation System support large manufacturers, energy related plants and other businesses. **Figure 3.16** shows the location of the 25 largest businesses in each of the following categories: food processing, manufacturing, and technology, based on the number of employees that each business has as reported by the North Dakota Department of Commerce. **Figure 3.17** illustrates the locations of numerous energy related plants across North Dakota, according to information from the Great Plains Energy Corridor, the U.S. Energy Information Administration, and the U.S. Geological Survey.

Figure 3.16 – Locations of Large Businesses and Manufacturers



Source: Business location data from North Dakota Department of Commerce

Figure 3.17 – Locations of Energy Related Plants



Source: Great Plains Energy Corridor, the U.S. Energy Information Administration, and the U.S. Geological Survey

3.13 Summary

This chapter identified current conditions of the 89 airports in North Dakota's aviation system. The inventory of these facilities and services is an important step in developing a plan for the system as a whole. The current conditions establish a baseline for airport evaluation and system analysis (Chapter 5) and the resulting recommendations (Chapter 6). This information may also be used by the NDAC in developing policy, distributing funding and making development and improvement decisions.

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CHAPTER 4 – AVIATION DEMAND PROJECTIONS

Projecting aviation demand is a crucial element in the aviation system planning process. It provides the basis for several key analyses, including:

- Determining the role of airports within North Dakota's aviation system
- Evaluating the capacity of existing airport facilities and their ability to accommodate projected aviation demand
- Estimating the extent of airside and landside improvements required in the future to accommodate projected demand
- Formulating critical aircraft and runway length projections for master plans and environmental planning for the airport system

This chapter provides projections of future aviation demand at the 89 public use airports within the North Dakota State Aviation System Plan (NDSASP). Projections of short, intermediate, and long-term activity at these airports are based on milestones in roughly five-year increments as follows: 2013, 2018, 2025, 2030, and 2035. The base year is 2013 because it was the most recent year for which a full year of activity data was available when the demand projections were developed.

This analysis uses the most recent aircraft activity data available to project future levels of aviation demand through the year 2035. The forecasting effort includes methodologies based on socioeconomic trends occurring in North Dakota. National projections of aviation activity developed by the Federal Aviation Administration (FAA) were also reviewed within the context of this forecast analysis.

This chapter provides a background on the significant growth that North Dakota has been experiencing from the oil boom (which impacts forecasting efforts). The chapter also discusses the methodologies that were evaluated and considered before selecting the preferred method to develop projections of passenger enplanements, aircraft operations, and based aircraft for airports in the system.

This chapter includes the following sections on trends, methodologies, and forecasting:

4.1 North Dakota's Growth
4.2 Statewide Socioeconomic and Demographic Trends
4.3 Overview of the U.S. Aviation Industry Trends
4.4 Forecasting Approach
4.5 Forecasting Results Summary

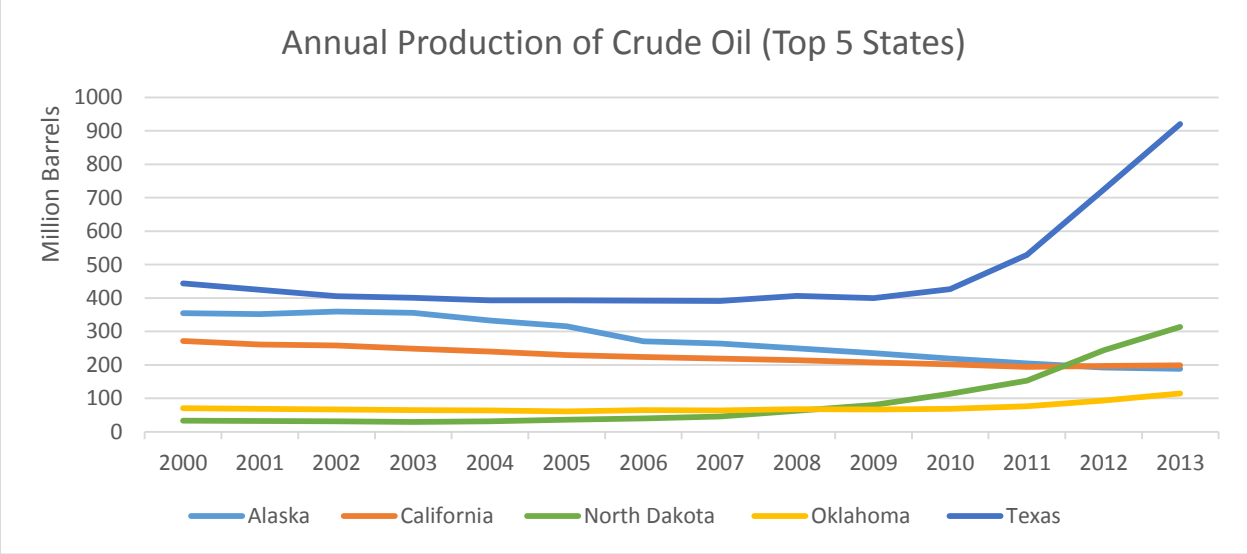
4.1 North Dakota's Growth

The United States has recently passed Saudi Arabia and Russia in oil production, becoming the world's biggest producer of oil and natural gas liquids in 2014, according to the International Energy Agency.[1] This growth is due in part to the soaring oil extraction in the Bakken region in North Dakota. The Bakken formation is one of the largest contiguous deposits of oil and natural gas in the United States and is home to six of the top 100 oil fields in the nation. It underlies large areas of northwestern North Dakota as well as northeastern Montana, and the southern portion of the Canadian provinces of Saskatchewan and Manitoba. Technological advances in hydraulic fracturing (fracking) and horizontal drilling have allowed access to shale formations that were previously out of reach. North Dakota now ranks 2nd (behind Texas) in the ten most oil-rich states, according to *USA Today*. In 2013, the state accounted for more than 11.5% of total U.S. crude oil production; an increase of 177% in production from 2010 to 2013. Proven oil reserves in the state have more than doubled in the last few years and during the ten-year period between 2003 and 2013, oil production in North Dakota increased by almost 1,000%.[2] **Figure 4.1** and **Figure 4.2** illustrate oil production rates in North Dakota, compared to other top oil producing states.

North Dakota ranks No.2

According to the U.S. Energy Information Administration data provided for April 2014, North Dakota is now the second largest oil producer in the United States.

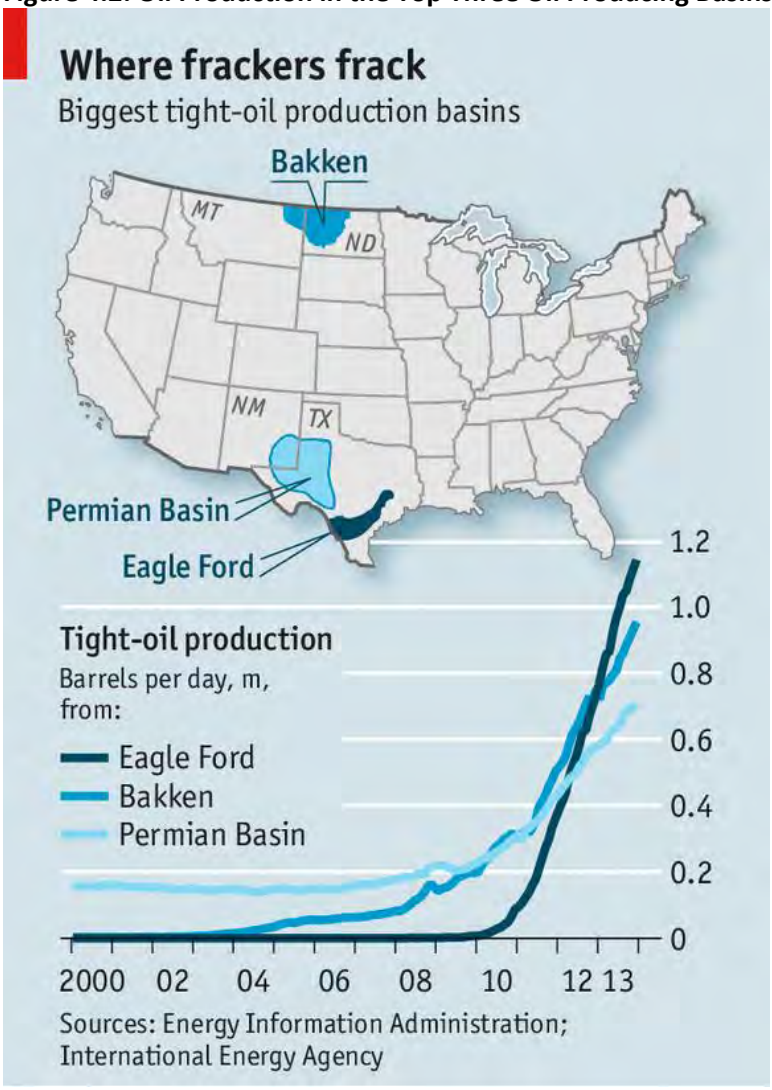
Figure 4.1: Oil Production in the Top 5 Oil Producing States through 2013



Source: Energy Information Administration (EIA)
Note: North Dakota's oil production continues to rise. Reported oil production for the first ten months of 2014 is 324,799,000 barrels, according to the EIA. The complete 2014 year data was not available at the time of this writing.

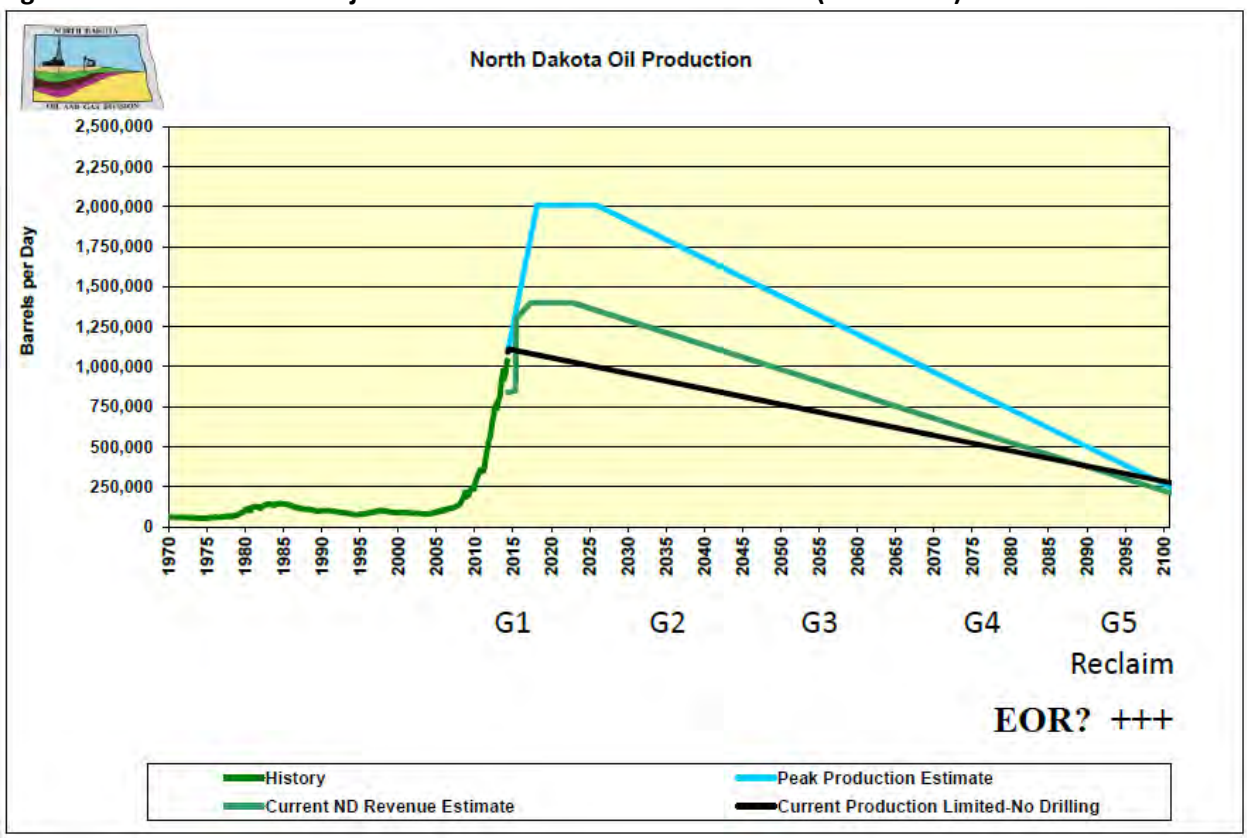
[1] http://www.bloomberg.com/news/2014-07-04/u-s-seen-as-biggest-oil-producer-after-overtaking-saudi.html
[2] http://www.usatoday.com/story/money/business/2014/08/03/oil-rich-states/13443353/

Figure 4.2: Oil Production in the Top Three Oil Producing Basins through 2013



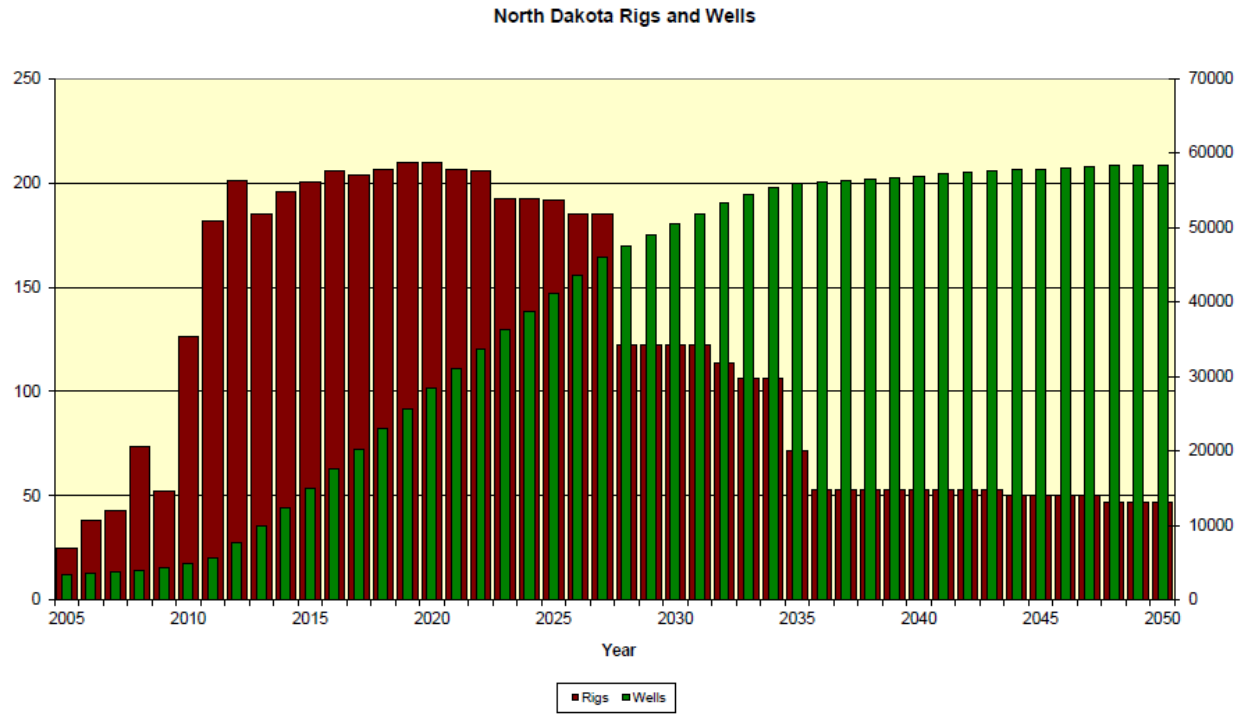
Oil production in North Dakota is not expected to slow anytime soon, with over one million barrels per day being produced in 2014, according to the North Dakota Department of Mineral Resources. The peak oil production is forecasted to reach two million barrels per day by 2016/2017 and continue at that rate for about ten years before declining slowly, shown in **Figure 4.3**. The number of oil rigs in the state has more than tripled in the past ten years, reaching nearly 200 in 2014. At the same time, the number of oil wells in the state has been steadily increasing and is anticipated to continue increasing through 2050, shown in **Figure 4.4**.

Figure 4.3: Historical and Projected Oil Production in North Dakota (1970-2100)



Source: North Dakota Department of Mineral Resources

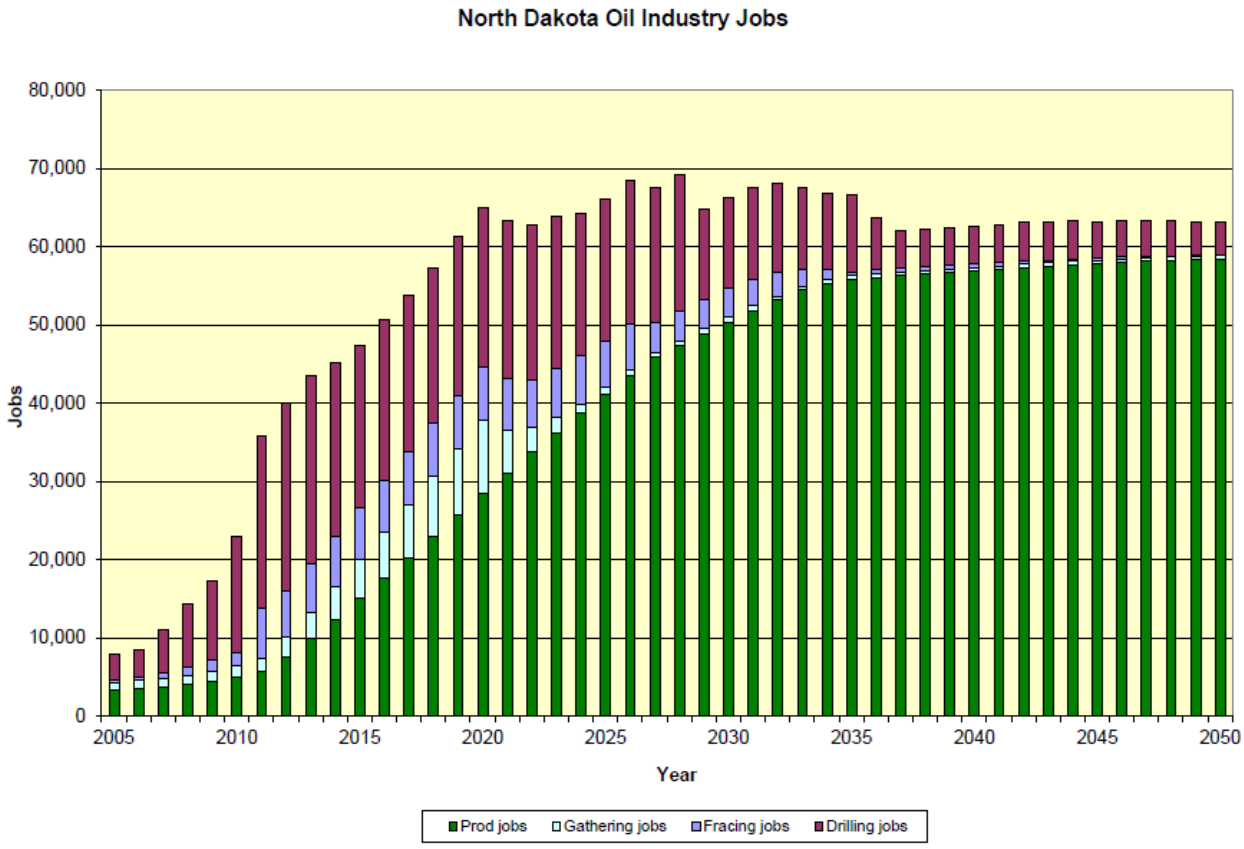
Figure 4.4: Oil Rigs and Wells in North Dakota (2005-2050)



Source: North Dakota Department of Mineral Resources

As a result of the oil boom in North Dakota, the number of oil-related jobs (production, gathering, fracking, drilling) continues to rise year after year. The North Dakota Department of Natural Resources is estimating the number of oil industry jobs to peak in 2028, at just shy of 70,000, shown in **Figure 4.5**. With jobs on the rise, it isn't a surprise that the state has consistently had the lowest unemployment rate in the U.S. since 2009.[3] Unemployment rates by county as of September 2014 are shown in **Figure 4.6**.

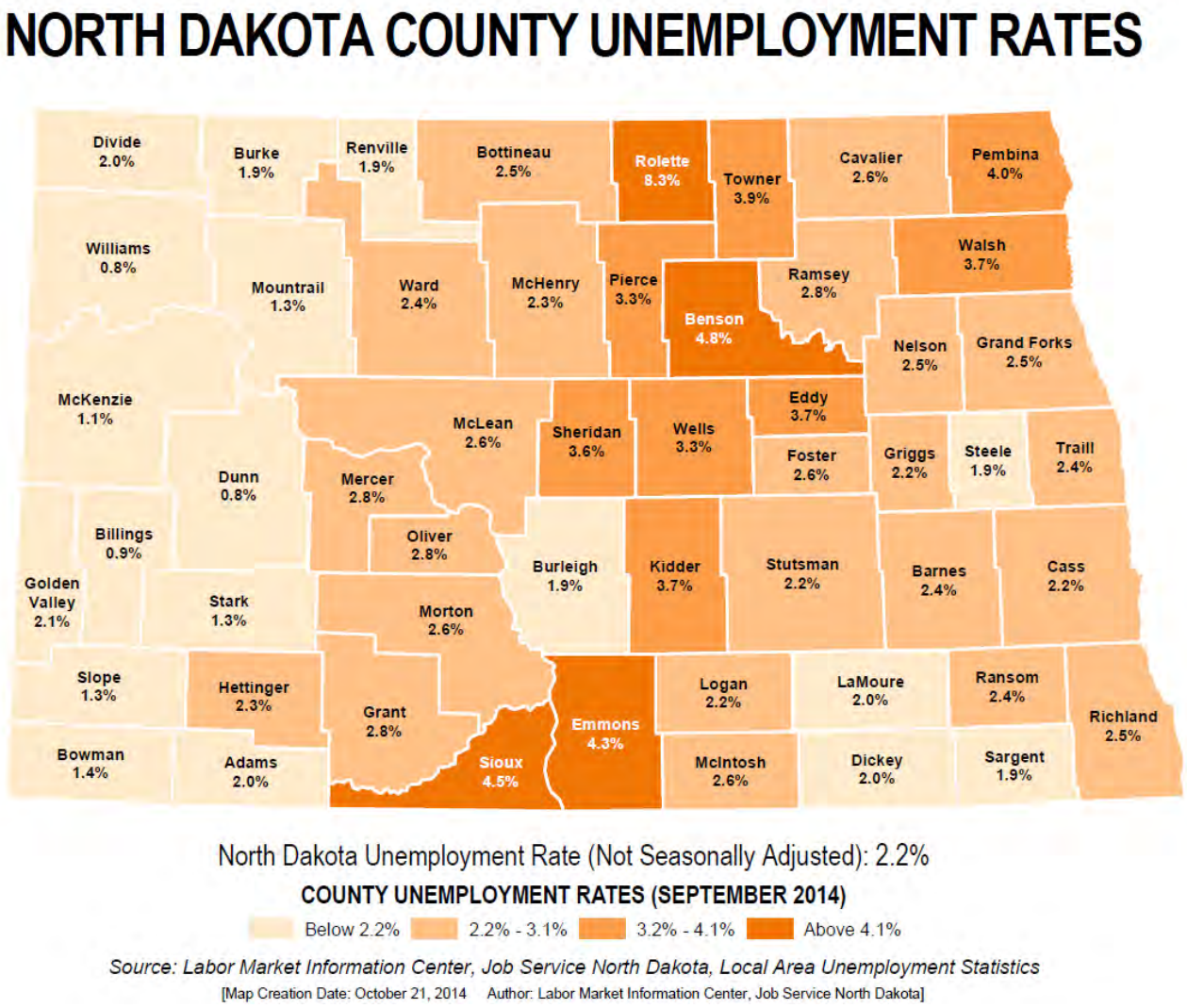
Figure 4.5: Oil Industry Jobs in North Dakota (2005-2050)



Source: North Dakota Department of Mineral Resources

[3] http://www.usatoday.com/story/money/business/2014/08/03/oil-rich-states/13443353/

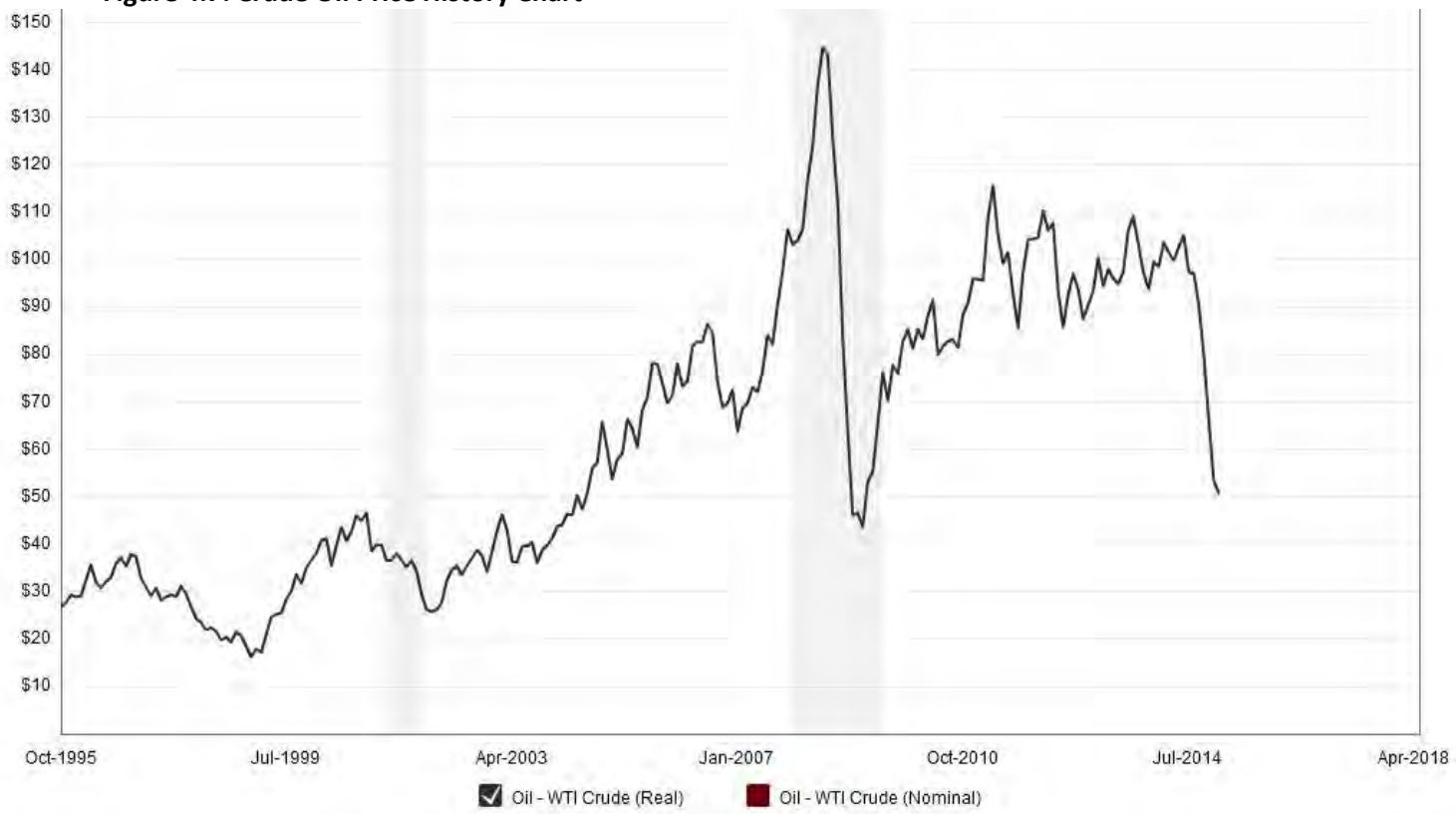
Figure 4.6: North Dakota Unemployment Rates by County (September 2014)



The price of oil has fluctuated greatly over the past several decades, however, since the late 1990s it has generally been on the rise. **Figure 4.7** illustrates the price per barrel of oil since late 1995. Until recently, the last major drop in oil prices was seen during the economic downturn of 2008 where oil hit a low of $43 per barrel. From 2011 through mid-2014, the price of oil rose and remained around the $100 per barrel mark. Recently, however, the combination of rising world supply and weaker demand has caused the cost of oil to drop to a low of about $50 per barrel in January 2015. It is unknown exactly how the drop in oil prices will affect oil production in North Dakota, however, some companies may reduce production in the U.S. to meet current demand, which could result in lower revenues and economic activity in the state. Although production may slow down for the time being, the oil boom continues to boost the state economy and drive additional aviation activity overall. Since these fluctuations are influenced by what is happening in the U.S., as well as abroad, it is difficult to project how long these drops in prices will last

and, more importantly, the overall impact to the region. For this reason, the forecasts contained in this chapter have taken into account growth in oil production, however, not in an aggressive scenario.

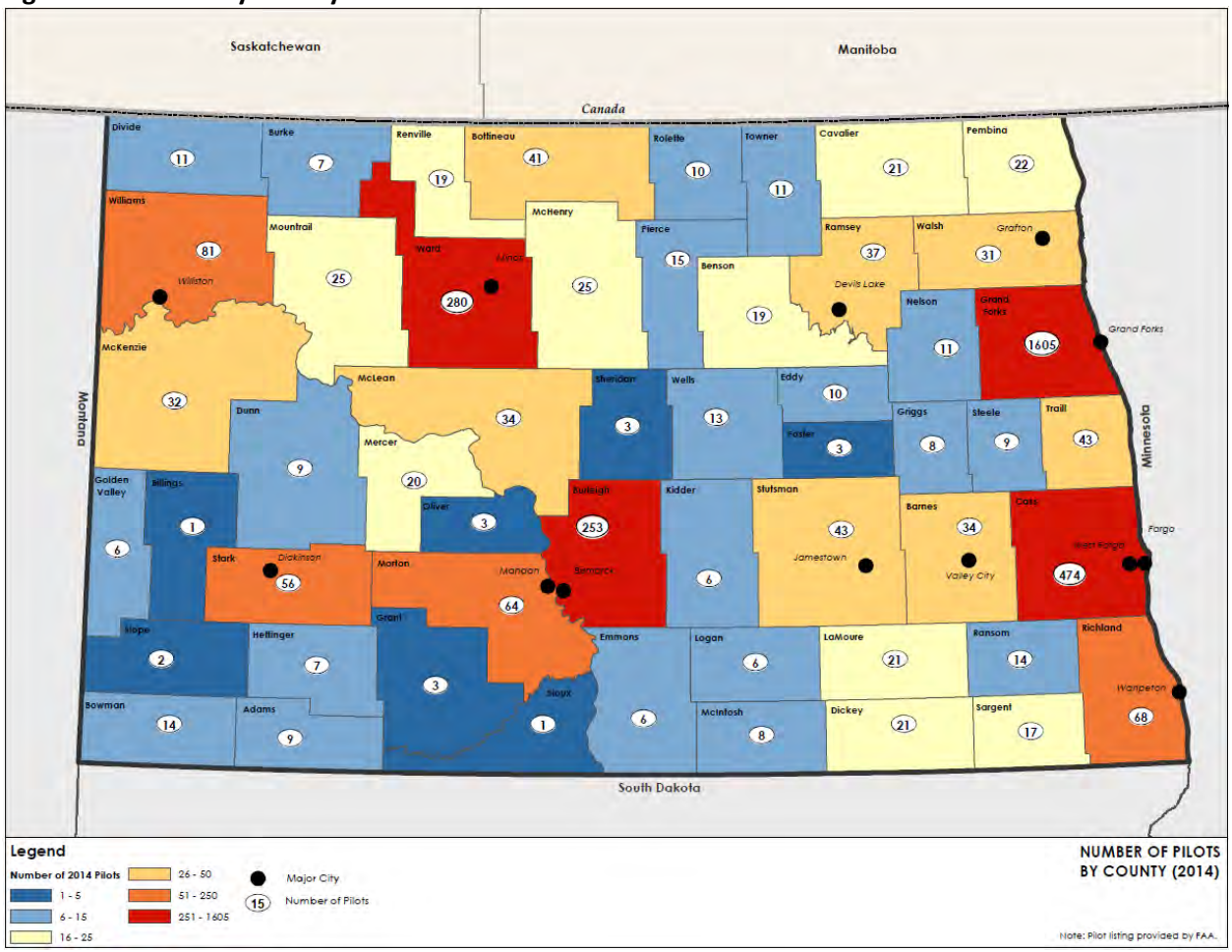
Figure 4.7: Crude Oil Price History Chart



Source: http://www.macrotrends.net/1369/crude-oil-price-history-chart using information from the Energy Information Administration

The oil boom has impacted many industries in the state, as population and average income continues to rise. North Dakota's aviation industry has seen tremendous growth in the number of licensed pilots, registered aircraft, based aircraft, operations, and enplanements. For example, since the last system plan update in 2007, an additional 50 aircraft have been registered and the total number of licensed pilots has increased 48 % to nearly 3,600 total, shown in **Figure 4.8**.

Figure 4.8 – Pilots by County in 2014



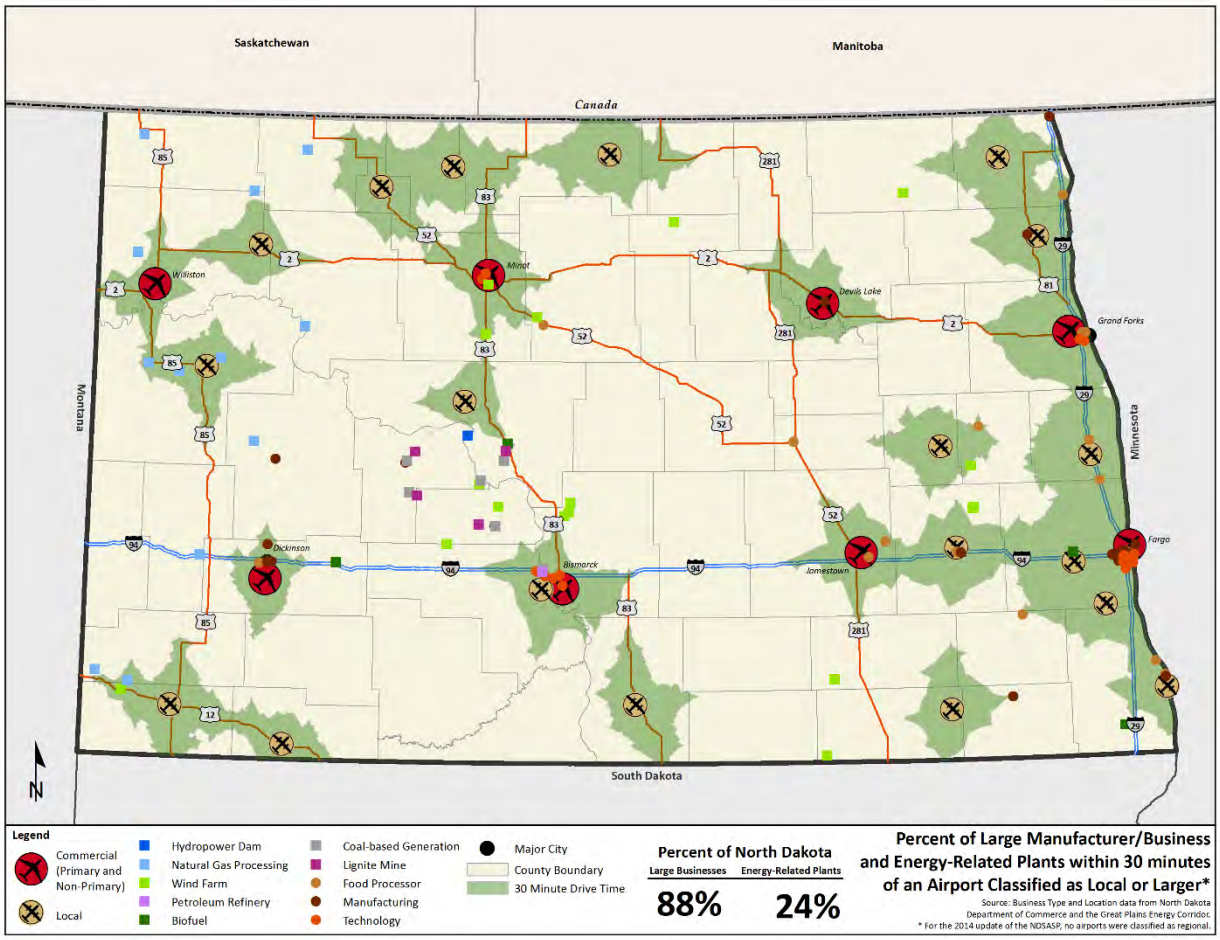
Source: FAA Pilot Listing, mapped by Mead & Hunt, Inc.

Air service is no exception to this growth, with the state currently averaging 75 airline departures per day to 12 different destination airports. For perspective, in 2008, the state averaged 52 airline departures per day to six destination airports and four of the eight commercial service airports were receiving support through the Essential Air Service (EAS) program. Today, Jamestown and Devils Lake are the only two commercial service airports that utilize EAS (Williston and Dickinson are no longer part of the EAS program). As of June 2014, for the first time all eight commercial service airports in North Dakota have jet service.

North Dakota is home to a variety of large companies and energy-related facilities that support the state's economy, provide jobs for North Dakotans, and benefit from access to aviation. To determine the percentage of these companies and facilities within a reasonable drive time of airports able to support corporate aviation, a 30-minute buffer was measured. **Figure 4.9** illustrates the coverage of area and population within the established drive time. Information on the location of large manufacturers and businesses (the 25 largest businesses in the following categories: food processing, manufacturing, and

technology, based on the number of employees that each business has) was provided by the North Dakota Department of Commerce. Information on the location of energy related plants across the state was provided by the Great Plains Energy Corridor, the U.S. Energy Information Administration, and the U.S. Geological Survey (USGS). North Dakota's larger airports are within a reasonable distance of 88 % of the large businesses, and 24 % of the energy-related plants.

Figure 4.9: Percent of Large Manufacturers, Businesses, and Energy Related Plants within 30 Minutes of Local or Larger Airports



Source: Business location data from North Dakota Department of Commerce. Energy plant data from the Great Plains Energy Corridor, the U.S. Energy Information Administration, and the U.S. Geological Survey

The growth discussed in this section greatly impacts all aviation forecasts for North Dakota's aviation system. Additional detail on specific socioeconomic and industry trends and their impact on NDSASP forecasts is provided in the following sections.

4.2 Statewide Socioeconomic and Demographic Trends

North Dakota's "oil boom" and robust agricultural climate is driving economic and population growth, especially on the western side of the state and in the larger metropolitan areas of Fargo and Grand Forks on the state's east side. Although the state has one of the smallest populations in the U.S., it experienced the greatest percent increase in Gross Domestic Product (GDP) in 2012, primarily because of the oil boom.[4]

It is a consensus among state industry officials that the production of oil and natural gas in the Bakken region will continue well into the future. Researchers studying the economic impact of oil and gas extraction and its potential impact on employment and population have forecast that the industry will continue to expand exploration and extraction activity well into the middle 2030s. In April 2013, the USGS released a new study estimating the Bakken formation and surrounding oil fields could yield up to 7.4 billion barrels of oil, 6.7 trillion cubic feet of associated/dissolved natural gas, and 0.53 billion barrels of natural gas liquids. The estimate of oil production was based on new information available from the more than 4,000 wells that have been drilled in the past five years, and it is twice what was estimated in 2008.[5]

Socioeconomic and demographic trends ultimately affect the demand for aviation facilities and services within North Dakota. A review of these conditions is important to help shape the future of the state's aviation system. The socioeconomic data presented in this chapter is provided primarily by Woods & Poole Economics, Inc. (W&P), an independent firm that specializes in long-term county economic and demographic projections. Unless otherwise noted, the data used for this report comes from a document produced by W&P titled *CEDDS 2014: Complete Economic and Demographic Data Source* (CEDDS 2014). This socioeconomic data source is a recognized standard in the aviation industry.

4.2.1 Population

W&P reported the 2010 North Dakota statewide population at 674,629 residents. In 2013, W&P estimates that the state population has reached 694,750 – an increase of 3% over three years. According to the U.S. Census Bureau, North Dakota's total population climbed by 2.17% between July 1, 2011, and July 1, 2012, which was the fastest growth of any state, and nearly three times faster than the nation as a whole.[6] Also according to Census Bureau state population estimates, North Dakota's most populous county is Cass County with a 2010 population of 150,263. Cass County is host to the City of Fargo and the adjacent City of West Fargo. Combined, these two cities accounted for 131,379 of the county's population. Only three other counties had a 2010 population that exceeded 50,000: Burleigh (88,706), Grand Forks (66,945) and Ward (62,081).

[4] North Dakota State Energy Profile. U.S. Energy Information Administration. Updated March 27, 2014. http://www.eia.gov/state/print.cfm?sid=ND

[5] "Assessment of Undiscovered Oil Resources in the Bakken and Three Forks Formations, Williston Basin Province, Montana, North Dakota, and South Dakota, 2013." Fact Sheet 2013-3013, April 2013, USGS.

[6] North Dakota is Nation's Fastest-Growing State Since 2011. U.S. Census Bureau Newsroom. December 20, 2012.

Burleigh includes Bismarck (61,272). Grand Forks County includes the city of Grand Forks (52,838), while the City of Minot (40,888) is located in Ward County.

While both the U.S. Census and W&P report current population conditions with reasonable accuracy, the question of population projections for the state of North Dakota poses a special challenge. The U.S. Census does not currently produce projections and the W&P population projections do not appear to capture the nuances of the exponential growth rates that are currently being experienced in some counties in the state. An additional resource for population projections was available through the North Dakota Statewide Housing Assessment Project, developed by the Center for Social Research at North Dakota State University. With its focus on the state, this third resource demonstrates a more accelerated population growth rate after 2010 in some counties in the Bakken formation areas. The statewide 2010 population number reported in this study was 672,591 – slightly below the W&P number. However, the study projects a statewide population growth rate of 25.2% from 2010 – 2025 and a population growth rate of 137% in Region I (Divide, Williams, and McKenzie Counties) and 59.5% in Region VIII (Dunn, Billings, Golden Valley, Stark, Slope, Hettinger, Bowman, and Adams Counties) in that same time. **Figure 4.10** illustrates the eight regions within the state.

In March 2014, the North Dakota Department of Commerce reported on North Dakota's growth areas compared with national trends as follows:

> Of the nation's ten fastest growing metropolitan areas, Fargo and Bismarck ranked fourth and fifth respectively. The Fargo metro area (Cass and Clay Counties) gained 6,075 residents, while the Bismarck metro area gained 3,528 residents. Three of the top five micro areas ranked as the nation's fastest growing are in North Dakota, with Williston taking the top spot. Dickinson ranked second on the list and Minot rounded off the top five as the fifth fastest growing micro area.[7]

[7] https://www.commerce.nd.gov/news/NorthDakotaCensusEstimatesShowStatewidePopulationGrowth/

Figure 4.10: Regions in the North Dakota Statewide Housing Assessment Project

Source: North Dakota Statewide Housing Assessment Resource Project. The Center for Social Research at North Dakota State University. http://www.ndsu.nodak.edu/sdc/sharp/

Table 4.1 contains North Dakota's population change by county from 2000 through 2010 and the projected change from 2010 – 2025 based on the Statewide Housing Assessment Resource Project. **Figure 4.11** illustrates the estimated population change by county from 2010 to 2025.

Table 4.1: North Dakota Population Change by County

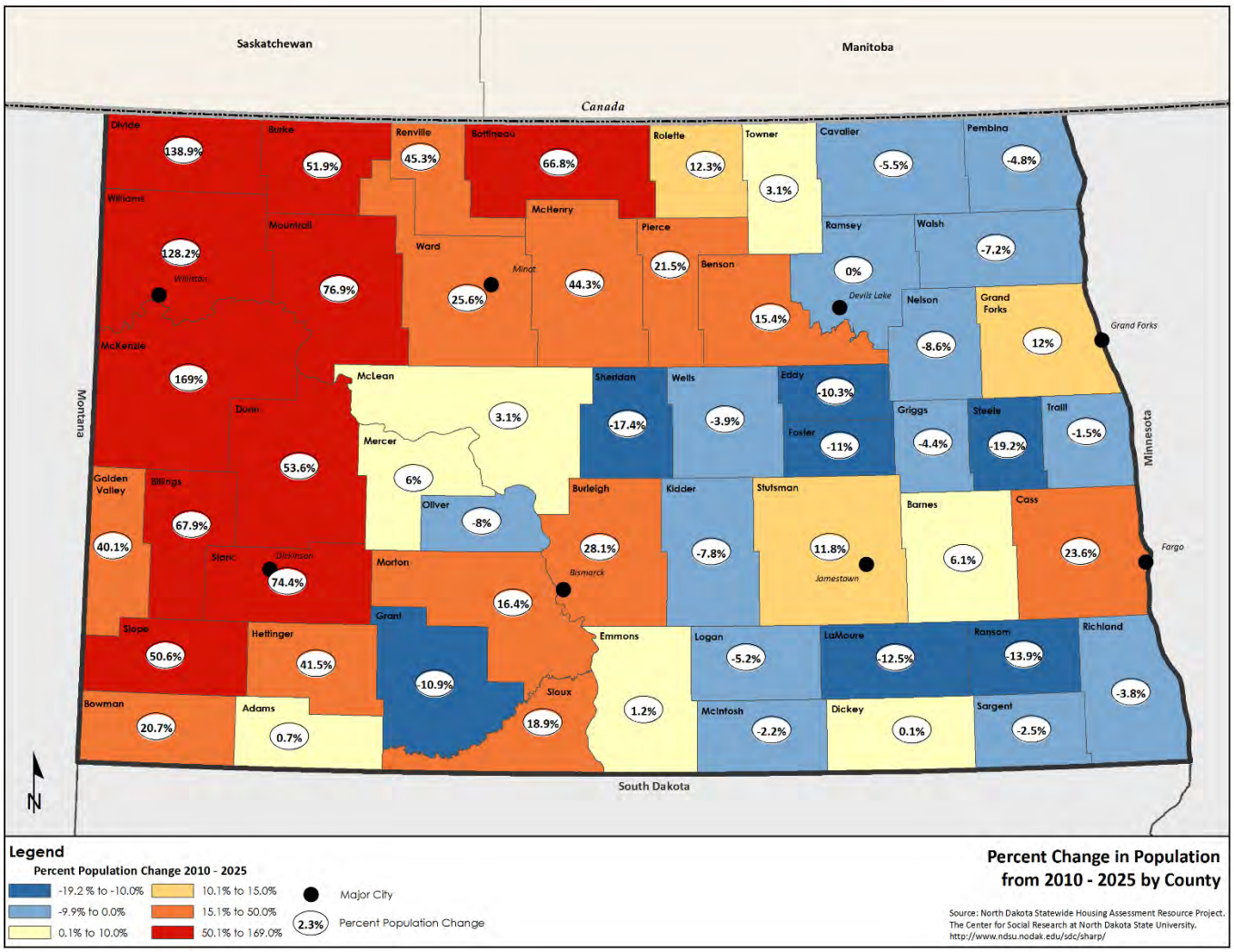
	2000	2010	Percent Change 2000-2010	2015	2020	2025	Percent Change 2010-2025
State of North Dakota	**642,200**	**672,591**	**4.7%**	**750,023**	**806,541**	**841,820**	**25.2%**
County							
Adams	2,593	2,343	-9.6%	2,347	2,297	2,360	0.7%
Barnes	11,775	11,066	-6%	11,372	11,574	11,743	6.1%
Benson	6,964	6,660	-4.4%	6,970	7,322	7,686	15.4%
Billings	888	783	-11.8%	997	1,183	1,315	67.9%
Bottineau	7,149	6,429	-10.1%	9,984	10,691	10,721	66.8%
Bowman	3,242	3,151	-2.8%	3,357	3,563	3,804	20.7%
Burke	2,242	1,968	-12.2%	2,921	3,043	2,989	51.9%
Burleigh	69,416	81,308	17.1%	88,543	96,055	104,154	28.1%
Cass	123,138	149,778	21.6%	161,283	172,921	185,071	23.6%
Cavalier	4,831	3,993	-17.3%	3,909	3,805	3,773	-5.5%
Dickey	5,757	5,289	-8.1%	5,315	5,313	5,296	0.1%
Divide	2,283	2,071	-9.3%	3,273	4,313	4,948	138.9%
Dunn	3,600	3,536	-1.8%	4,550	5,254	5,433	53.6%
Eddy	2,757	2,385	-13.5%	2,254	2,182	2,139	-10.3%
Emmons	4,331	3,550	-18%	3,606	3,575	3,593	1.2%
Foster	3,759	3,343	-11.1%	3,153	3,018	2,974	-11%
Golden Valley	1,924	1,680	-12.7%	1,954	2,205	2,354	40.1%
Grand Forks	66,109	66,861	1.1%	69,268	72,014	74,894	12%
Grant	2,841	2,394	-15.7%	2,291	2,192	2,133	-10.9%
Griggs	2,754	2,420	-12.1%	2,393	2,352	2,314	-4.4%
Hettinger	2,715	2,477	-8.8%	2,920	3,341	3,506	41.5%
Kidder	2,753	2,435	-11.6%	2,389	2,319	2,246	-7.8%
La Moure	4,701	4,139	-12%	3,926	3,771	3,620	-12.5%
Logan	2,308	1,990	-13.8%	1,884	1,861	1,886	-5.2%
Mchenry	5,987	5,395	-9.9%	7,116	7,687	7,784	44.3%
Mcintosh	3,390	2,809	-17.1%	2,767	2,766	2,747	-2.2%
Mckenzie	5,737	6,360	10.9%	11,771	15,550	17,110	169%
Mclean	9,311	8,962	-3.7%	9,158	9,277	9,237	3.1%
Mercer	8,644	8,424	-2.5%	8,684	8,817	8,927	6%
Morton	25,303	27,471	8.6%	29,048	30,498	31,976	16.4%
Mountrail	6,631	7,673	15.7%	12,819	13,527	13,575	76.9%
Nelson	3,715	3,126	-15.9%	3,047	2,976	2,857	-8.6%
Oliver	2,065	1,846	-10.6%	1,803	1,747	1,699	-8%
Pembina	8,585	7,413	-13.7%	7,278	7,174	7,060	-4.8%
Pierce	4,675	4,357	-6.8%	4,958	5,202	5,295	21.5%
Ramsey	12,066	11,451	-5.1%	11,428	11,472	11,452	0%
Ransom	5,890	5,457	-7.4%	5,166	4,907	4,699	-13.9%

Table 4.1: North Dakota Population Change by County

	2000	2010	Percent Change 2000-2010	2015	2020	2025	Percent Change 2010-2025
Renville	2,610	2,470	-5.4%	3,337	3,593	3,589	45.3%
Richland	17,998	16,321	-9.3%	16,171	15,971	15,701	-3.8%
Rolette	13,674	13,937	1.9%	14,596	15,172	15,651	12.3%
Sargent	4,366	3,829	-12.3%	3,794	3,763	3,733	-2.5%
Sheridan	1,710	1,321	-22.7%	1,255	1,183	1,091	-17.4%
Sioux	4,044	4,153	2.7%	4,415	4,693	4,937	18.9%
Slope	767	727	-5.2%	837	1,056	1,095	50.6%
Stark	22,636	24,199	6.9%	31,547	39,195	42,191	74.4%
Steele	2,258	1,975	-12.5%	1,824	1,689	1,595	-19.2%
Stutsman	21,908	21,100	-3.7%	21,861	22,623	23,598	11.8%
Towner	2,876	2,246	-21.9%	2,277	2,301	2,315	3.1%
Traill	8,477	8,121	-4.2%	8,084	8,033	8,000	-1.5%
Walsh	12,389	11,119	-10.3%	10,913	10,636	10,314	-7.2%
Ward	58,795	61,675	4.9%	73,574	77,682	77,490	25.6%
Wells	5,102	4,207	-17.5%	4,142	4,071	4,044	-3.9%
Williams	19,761	22,398	13.3%	35,485	47,075	51,106	128.2%

Source: North Dakota Statewide Housing Assessment Resource Project. The Center for Social Research at North Dakota State University. http://www.ndsu.nodak.edu/sdc/sharp/

Figure 4.11 – Forecasted Population Change by County 2010-2025



According to W&P's CEDDS 2014, North Dakota ranked 45th in the nation based on the annual average population growth rate from 1970-2010, but moved to 29th based on projections for 2010-2040. At the same time, North Dakota is ranked 48th by total residential population and is projected to remain in that spot through 2040. So the projected population growth in percentage shows the change in population in relation to the actual base population. Also, of the 53 counties in North Dakota, 20 are projected by the Statewide Housing Assessment Resource Project to experience a population decrease through 2025 so the projected population growth is taking place in specific geographic areas. Planning for the state aviation system needs to reflect these unique circumstances.

4.2.2 Economic Factors

Economic trends have an impact on the demand for aviation services and were reviewed as part of the aviation demand forecasting efforts. According to a news release from the Bureau of Economic Analysis, North Dakota had the nation's fastest growing economy in 2013 with a 9.7 % growth in real GDP,[8] the state's third year in the leading position. In 2012, the state experienced an increase of 13.4 % in GDP.[9] Historic and projected levels of three economic factors including total employment, per capita income, and retail sales were obtained from W&P. The W&P data, which is available by county, was compared to a statewide economic forecast prepared in 2012 by North Dakota's Labor Market Information Center – part of Job Service North Dakota. The report produced by the state's Labor Market Information Center forecasts a 2022 statewide employment number of 542,416. The W&P forecast numbers for 2020 and 2025 are both higher than this (596,858 and 639,626 respectively), but in the same range when compared to the Labor Market Information Center's forecast, providing an informal validation of the W&P economic forecasts.

Table 4.2 summarizes the economic trends occurring within the state. All three of the factors noted previously are projected to increase through the year 2035 at rates ranging from 1.39% to 1.75% Compound Annual Growth Rate (CAGR). The FAA notes that there is a strong correlation between economic growth and aviation demand in the *FAA Aerospace Forecast Fiscal Years 2014-2034* writing that "…fundamentally, demand for aviation is driven by economic activity. As the economy returns to growth, so will aviation."[10] This suggests that North Dakota will experience a steady increase in aviation demand during the 20-year planning horizon based on the projections for statewide economic growth.

Table 4.2: North Dakota State Economic Trend Data

Year	Total Employment	Income per Capita (in 2009 dollars)	Total Retail Sales (in 2009 dollars)
1975	313,543	21,042	6,562,506
1980	354,838	17,947	7,693,181
1985	363.526	22,464	7,594,144
1990	373.873	23,526	7,333,298
1995	418,072	24,889	8,525,630
2000	443,467	30,786	9,932,240
2005	462,672	34,462	11,055,839
2010	504,067	41,771	10,887,885
2011	527,004	45,382	11,503,852
2012	534,316	45,153	11,704,424

[8] http://www.bea.gov/newsreleases/regional/gdp_state/gsp_newsrelease.htm. News Release BEA 14—25.
[9] http://www.bea.gov/newsreleases/regional/gdp_state/2013/pdf/gsp0613.pdf. News Release BEA 13—25.
[10] FAA Aerospace Forecast Fiscal Years 2014-2034.

Table 4.2: North Dakota State Economic Trend Data

Year	Total Employment	Income per Capita (in 2009 dollars)	Total Retail Sales (in 2009 dollars)
2013	541,764	45,583	11,908,444
Projected			
2018	580,572	48,369	12,984,253
2025	639,626	53,443	14,657,931
2030	685,425	57,731	15,985,197
2035	734,454	62,564	17,433,444
CAGR (2013 – 2035)	1.39%	1.45%	1.75%

CAGR: Compound Annual Growth Rate
Source: Woods & Poole Economics, Inc.

Within the state, there are specific areas where more notable economic growth is projected. These include 15 counties where retail sales growth is projected to exceed 1%. The rate of population growth for these counties has the same order of increase indicating that population growth and retail sales growth have a direct correlation. As shown in **Table 4.3**, 12 of the same counties are also ranked in the top 15 for projected employment growth. Some counties, such as McKenzie and Mountrail, ranked higher in total employment than in retail sales and population due to the higher percentage of transient workers in the oil industry. Personal income correlated with only four counties appearing in the top 15 list.

Table 4.3: Top 15 Counties Ranked by Projected Increase in Retail Sales (CAGR* 2013 -20135)

County	Retail Sales ranking	Total Population ranking	Total Employment ranking	Income per Capita ranking
CASS	1st	1st	2nd	
BURLEIGH	2nd	2nd	1st	
STARK	3rd	3rd	5th	
MORTON	4th	4th	10th	
WILLIAMS	5th	5th	11th	
OLIVER	6th	6th	7th	
MERCER	7th	7th	13th	
WARD	8th	8th	9th	
MOUNTRAIL	9th	9th	4th	8th
MCKENZIE	10th	10th	3rd	5th
RICHLAND	11th	11th		
ROLETTE	12th	12th		
SIOUX	13th	13th	14th	9th
HETTINGER	14th	14th		6th
SLOPE	15th	15th	12th	

Source: Woods & Poole Economics, Inc.
*CAGR = Compound Annual Growth Rate

4.3 Overview of the U.S. Aviation Industry Trends

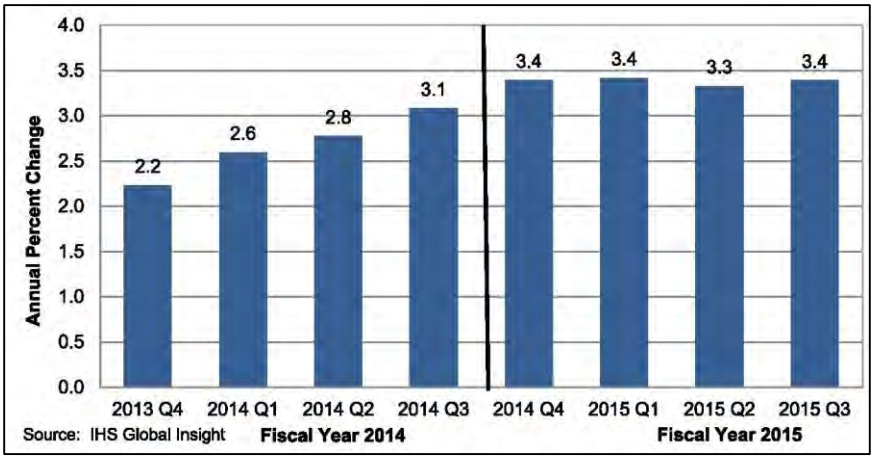
The following sections present a summary of some of the current national aviation trends as detailed in the *FAA's Aerospace Forecasts Fiscal Year 2014-2034* and the associated projections for commercial and general aviation activity. In many cases, national aviation trends are a guiding force applied to aviation forecasts at the state level. In North Dakota, the acceleration in both population and economic growth triggered by the oil boom is expected to overshadow the influence of the national trends in the development of individual forecasts. They are, however, important to the understanding of long-term trends in aviation.

4.3.1 Socioeconomic Trends

The FAA uses world and individual country economic projections provided by IHS Global Insight, Inc. to forecast the demand for domestic aviation services. While these projections are carefully developed, the FAA recognizes that they reflect the current uncertainty of the world's economy.

This data projects that the economic recovery, now approaching its fifth year, is expected to accelerate and the U.S. economy is expected to grow faster than in the past few years. As shown in **Figure 4.12,** U.S. economic growth is projected to range between 2.2% and 3.4% per quarter over the next two years.

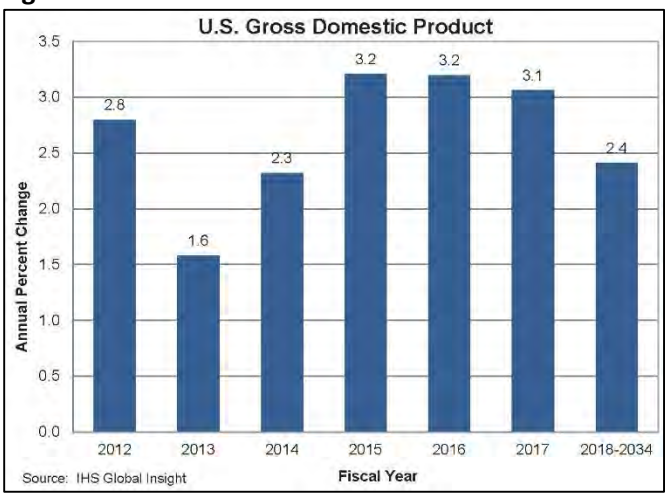
Figure 4.12: U.S. Gross Domestic Product (Seasonally Adjusted Annual Growth by Quarter)



Source: FAA Aerospace Forecast Fiscal Years 2014-2034

In the medium term (2015 – 2019), U.S. economic growth is projected to average 3% per year as shown in **Figure 4.13**.

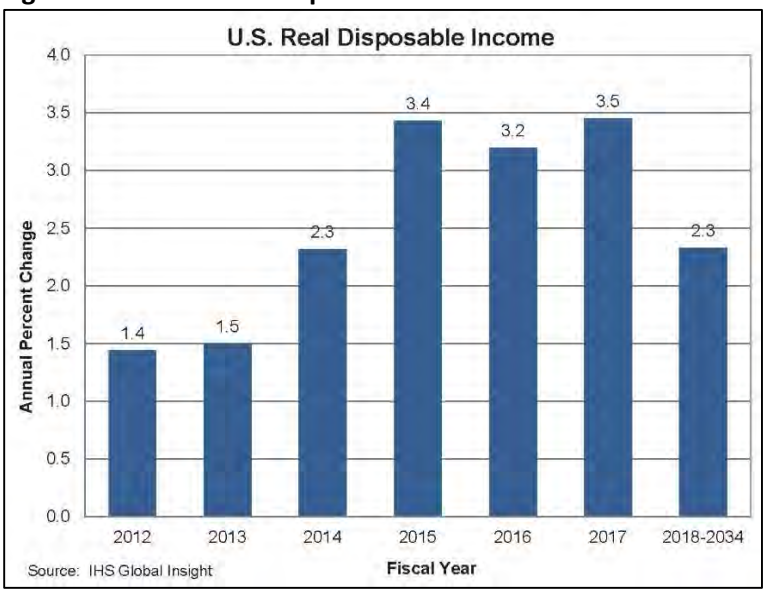
Figure 4.13: U.S. Gross Domestic Product



Source: FAA Aerospace Forecast Fiscal Years 2014-2034

Income growth is expected to pick up during the same period (2015 – 2019) averaging 3.2% per year (**Figure 4.14)**.

Figure 4.14: U.S. Real Disposable Income



Source: FAA Aerospace Forecast Fiscal Years 2014-2034

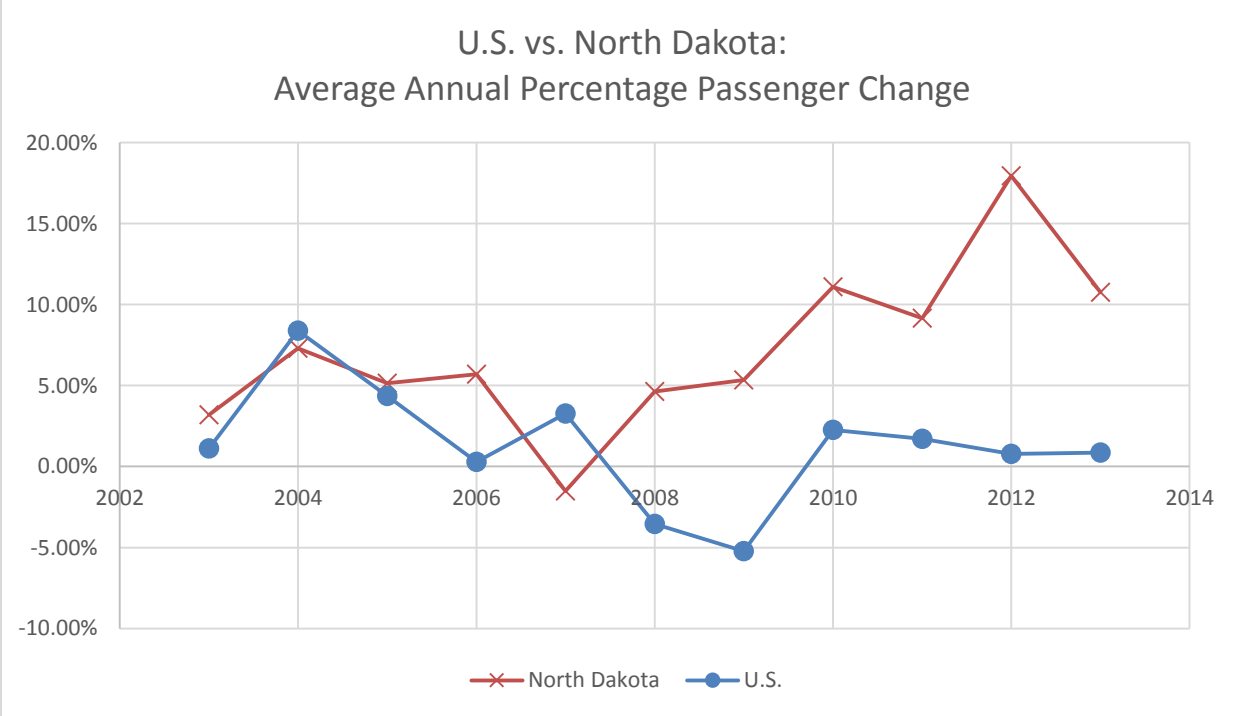
For the balance of the forecast period, both U.S. real GDP growth and real income growth slow to around 2.4% annually. Real Disposable Income and other economic indicators are valuable to aviation forecasting because, as noted in Section 4.2.2, there is a direct correlation between

economic growth and growth in the aviation industry. These economic trends are used to inform the FAA's commercial and general aviation forecasts along with other sources including future airline schedules, discussions with industry experts and comments from industry staff and aviation associations.

4.3.2 Historical Commercial Aviation Trends: U.S. Compared to North Dakota

The U.S. has seen fairly steady commercial passenger rates (enplanement rates) since 2010, fluctuating between increases of about 0.8% and 2.3%. Prior to 2010, enplanement rates in the US varied greatly (about 14% between 2003 and 2010), and were impacted during national events, such as the economic downturn of 2008. By comparison, enplanement rates in North Dakota have been on the rise overall since 2007. **Figure 4.15** and **Table 4.4** illustrate the rate of change in enplanements in the U.S. compared to North Dakota. It is important to note that although the rates of change decrease at times, the number of overall passengers continues to increase year to year (as long as the rate is above 0), it just may be at a different rate. Since 2007, the number of enplanements in North Dakota has nearly doubled from 652,380 to 1,139,434 in 2013.

Figure 4.15: U.S. Compared to North Dakota Average Annual Passenger Change



Source: FAA Passenger Boarding (Enplanement) and All-Cargo Data for U.S. Airports Database and airport reported boarding data

Table 4.4: U.S. vs. North Dakota Average Annual Passenger Change

Year	U.S. Annual Passenger Change	North Dakota Annual Passenger Change	North Dakota Passengers
2013	0.86%	10.76%	1,139,434
2012	0.78%	17.95%	1,028,718
2011	1.71%	9.16%	872,169
2010	2.26%	11.10%	798,965
2009	-5.22%	5.34%	719,121
2008	-3.54%	4.64%	682,676
2007	3.27%	-1.52%	652,380
2006	0.29%	5.71%	662,437
2005	4.35%	5.14%	626,653
2004	8.39%	7.30%	596,019
2003	1.11%	3.20%	555,488

Source: FAA Passenger Boarding (Enplanement) and All-Cargo Data for U.S. Airports Database and airport reported boarding data

The dramatic increase in passengers is certainly due, at least in large part, to the oil boom that is being experienced in the state. Although the Bakken formation and oil drilling activities are taking place mostly on the western side of North Dakota, all eight commercial service airports in the state are experiencing significant growth in enplanements (exceeding projections of the last system plan), shown in **Table 4.5.** The largest increase was seen in Williston with an enplanement total in 2007 of 8,469, jumping to 94,459 in 2013 (over 11 times the total in 2007).

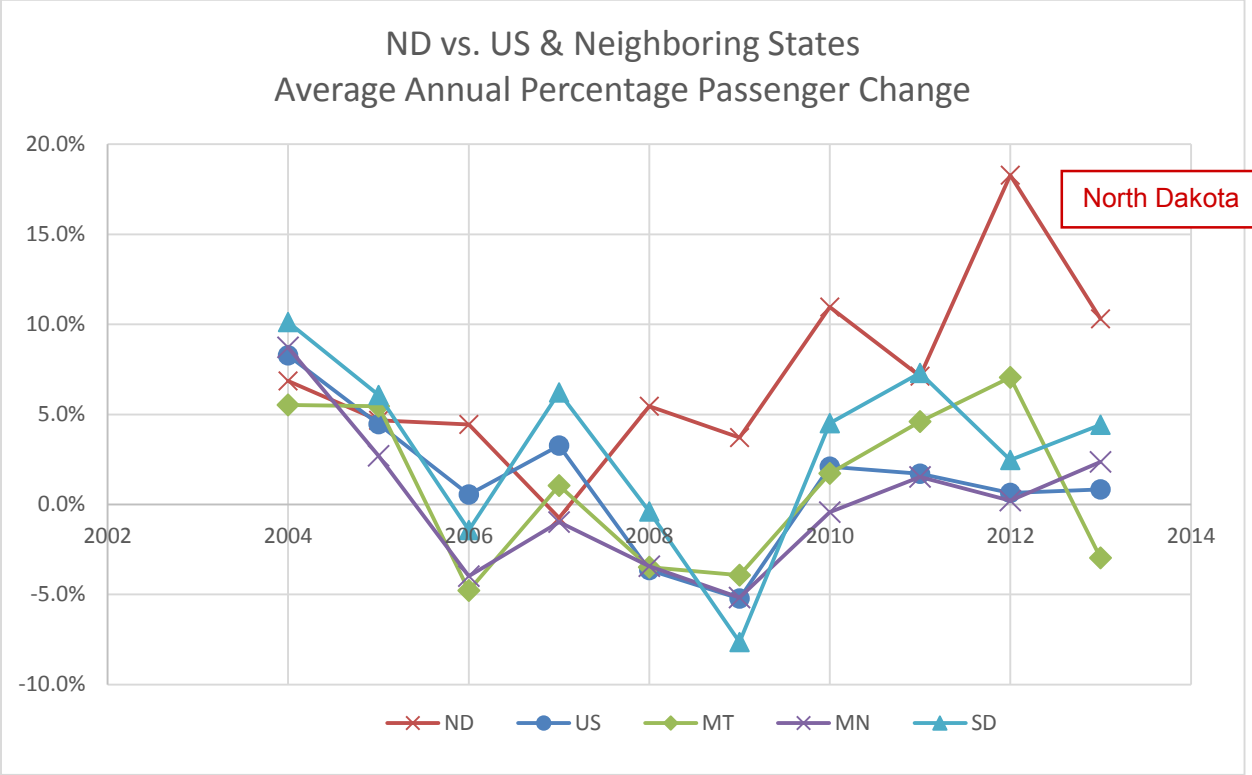
Table 4.5: Enplanements at North Dakota's Commercial Service Airports

Fargo	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
2008 Forecast					305,200	308,940	312,680	316,420	320,160	323,900	328,920	333,940
Actual numbers	230,406	243,097	256,004	275,200	305,218	297,964	324,434	348,951	363,138	350,458	364,727	398,677
% annual change		5.51%	5.31%	7.50%	10.91%	-2.38%	8.88%	7.56%	4.07%	-3.49%	4.07%	9.31%
Grand Forks	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
2008 Forecast					84,000	88,240	92,480	96,720	100,960	105,200	107,400	109,600
Actual numbers	86,573	87,935	89,301	86,790	84,049	80,725	85,571	94,901	115,483	116,938	135,209	146,068
% annual change		1.57%	1.55%	-2.81%	-3.16%	-3.95%	6.00%	10.90%	21.69%	1.26%	15.62%	8.03%
Devils Lake	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
2008 Forecast					3,300	3,440	3,580	3,720	3,860	4,000	4,160	4,320
Actual numbers	2,129	1,968	2,946	3,378	3,292	3,548	3,226	3,756	4,943	5,488	2,998	2,667
% annual change		-7.56%	49.70%	14.66%	-2.55%	7.78%	-9.08%	16.43%	31.60%	11.03%	-45.37%	-11.04%
Jamestown	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
2008 Forecast					2,400	2,800	3,200	3,600	4,000	4,400	4,620	4,840
Actual numbers	2,166	1,879	2,495	2,206	2,368	2,234	2,829	3,438	4,284	5,689	3,861	2,672
% annual change		-13.25%	32.78%	-11.58%	7.34%	-5.66%	26.63%	21.53%	24.61%	32.80%	-32.13%	-30.80%
Dickinson	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
2008 Forecast					5,400	5,400	5,350	5,300	5,250	5,200	5,300	5,400
Actual numbers	2,911	3,827	5,081	4,851	5,403	7,576	8,734	8,961	10,354	18,958	23,822	35,125
% annual change		31.47%	32.77%	-4.53%	11.38%	40.22%	15.29%	2.60%	15.55%	83.10%	25.66%	47.45%
Williston	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
2008 Forecast					5,600	5,780	5,960	6,140	6,320	6,500	7,180	7,860
Actual numbers	4,163	5,164	6,144	5,594	6,493	8,469	11,802	11,229	15,897	27,774	37,508	94,459
% annual change		24.05%	18.98%	-8.95%	16.07%	30.43%	39.36%	-4.86%	41.57%	74.71%	35.05%	151.84%
Minot	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
2008 Forecast					74,900	77,140	79,380	81,620	83,860	86,100	86,420	86,740
Actual numbers	70,571	70,528	74,085	75,344	74,940	70,554	70,998	66,771	90,823	150,450	224,421	222,083
% annual change		-0.06%	5.04%	1.70%	-0.54%	-5.85%	0.63%	-5.95%	36.02%	65.65%	49.17%	-1.04%
Bismarck	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
2008 Forecast					180,700	185,260	190,120	194,980	199,840	203,500	209,000	214,500
Actual numbers	139,343	141,090	159,963	173,290	180,674	181,310	175,082	181,114	194,043	196,414	236,172	237,683
% annual change		1.25%	13.38%	8.33%	4.26%	0.35%	-3.44%	3.45%	7.14%	1.22%	20.24%	0.64%

Source: 2006 – 2012 forecast numbers came from the 2007 North Dakota State Aviation System Plan and the actual enplanements recorded came from airport reported boarding data (2002 – 2012).

When compared to the surrounding states of South Dakota, Minnesota, and Montana, the increase in passenger change in North Dakota is remarkable, as shown in **Figure 4.16** and **Table 4.6**. While the neighboring states have generally followed the U.S. trend, North Dakota's enplanements have far exceeded this pattern since 2007. It is important to note that the enplanement numbers of the surrounding states came from airline-reported DOT onboard passengers. The data from this source differs slightly from the airport-reported boarding data used in **Figure 4.15**, **Table 4.4**, and **Table 4.5**, but is very close.

Figure 4.16: North Dakota Compared to U.S. and Regional Average Annual Passenger Change



Source: US DOT T-100 Outbound Onboard Passengers
Note: 2014 YTD through May vs. 2013 YTD through May

Table 4.6: Percent Change in Reported Outbound Onboard Passengers

	US	MT	MN	SD	ND
2013	0.8%	-3.0%	2.4%	4.4%	10.3%
2012	0.6%	7.1%	0.2%	2.5%	18.3%
2011	1.7%	4.6%	1.5%	7.3%	7.1%
2010	2.1%	1.7%	-0.4%	4.5%	11.0%
2009	-5.2%	-3.9%	-5.2%	-7.6%	3.7%
2008	-3.6%	-3.5%	-3.4%	-0.4%	5.5%
2007	3.3%	1.0%	-1.0%	6.2%	-0.7%
2006	0.6%	-4.8%	-4.0%	-1.4%	4.4%
2005	4.5%	5.5%	2.7%	6.1%	4.7%
2004	8.3%	5.5%	8.7%	10.1%	6.9%

Source: US DOT T-100 Outbound Onboard Passengers
Note: 2014 YTD through May vs. 2013 YTD through May

4.3.3 Commercial Aviation Trend Projections: Domestic and International

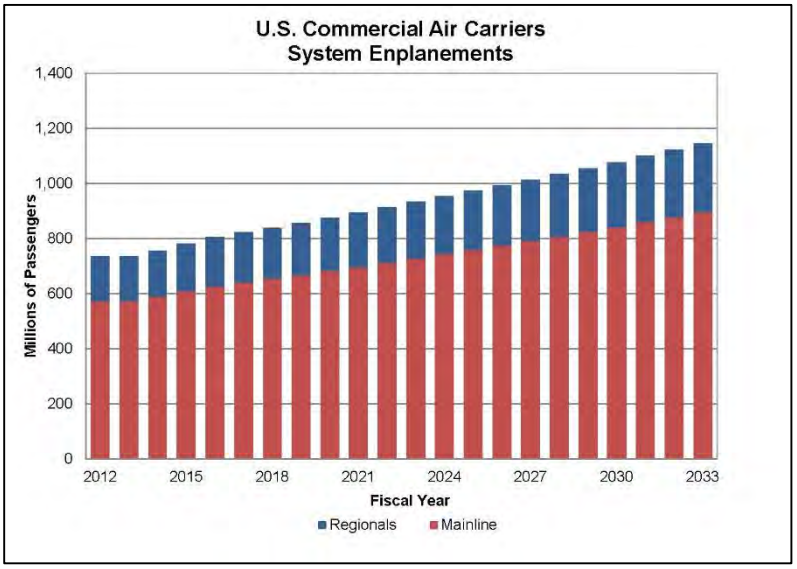
After experiencing minimal growth in 2013 and 2014 nationally, an upturn in growth is projected for commercial aviation during the 2015-2019 period. Revenue passenger miles (RPMs) are measures of traffic for an airline flight calculated by multiplying the number of revenue-paying passengers aboard the aircraft by the distance traveled. In the commercial aviation sector, RPMs and the number of passengers are projected to increase at an average annual rate of 3.4% and 2.9%, respectively. System capacity growth is projected to average 3.3% per year during that same timeframe. This increase coincides with faster economic growth anticipated across the country.

Regional & Mainline Carriers

Mainline air carriers are those operating aircraft larger than 90 seats and regional carriers are those operating aircraft up to 90 seats.

For the overall forecast period (2014-2034), system capacity is projected to increase an average of 2.7% a year, and system RPMs are projected to increase 2.8% per year. This growth is based on a combination of projected growth among regional carriers (up 2.3% a year) and growth in the mainline carriers (up 2.8% a year) as shown in **Figure 4.17**. Overall, system passengers (enplanements) are projected to increase an average of 2.2% a year, a combination of projected annual growth in mainline carriers (2.3%) and regional carriers (1.9%). By 2034, U.S. commercial air carriers are projected to fly 1.75 trillion Available Seat Miles (ASMs) and transport 1.15 billion enplaned passengers a total of 1.47 trillion passenger miles. These numbers include domestic and international flights on U.S. commercial carriers.

Figure 4.17: U.S. Commercial Air Carriers System Enplanements

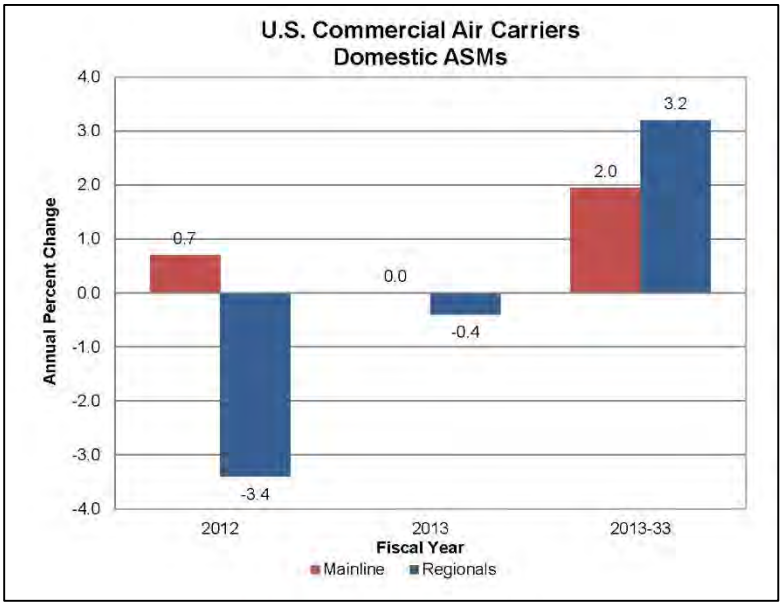


Source: FAA Aerospace Forecast Fiscal Years 2014-2034

4.3.4 Domestic Commercial Aviation Trend Projections

Overall domestic capacity is projected to increase at an average annual rate of 2.1% based on ASMs in the domestic market alone for the entire forecast period (2014-2034), which is slower than the overall economic growth projected for this timeframe. Mainline carriers are projected to grow at an annual rate of 2% while regional carriers are projected to grow slightly faster at 2.3% per year, shown in **Figure 4.18**.

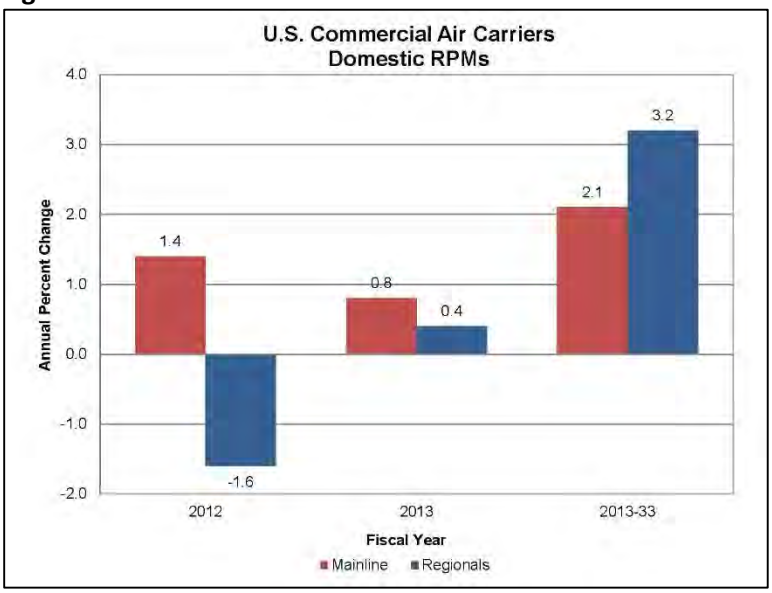
Figure 4.18: U.S. Commercial Air Carriers Domestic Available Seat Miles



Source: FAA Aerospace Forecast Fiscal Years 2014-2034

From 2014-2034, domestic RPMs are projected to grow an average of 2.2% a year with mainline carriers growing slightly more slowly than the regional carriers as shown in **Figure 4.19**. Over the same forecast period, domestic enplanements are projected to grow at an average annual rate of 1.9% with mainline and regional carriers growing at the same rate. As capacity and passenger enplanements increase, load factors are expected to remain high, gradually rising from 83.4% in 2014 to 84.7% by 2034.

Figure 4.19: U.S. Commercial Air Carriers Domestic Revenue Passenger Miles



Source: FAA Aerospace Forecast Fiscal Years 2014-2034

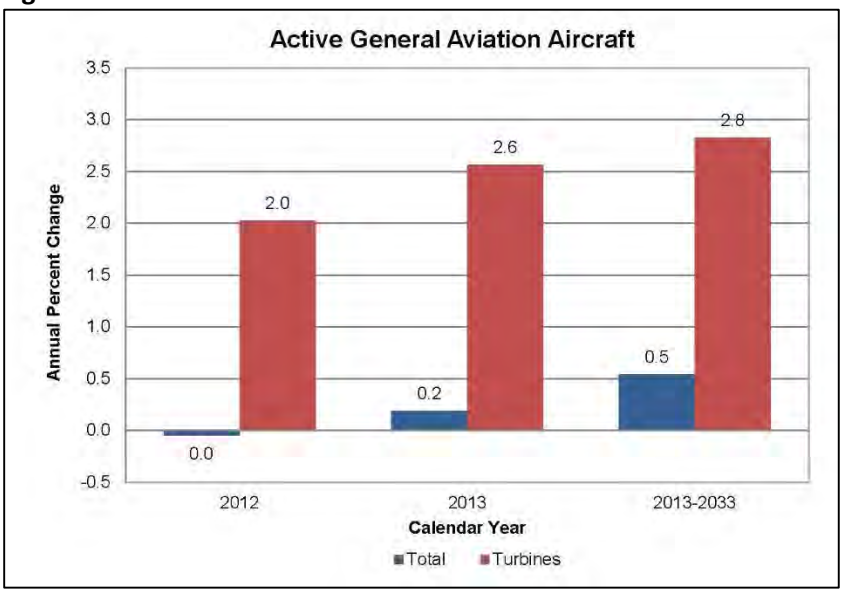
4.3.5 Projections for General Aviation

FAA projections for General Aviation (GA) activity include a projection of fleet size and hours flown for all of the following types of aircraft:

- Single-engine and multi-engine piston aircraft
- Turboprops
- Turbojets
- Piston and turbine powered rotorcraft
- Light Sport Aircraft (LSA)
- Experimental and "other"

The "other" category consists of gliders and lighter-than-air vehicles. The base year for the fleet size forecast is 2013 where the base GA active fleet is estimated to be 202,865 aircraft nationally. Activity forecasts began in 2014 and continue through 2034. Overall, projections are for modest growth to continue in the overall GA aircraft market.

Figure 4.20: U.S. Active General Aviation Aircraft



Source: FAA Aerospace Forecast Fiscal Years 2014-2034

As shown in **Figure 4.20**, the total active GA fleet is projected to increase at an average annual rate of 0.5% over the 21-year forecast period, growing to 225,700 aircraft by 2034. The total active general aviation projection includes a "light sport" aircraft category that is expected to experience a 4.1% annual growth of the fleet by 2034, to a total of 4,880 LSA. The more expensive and sophisticated turbine-powered fleet (including rotorcraft) is projected to grow to a total of 49,565 aircraft over the forecast period, with the turbine jet portion increasing at 3.0% a year, reaching a total of 22,050 by 2034. A summary of these projections is provided in **Table 4.7**. Several factors related to the national economic recovery contributed to the projected growth in this sector of the GA market, including higher corporate profits and the attractiveness of business aviation relative to commercial air travel.

Table 4.7: General Aviation Aircraft Projections for Total Active GA Fleet and Select Aircraft Categories

Aircraft Type	Total Projected Aircraft in 2034	Annual Growth/Decline Percentage
Total Active GA Fleet	**225,700**	**0.5%**
Select Aircraft Categories		
Light Sport Aircraft	4,880	4.1%
Turbine-Powered Fleet	49,565	2.6%
Piston-Powered Fleet	131,615	-0.3%

Source: FAA Aerospace Forecast Fiscal Years 2014-2034

While increases are projected for some parts of the GA market, others are projected to decrease, also shown in **Table 4.7**. The number of active piston-powered aircraft (including rotorcraft) is

projected to decrease at an average annual rate of 0.3% from the 2013 total of 141,325 to 131,615 by 2034, with declines in both single and multi-engine fixed wing aircraft.

The total number of GA hours flown is projected to increase by 1.4% yearly over the forecast period for the whole market. The FAA projects that in the medium term, much of the increase in hours flown will be a reflection of the strong growth in the rotorcraft and turbine jet fleets. In the long term, a faster growth in hours is expected after 2023 with increases in the fixed wing turbine aircraft fleet, as well as increasing utilization of both single- and multi-engine piston aircraft.

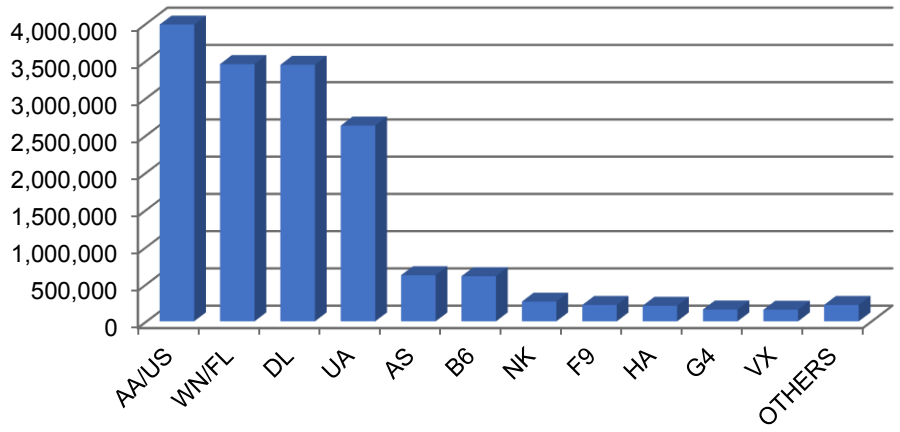
4.3.6 Aviation Industry Trends

In addition to the national trends in the aviation industry noted in the preceding sections, an understanding of trends occurring in the airline industry will provide a better understanding of the future of aviation within the state of North Dakota. Trends and development at the local and surrounding airports have an effect on the use of the local airport, especially with regard to air service. U.S. trends also have an effect on local air service and can influence airport use by either expanding or contracting service levels. Factors that have the most impact on airports throughout the country include airline consolidation, fleet trends, and changes in governmental regulation. However, changes don't happen in a vacuum and local, regional, and state trends have a varying degree of impact on airports.

Airline Consolidation

Airline consolidation (i.e., mergers) have led to just four airlines controlling 85 %of the domestic U.S. market. The four airlines include: American Airlines (merged with US Airways), Delta Air Lines (merged with Northwest Airlines), United Airlines (merged with Continental Airlines) and Southwest Airlines (merged with AirTran Airways). **Figure 4.21** provides the average seats per week by airline in July 2014.

Figure 4.21: Average Domestic Seats per Week by Airline



Source: Diio Mi Schedule (YE July 2014)

In recent years these four dominant airlines have focused mainly on international growth while their domestic U.S. systems have generally been stagnant or shrinking. Domestically, with both seats for sale and the number of flights declining over the past five years, new market development can only be achieved through "addition by subtraction,"—that is, for one market to gain new air service, another market must lose air service due to limited aircraft availability.

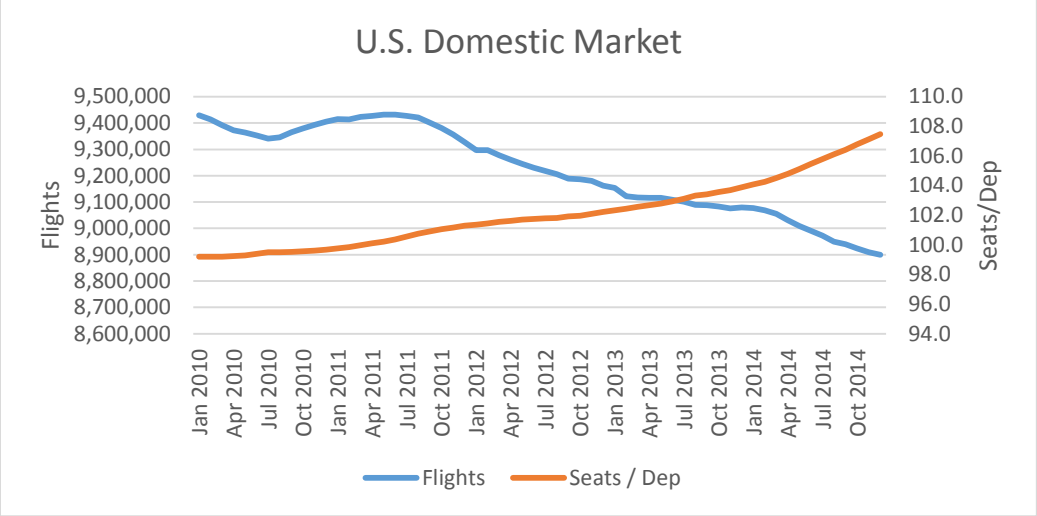
In the state of North Dakota during the same period, the big four carriers control about 74%. Although the big four carriers still control a large percentage of seats, it is partially offset by carriers like Allegiant and Frontier that have historically had a tendency to grow in smaller markets while others are shrinking.

Fleet Trends

Fleet types are changing rapidly among the traditional "legacy" airlines (i.e. American, Delta, and United); smaller turboprop and regional jet aircraft are being phased out or replaced by larger regional jets and narrow-body jets. Fuel costs and aging fleets have forced airlines to replace 50-seat and smaller aircraft with 70-seat and larger aircraft with demand for these larger jets far exceeding availability. There is currently no replacement for the 50-seat or smaller aircraft on the horizon with manufacturers showing limited interest due to internal forecast of low demand for aircraft below 70 seats. There has also been a large churn with older mainline jets being replaced.

As shown in **Figure 4.22**, at an industry level, carriers are reducing the total number of flights while increasing aircraft size.

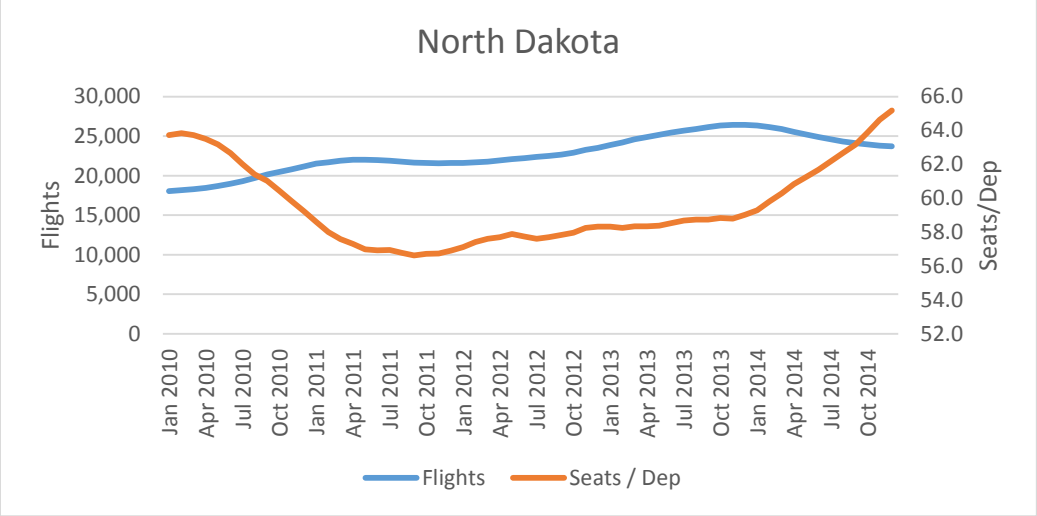
Figure 4.22 Domestic Flights and Seats per Departure



Source: Diio Mi schedules accessed November 14, 2014

Figure 4.23 shows the trends of flights and seats per departure in North Dakota. Unlike the national trends of fewer flights but with larger airplanes, North Dakota experienced a continued increase in the number of flights from 2010 – 2014 as airlines began responding to the increase in demand as a result of economic and population growth. Whereas the US has been experiencing a steady increase in the number of seats per flight flown, North Dakota experienced a slight decline – from 64 to 57 seats per departure – between January 2010 and April 2011. This reflects the use of smaller, regional aircraft for many of these flights. In 2014, the number of flights leveled off and even declined slightly. At the same time, the number of seats per operation is climbing back up – indicating a shift by commercial carriers to larger gauge aircraft that are now making their way into the state's commercial aviation system.

Figure 4.23 North Dakota Flights and Seats per Departure



Source: Diio Mi schedules accessed November 14, 2014

Changes in Government Regulation

Pilot scope changes at the mainline airline allowing regional pilots to operate larger regional jets on behalf of the mainline airline in conjunction with a shortage of new pilots coming into the system have sped up the reduction in the retirement of smaller aircraft. This situation was exacerbated as a result of legislation imposed by Congress in the wake of the Colgan Air accident requiring pilots to have significantly more hours before they can get their Airline Transport Pilot (ATP) rating and imposing additional rest time requirements, which increases the number of pilots needed to fly the same schedules.

Moving forward, on a macro basis, there will be additional pressure for smaller regional aircraft to be increased to larger gauge aircraft resulting in a possible loss of service in smaller markets that aren't generating the growth needed to sustain service on larger aircraft. Fortunately for North Dakota, due to the large increases in demand for additional seats, this likely won't translate in the service losses.

4.4 Forecasting Approach

There are a number of different forecasting techniques available for use in the projection of aviation activity, ranging from subjective judgment to sophisticated mathematical modeling. Due to the fact that a large number of variables affect projected growth rates, it is important that each variable be considered in the context of its use in this statewide plan.

Typically, the forecasting effort includes the assessment of historical trends on aviation activity data at the local, regional, and national level. Aviation activity statistics on items such as passenger

enplanements, aircraft operations, and based aircraft are usually collected, reviewed, and analyzed as a part of this task. Similarly, historic socioeconomic factors such as population and income are normally analyzed for the effect they may have on aviation growth. Often, it is the comparison of historic relationships among these various indicators that provides the initial step in the development of realistic forecasts of aviation demand. However, due to the unique growth being experienced by specific regions in North Dakota, the emphasis on historical trends as a future indicator and comparison with national trends was not expected to best represent the future growth in the system.

The following three general methodologies were considered for the development of system projections:

- Time Series/Trend Line Methodology
- Market Share Methodology
- Socioeconomic Methodology

Each is discussed briefly in the following paragraphs, including its selection or dismissal.

- **Time Series/Trend Line Methodology –** Historical trend lines and linear extrapolation are some of the most widely used methods of forecasting. These two techniques utilize time-series types of data and are often both useful for establishing a pattern of demand that demonstrates a historical relationship with time. This approach assumes that the same factors that have influenced demand will continue to affect future demand. In many cases, this approach often provides a reliable benchmark for comparing the results of other analyses. In this case, however, the growth currently being experienced in North Dakota and the continued growth rates that are anticipated would not be accurately reflected through a projection of past growth rates. As a result, this methodology was not pursued.

- **Market Share Methodology –** Market share, ratio, or top-down models, are utilized to develop local activity levels derived from a larger national activity scale. Inherent to the use of these methods is the demonstration that a proportion of the large scale activity that can be assigned to the local level is a regular and predictable quantity. Using this method, historical data is examined to determine the ratio of local airport traffic to total national traffic. From outside data sources—in this case the FAA—projected levels of national activity are determined and then proportioned to the airport based upon the observed and projected trends. This method is flawed in two ways for application here. First, the assumption that the national trends would correlate in a regular predictable quantity is not well-suited to the accelerated growth in parts of the state. Also, this method relies on an assumption that historical trends will continue into the future which does not apply to the trend in North Dakota. For both of these reasons, this methodology was not pursued.

- **Socioeconomic Methodology –** Traditionally, socioeconomic methodology is a correlation analysis that examines the direct relationship between two or more sets of historical data. Because the traditional approach relies on historical data, the approach was modified in this case to reflect the unique growth currently being experienced in the state and projected to continue through the duration of the study horizon.

- **Modified Socioeconomic Methodology (Preferred Methodology) –** For this study, analyses were performed that relate future aviation activity at individual airports to the future socioeconomic and population projections for the host county. The specific county-level data was selected rather than statewide figures to adjust for the different growth rates projected in different geographic areas around the state.

Initially, four sets of historical and projected levels of socioeconomic data were obtained from W&P: total population, per capita income, retail sales, and employment. Using all four factors, a single growth rate was calculated by averaging them together to produce a single growth projection. This approach was taken because each indicator is believed to reflect a factor of aviation growth. Future growth trend lines using county-specific projections were tested initially for four airports in different regions of the state for all four socioeconomic categories. As a result of this exercise, the W&P population indicator was eliminated as a basis for projected correlation because the population growth rates by county were found to be statistically low in many areas where economic growth is projected to continue on an aggressive course through the planning horizon. Consequently, the W&P population factor was replaced by a county-specific growth rate calculated from the Statewide Housing Assessment Resource Project. In high-growth counties, this change resulted in an increased growth rate when compared to the three economic indicators alone. At the same time, this exercise confirmed that the economic indicators of retail sales, employment, and per capita income reflected the robust growth rates currently being experienced in the state that are expected to continue over the course of the next 20 years. **Table 4.8** provides a summary of the sources for these four socioeconomic data factors.

Table 4.8: Summary of Socioeconomic Data Sources

Socioeconomic Factor	Source
Total Employment*	CEDDS 2014: Complete Economic and Demographic Data Source, Woods & Poole Economics, Inc.
Income per Capita*	CEDDS 2014: Complete Economic and Demographic Data Source, Woods & Poole Economics, Inc.
Total Retail Sales*	CEDDS 2014: Complete Economic and Demographic Data Source, Woods & Poole Economics, Inc.
Population	North Dakota Statewide Housing Assessment Resource Project, The Center for Social Research at North Dakota State University. http://www.ndsu.nodak.edu/sdc/sharp/

*In 2009 dollars
(Note: All earnings, personal income, and retail sales data are presented in 2009 dollars – called "constant dollars" – to measure the real change in earnings and income when inflation is taken into account.)

Based upon the observed and projected economic growth in the state, especially in the Bakken Oil region as well as Bismarck, Fargo, and Grand Forks, economic growth projections combined with population projections are expected to provide a reasonably accurate correlation for future aviation activity projections without regard to their previous role. For this reason, the "modified socioeconomic methodology" was selected as the preferred methodology.

4.5 Forecasting Results Summary

Projections of aircraft operations were developed as part of this study for 85 of the 89 public use airports in the state. This includes projections for four of the eight air carrier airports, National Plan of Integrated Airport Systems (NPIAS) general aviation airports, and non-NPIAS general aviation airports. New projections were not done for four commercial service airports that had recent aviation projections developed as part of an airport planning exercise. For those airports, the existing projections were brought in directly from the other plans or from current FAA Terminal Area Forecast (TAF) projections. The methodology used to develop the forecasts is described previously in detail in **Section 4.4 Forecasting Approach**. The FAA's TAF projections were not used for the GA planning effort because they did not reflect the impacts of the economic growth being experienced in much of the state. A summary of the individual airport forecasts developed for this study are presented in this section, and the individual airport forecast reports are included in **Appendix D**.

4.5.1 Summary of CAGR by Category

Table 4.9 contains a summary of the growth rates used for each county in the creation of the aviation forecasts. No growth rate is presented for counties that do not have airports. A growth rate was calculated for each individual county and then applied to the airports in that county. This was done in order to recognize the geographic variation of growth rates in the state. A CAGR was calculated for each of the four socioeconomic factors based on the W&P projections from 2013 through 2035 and then those four rates were averaged to determine a CAGR for each county.

Table 4.9: Projections Summary of CAGR by Category

	Total Employment	Income per Capita (in 2009 dollars)	Total Retail Sales (in 2009 dollars)	Population	Average CAGR
	2013 - 2035	2013 - 2035	2013 - 2035	2013 - 2025	2013 - 2035
State of North Dakota	1.39%	1.45%	1.75%	1.51%	1.52%
County					
Adams	-0.22%	1.18%	0.55%	0.05%	0.39%
Barnes	0.41%	1.51%	0.52%	0.40%	0.71%
Benson	-0.09%	1.17%	0.64%	0.96%	0.67%
Bottineau	0.29%	1.67%	0.47%	3.47%	1.47%
Bowman	1.00%	1.78%	0.91%	1.26%	1.24%
Burke	0.38%	2.13%	-0.08%	2.83%	1.31%
Burleigh	2.21%	1.52%	2.54%	1.66%	1.98%
Cass	2.03%	1.31%	2.59%	1.42%	1.84%
Cavalier	-0.16%	0.60%	0.56%	-0.38%	0.16%
Dickey	0.23%	0.59%	0.53%	0.01%	0.34%
Divide	0.45%	2.45%	0.02%	5.98%	2.22%
Dunn	1.31%	1.20%	0.96%	2.90%	1.59%
Eddy	-0.11%	1.13%	0.57%	-0.72%	0.22%
Emmons	0.91%	0.60%	0.42%	0.08%	0.50%
Foster	0.53%	1.67%	0.42%	-0.78%	0.46%
Golden Valley	0.38%	2.50%	0.40%	2.27%	1.39%
Grand Forks	1.26%	1.87%	0.93%	0.76%	1.21%
Grant	0.41%	1.53%	0.81%	-0.77%	0.49%
Griggs	0.29%	1.67%	0.18%	-0.30%	0.46%
Hettinger	0.81%	1.87%	1.04%	2.34%	1.52%
La Moure	0.20%	0.78%	0.20%	-0.89%	0.07%
Logan	0.64%	1.55%	0.92%	-0.36%	0.69%
Mchenry	0.16%	1.77%	0.34%	2.47%	1.18%
Mcintosh	0.44%	1.52%	0.91%	-0.15%	0.68%
Mckenzie	1.91%	1.88%	1.21%	6.82%	2.95%
Mclean	0.87%	1.95%	0.57%	0.20%	0.90%
Mercer	1.12%	1.33%	1.37%	0.39%	1.05%
Morton	1.16%	1.51%	1.43%	1.02%	1.28%
Mountrail	1.82%	1.83%	1.29%	3.88%	2.20%
Nelson	-0.32%	1.10%	0.41%	-0.60%	0.15%
Pembina	0.01%	1.13%	0.69%	-0.32%	0.37%
Pierce	0.42%	0.78%	0.49%	1.31%	0.75%
Ramsey	0.04%	1.32%	0.55%	0.00%	0.48%
Ransom	0.43%	1.33%	0.53%	-0.99%	0.33%
Renville	0.54%	1.76%	0.41%	2.52%	1.31%
Richland	-99.83%	1.14%	1.19%	-0.26%	-24.44%
Rolette	0.50%	1.30%	1.09%	0.78%	0.92%
Sargent	0.46%	1.42%	0.33%	-0.17%	0.51%
Sheridan	0.06%	0.73%	0.88%	-1.27%	0.10%
Sioux	1.12%	1.79%	1.07%	1.16%	1.28%
Stark	1.38%	1.62%	1.63%	3.78%	2.10%

Table 4.9: Projections Summary of CAGR by Category

	Total Employment	Income per Capita (in 2009 dollars)	Total Retail Sales (in 2009 dollars)	Population	Average CAGR
	2013 - 2035	2013 - 2035	2013 - 2035	2013 - 2025	2013 - 2035
State of North Dakota	1.39%	1.45%	1.75%	1.51%	1.52%
County					
Stutsman	0.62%	1.60%	0.73%	0.75%	0.92%
Towner	-0.04%	0.66%	0.07%	0.20%	0.22%
Traill	0.16%	1.26%	0.49%	-0.10%	0.45%
Walsh	-0.16%	1.19%	0.55%	-0.50%	0.27%
Ward	1.20%	1.59%	1.37%	1.53%	1.42%
Wells	0.39%	1.57%	0.12%	-0.26%	0.45%
Williams	1.14%	1.66%	1.43%	5.65%	2.47%

Note: Billings, Kidder, Oliver, Slope, and Steele Counties are not included because they do not have an airport that is part of this State System Plan.

4.5.2 Summary of Projections for GA Airports

Table 4.10 provides a summary of the individual GA airport projections developed for this project using the preferred methodology described in Section 4.3 titled *Modified Socioeconomic Methodology*. "Operations" are defined as either a takeoff or a landing of an aircraft, and "Based Aircraft" are aircraft that are registered and kept at a specific airport when not in use. The 2013 Base Year Operations and the 2013 Based Aircraft values were taken from the FAA's 5010 form. The complete individual airport forecast reports are included in **Appendix D.**

Table 4.10: Aviation Forecast Summary of North Dakota GA Airports

	Base Year Operations	Forecast of Operations				Based Aircraft	
	2013	2018	2025	2030	2035	2013	2035
Airport							
Arthur Airport	510	559	635	695	761	3	4
Ashley Municipal Airport	2610	2,700	2,831	2,929	3,030	12	14
Barnes County Municipal Airport	7800	8,081	8,492	8,799	9,116	42	49
Beach Airport	1,170	1,253	1,380	1,479	1,584	10	14
Beulah Municipal Airport	1,830	1,928	2,075	2,186	2,304	21	26
Bottineau Municipal Airport	5,050	5,434	6,020	6,477	6,969	32	44
Bowbells Municipal Airport	260	278	304	325	346	3	4
Bowman Municipal Airport	4,840	5,147	5,609	5,965	6,343	18	24
Cando Municipal Airport	3,550	3,590	3,646	3,686	3,727	6	6
Carrington Municipal Airport	3,490	3,571	3,688	3,775	3,863	13	14
Casselton Robert Miller Regional	19,100	20,920	23,763	26,027	28,507	68	101
Cavalier Municipal Airport	3,850	3,923	4,027	4,103	4,180	18	20
Columbus Municipal Airport	120	128	140	150	160	0	0
Cooperstown Municipal Airport	3,340	3,418	3,530	3,612	3,696	14	15
Crosby Municipal Airport*	2,950	3,293	3,840	4,286	4,784	14	23
Drayton Municipal Airport	2,710	2,761	2,834	2,888	2,942	4	4
Edgeley Municipal Airport	2,060	2,068	2,078	2,086	2,094	12	12
Elgin Municipal Airport	210	215	223	228	234	1	1
Ellendale Municipal Airport	2,610	2,655	2,719	2,766	2,813	11	12
Fessenden-Streibel Municipal Airport	560	573	591	605	619	2	2
Gackle Municipal Airport	20	21	22	22	23	0	0
Garrison Dam Recreational Airpark	3,420	3,576	3,806	3,980	4,161	0	0
Garrison Municipal Airport	3,420	3,576	3,806	3,980	4,161	16	19
Glen Ullin Regional Airport	860	916	1,002	1,067	1,137	12	16
Gwinner Airport -Roger Melroe Field	3,120	3,200	3,316	3,401	3,489	12	13
Robert Odegaard Field	5,300	5,805	6,594	7,222	7,910	29	43
Harry Stern Airport	13,100	3,227	14,224	14,720	15,223	63	73
Harvey Municipal Airport	1,710	1,749	1,805	1,847	1,889	15	17
Hazelton Municipal Airport	1,070	1,097	1,136	1,165	1,195	1	1
Hettinger Municipal Airport	4,850	4,945	5,082	5,182	5,284	24	26
Hillsboro Municipal Airport	14,670	15,005	15,486	15,840	16,201	23	25
Hutson Field Airport	25,500	25,849	26,347	26,708	27,074	29	31
International Peace Garden Airport	630	659	703	736	770	0	0
Kenmare Municipal Airport	3,175	3,407	3,761	4,036	4,332	21	29
Kulm Municipal Airport (frmr Pruetz)	1,250	1,255	1,261	1,266	1,270	8	8
La Moure Rott Municipal Airport*	3,700	3,714	3,733	3,747	3,761	8	8
Lakota Municipal Airport	1,320	1,330	1,344	1,354	1,364	13	13
Larimore Municipal Airport	8,030	8,526	9,272	9,845	10,452	16	21
Leeds Municipal Airport	1,020	1,055	1,105	1,143	1,182	3	3
Lidgerwood Municipal Airport	306	75	11	3	1	0	0
Linton Municipal Airport	4,050	4,153	4,301	4,410	4,522	17	19
Lisbon Municipal Airport	4,200	4,269	4,368	4,440	4,513	15	16
Maddock Municipal Airport	1,810	1,872	1,961	2,028	2,097	9	10
Mandan Municipal Airport	24,740	26,363	28,816	30,707	32,722	78	103
Mayville Municipal Airport	5,120	5,237	5,405	5,528	5,654	8	9
McClusky Municipal Airport	300	301	304	305	307	1	1
McVille Municipal Airport	0	0	0	0	0	4	4

Table 4.10: Aviation Forecast Summary of North Dakota GA Airports

	Base Year Operations	Forecast of Operations				Based Aircraft	
	2013	2018	2025	2030	2035	2013	2035
Airport							
Mercer County Regional Airport	930	980	1,054	1,111	1,171	10	13
Milnor Municipal Airport	300	308	319	327	335	4	4
Minto Municipal Airport	1,800	1,825	1,860	1,885	1,911	2	2
Mohall Municipal Airport	4,044	4,316	4,727	5,045	5,383	30	40
Mott Municipal Airport*	1,890	2,038	2,264	2,441	2,631	9	13
Napoleon Municipal Airport	1,160	1,201	1,260	1,304	1,349	2	2
New Town Municipal Airport	1,100	1,227	1,429	1,594	1,777	9	15
Northwood Municipal Airport-Vince Field	10,360	11,000	11,962	12,701	13,485	18	23
Oakes Municipal Airport**	4,850	4,933	5,052	5,139	5,227	17	18
Page Regional Airport	4,210	4,611	5,238	5,737	6,283	14	21
Park River Airport - W C Skjerven Field	4,430	4,491	4,577	4,640	4,703	10	11
Parshall-Hankins Airport	1,460	1,628	1,897	2,115	2,359	9	15
Pembina Municipal Airport	1,500	1,528	1,569	1,598	1,629	14	15
Richardton Airport	34	38	44	48	54	0	0
Robertson Field Airport	3,750	3,779	3,821	3,851	3,881	20	21
Rolette Airport	1,230	1,287	1,372	1,436	1,503	0	0
Rolla Municipal Airport	4,010	4,197	4,474	4,682	4,901	12	15
Rugby Municipal Airport	4,050	4,204	4,429	4,597	4,772	14	16
Sky Haven Airport	3,280	3,334	3,411	3,467	3,524	14	15
St. Thomas Municipal Airport	1,900	1,936	1,987	2,025	2,063	5	5
Standing Rock Airport	200	213	233	248	265	0	0
Stanley Municipal Airport	4,700	5,241	6,106	6,809	7,594	17	27
Tioga Municipal Airport	5,550	6,271	7,439	8,405	9,496	17	29
Tomlinson Field Airport	1,360	1,375	1,396	1,411	1,426	6	6
Towner Municipal Airport	912	967	1,050	1,114	1,182	0	0
Trulson Field Airport	110	123	143	159	178	0	0
Turtle Lake Municipal Airport	800	836	890	931	973	2	2
Walhalla Municipal Airport	2,910	2,965	3,044	3,101	3,160	6	7
Washburn Municipal Airport	2,300	2,405	2,560	2,676	2,798	13	16
Watford City Municipal Airport	5,750	6,651	8,154	9,432	10,909	30	57
West Fargo Municipal Airport	11,400	12,486	14,183	15,534	17,015	45	67
Westhope Municipal Airport	720	775	858	923	994	10	14
Weydahl Field Airport	1,700	1,840	2,055	2,224	2,407	0	0
Wishek Municipal Airport	2,324	2,404	2,521	2,608	2,698	4	5
TOTAL	302,335	307,090	340,774	359,067	378,802	1,092	1,391

Source: 2013 Base Year Operations and 2013 Based Aircraft numbers were taken from the FAA 5010 forms for each airport unless otherwise noted. For all airports, Forecast of Operations and 2035 Based Aircraft numbers were developed using the Mead & Hunt methodology described in **Section 4.4 Forecasting Approach** of this chapter.
*2013 Based Aircraft Source: 2014 FAA 5010 form
**2013 Base Year Operations and 2013 Based Aircraft Source: 2014 FAA 5010 form

4.5.3 Projections for Commercial Service Airports

Table 4.11 provides a summary of the four commercial service airport projections for operations and based aircraft developed for this project. The complete individual airport forecast reports for these four airports are also included in **Appendix D**. Four other forecasts for commercial service airports that were brought in from other planning efforts and from the TAF are also included in this section.

Table 4.11: Aviation Forecast Summary of Select North Dakota Commercial Service Airports

	Base Year Operations	Forecast of Operations				2035 Based Aircraft	
Airport	**2013**	**2018**	**2025**	**2030**	**2035**	**2013**	**2035**
Bismarck Municipal Airport	48,353	50,949	54,820	57,764	60,865	114*	143
Devils Lake Regional Airport	23,342	23,904	24,713	25,308	25,917	32	36
Grand Forks International Airport	341,549	362,641	394,376	418,730	444,588	159	207
Jamestown Regional Airport	37,252	39,005	41,599	43,557	45,607	51	62

Source: 2013 Base Year Operations and Based Aircraft Values from FAA TAF, Aug 9, 2013 for all except as noted below. Forecast of Operations and 2035 Based Aircraft values were developed using the Mead & Hunt methodology described in Section 4.4 Forecasting Approach of this chapter.
*Source: Email communication from Matthew Remynse (Bismarck Municipal Airport) to Gordon Howard (FAA Airports Division/Great Lakes Region) regarding an update to the airport's 5010 Form, November 4, 2014.

The base year operations, the forecast of operations, and the 2013 based aircraft number for Sloulin Field International Airport in Williston (**Table 4.12**) was taken from the FAA TAF, which was modified to match the airport's forecast on March 20, 2014. The based aircraft 2035 forecast was developed using the Mead & Hunt methodology described in Section **4.4 Forecasting Approach** of this chapter. This was done because the FAA TAF data for based aircraft showed no increase over time, which is an unlikely outcome considering the expected growth rate in the area and the expected increase in operations over time. The "no growth" projection for based aircraft is more likely an indication that it had not been adjusted as part of the March 20, 2014, TAF update.

Table 4.12: Aviation Forecast Summary of Sloulin Field International Airport (Williston)

	Base Year Operations	Forecast of Operations				Based Aircraft	
Airport	**2013**	**2018**	**2025**	**2030**	**2035**	**2013**	**2035**
Sloulin Field International Airport	43,041	43,640	48,769	49,314	49,728	47	80

Source: FAA TAF, March 20, 2014 for Base Year Operations, Forecast of Operations and 2013 Based Aircraft. 2035 Based Aircraft forecast developed using the Mead & Hunt methodology described in **Section 4.4 Forecasting Approach** of this chapter.

In February 2012, an Aviation Activity Forecast was developed as part of a Terminal Area Master Plan for Minot International Airport. However, that report focused exclusively on commercial service activity with an emphasis on enplanements. This is appropriate for a Terminal Area Master

Plan that will consider the needs of the traveling public and the commercial service carriers in the context of the terminal building. However, it did not provide the based aircraft and comprehensive operations forecast that was desired for this planning effort. The 2013 TAF numbers were compared to the Mead & Hunt methodology for both the forecast of operations and the based aircraft forecast, and the TAF numbers were higher in both cases. This indicates that the TAF numbers had been adjusted recently to account for the accelerated growth rate that is expected in the western part of the state. As a result, the forecast presented here for Minot International Airport in **Table 4.13** was taken from the 2013 FAA TAF.

Table 4.13: Aviation Forecast Summary of Minot International Airport

	Base Year Operations	Forecast of Operations				Based Aircraft	
Airport	**2013**	**2018**	**2025**	**2030**	**2035**	**2013**	**2035**
Minot International Airport	32,023	38,032	45,219	49,140	52,640	132	236
Source: FAA TAF, Aug 9, 2013							

The forecast for Theodore Roosevelt Regional Airport in Dickinson (**Table 4.14**) was taken from Chapter 3 of the Airport Master Plan Update titled *Aviation Forecasts* prepared for the airport in May 2014 by Trillion Aviation and KLJ.

Table 4.14: Aviation Forecast Summary of Dickinson Theodore Roosevelt Regional Airport

	Base Year Operations	Forecast of Operations				Based Aircraft	
Airport	**2013**	**2018**	**2023**	**2028**	**2033**	**2013**	**2033**
Dickinson Theodore Roosevelt Regional Airport	16,319	21,053	23,386	24,152	24,973	24	49
Source: Airport Master Plan Update (Chapter 3 – Aviation Forecasts), May 2014, Trillion Aviation and KLJ.							

The forecast for Hector International Airport in Fargo (**Table 4.15**) was taken from the Master Plan Update that is currently underway for that airport. The work is being performed by Mead & Hunt. The forecasts have been submitted to the FAA for review.

Table 4.15: Aviation Forecast Summary of Hector International Airport (Fargo)

	Base Year Operations	Forecast of Operations				Based Aircraft	
Airport	**2013**	**2018**	**2023**	**2028**	**2033**	**2013**	**2035**
Hector International Airport (Fargo)	80,438	86,505	93,864	101,279	109,088	190	277
Source: Master Plan Update (Forecast Chapter Table 2-9), Mead & Hunt, 2014.							

Socioeconomic factors used in this forecasting exercise are indicative of the growth trends being experienced at airports across the state. However, the projected growth rate of enplanements at commercial service airports through 2035 is expected to occur at a comparatively higher rate than the growth rate for operations and based aircraft at GA airports. This is because the demand for air travel from the population as a whole is placed primarily on commercial service airline seats, and the need for access to the expanding North Dakota economy is expected to continue along with the oil production through the forecast period. The 2013 FAA TAF projections for enplanements at North Dakota Airports have been updated to reflect this trend and those numbers are presented here in **Table 4.16**.

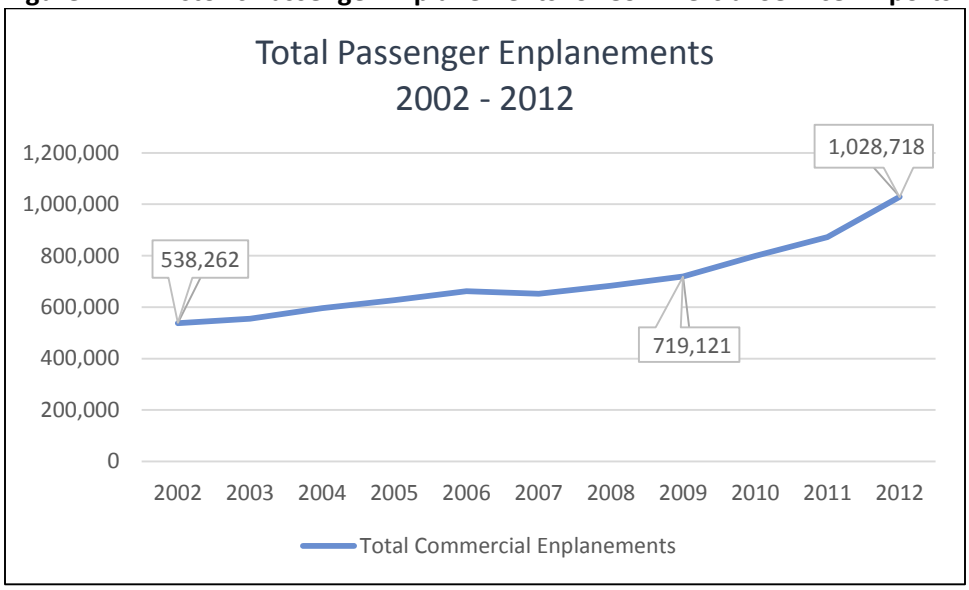
Table 4.16: Forecasted Passenger Enplanements for Commercial Service Airports

Passenger Enplanements for Commercial Service Airports						
Commercial Service Airports	**Base Year**	**Forecast**				
	2013	**2018**	**2025**	**2030**	**2035**	**% Growth 2013-2035**
Bismarck Municipal Airport	246,435	298,274	356,101	402,141	456,532	85.3%
Devils Lake Regional Airport#	4,224	4,326	4,472	4,580	4,690	11%
Grand Forks Int'l Airport	144,836	160,509	185,366	205,454	227,731	57.2%
Jamestown Regional Airport#	5,664	5,931	6,325	6,623	6,934	22.4%
Sloulin Field Int'l Airport *	81,108	156,037	314,926	334,189	334,189	312%
Minot Int'l Airport	222,056	299,236	413,868	479,580	539,763	143%
Dickinson Theodore Roosevelt Regional Airport**	35,082	82,992	136,989	169,589	176,164	402.1%
Hector Int'l Airport (Fargo)***	398,677	481,639	530,038	582,029	638,353	60.1%
TOTAL ENPLANEMENTS	**1,138,082**	**1,488,943**	**1,948,085**	**2,184,184**	**2,384,356**	**109.5%**

Source: 2013 FAA TAF except as noted
#Source: 2013 base year number was calculated based on the June 2014 – October 2014 enplanement average from the North Dakota Aeronautics Commission averaged out amongst 12 months. Forecast years were calculated using the CAGR rate from the Mead & Hunt methodology applied to the base year.
*Source: FAA TAF updated March 20, 2014
** Source: Airport Master Plan Update (Chapter 3 – Aviation Forecasts), May 2014, Trillion Aviation and KLJ
*** Source: Master Plan Update (Forecast Chapter), Mead & Hunt, 2014

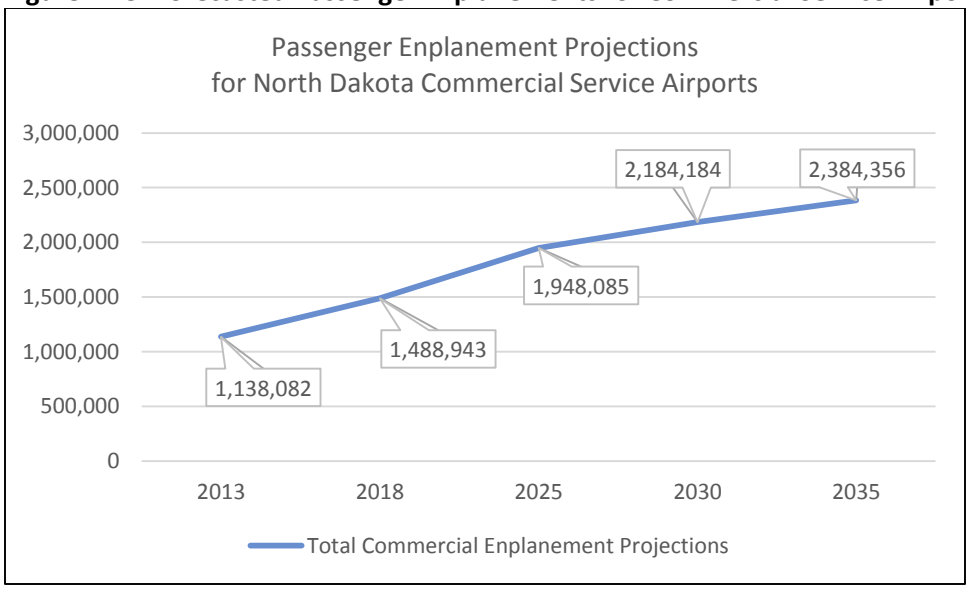
Historically, after a fairly flat growth rate from 2002 – 2009, the rates show a marked increase as shown in **Figure 4.24**. The total enplanement forecast information presented in **Table 4.16** is also shown graphically in **Figure 4.25**. **Figure 4.26** includes a combined look at historical as well as projected enplanements. Looking forward, there is continues growth expected through 2035, although the rate of growth slows somewhat after 2025.

Figure 4.24: Historic Passenger Enplanements for Commercial Service Airports



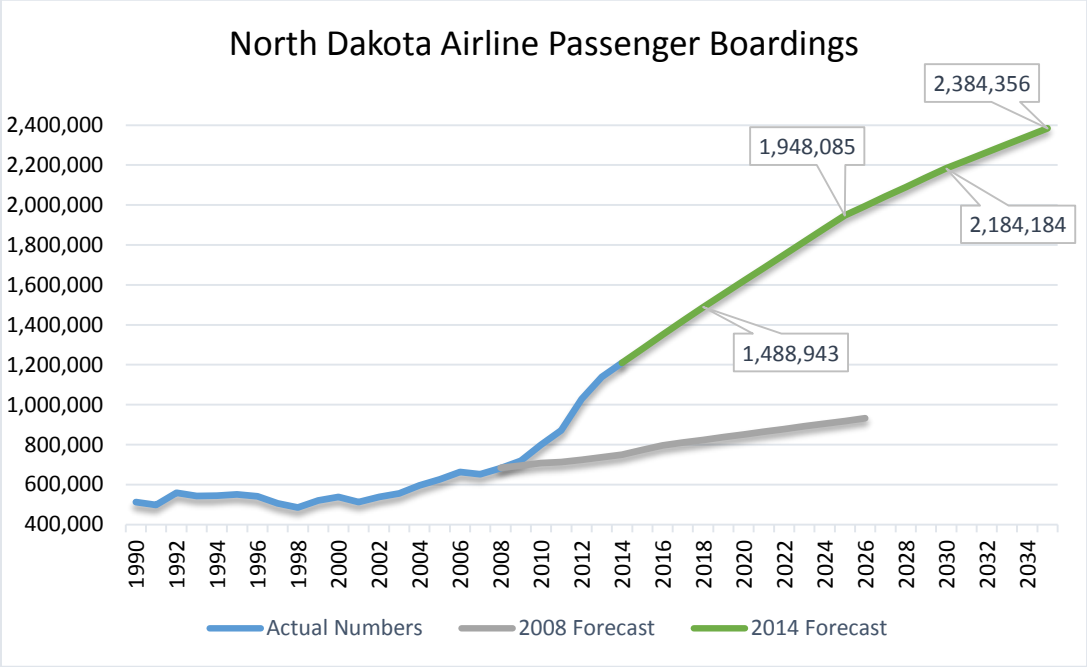
Source: Table 4.5: Enplanements at North Dakota's Commercial Service Airports

Figure 4.25: Forecasted Passenger Enplanements for Commercial Service Airports



Source: Table 4.16: Forecasted Passenger Enplanements for Commercial Service Airports

Figure 4.26: Historic and Forecasted Passenger Enplanements



Source: Table 4.5: Enplanements at North Dakota's Commercial Service Airports and Table 4.16: Forecasted Passenger Enplanements for Commercial Service Airports

4.6 Summary

The state of North Dakota is experiencing an oil boom that impacts the state in a variety of ways, including the demand for aviation services. As noted in **Section 4.1**, the United States became the world's largest producer of oil in 2014 and the state of North Dakota is the second largest producer of oil in the country. Oil production in the state is projected to peak in 2016 or 2017 and continue at that rate for another decade before beginning a slight decline. The oil boom and the associated activity impacts the demand for both GA and commercial air service. Both have seen quantifiable increases, such as the number of aircraft registered in the state, the number of licensed pilots in the state, and the number of daily airline departures.

The impacts of the oil boom can be seen in the state's socioeconomic profile as well. This information is presented in **Section 4.2**. From July 2011 to July 2012, North Dakota's population had the fastest growth rate overall and grew at a rate that was three times the national average. Within the state, the population growth is taking place primarily in the western part of the state while many counties in the eastern part of the state are projected to lose population during the planning horizon. North Dakota also had the fastest growing economy in the country in 2013 measured in real GDP. Growth rates for total employment, income per capita and total retail sales are all expected to increase over the planning horizon at the state level. The FAA notes that there is a strong correlation between economic growth and aviation demand in the *FAA Aerospace Forecast Fiscal Years 2014-2034.* Like population, economic

growth rates in all categories are higher in the oil counties on the west side of the state and around major population centers – especially Fargo and Bismarck.

The national aviation industry trends are highlighted in **Section 4.3**. The information in this section is taken from the *FAA Aerospace Forecast, Fiscal Years 2014-2034*. Although the aviation forecasts for the state of North Dakota are expected to be more directly influenced by the unique growth from the oil boom, the national aviation industry trends are also important. Through 2034, the national commercial aviation system capacity is expected to increase 2.1 %each year in the domestic market, which is lower than the economic growth projected. This means that other states will be competing with North Dakota airports for increased commercial air service. The total active GA fleet is projected to increase nationally at an average annual rate of 0.5 % through 2034. **Section 4.3** also addresses changing trends in the airline industry. Trends such as consolidation and fleet trends will also have an impact on future growth expectation.

With all of this information in mind, a forecasting approach was developed that reflects the unique growth conditions in North Dakota. Since the state is experiencing a growth rate that outpaces the rest of the country, a correlation to socioeconomic trends was selected over a correlation to national trends or trend line approaches. However, the traditional socioeconomic methodology was modified again to correlate with the specific growth rates projected for each county rather than looking at past trends at the state level as an indicator of future growth. The *Modified Socioeconomic Methodology* is the preferred methodology and it is described in detail in **Section 4.4**.

Section 4.5 provides a summary of the results of the forecasting efforts for each airport. First the growth rates by county are presented in **Table 4.9**. Then an aviation forecast summary of North Dakota GA Airports are listed in **Table 4.10**. Operations and based aircraft forecasts for commercial service airports are shared in **Section 4.5.3.** The information is presented in several tables to more easily communicate the source data and the forecast years, which vary between airports. Some of the forecasts were developed using the same methodology as the GA airports, and others, pulled from a recent Master Plan or recently updated TAF data. Passenger enplanement forecasts are assembled in **Table 4.16** using a combination of sources. Enplanements are expected to grow by more than 100 % from 2013 to 2035. The aviation forecasts for GA and commercial service airports for operations and based aircraft are presented in a combined format in **Table 4.17**. Total operations in North Dakota are expected to grow by nearly 30 % over the planning period, while based aircraft are expected to grow by nearly 35 % during the same time.

Table 4.17: Aviation Forecast Summary of North Dakota Airports

	Base Year Operations	Forecast of Operations*					Based Aircraft*		
Category	2013	2018	2025	2030	2035	% Growth 2013-2035	2013	2035	% Growth 2013-2035
ND Commercial Service Airports*	622,317	665,729	726,746	769,244	813,406	30.7%	749	1,090	45.5%
ND General Aviation Airports**	302,335	307,090	340,774	359,067	378,802	25.3%	1,092	1,391	27.4%
TOTAL All North Dakota Airports	**924,652**	**972,819**	**1,067,520**	**1,128,311**	**1,192,208**	**28.9%**	**1,841**	**2,481**	**34.8%**

*Source: Tables 4.11 – 4.15 of this chapter. Note: Forecast Years for all commercial service forecasts were combined at 5-year integrals with 2023/2025 projections, 2028/2030 projections and 2033/2035 projections combined into single forecast years.
**Source: Table 4.10 of this chapter.

As noted in the beginning of this chapter, projecting aviation demand is a crucial element in the aviation system planning process as it provides the basis for several key analyses. Because the forecasting process requires a static point-in-time to be established from which to make projections of operations and based aircraft, projections will change as time passes. Since the forecasts of based aircraft were based on 2013 figures and created in 2014 for the NDSASP, growth has continued across the state. At the time of printing of the NDSASP, February 2015, the number of current and anticipated based aircraft has increased at the airports listed in **Table 4.18**, further illustrating the continued growth of aviation in the state.

Table 4.18: 2015 Updated Based Aircraft Projections

	Original Based Aircraft Projections (2014)		Updated Based Aircraft Projections (2015)		Reason for Change
	2013	2035	2015	2035	
Airport					
Ashley Municipal Airport	12	14	**14**	**18-20**	Anticipated NPIAS inclusion
Cando Municipal Airport	6	6	**10**	**12**	Additional hangar development
Carrington Municipal Airport	13	14	**17**	**20**	Current based aircraft increased
Cavalier Municipal Airport	18	20	**24**	**26**	Current based aircraft increased
Edgeley Municipal Airport	12	12	12	**16**	Additional hangar development
Gwinner Airport -Roger Melroe Field	12	13	12	**16**	Future hangar development to meet demand
Hillsboro Municipal Airport	23	25	23	**35**	Future land purchase and hangar development
Kulm Municipal Airport (frmr Pruetz)	8	8	8	**12**	Expecting continued growth
La Moure Rott Municipal Airport*	8	8	**10**	**12**	Current based aircraft increased
Maddock Municipal Airport	9	10	9	**12**	Growing pilot population
Mayville Municipal Airport	8	9	8	**14**	Future hangar development to meet demand
Milnor Municipal Airport	4	4	**5**	**6**	Current based aircraft increased
Park River Airport - W C Skjerven Field	10	11	10	**16**	Additional hangar development
Walhalla Municipal Airport	6	7	6	**12**	Additional hangar development
Weydahl Field Airport	0	0	0	**15**	Airport reconstruction and location in a leading oil producing county

Notes: **Bold = indicates updated value as of February 2015.** If an updated 2015 aircraft count was not necessary, the 2013 aircraft count was carried over.

The original forecast data and the updated forecast data presented in this chapter will be used to aid in determining the role of airports within North Dakota's aviation system. It will also be used to evaluate the capacity of existing airport facilities and their ability to accommodate projected aviation demand, and to estimate the extent of airside and landside improvements required in the future to accommodate projected demand. See **Appendix D** – Individual Airport Reports for detailed, airport-specific forecast data.

CHAPTER 5 – SYSTEM ANALYSIS

The evaluation of the system in the planning process is one of the most important components, since the performance of the system as a whole is measured against the goals that were first established for the plan. It is in this evaluation step that the successes and shortfalls of the system are identified. Both successes and shortfalls are used in the development of recommendations that are aimed at helping airports meet the system goals, both at the system-wide level and at the local airport level.

The goals, performance measures, and benchmarks that were established as a part of the 2007 NDSASP have been carried forward into this 2014 update to evaluate system performance and progress. By carrying forward the same goals and performance measures, a true evaluation of system performance can be made. The evaluations of the system in meeting each individual performance measure is provided in the following sections:

5.1 Goal: Strive to Attain Safety and Security
5.2 Goal: Accommodate Accessibility Needs
5.3 Goal: Enhance Air Access to Airports
5.4 Goal: Support North Dakota's Economy
5.5 Goal: Enhance Quality of Life
5.6 Goal: Preserve North Dakota Airport Assets

For some performance measures, a simple calculation was required as to whether an airport had or did not have a particular facility or service. For other performance measures, Geographic Information System (GIS) mapping and analysis was required to determine the percentage of population and area that fall within a specific drive time of an airport with a particular facility or service. For those measures that required GIS analysis, a map has been provided that illustrates the coverage of the state both in area and in population (full page size maps can be found in **Appendix C**). Data from Woods & Poole was used for all population coverage analysis, and drive times were generated assuming that the user is able to travel at posted speed limits. Although the population and area coverages shown on these maps truncate at state borders, coverage often extends into neighboring states for airports located along the borders.

It is important to note that these maps look different than the maps that are included in the 2007 plan due to advances in drive time analyses. In 2007, the maps include rounded, general drive time areas, and in this 2014 update, more precise drive time areas are shown that are generated from the most current traffic and road infrastructure data. As a result, the updated maps provided in this chapter show irregular shapes that outline specific drive times for the appropriate performance measures. Since the drive times

are not rounded or generalized for this system plan update, in some instances the areas of coverage are slightly reduced from the coverage shown previously, but are expected to be more accurate.

5.1 Goal: Strive to Attain Safety and Security

The following performance measures are aimed at achieving a high level of safety and security within North Dakota's aviation system. For a listing of security measures available at each airport, see the detailed inventory provided in **Appendix B**.

5.1.1 Percent of Airports with Clear Approaches to Primary Runway Ends

Maintaining clear approaches to all runway ends is critically important to preserve the safety of airport operations. An approach is defined as a three-dimensional surface extending from the end of a runway, which is used by aircraft taking off and landing at an airport. The size of the approach surface depends on the type of approach a runway has. When obstructions exist that penetrate this three-dimensional surface, such as trees and other structures, approach minimums can be raised. Raising the approach minimums limits the usability of an airport in times of reduced visibility.

Airport Layout Plans (ALPs) for each system airport (if available) were compared to obstruction data found on the Airport Master Records (FAA 5010 Forms) to determine which primary runway ends have clear approaches. For this performance measure, the 20:1 approach surface size was used in the analysis even though a runway may have a different approach ratio and related overall size (34:1 or 50:1 depending on the type of approach [precision, non-precision, or visual]). This approach size was used due to the recent effort of the Federal Aviation Administration (FAA) to mitigate obstructions to the 20:1 approaches at airports across the country. On November 15th, 2013, the FAA issued a Memorandum titled *Mitigation of obstructions within the 20:1 Visual Area Surface.* This memo outlined procedures for identifying, verifying, and mitigating approach obstructions at all airports in order to maintain safe operations. If obstructions to the 20:1 surface are not addressed at an airport, the FAA can restrict operations leading to loss of airport access. This performance measure is aimed at providing clear 20:1 approaches at system airports, and achieving system compliance with the regulations established in the recently released FAA memo. It is important to note that this analysis is a snapshot in time, and obstruction data can change at any time; therefore, it is necessary to keep this information updated.

The benchmark for this performance measure is to have 100% of primary runway approaches in the system clear of obstructions to the 20:1 surface. To achieve this benchmark, the 20:1 approach to both ends of an airport's primary runway must be clear. In 2014, 65% of airports have

clear 20:1 approaches, shown in **Table 5.1**. A listing of airports not meeting this benchmark is provided in **Table 5.2**.

Benchmark: 100% of Airports have Clear Approaches to their Primary Runway Ends
Performance: 65% of Airports have Clear Approaches to their Primary Runway Ends

Table 5.1: Percent of Airports with Clear Approaches

Clear Approaches to Primary Runway Ends	Number of System Airports	Percentage of System Airports
Has Clear Approaches to Both Primary Runway Ends	58	65.2%
Doesn't Have Clear Approaches to Both Primary Runway Ends	31	34.8%
Total System Airports	**89**	**100.0%**

Source: Airport Layout Plans and Airport Master Records (FAA 5010 Forms)

Table 5.2: Airports not Meeting the Clear Approaches Performance Measure

Arthur	Killdeer	New Rockford
Beulah	La Moure (N)	New Town
Bowbells	Larimore	Park River (N)
Bowman (N)	Leeds	Riverdale
Cavalier (N)	Lidgerwood	Rolette
Columbus	Maddock	Towner
Devils Lake (N)	Mayville	West Fargo
Dunseith (N)	McClusky	Westhope
Enderlin	McVille	Wishek
Fort Yates (N)	Milnor	
Hazelton	Minto	

(N) = NPIAS airports
Note: Airports are listed by associated city.

5.1.2 Percent of Airports with No Wetlands, Roads and/or Structures in the Runway Protection Zones

This performance measure is related to the two-dimensional surface underneath a runway's approach, known as the Runway Protection Zone (RPZ). This area is intended to protect people and property on the ground in the event of an aircraft overrun or undershoot. Research shows that a significant number of takeoff and landing accidents occur within this area, and as such it is critical that RPZs are clear of incompatible objects and activities. The dimensions of an RPZ depend on the runway design and approach minimums. Aerial photography and ALPs (if available) were reviewed for each system airport to identify wetlands, structures, and roads within airport RPZs.

The benchmark for this performance measure is to have 100% of system airports with clear RPZs. In order to achieve this benchmark, all RPZs for all runways at an airport need to be clear. In 2007, the presence of roads in RPZs was not considered in this analysis. Since recent FAA guidance indicates that roads should be avoided in RPZs, they were considered to be an incompatible use

in this 2014 update. In 2007, 38% of airports had clear RPZs. In 2014, 4.5% of airports have clear RPZs, due in part to the addition of roads as an incompatible use, shown in **Table 5.3** (when the presence of roads is removed from the analysis, 38 percent of airports have clear RPZs). As noted in **Table 5.3,** the predominant issue appears to be the presence of roads in the RPZ areas, followed by the existence of wetlands. A listing of airports not meeting this benchmark is provided in **Table 5.4**.

Benchmark: 100% of Airports with No Wetlands, Roads and/or Structures in their RPZs.
Performance: 4.5% of Airports with No Wetlands, Roads and/or Structures in their RPZs.

Table 5.3: Percent of Airports with Clear RPZs*

Clear RPZs	Number of System Airports	Percentage of System Airports
Has Clear RPZs on all Runways	4	4.5%
Has at Least 1 Wetland in an RPZ	47	52.8%
Has at Least 1 Structure in an RPZ	14	15.7%
Has at Least 1 Road in an RPZ	80	89.9%

*Clear = no wetlands, structures or roads in any of the RPZs
Note: Some airports had two or all three of these uses in their RPZs; therefore, the total number of system airports does not equal 89 as airports were counted multiple times across the categories, if applicable.
Source: Airport Layout Plans and aerial photography

Table 5.4: Airports not Meeting the Clear RPZs Performance Measure

Arthur	Gwinner (N)	Northwood (N)
Ashley	Harvey (N)	Oakes (N)
Beach (N)	Hazelton	Page
Beulah	Hazen (N)	Park River (N)
Bismarck (N)	Hettinger (N)	Parshall (N)
Bottineau (N)	Hillsboro (N)	Plaza
Bowbells	Jamestown (N)	Richardton
Bowman (N)	Kenmare (N)	Riverdale
Cando (N)	Kindred (N)	Rolette
Carrington (N)	La Moure (N)	Rolla (N)
Casselton (N)	Lakota (N)	Rugby (N)
Columbus	Langdon (N)	St Thomas
Cooperstown (N)	Larimore	Stanley (N)
Crosby (N)	Leeds	Tioga (N)
Devils Lake (N)	Lidgerwood	Towner
Dickinson (N)	Linton (N)	Turtle Lake
Drayton	Lisbon (N)	Valley City (N)
Dunseith (N)	Maddock	Wahpeton (N)
Edgeley (N)	Mandan (N)	Walhalla (N)
Elgin	Mayville	Washburn (N)
Ellendale (N)	McClusky	Watford City (N)
Enderlin	McVille	West Fargo

Table 5.4: Airports not Meeting the Clear RPZs Performance Measure (Continued)

Fargo (N)	Milnor	Westhope
Fessenden	Minot (N)	Williston (N)
Fort Yates (N)	Minto	Wishek
Gackle	Mohall (N)	
Garrison (N)	Mott (N)	
Glen Ullin (N)	Napoleon	
Grafton (N)	New Rockford	
Grand Forks (N)	New Town	

(N) = NPIAS airports
Note: Airports are listed by associated city.

5.1.3 Percent of Airports That Control RPZs through Fee Simple Ownership or Easements

Keeping RPZs clear of incompatible uses can be less challenging when an airport owns the land within each runway's RPZ. Therefore, it is ideal for an airport to have control over this property to protect the area and people within this safety area. An airport can control this land through easements (purchasing the rights to the airspace above a property) or using fee simple acquisition (purchasing the property). Either method gives the airport the right to control the use of the property, including limiting the height of trees and structures on the parcel. Information about RPZ control was gathered through the airport manager survey effort.

The benchmark for this performance measure is to have 100% of system airports control their RPZs. In order to achieve this benchmark, an airport has to have complete control (through either easements or fee simple ownership) over all of their RPZs. In 2007, 27% of system airports had complete control over their RPZs. In 2014, 37% of airports had complete control over their RPZs, an increase of ten percent, shown in **Table 5.5**. Additionally, 30% of airports have partial control over their RPZs. A listing of airports not meeting this benchmark is provided in **Table 5.6.**

Benchmark: 100% of Airports that Control their RPZs

Performance: 37% of Airports Control their RPZs

Table 5.5: Percent of Airports Controlling RPZs

Control of RPZs	Number of System Airports	Percentage of System Airports
Complete Control of RPZs	33	37.1%
Incomplete Control of RPZs	27	30.3%
No Response	29	32.6%
Total System Airports	**89**	**100.0%**

Source: Airport Manager Survey

Table 5.6: Airports not Meeting the RPZ Control Performance Measure

Arthur	Garrison (N)	Minto
Ashley	Harvey (N)	New Rockford
Beulah	Hazelton	Plaza
Bottineau (N)	Hillsboro (N)	Richardton
Bowbells	Killdeer	Rolette
Bowman (N)	La Moure (N)	St. Thomas
Columbus	Mayville	Watford City (N)
Drayton	McVille	West Fargo
Dunseith (N)	Milnor	Williston (N)
Airports that did not Respond:		
Beach (N)	Jamestown (N)	Oakes (N)
Cooperstown (N)	Kulm	Parshall (N)
Crosby (N)	Langdon (N)	Riverdale
Devils Lake (N)	Larimore	Towner
Edgeley (N)	Leeds	Turtle Lake
Elgin	Lidgerwood	Valley City (N)
Fessenden	Maddock	Walhalla (N)
Gackle	McClusky	Westhope
Grafton (N)	Minot (N)	Wishek
Gwinner (N)	Napoleon	

(N) = NPIAS airports
Note: Airports are listed by associated city.

5.1.4 Percent of Airports That Have a Wildlife Management Plan

Wildlife hazards can impact the safety of aircraft operations at an airport. Likewise, an airport environment can be unsafe for wild animals. As such, the development of a wildlife management plan is important for airports to manage and mitigate wildlife concerns in proximity to an airfield. Information regarding the existence of wildlife management plans at airports was collected through the airport manager survey effort.

This performance measure is new for this 2014 update of the NDSASP. The benchmark for this performance measure is to have 100% of system airports classified as Primary Commercial Service, Non-Primary Commercial Service, National, Regional, and Local with wildlife management plans. To achieve this benchmark, an airport has to have a wildlife management plan, or be in the process of developing one. In 2014, 27 airports were recommended to have a management plan and 17 of those airports either have or are in the process of developing one (63%). **Table 5.7** and **Figure 5.1** illustrate the performance of the system for this measure. A listing of airports not meeting this benchmark is provided in **Table 5.8**.

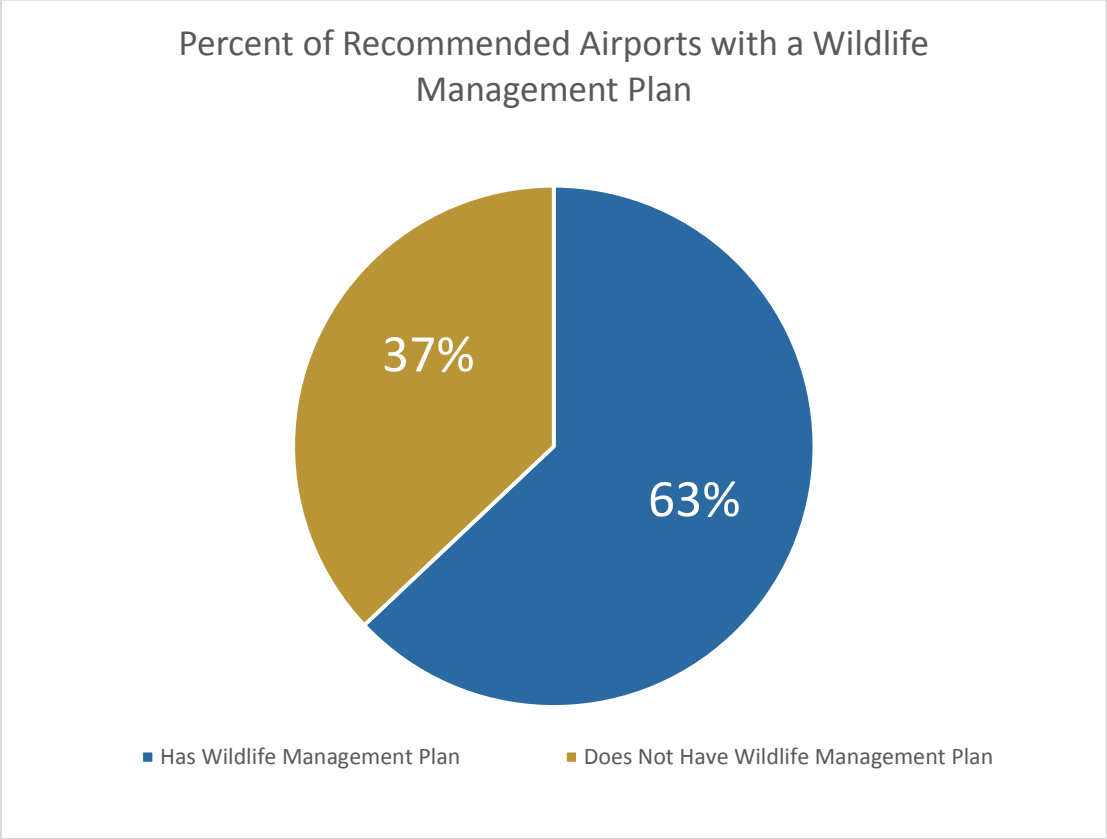
Benchmark: 100% of Airports Classified as Primary or Non-Primary Commercial Service, National, Regional, and Local Recommended to have a Wildlife Management Plan.
Performance: 63% of Recommended Airports have a Wildlife Management Plan.

Table 5.7: Percent of Airports with a Wildlife Management Plan*

Wildlife Management Plan	Number of Recommended Airports	Percentage of Recommended Airports
Has Wildlife Management Plan	17	63.0%
Does Not Have Wildlife Management Plan	10	37.0%
Total System Airports Recommended to Have Wildlife Plan	**27**	**100.0%**

*Airports with Wildlife Management Plans in progress were counted as having a Wildlife Management Plan.
Source: Airport Manager Survey

Figure 5.1: Percent of Airports with a Wildlife Management Plan*



*Airports with Wildlife Management Plans in progress were counted as having a Wildlife Management Plan.
Source: Airport Manager Survey

Table 5.8: Recommended Airports not Meeting the Wildlife Management Plan Performance Measure

Bottineau (N)	Hettinger (N)	Wahpeton (N)
Casselton (N)	Kindred (N)	Watford City (N)
Cavalier (N)	Mohall (N)	
Garrison (N)	Tioga (N)	

(N) = NPIAS airports
Note: Airports are listed by associated city.

5.2 Goal: Accommodate Accessibility Needs

Enhancing ground access to system airports is important for airport users of all kinds, including pilots, pilots in training, medical patients, and the general traveling public. The next five performance measures are related to the provision of certain types of airports within what is considered to be a reasonable drive time of North Dakota's population.

5.2.1 Percent of Area and Population within 60 Minutes of a Commercial Service Airport

Providing reasonable access to the state's eight commercial service airports is critical for business, medical, and leisure travelers. A drive time of 60 minutes was considered reasonable to reach these airports. **Figure 5.2** illustrates the coverage of area and population within this established drive time.

The benchmark for this performance measure is coverage of 50% of the land and 90% of the population within 60 minutes of the Commercial Service Airports. In 2007, coverage was based on a 90-minute drive time from Bismarck, Fargo, Grand Forks and Minot, and a 60-minute drive time from Devils Lake, Dickinson, Jamestown, and Williston that covered 70% of the area and 89% of the population. Due to the modification of the drive times used in this evaluation, 40% of the state's land and 80% of the state's population are currently covered. The land and population coverage benchmarks are nearly being met.

When the forecasted population in 2018 and 2025 are taken into account, the percentage of population coverage increases to 81% and 82% , respectively (shown in **Figure 5.3** and **Figure 5.4**).

Benchmark: 50% of Area and 90% of Population within 60 Minutes of a Commercial Service Airport
Performance: 40% of Area and 80% of Population within 60 Minutes of a Commercial Service Airport

Figure 5.2: 2013 Percent of Area and Population within 60 Minutes of Commercial Service Airports

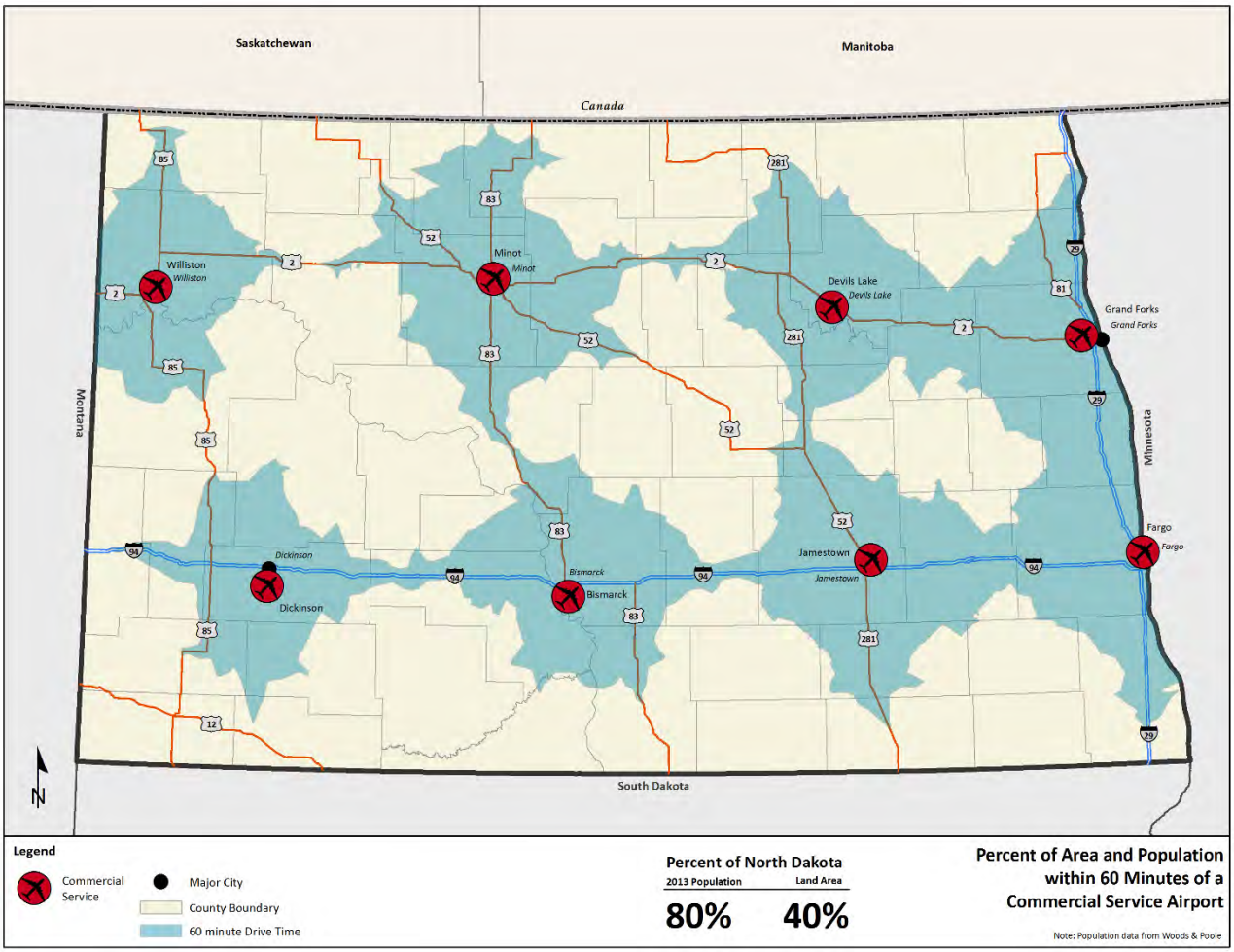


Figure 5.3: 2018 Percent of Area and Population within 60 Minutes of Commercial Service Airports

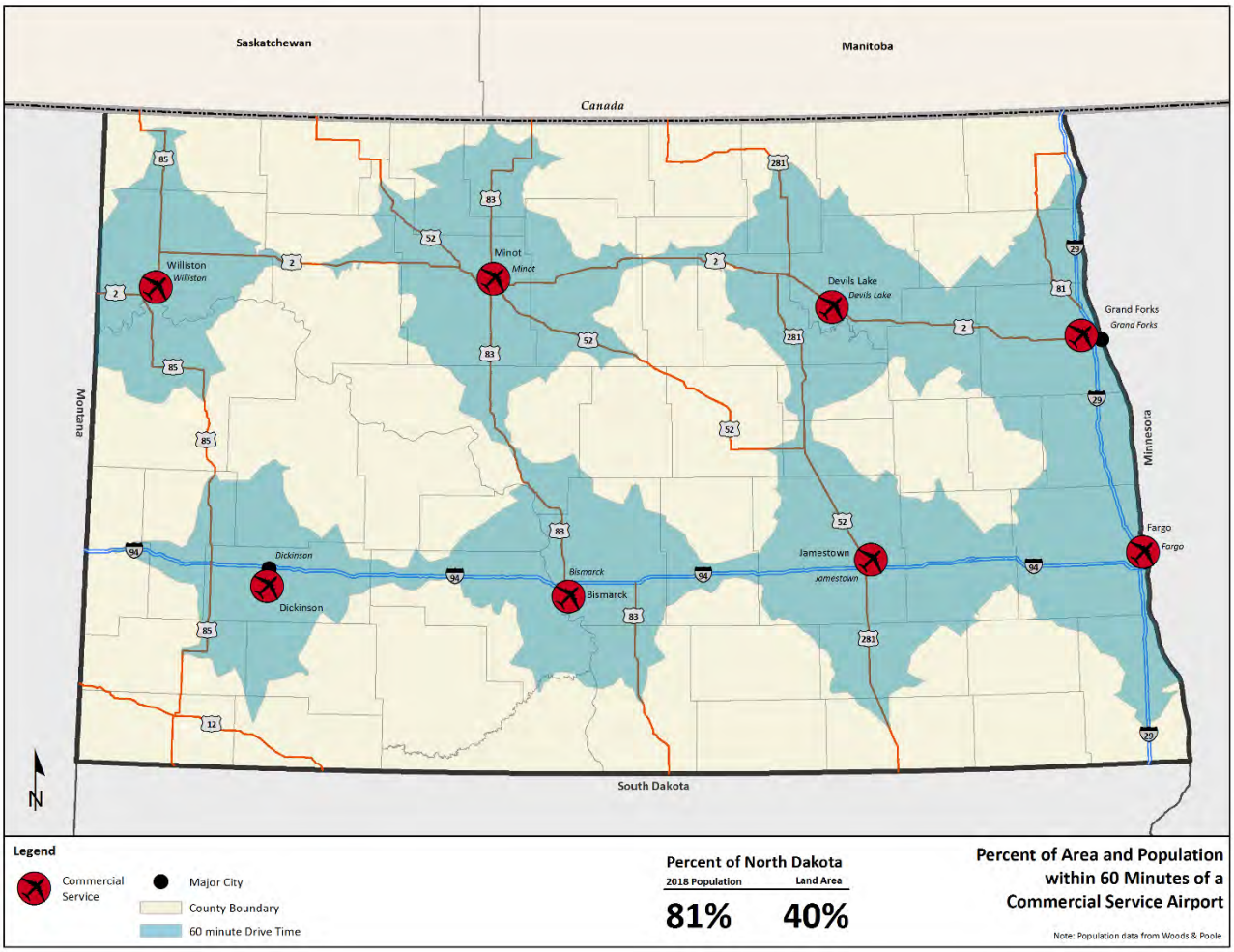
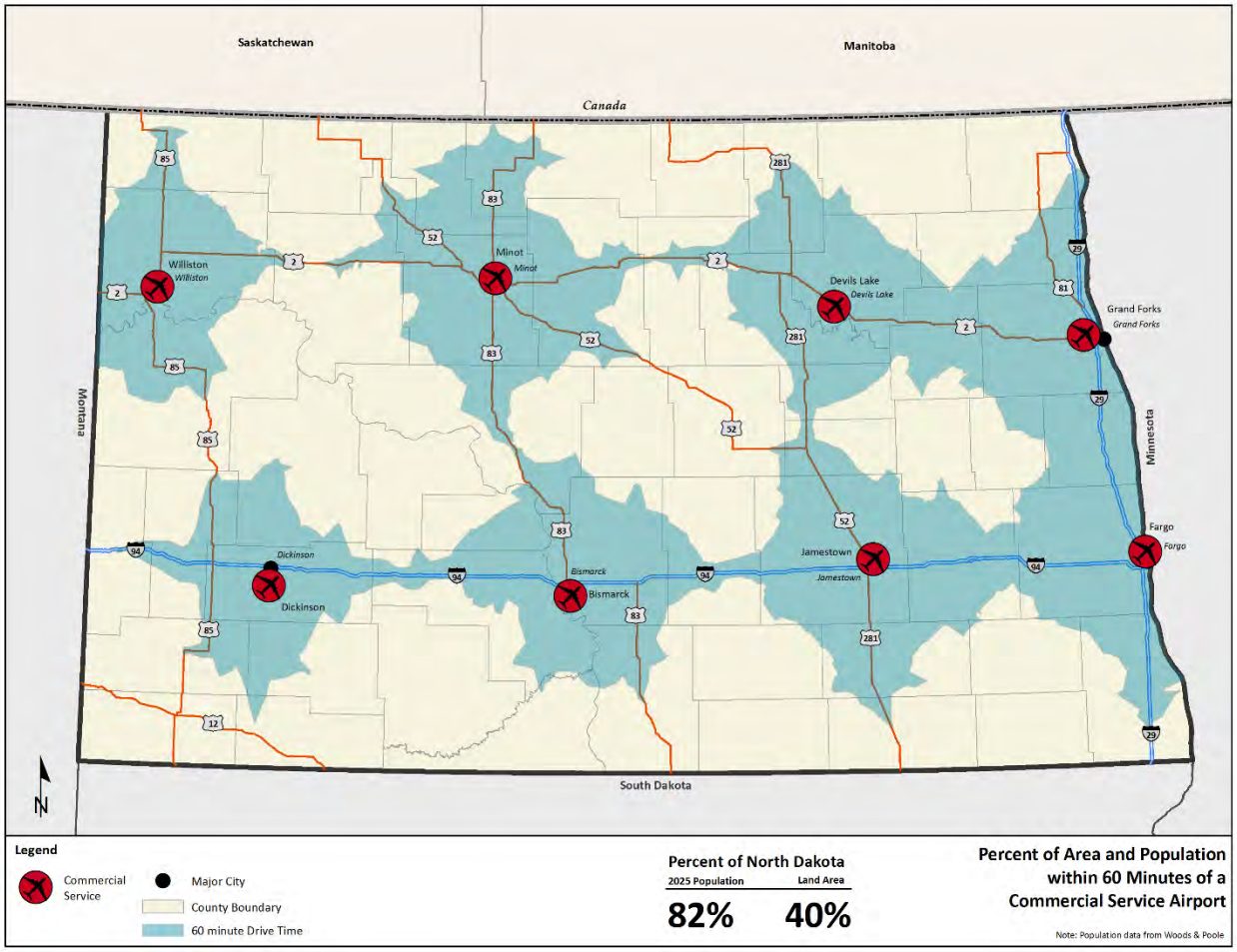


Figure 5.4: 2025 Percent of Area and Population within 60 Minutes of Commercial Service Airports



5.2.2 Percent of Population within 30 Minutes of an Airport Classified as Local or Larger

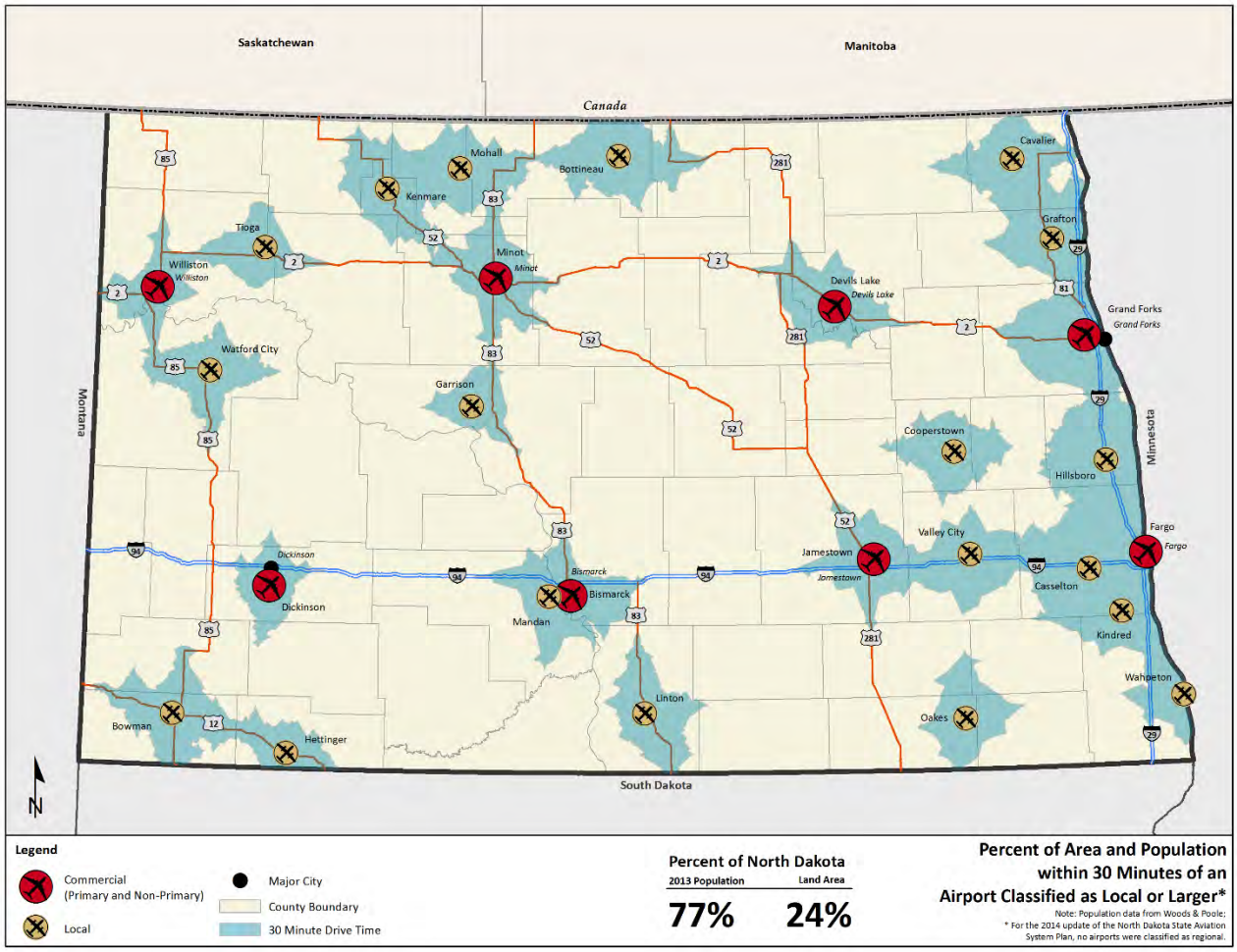
As discussed in Chapter 2, this 2014 system plan update generally utilizes the classifications that are used by the FAA in their study *General Aviation Airports: A National Asset* (known as the ASSET Study). Airports classified as local or larger can usually support use by a variety of users, including corporate or business aviation. Providing access to these airports is important to support their continued use. **Figure 5.5** illustrates the coverage of area and population within this established drive time.

This performance measure is new for this NDSASP update. The benchmark for this performance measure is coverage of 90% of the population within 30 minutes of a Local or larger airport. At the time of this report writing, no airports were classified as Regional in the system, therefore only Local, Non-Primary and Primary Commercial Service airports were used in the evaluation (27 airports). The current population coverage is 77%. This benchmark is not being met.

Although coverage of area is not included in this benchmark, current area coverage of airports that classified as local or larger is 24%.

Benchmark: 90% of Population within 30 Minutes of a Local or Larger Airport
Performance: 77% of Population within 30 Minutes of a Local or Larger Airport

Figure 5.5: 2013 Percent of Population within 30 Minutes of Local or Larger Airports



To anticipate the population coverage over the planning period, projections for 2018 and 2025 were made and are presented in **Figure 5.6** and **Figure 5.7**. This indicates a small amount of growth with population coverage increasing by one percent in 2018 to 78%, and another one percent to 79% in 2025.

Figure 5.6: 2018 Percent of Population within 30 Minutes of Local or Larger Airports

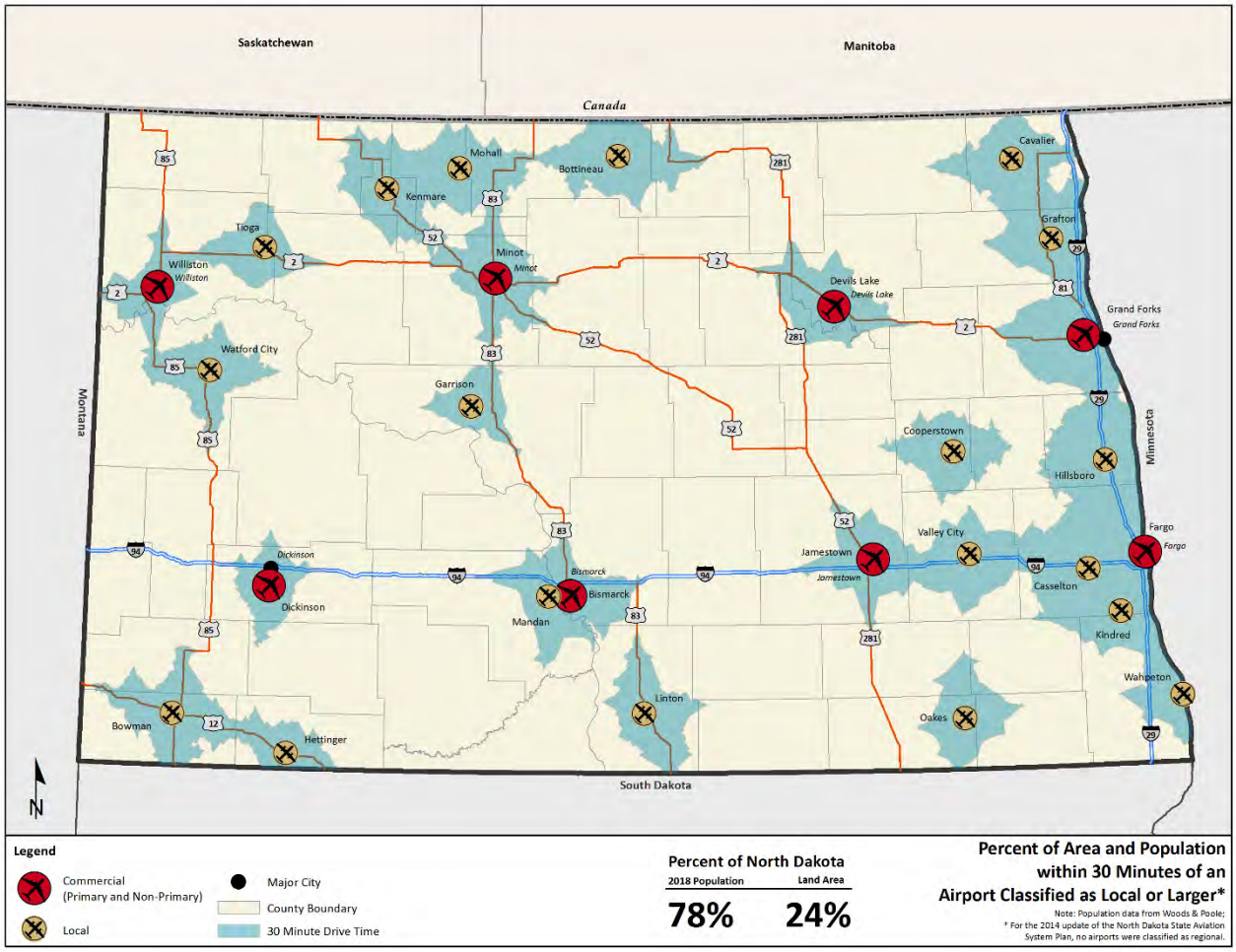
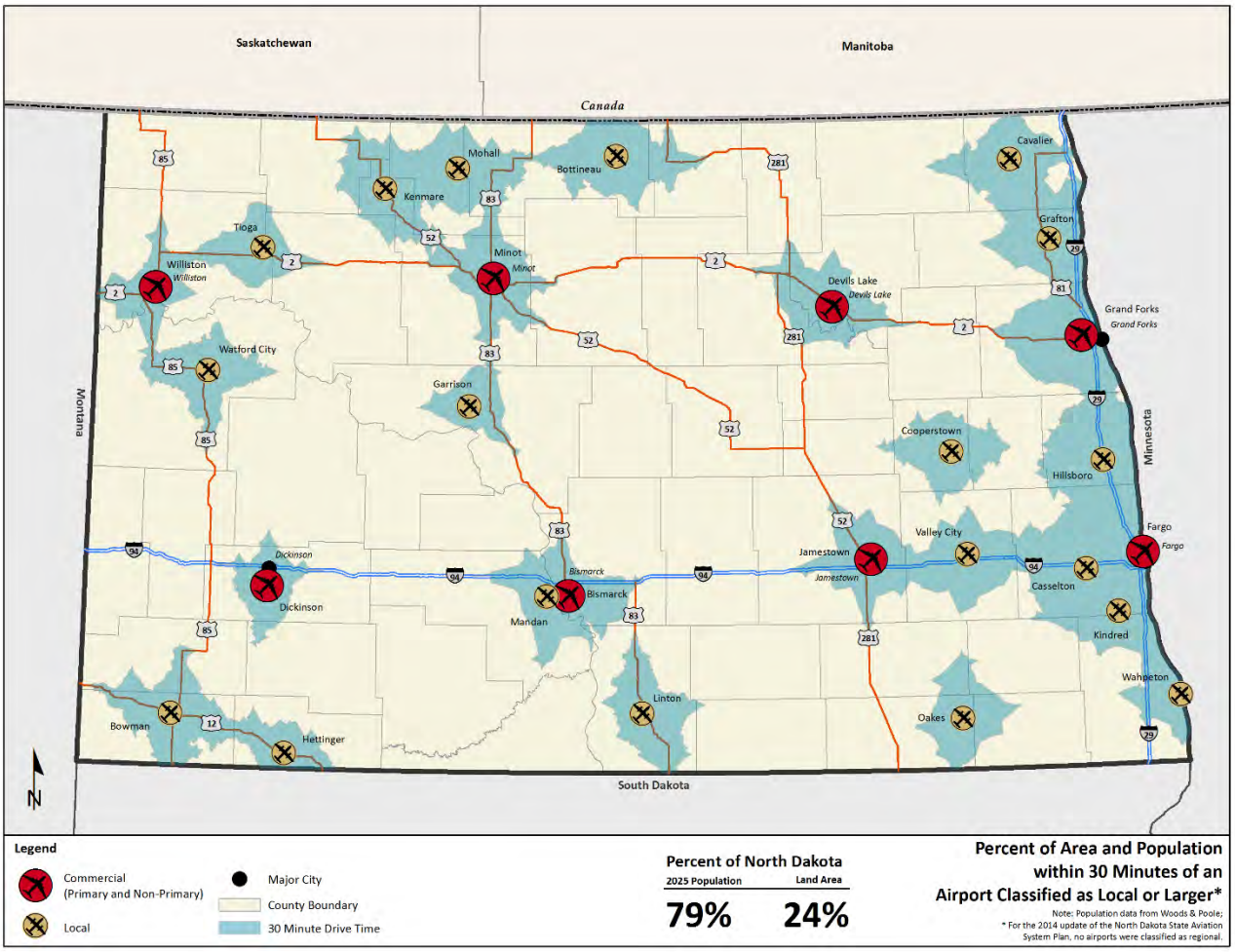


Figure 5.7: 2025 Percent of Population within 30 Minutes of Local or Larger Airports



5.2.3 Percent of Population within 30 Minutes of an NPIAS Airport

As discussed in Chapter 1, an airport must be included in the National Plan of Integrated Airport Systems (NPIAS) to be eligible for federal funding through the FAA's Airport Improvement Program (AIP). Airports that are included in the NPIAS must meet certain criteria (such as based aircraft counts) and be located at least a 30-minute drive time from the nearest NPIAS airport. North Dakota's aviation system has 53 airports included in the NPIAS. A drive time of 30 minutes was considered reasonable to these airports. **Figure 5.8** illustrates the coverage of population within this established drive time.

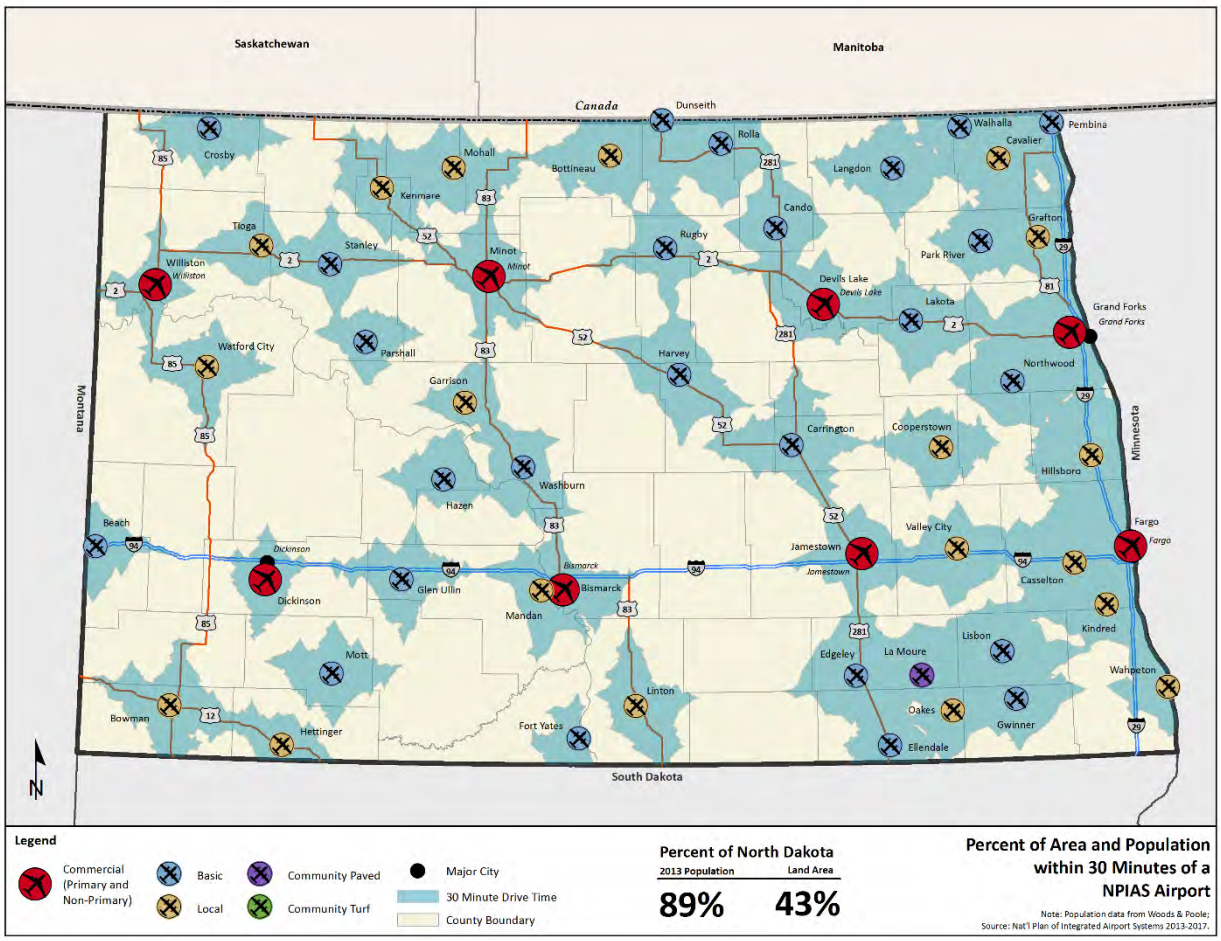
The benchmark for this performance measure is coverage of 90% of the population within 30 minutes of the state's NPIAS airports. In 2007, 88% of the population was covered. Currently, the same 53 airports are included in the NPIAS. Due to population shifts and a refined drive time

analysis, the current population coverage is 89%. The population coverage benchmark is nearly being met.

Although coverage of area is not included in this benchmark, current area coverage of NPIAS airports is 43%.

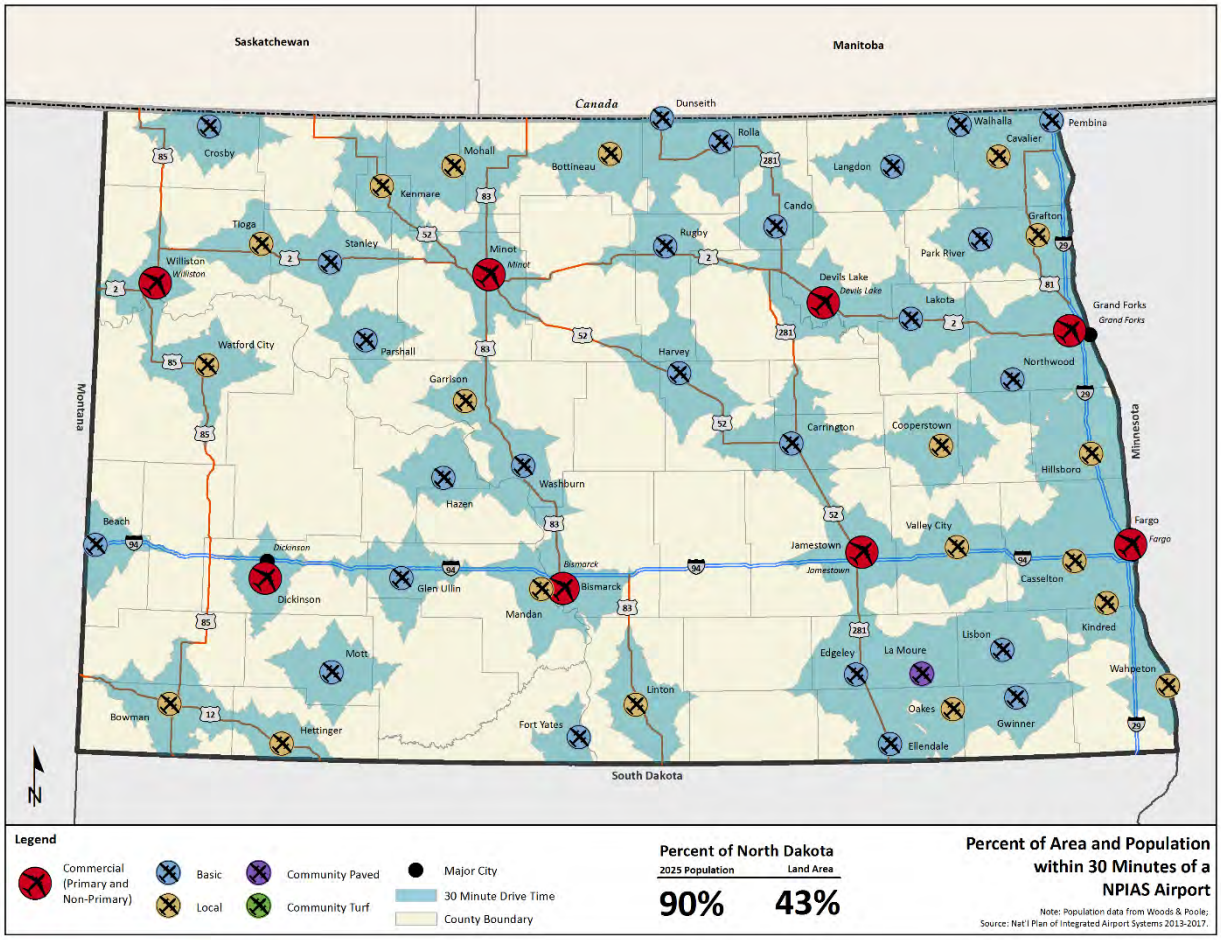
Benchmark: 90% of Population within 30 Minutes of a NPIAS Airport
Performance: 89% of Population within 30 Minutes of a NPIAS Airport

Figure 5.8: 2013 Percent of Population within 30 Minutes of NPIAS Airports



To anticipate the population coverage over the planning period, projections for 2018 and 2025 were made. Population coverage remains the same from 2013 to 2018 at 89%, and increases to 90% in 2025, presented in **Figure 5.9**. The population coverage benchmark is expected to be accomplished by 2025.

Figure 5.9: 2025 Percent of Population within 30 Minutes of NPIAS Airports



5.2.4 Percent of Population within 30 Minutes of Any Public Airport

Providing access for airport users to all 89 airports in the system is important, regardless of commercial service availability, inclusion in the NPIAS, etc. The coverage of population for the entire system of airports was evaluated in this performance measure. A drive time of 30 minutes was considered reasonable to each of the 89 system airports. **Figure 5.10** illustrates the coverage of population within this established drive time.

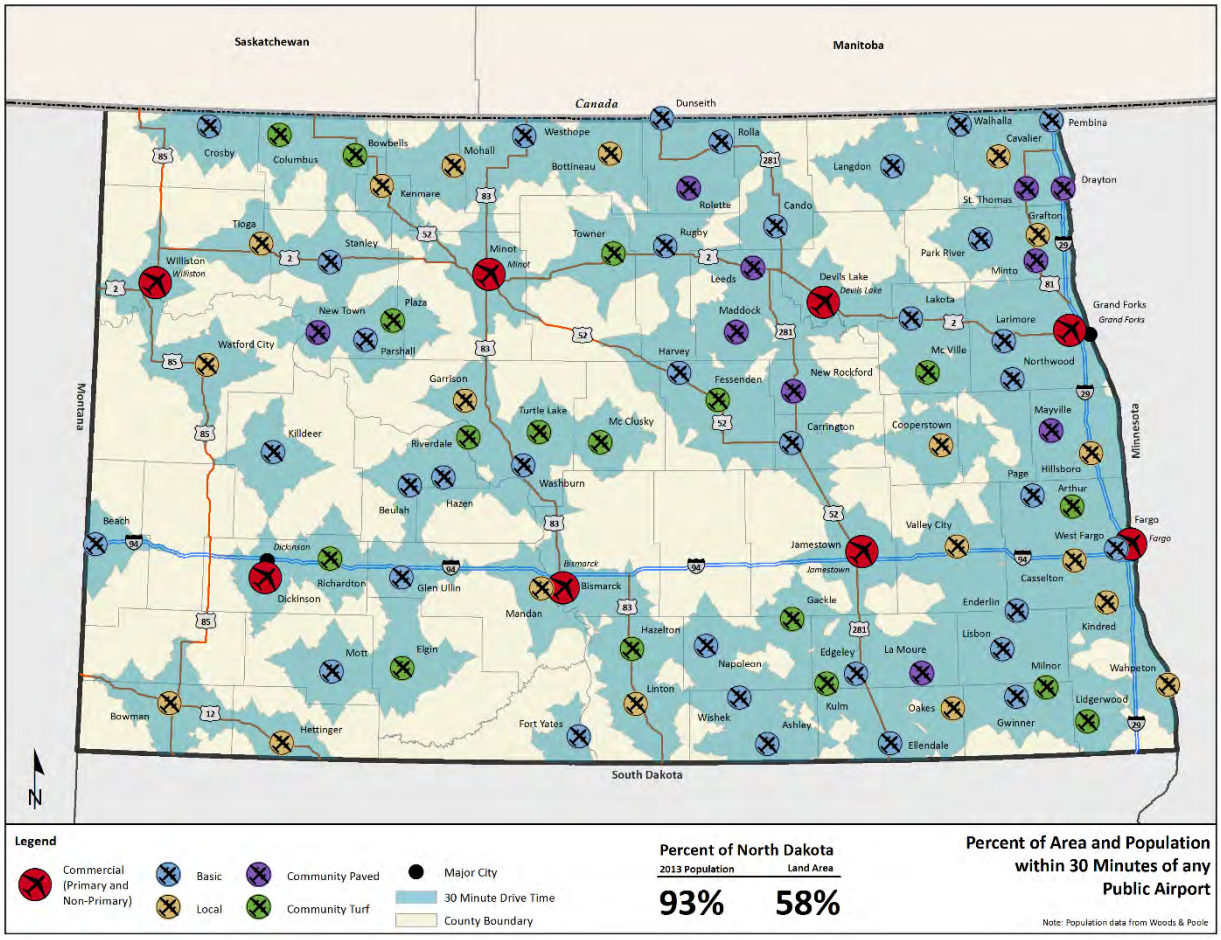
The benchmark for this performance measure is coverage of 95% of the population within 30 minutes of all system airports. In 2007, 94% of the population was covered. Due to population shifts and a refined drive time analysis, the current population coverage is 93%.

Although coverage of area is not included in this benchmark, current area coverage of all 89 public use airports is 58%.

Benchmark: 95% of Population within 30 Minutes of Any Public Airport

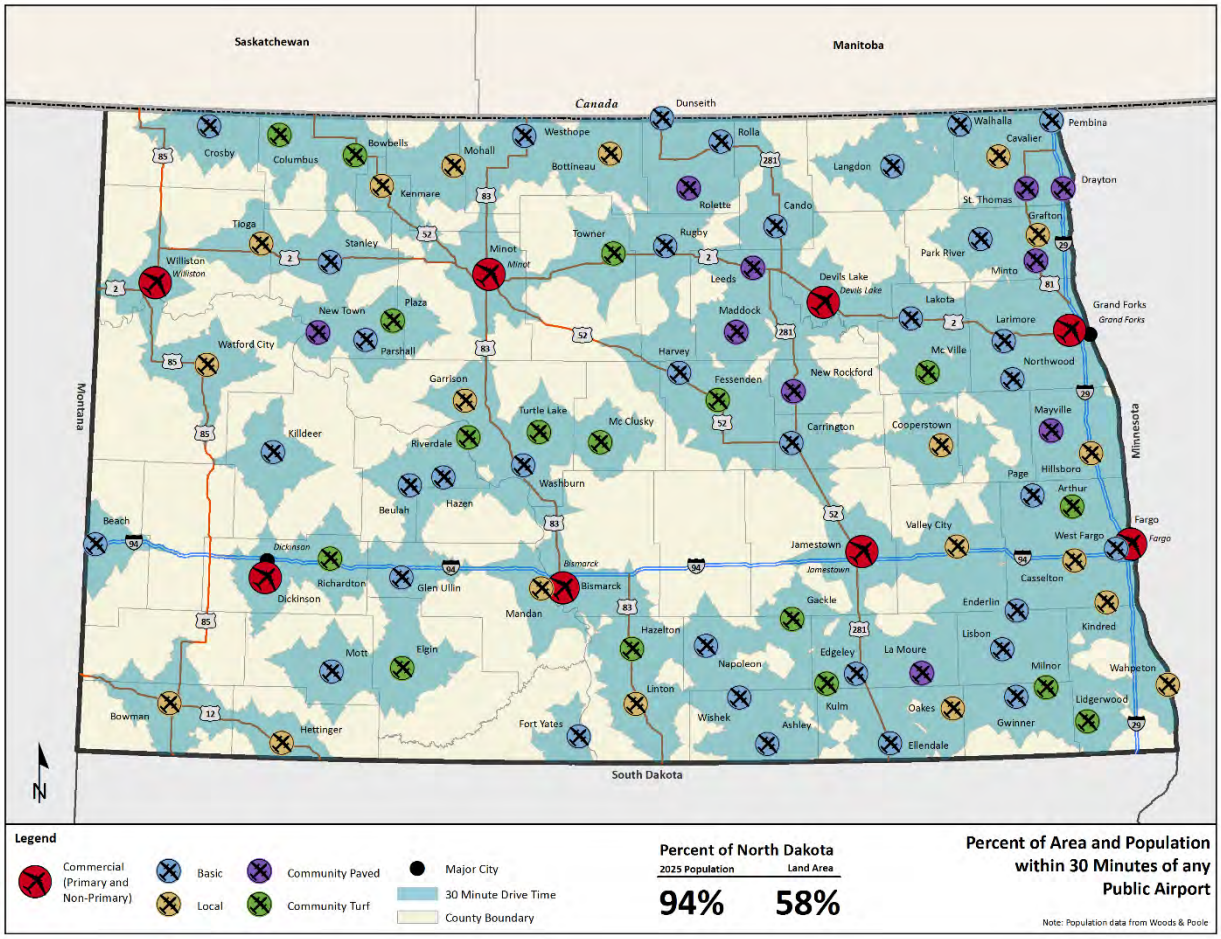
Performance: 93% of Population within 30 Minutes of Any Public Airport

Figure 5.10: 2013 Percent of Population within 30 Minutes of Any Public Airport



To anticipate the population coverage over the planning period, projections for 2018 and 2025 were made. Population coverage remains the same from 2013 to 2018 at 93%, and then increases to 94% in 2025, shown in **Figure 5.11**.

Figure 5.11: 2025 Percent of Population within 30 Minutes of Any Public Airport



5.2.5 Percent of Area within 30 Minutes of an Airport Serving an Aerial Applicator

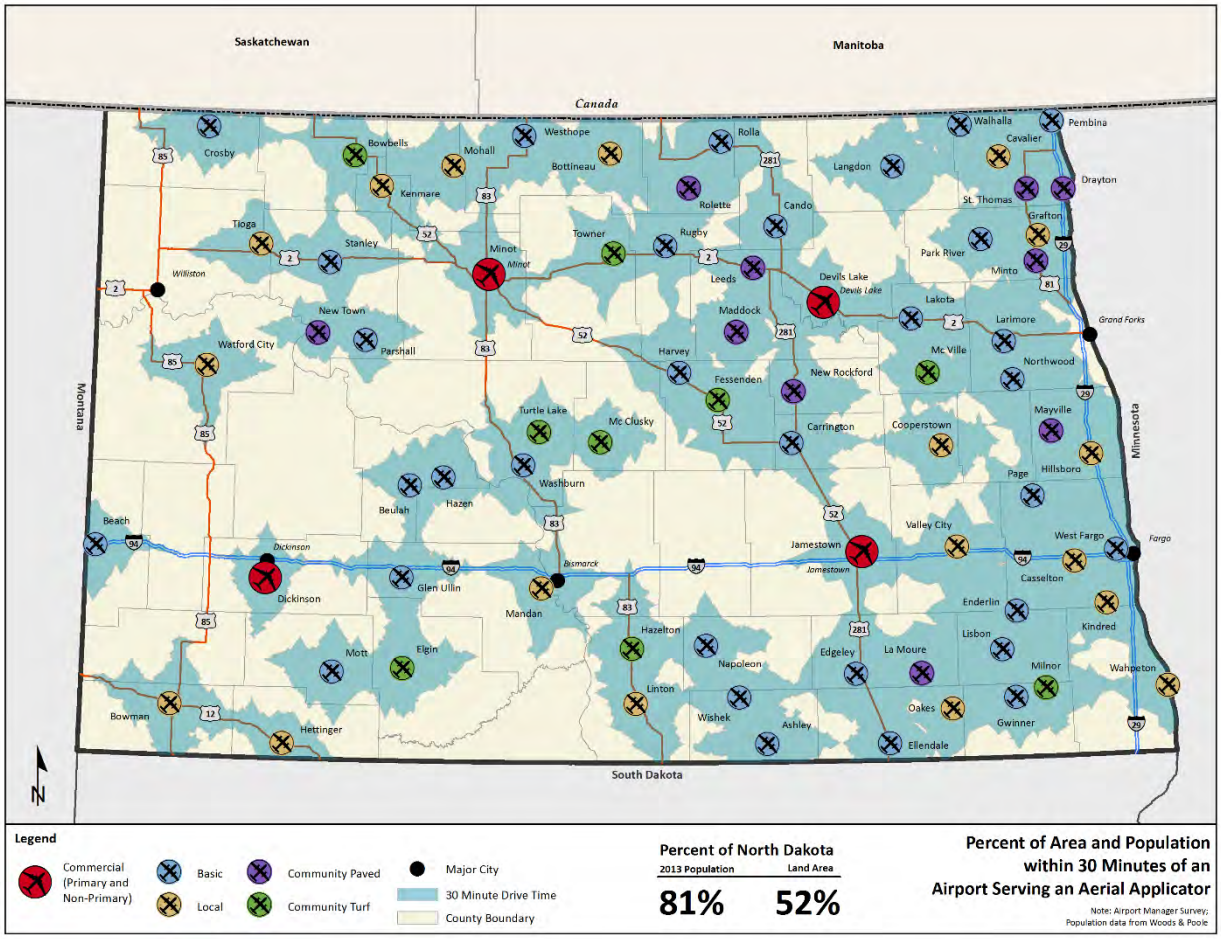
Agriculture is one of North Dakota's largest industries, with nearly 25% of the State's working population being employed in agricultural-related business. Many of the airports in North Dakota's aviation system support operations by aerial applicators who utilize special aircraft to apply fertilizers, pesticides, and other products to crops. Agricultural spraying helps meet production needs that ground-only operations are not able to meet. Annually, 4-5 million acres in North Dakota have aerial applicator services. Providing space at an airport for agricultural aircraft to operate without impacting normal aircraft operations is preferred. With over 200 agricultural spraying aircraft operating in the state in 2013, it is important that system airports support agricultural spraying activities and that these facilities are within a reasonable distance for users (30 minutes or less). **Figure 5.12** illustrates the coverage of area within this established drive time. Information regarding the existence of based and transient aerial applicators at airports was collected through the airport manager survey effort.

The benchmark for this performance measure is coverage of 80% of North Dakota's land and within 30 minutes of airports who serve aerial applicators. In 2007, coverage was based on the location of individual aerial applicators and 64% of the land area was covered. For this 2014 NDSASP update, coverage is based strictly on airports who support aerial applicators and the current land coverage is 52%. This benchmark is not being met.

Benchmark: 80% of Area within 30 Minutes of an Airport Serving an Aerial Applicator
Performance: 52% of Area within 30 Minutes of an Airport Serving an Aerial Applicator

Although coverage of population is not included in this benchmark, current population coverage of airports that serve aerial applicators is 81%.

Figure 5.12: 2013 Percent of Area and Population within 30 Minutes of Airports Serving Aerial Applicators



Source: Airport Manager Survey

Since the number of airports remains unchanged in the study horizon, no changes are expected between 2013 and 2025.

5.3 Goal: Enhance Air Access to Airports

Just as it is important to provide ground access to system airports for users, it is important to provide facilities and services that enhance safety and convenience before, during, and after flight. The following four performance measures are aimed at enhancing air access to system airports.

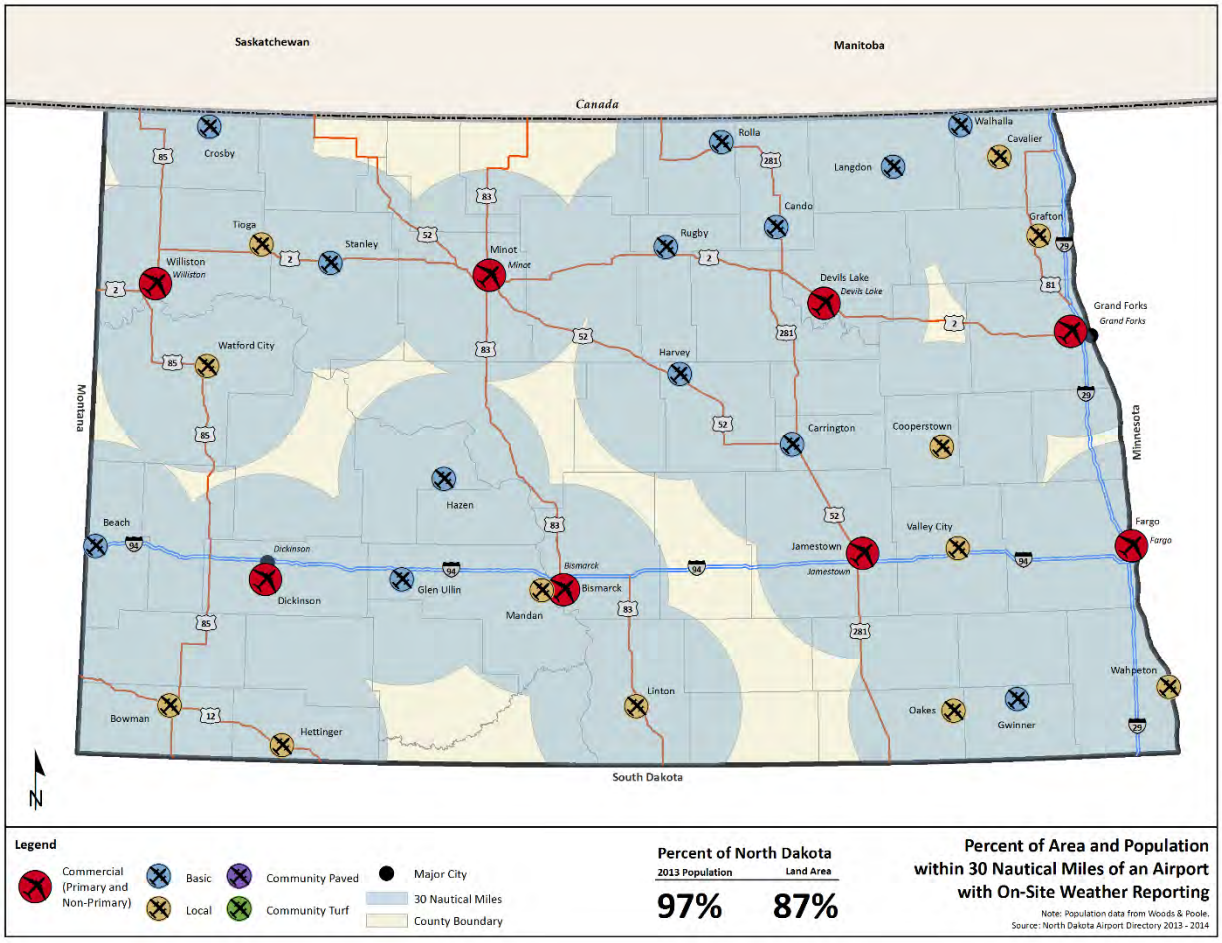
5.3.1 Percent of Area and Population within 30 Nautical Miles of an Airport with On-Site Weather Reporting (AWOS/ASOS)

Weather reporting systems provide critical information to pilots when preparing for flight and traveling en route about on-site airfield conditions such as visibility, ceiling height, atmospheric conditions, wind speed and direction, and barometric pressure. Airports that have weather reporting systems, Automated Surface Observing Systems (ASOS) or Automated Weather Observing Systems (AWOS), can be more attractive to pilots, especially when operating during times of inclement weather. A distance of 30 nautical miles was considered reasonable for pilot access to airports with weather reporting. **Figure 5.13** illustrates the coverage of area and population within this established distance. Information on the availability of ASOS or AWOS at airports was taken from the 2013-2014 North Dakota Airport Directory.

The benchmark for this performance measure is coverage of 80% of the land and 90% of the population within 30 nautical miles of airports with weather reporting systems. In 2007, 72% of the land area and 90% of the population was covered. Due to the addition of a few weather reporting systems, the current land coverage is 87% and population coverage is 97%. This benchmark is being met.

Benchmark: 80% of Area and 90% of Population within 30 Nautical Miles of an Airport with On-Site Weather Reporting
Performance: 87% of Area and 97% of Population within 30 Nautical Miles of an Airport with On-Site Weather Reporting

Figure 5.13: Percent of Area and Population within 30 Nautical Miles of Airports with On-Site Weather Reporting



Source: 2013-2014 North Dakota Airport Directory

5.3.2 Percent of Area and Population within 30 Nautical Miles of an Airport with a Non-Precision Approach

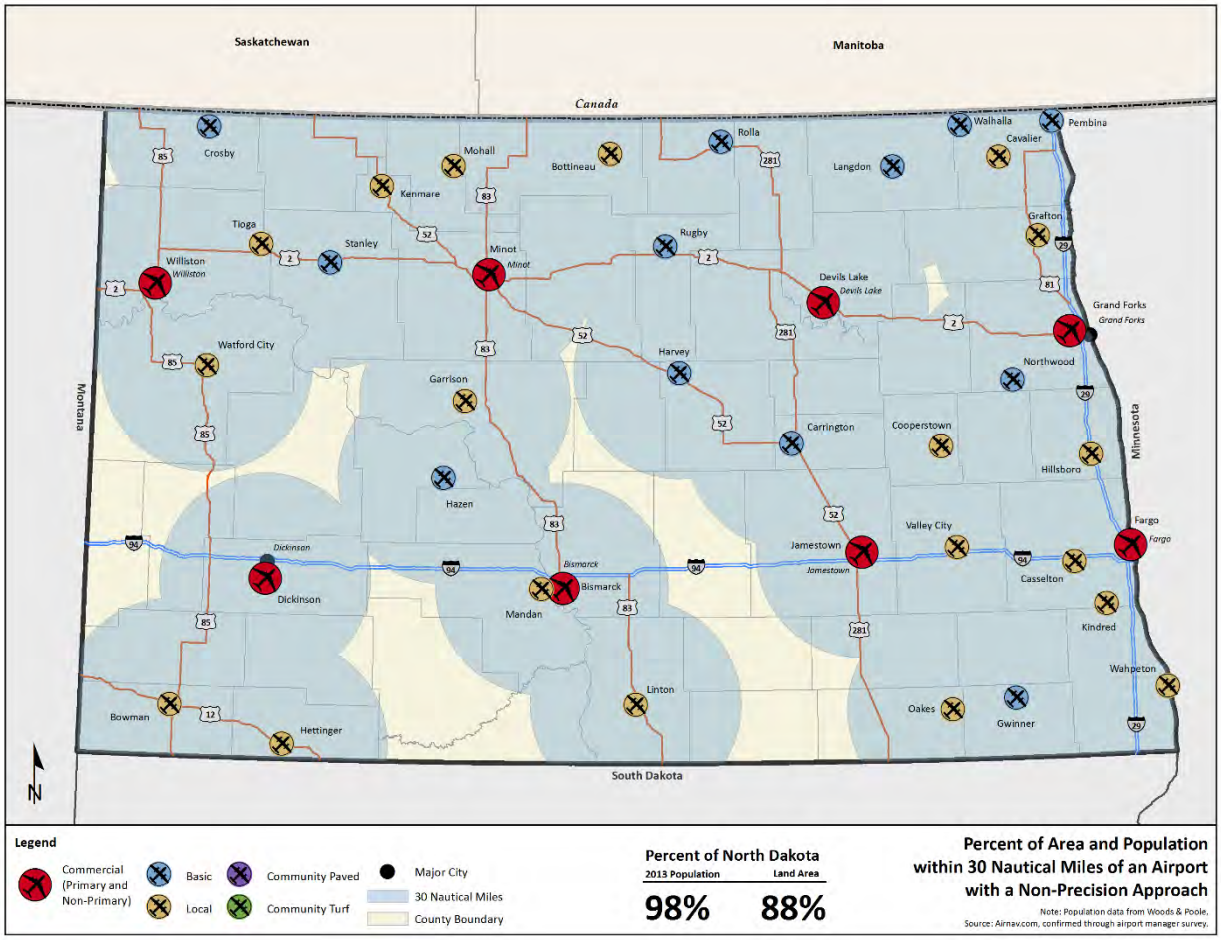
Non-precision approaches provide pilots with horizontal (lateral) guidance when landing at an airport. This type of approach helps pilots align with the center of the runway upon approach and landing. This guidance is especially helpful when trying to land in times of inclement weather, crosswinds, and reduced visibility. It is important that pilots have access to land at airports with this type of approach when needed, and that non-precision approaches are offered at many of the system airports. A distance of 30 nautical miles was considered reasonable for pilot access to airports with non-precision approaches. **Figure 5.14** illustrates the coverage of area and population within this established distance. Information on the availability of non-precision approaches at airports was collected from a website (airnav.com) and was confirmed through the airport manager survey effort.

The benchmark for this performance measure is coverage of 90% of the land and 100% of the population within 30 nautical miles of airports with non-precision approaches. In 2007, 84% of the land area and 97% of the population was covered. Due to the addition of several non-precision approaches in the system since 2007, the current land coverage is 88% and population coverage is 98%. The benchmark for both land and population coverage is close to being met.

Benchmark: 90% of Area and 100% of Population within 30 Nautical Miles of an Airport with a Non-Precision Approach

Performance: 88% of Area and 98% of Population within 30 Nautical Miles of an Airport with a Non-Precision Approach

Figure 5.14: Percent of Area and Population within 30 Nautical Miles of Airports with Non-Precision Approaches



Source: Airnav.com, confirmed through Airport Manager Survey

5.3.3 Percent of Area and Population within 30 Nautical Miles of an Airport with a Vertically-Guided Approach

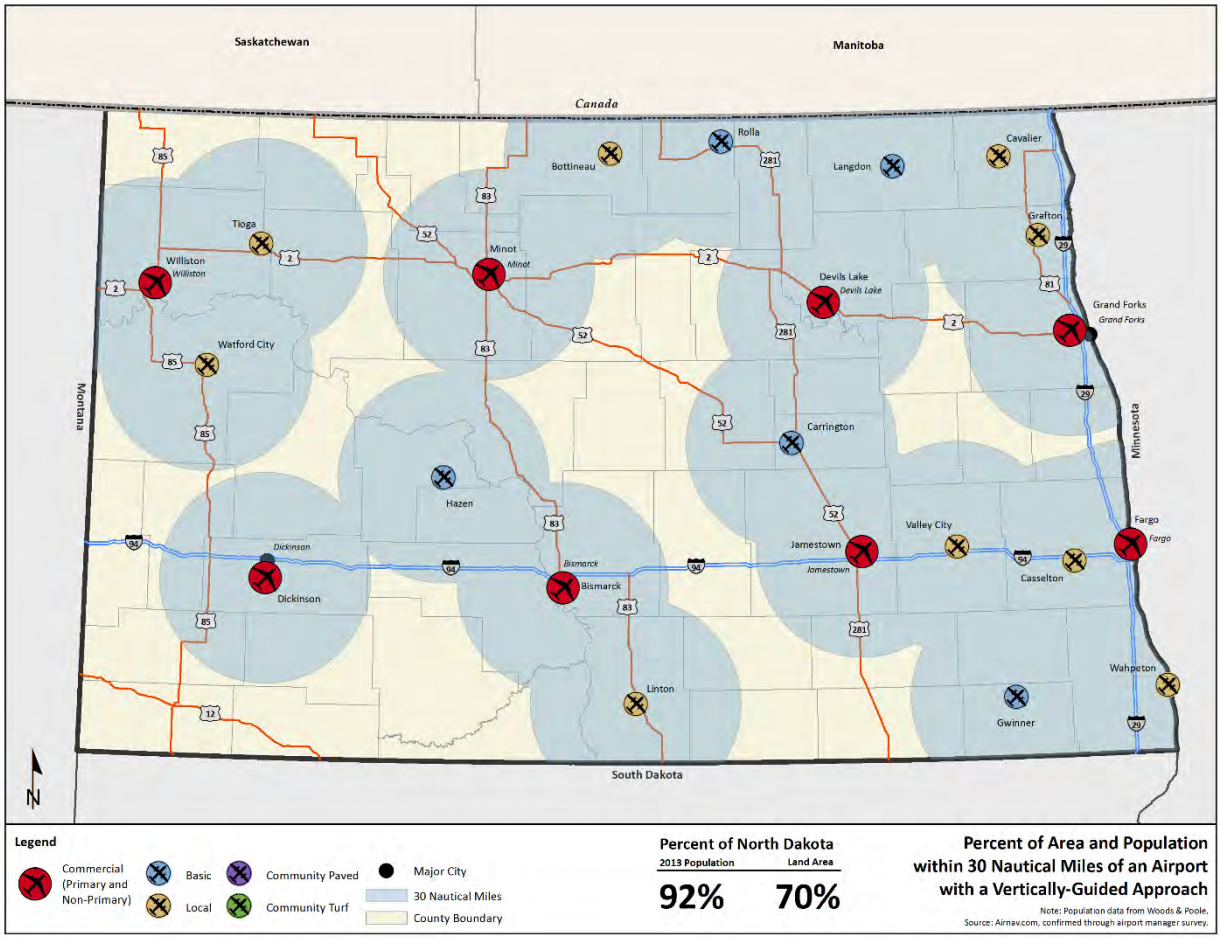
Two types of runway approaches have vertical guidance – precision approaches and non-precision approaches with vertical guidance. As the name indicates, these types of enhanced approaches provide pilots with vertical guidance (as well as horizontal guidance) when landing at an airport. This guidance is helpful when landing in times of inclement weather or reduced visibility. It is important that pilots have access to land at airports with this type of approach when needed, and that vertically-guided approaches are offered throughout the system. A distance of 30 nautical miles was considered reasonable for pilot access to airports with vertically-guided approaches. **Figure 5.15** illustrates the coverage of area and population within this established distance. Information on the availability of vertically-guided approaches at airports was collected from a website (airnav.com) and was confirmed through the airport manager survey effort.

The benchmark for this performance measure is coverage of 80% of the land and 90% of the population within 30 nautical miles of airports with vertically-guided approaches. In 2007, 37% of the land area and 73% of the population was covered. Due to the addition of several vertically-guided approaches into the system since 2007, the current land coverage is 70% and population coverage is 92%. The benchmark for land coverage is not being met, while the benchmark for population coverage is being met.

Benchmark: 80% of Area and 90% of Population within 30 Nautical Miles of an Airport with a Vertically-Guided Approach

Performance: 70% of Area and 92% of Population within 30 Nautical Miles of an Airport with a Vertically-Guided Approach

Figure 5.15: Percent of Area and Population within 30 Nautical Miles of Airports with Vertically-Guided Approaches



Source: Airnav.com, confirmed through Airport Manager Survey

5.3.4 Percent of Airports with Adequate Terminal Capacity to Support Passenger Demand

Two types of airport terminals were evaluated for this performance measure – commercial service terminals and general aviation (GA) terminals. Commercial service airport terminals require space for multiple functions, including space for airport administration offices, security screening, waiting passengers, restrooms, food and beverage options, and others. GA terminals also require space for various functions such as pilot lounges, flight planning, sleeping rooms, airport administration and more. It is important that terminals be large enough to handle passenger demand for several reasons, including maintaining security and enhancing the passenger experience. Since North Dakota is experiencing a large increase in the number of airport users (at both commercial service and GA airports) as well as expansion of air service options, several airports in the system have terminals that cannot meet current passenger demand. Therefore, it is critical to identify the airports that do not have adequate terminal capacity so they can be

targeted for terminal expansion. Information on the capacity of commercial service and GA terminals was collected through the airport manager survey. This was a personal judgment on behalf of the airport manager; no specific analysis was completed to evaluate this issue.

This performance measure is new for the 2014 update of the NDSASP. The benchmark for this performance measures is to have all 89 system airports with terminals that can support passenger demand. Airports that do not have terminals were counted as not having adequate terminal capacity. **Table 5.9** indicates that 54% of system airports have adequate GA terminal capacity, while **Table 5.11** indicates that 75% of the commercial service airports are operating with adequate terminal capacity. A listing of GA and commercial service airports not meeting this benchmark is provided in **Table 5.10** and **Table 5.12**, respectively.

Benchmark: 100% of Airports Should have a Terminal with Adequate Capacity to Support Passenger Demand

Performance: 54% of Airports have a GA Terminal with Adequate Capacity and 75% of Commercial Service Airports have a Commercial Service Terminal with Adequate Capacity

Table 5.9: Percent of Airports with Adequate GA Terminal Capacity*

Adequate GA Terminal Capacity	Number of System Airports	Percentage of System Airports
Has Adequate Terminal Capacity	48	53.9%
Does Not Have Adequate Terminal Capacity	41	46.1%
Total System Airports	**89**	**100.0%**

*GA airports without GA terminals are counted as not having adequate terminal capacity.
Source: Airport Manager Survey

Table 5.10: GA Airports not Meeting the Terminal Capacity Performance Measure

Arthur	Killdeer	New Town
Ashley	Kindred (N)	Northwood (N)
Bottineau (N)	La Moure (N)	Plaza
Bowbells	Leeds	Richardton
Columbus	Lidgerwood	Riverdale
Drayton	Maddock	Rolette
Dunseith (N)	Mandan (N)	Rolla (N)
Elgin	Mayville	St. Thomas
Fessenden	McClusky	Tioga (N)
Fort Yates (N)	McVille	Towner
Gackle	Minot (N)	Turtle Lake
Garrison (N)	Mott (N)	Westhope
Harvey (N)	Napoleon	Williston (N)
Hazelton	New Rockford	

(N) = NPIAS airports
Note: Airports are listed by associated city.

Table 5.11: Percent of Airports with Adequate Commercial Terminal Capacity

Adequate Commercial Terminal Capacity	Number of CS Airports	Percentage of CS Airports
Has Adequate Terminal Capacity	6	75.0%
Does Not Have Adequate Terminal Capacity	2	25.0%
Total Commercial Service Airports	**8**	**100.0%**

Source: Airport Manager Survey

Table 5.12: Commercial Service Airports not Meeting the Terminal Capacity Performance Measure*

Dickinson (N)	Grand Forks (N)

*future or in-progress terminal projects at Williston and Minot were considered to be completed for this evaluation.
(N) = NPIAS airports
Note: Airports are listed by associated city.

5.4 Goal: Support North Dakota's Economy

North Dakota's aviation system is a large contributor of the state's economy. The *2010 North Dakota Economic Impact of Aviation* study reports the aviation system in North Dakota creates over 15,000 jobs, a total payroll of nearly $600 million, and a total output of over $1.5 billion. It is critical for the aviation system to continue supporting the state economy and the increased use resulting from the oil boom. To support the wide variety of aviation users, system airports need to have the appropriate facilities and services. The following performance measures are directly related to the provision of these facilities and services.

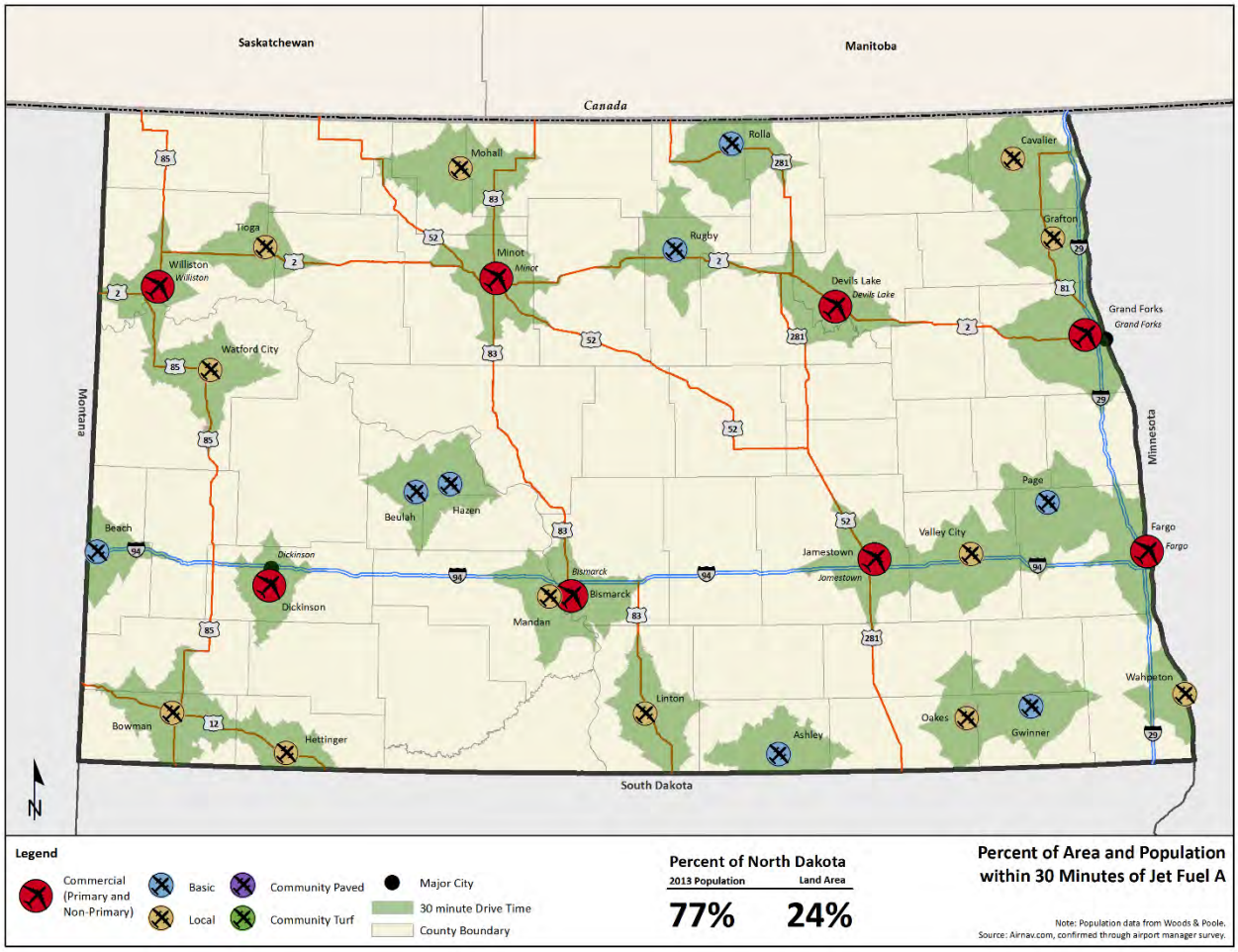
5.4.1 Percent of Area and Population within 30 Minutes of Jet A Fuel

The provision of aircraft fuel throughout the aviation system is critical for the operation of aircraft to and from system airports. Jet A fuel is designed for use in aircraft powered by turbine engines. A drive time of 30 minutes or less was considered reasonable to airports with Jet A fuel. **Figure 5.16** illustrates the coverage of area and population within this established drive time. Information on the availability of Jet A fuel at system airports was gathered from a website (airnav.com) and confirmed through the airport manager survey effort.

The benchmark for this performance measure is coverage of 30% of the land and 75% of the population within a 30-minute drive time from airports with Jet A fuel. In 2007, 21% of the land area and 72% of the population was covered. Due to the addition of Jet A fuel at several system airports, the current land coverage is 24% and population coverage is 77%. The benchmark for area coverage is not being met, however the benchmark for population coverage is being met.

Benchmark: 30% of Area and 75% of Population within 30 Minutes of an Airport with Jet A Fuel
Performance: 24% of Area and 77% of Population within 30 Minutes of an Airport with Jet A Fuel

Figure 5.16: Percent of Area and Population within 30 Minutes of Airports with Jet A Fuel



Source: Airnav.com, confirmed through Airport Manager Survey

5.4.2 Percent of Area and Population within 30 Minutes of 100 LL fuel

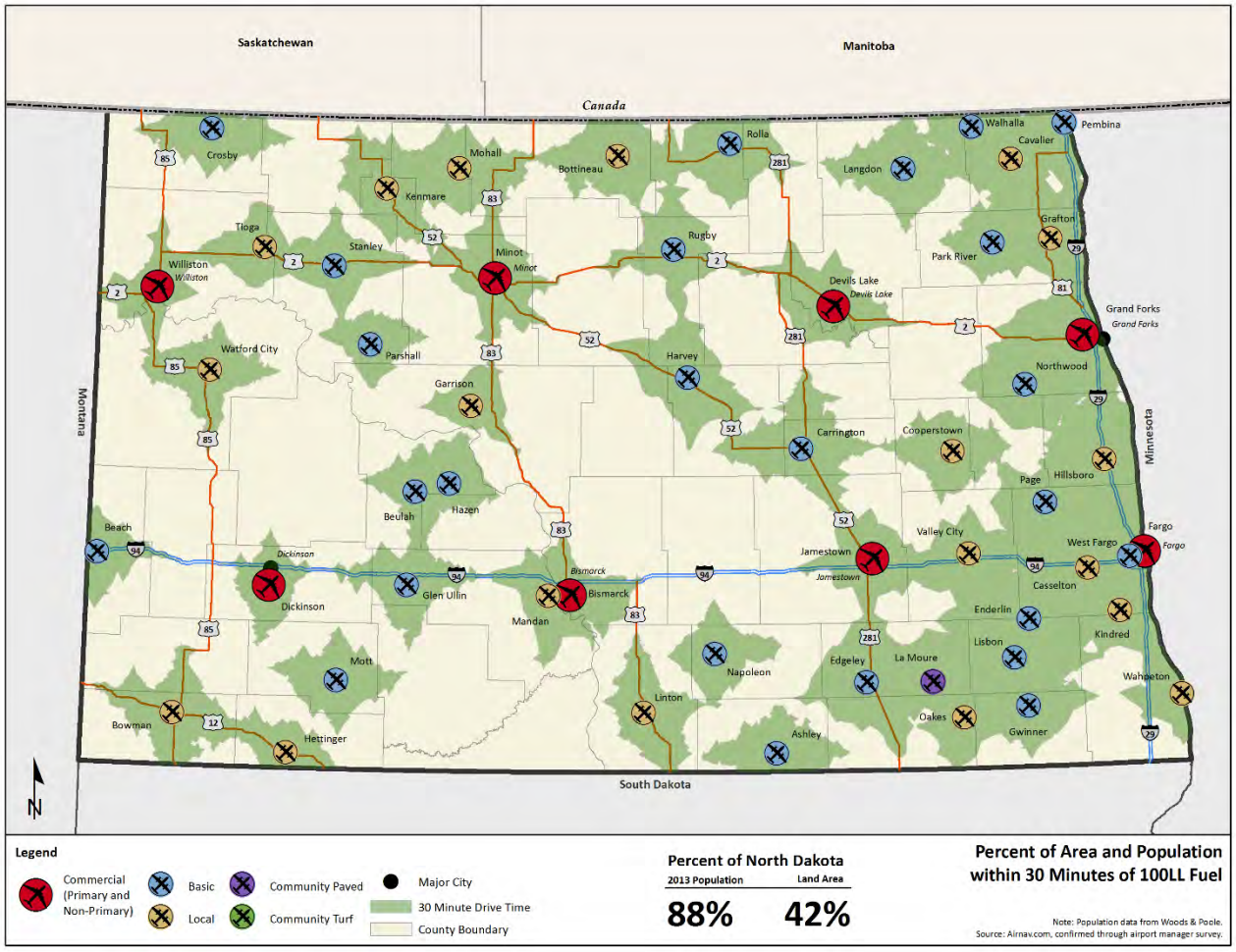
100 low lead (LL) fuel is designed for use in aircraft with piston engines. This fuel is the most commonly used fuel in the GA community. A drive time of 30 minutes or less was considered reasonable to airports with 100LL fuel. **Figure 5.17** illustrates the coverage of area and population within this established drive time. Information on the availability of 100LL fuel at system airports was gathered from a website (airnav.com) and confirmed through the airport manager survey effort.

The benchmark for this performance measure is coverage of 60% of the land and 90% of the population within a 30-minute drive time from airports with 100LL fuel. In 2007, 55% of the land area and 88% of the population was covered. Due to the availability of 100LL at a few less airports in 2014, the current land coverage is 42% and population coverage is 88%. The benchmark for area coverage is not being met, while the benchmark for population coverage is nearly being met.

Benchmark: 60% of Area and 90% of Population within 30 Minutes of an Airport with 100LL Fuel

Performance: 42% of Area and 88% of Population within 30 Minutes of an Airport with 100LL Fuel

Figure 5.17: Percent of Area and Population within 30 Minutes of Airports with 100LL Fuel



Source: Airnav.com, confirmed through Airport Manager Survey

5.4.3 Percent of Population within 30 Minutes of a Large Aircraft Runway (5,000ft+)

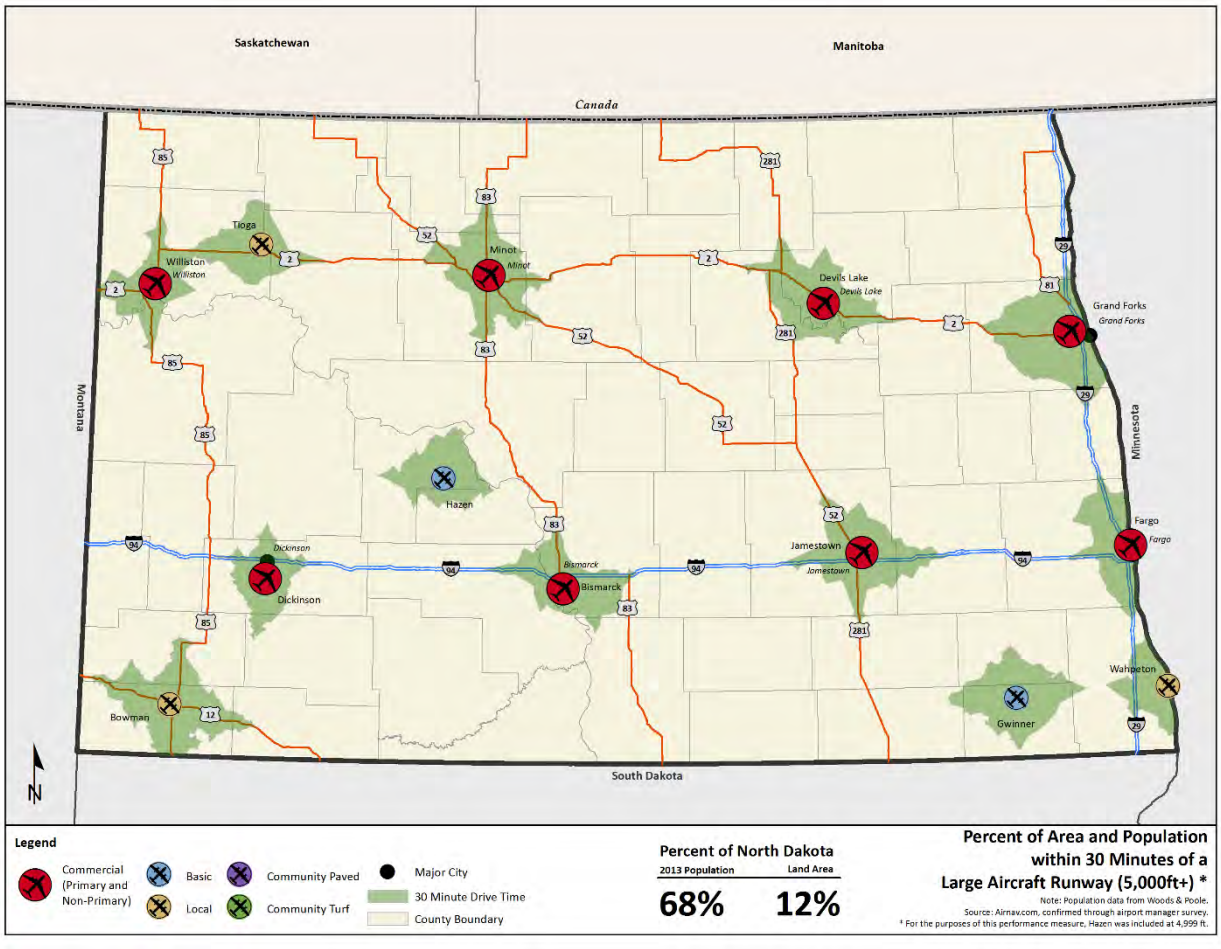
Airports that have runways of 5,000 feet or longer are often capable of supporting use by larger aircraft, such as corporate jets. By providing runways that can handle this type of use, North Dakota's aviation system supports a variety of aviation users from small recreational aircraft to cargo aircraft, charters, and corporate aircraft. A drive time of 30 minutes or less was considered reasonable to airports with runways of 5,000 feet or longer. **Figure 5.18** illustrates the coverage of population within the established drive time. For the purposes of this performance measure, Hazen was included at 4,999 feet. Information on the length of system runways was gathered from airnav.com and confirmed through the airport manager survey.

The benchmark for this performance measure is coverage of 75% of the state's population within a 30-minute drive time of airports with large aircraft runways. In 2007, 74% of the population was covered. Due to population shifts and a refined drive time analysis, current population coverage is 68%. This benchmark is not being met since only 13 of the 89 system airports have 5,000 feet or more of runway length.

Benchmark: 75% of Population within 30 Minutes of a Large Aircraft Runway
Performance: 68% of Population within 30 Minutes of a Large Aircraft Runway

Although coverage of area is not included in this benchmark, 2013 area coverage of airports with large aircraft runways is 12%.

Figure 5.18: Percent of Area and Population within 30 Minutes of Airports with Large Aircraft Runways



Source: Airnav.com, confirmed through Airport Manager Survey

5.4.4 Percent of Airports with Ground Transportation Services

Airports that provide some form of ground transportation can allow passengers and cargo to reach their final destination after landing at an airport, and to access the airport for travel to another location. Ground transportation can take many forms, whether it be rental cars, courtesy cars, taxis, or shuttles. Providing ground transportation at airports in the system is important as airports are often not the final destination for passengers. Information on the availability of ground transportation at system airports was collected through the airport manager survey effort. This performance measure is new for the 2014 NDSASP update. The benchmark for this performance measure is to have ground transportation at all system airports with paved runways (72 total). To achieve this benchmark, an airport had to have at least one type of ground transportation available. Currently, 61% of the paved airports in the system have ground transportation, shown in **Table 5.13** and **Figure 5.19**. A listing of airports not meeting this benchmark is provided in **Table 5.14**. This benchmark is not being met.

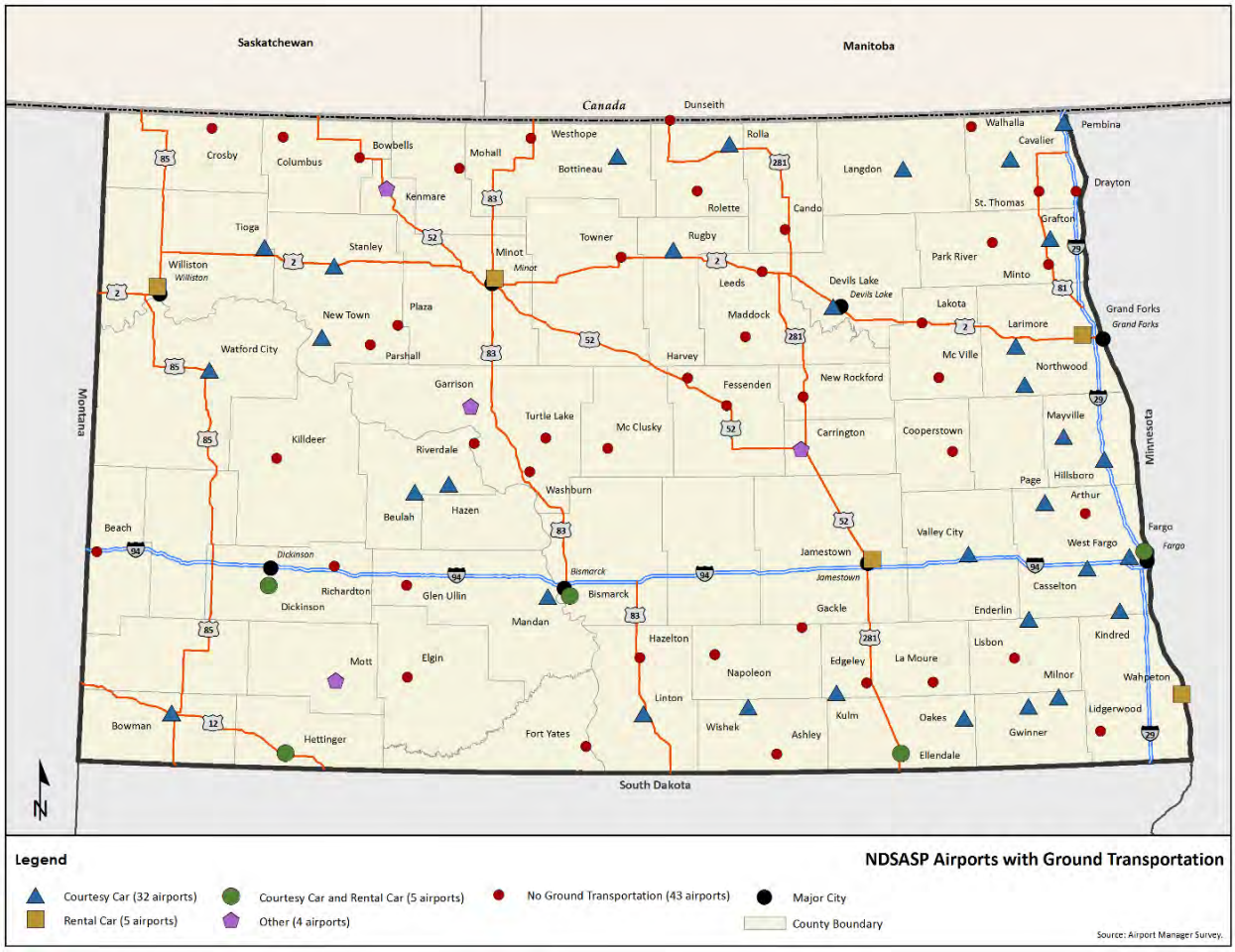
Benchmark: 100% of Airports with Paved Runways Should have Ground Transportation Services
Performance: 61% of Airports with Paved Runways Have Ground Transportation Services

Table 5.13: Percent of Paved Airports with Ground Transportation

Ground Transportation	Number of Paved Airports	Percentage of Paved Airports
Has Ground Transportation	44	61.1%
Does Not Have Ground Transportation	28	38.9%
Total Paved Airports	**72**	**100.0%**

Source: Airport Manager Survey

Figure 5.19: Location of Airports with Ground Transportation



Source: Airport Manager Survey

Table 5.14: Paved Airports not Meeting the Ground Transportation Performance Measure

Ashley	Harvey (N)	New Rockford
Beach (N)	Killdeer	Park River (N)
Cando (N)	La Moure (N)	Parshall (N)
Cooperstown (N)	Lakota (N)	Rolette
Crosby (N)	Leeds	St. Thomas
Drayton	Lisbon (N)	Walhalla (N)
Dunseith (N)	Maddock	Washburn (N)
Edgeley (N)	Minto	Westhope
Fort Yates (N)	Mohall (N)	
Glen Ullin (N)	Napoleon	

(N) = NPIAS airports
Note: Airports are listed by associated city.

In addition to reviewing the availability of ground transportation at airports with paved runways, ground transportation options were also inventoried at airports with turf or gravel runways. Of

the 17 airports with unpaved runways, one airport provides ground transportation, shown in **Table 5.15.**

Table 5.15: Percent of Unpaved Airports with Ground Transportation

Ground Transportation	Number of Unpaved Airports	Percentage of Unpaved Airports
Has Ground Transportation	1	5.9%
Does Not Have Ground Transportation	16	94.1%
Total Unpaved Airports	**17**	**100.0%**

Source: Airport Manager Survey

5.4.5 Percent of Population within 30 Minutes of Airports That Can Meet the Needs of King Air Aircraft

Beechcraft King Air aircraft are considered to be representative of typical business aircraft and are classified with an Airport Reference Code (ARC) of B-II. Airports that can support use by this type of aircraft often support their area's business community, which benefits the local, regional, and state economy. In order to support use by this aircraft (or similar aircraft), an airport needs approximately 3,800 feet or more of runway length and an ARC of B-II or greater. A 30-minute drive time was considered reasonable to airports that are able to support the use of King Air aircraft. **Figure 5.20** illustrates the coverage of population within this established drive time. Information on runway lengths and ARCs was confirmed through the airport manager survey effort.

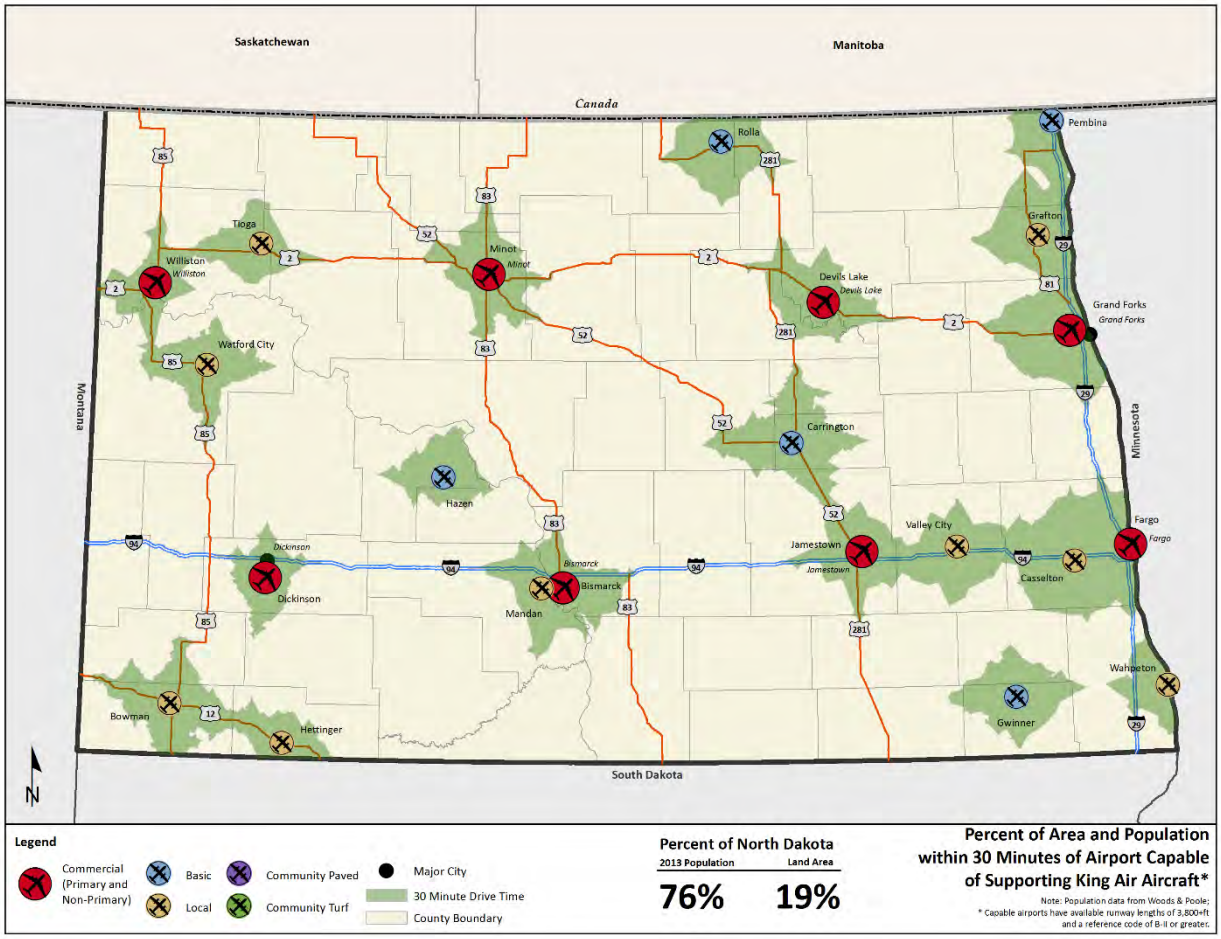
This performance measure is new for the 2014 NDSASP update. The benchmark for this performance measure is coverage of 90% of the state's population within a 30-minute drive time of airports capable of supporting King Air aircraft. Currently, 76% of the population is covered. This benchmark is not being met.

Although coverage of area is not included in this benchmark, current area coverage of airports that are able to support King Air use is 19%.

Benchmark: 90% of Population within 30 Minutes of an Airport Able to Support the Use of King Air Aircraft

Performance: 76% of Population within 30 Minutes of an Airport able to Support the Use of King Air Aircraft

Figure 5.20: Percent of Population within 30 Minutes of an Airport able to Support King Air Aircraft



Source: Airnav.com and Airport Layout Plans, confirmed through Airport Manager Survey

5.5 Goal: Enhance Quality of Life

Due to the vast size of North Dakota and wide distribution of the population, it is critical for the aviation system to support use by various medical users. Several operations depend on ground and air access to North Dakota's airports, such as the transportation of patients, supplies, organs, and medical staff. The following performance measures are related to the provision of necessary air access for medical and emergency operations.

5.5.1 Percent of Communities in North Dakota with a Hospital and/or Clinic Served by an Airport

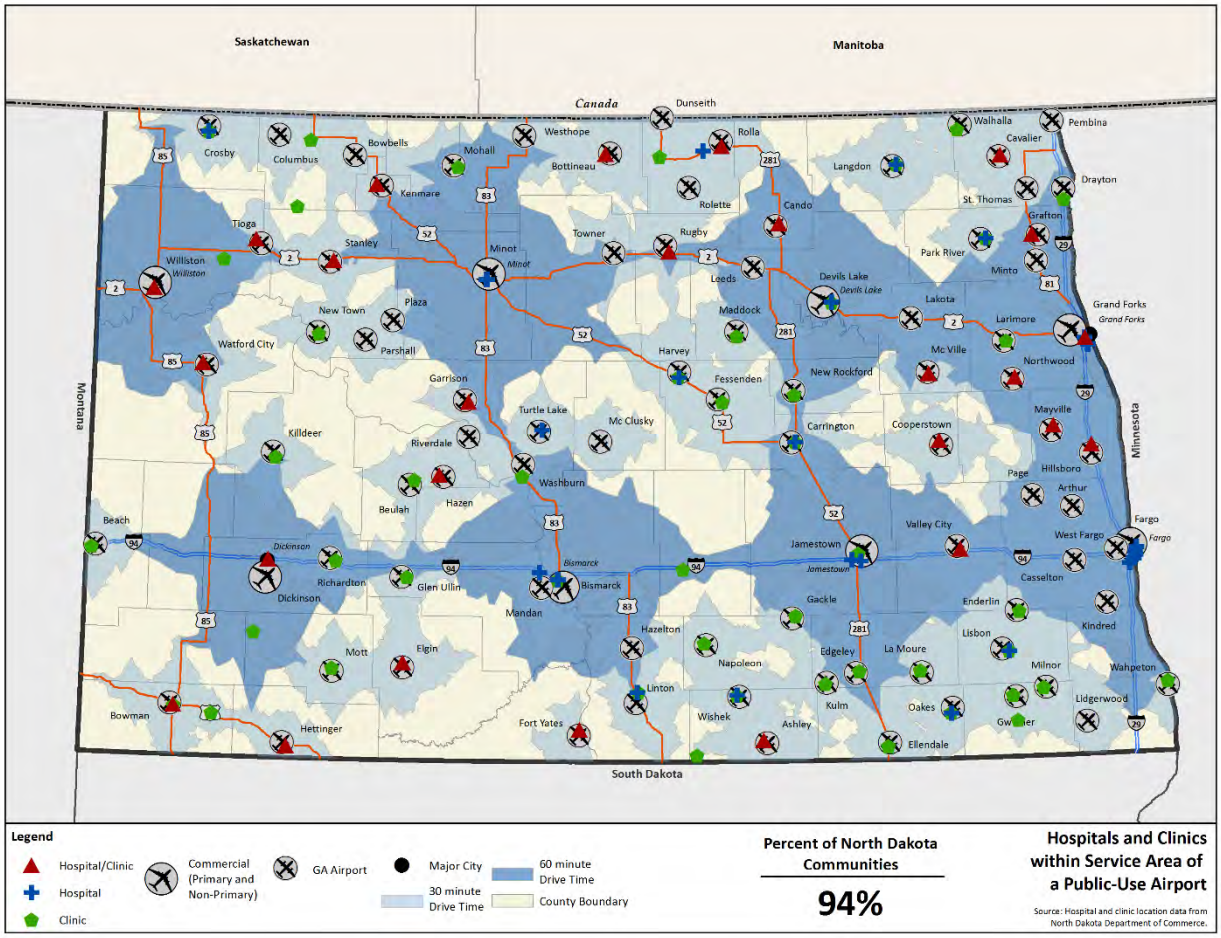
It is critical that hospitals and clinics are within a reasonable distance of a local airport in the event that air transportation is needed. A 30-minute drive time was considered reasonable to GA airports, while a 60-minute drive time was considered reasonable to commercial service airports. **Figure 5.21** illustrates the coverage of hospitals and clinics within these established drive times.

Information on the location of hospitals and clinics within the state was provided by the North Dakota Department of Commerce.

The benchmark for this performance measure is 100% coverage of communities with a hospital and/or clinic. In order to meet this benchmark, all hospitals and clinics must be within either a 30-minute drive time to a GA airport or 60-minute drive time to a commercial service airport. In 2007, 100% of hospitals/clinics were covered. Due to a refined drive time analysis, two facilities are located out of the coverage area (one is north east of Tioga in the north west part of the state, and the other is west of Ashley in the southern part of the state) resulting in a current coverage of 94% of hospitals/clinics. This benchmark is nearly being met.

Benchmark: 100% of Communities with a Hospital and/or Clinic should be served by an Airport
Performance: 94% of Communities with a Hospital and/or Clinic within Service Area of a Public-Use Airport

Figure 5.21: Percent of Communities with a Hospital/Clinic within Service Area of a Public Use Airport



Source: Hospital and clinic location data from North Dakota Department of Commerce

5.5.2 Percent of Population within 30 Minutes of an Airport Capable of Supporting Fixed-Wing Emergency Operations

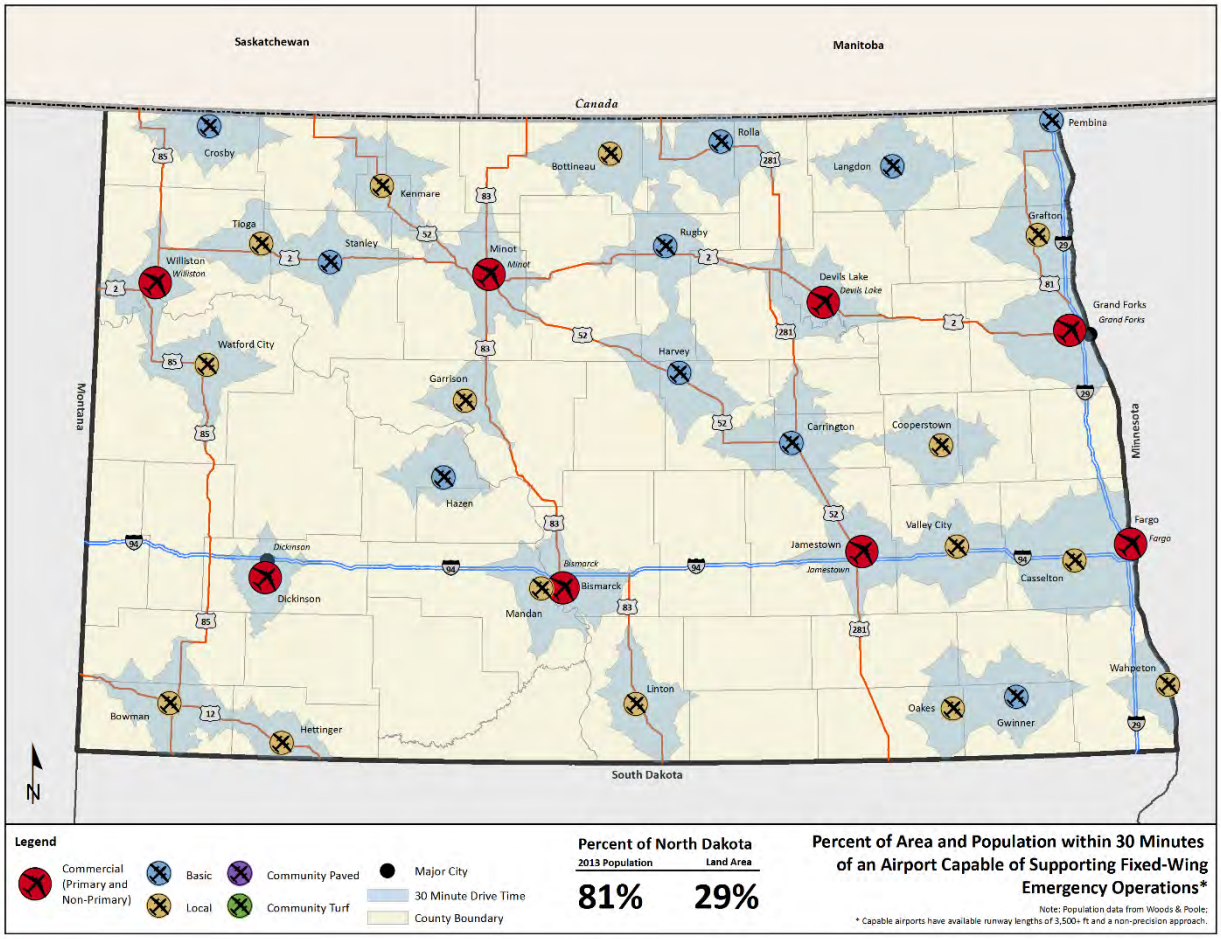
Providing air access is critical during emergencies. As such, it is important for system airports to be able to support the use of fixed-wing aircraft that are used for emergency transportation (such as Pilatus and King Air aircraft). In order to serve these types of operations, a runway length of 3,500+ feet and a non-precision approach is often needed. A drive time of 30 minutes was considered reasonable to airports that can support fixed-wing emergency operations. **Figure 5.22** illustrates the coverage of population within this established drive time. Information on runway lengths and approaches was confirmed through the airport manager survey effort.

This performance measure is new for the 2014 NDSASP update. The benchmark for this performance measure is coverage of 90% of the population within 30 minutes of airports capable of supporting fixed-wing emergency operations. Currently, 81% of the population is covered. The benchmark for population coverage is nearly being met.

Although coverage of area is not included in this benchmark, current area coverage of airports that are capable of supporting fixed-wing emergency aircraft is 29%.

Benchmark: 90% of Population within 30 Minutes of an Airport Capable of Supporting Fixed-Wing Emergency Aircraft
Performance: 81% of Population within 30 Minutes of an Airport Capable of Supporting Fixed-Wing Emergency Aircraft

Figure 5.22: Percent of Population within 30 Minutes of Airports Capable of Supporting Fixed-Wing Emergency Aircraft



Source: Airnav.com, confirmed through Airport Manager Survey

5.6 Goal: Preserve North Dakota Airport Assets

A great deal of investment has been made at the national, state, and local levels into North Dakota's aviation system. It is important to protect this investment at airports through infrastructure maintenance and planning efforts. As the system continues to grow and experience unprecedented usage, it is critical that airports have the resources needed to maintain facilities and meet the needs of system users. The following performance measures are directly related to the preservation of this valuable transportation system.

5.6.1 Percent of Airports with a Local Mill Levy

A local government may use a mill levy to raise revenue for an airport based on the total value of property within the area. The funds raised through local mill levies can be used to meet local match requirements for state and federal grants that will be used to improve airport facilities. Airports that are supported by this dedicated funding source can also use the funds to cover operation costs. Information on the presence of local mill levies for system airports was collected through the airport manager survey effort.

The benchmark for this performance measure is to have local mill levies for every airport in the system. In 2007, 78% of system airports had a local mill levy. In 2014, 67% of system airports reported having a local mill levy and eight percent of airports did not respond to this question, shown in **Table 5.16** and **Figure 5.23**. A listing of airports not meeting this benchmark is provided in **Table 5.17**. This benchmark is not being met.

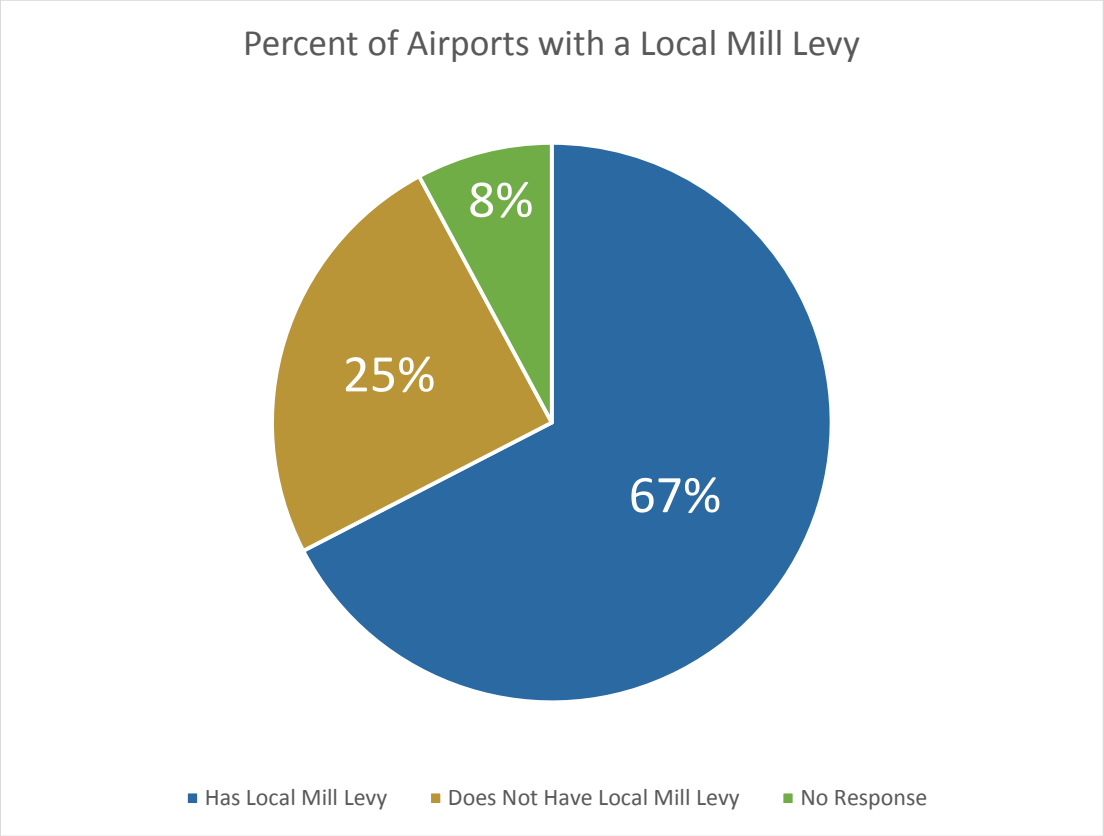
Benchmark: 100% of Airports Should have a City Mill Levy
Performance: 67% of Airports have a City Mill Levy

Table 5.16: Percent of Airports with a Local Mill Levy

Local Mill Levy	Number of System Airports	Percentage of System Airports
Has Local Mill Levy	60	67.4%
Does Not Have Local Mill Levy	22	24.7%
No Response	7	7.9%
Total System Airports	**89**	**100.0%**

Source: Airport Manager Survey

Figure 5.23: Percent of Airports with a Local Mill Levy



Source: Airport Manager Survey

Table 5.17: Airports not Meeting the Local Mill Levy Performance Measure

Arthur	Garrison (N)	New Rockford
Beach (N)	Hettinger (N)	New Town
Bismarck (N)	Killdeer	Richardton
Cooperstown (N)	Kindred (N)	Rolette
Dunseith (N)	Langdon (N)	Towner
Edgeley (N)	McClusky	Valley City (N)
Fessenden	Minot (N)	
Fort Yates (N)	Mott (N)	
Airports that did not Respond:		
Cando (N)	Hazen (N)	Riverdale
Elgin	Lidgerwood	
Gackle	Parshall (N)	

(N) = NPIAS airports
Note: Airports are listed by associated city.

5.6.2 Percent of Airports with a County-Wide Mill Levy

Airports may also receive financial support at the county level from a county-wide mill if levied. Information on the presence of county-wide mill levies for system airports was collected through the airport manager survey effort.

The benchmark for this performance measure is to have county-wide mill levies for every airport in the system. In 2007, 49% of system airports had a county-wide mill levy. In 2014, 47% of system airports reported having a county-wide mill levy (a two percent reduction, likely from the removal of Grenora from the aviation system) and eight percent of airports did not respond to this question, shown in **Table 5.18** and **Figure 5.24.** A listing of airports not meeting this benchmark is provided in **Table 5.19.** This benchmark is not being met.

Benchmark: 100% of Airports Should Have a County-Wide Mill Levy

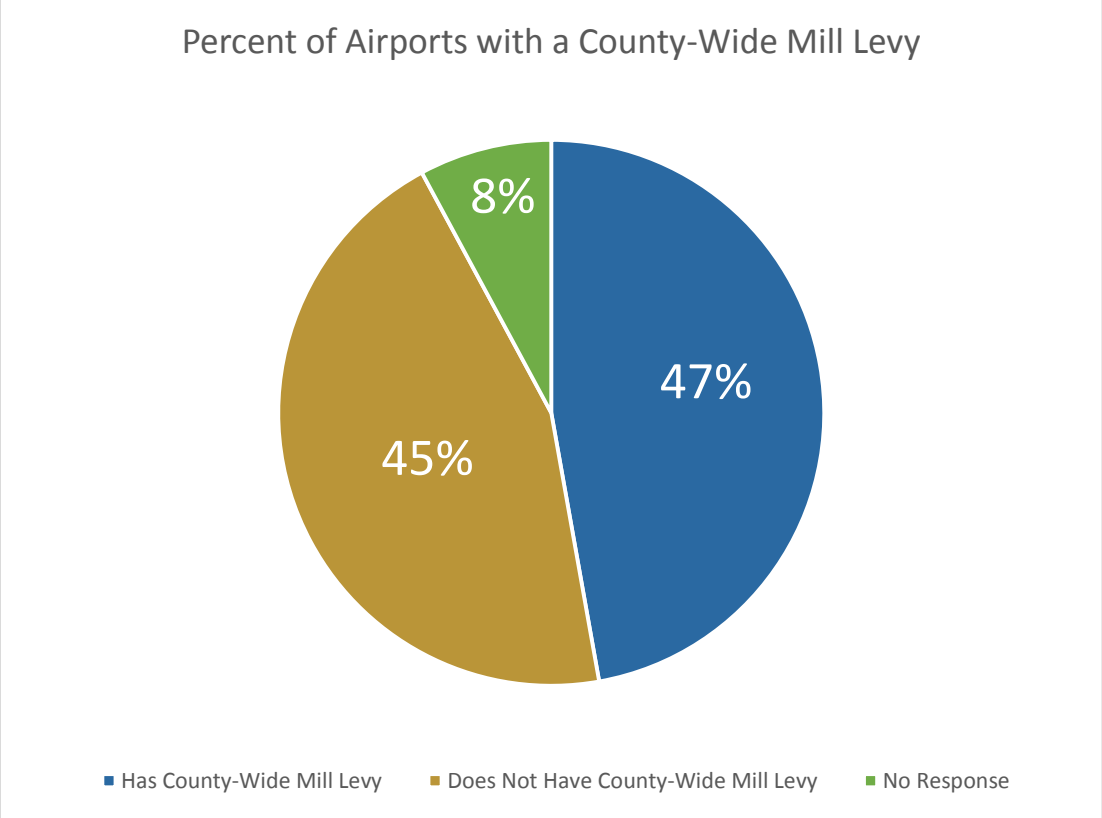
Performance: 47% of Airports Have a County-Wide Mill Levy

Table 5.18: Percent of Airports with a County-Wide Mill Levy

County-Wide Mill Levy	Number of System Airports	Percentage of System Airports
Has County-Wide Mill Levy	42	47.2%
Does Not Have County-Wide Mill Levy	40	44.9%
No Response	7	7.9%
Total System Airports	**89**	**100.0%**

Source: Airport Manager Survey

Figure 5.24: Percent of Airports with a County-Wide Mill Levy



Source: Airport Manager Survey

Table 5:19: Airports not Meeting the County-Wide Mill Levy Performance Measure

Beach (N)	Fargo (N)	Minto
Bismarck (N)	Glen Ullin (N)	Mohall (N)
Cooperstown (N)	Grafton (N)	Napoleon
Dunseith (N)	Harvey (N)	Page
Fort Yates (N)	Hazelton	Plaza
Garrison (N)	Kenmare (N)	Rugby (N)
McClusky	Kulm	St. Thomas
Minot (N)	La Moure (N)	Turtle Lake
New Rockford	Lakota (N)	Wahpeton (N)
Beulah	Larimore	Washburn (N)
Bowbells	Lisbon (N)	Watford City (N)
Carrington (N)	Mandan (N)	West Fargo
Columbus	Mayville	
Enderlin	McVille	
Airports that did not Respond:		
Casselton (N)	Lidgerwood	Williston (N)
Elgin	Parshall (N)	
Gackle	Riverdale	

(N) = NPIAS airports
Note: Airports are listed by associated city.

5.6.3 Percent of Airports with Non-Mill Levy Revenue

Airports can generate revenue for projects and operating costs from sources other than levies. Examples include hangar rental charges, fuel surcharges, and landing fees. Information on the presence of non-mill levy revenue sources for system airports was collected through the airport manager survey effort.

This performance measure is new for the 2014 NDSASP update. The benchmark for this performance measure is to have non-mill levy revenue sources at system airports that have paved runways (72 airports). Currently, 57% of system airports with paved runways are reporting they have non-mill levy revenue, and 15% of airports did not respond to this question, shown in **Table 5.20** and **Figure 5.25**. A listing of paved airports not meeting this benchmark is provided in **Table 5.21**. This benchmark is not being met.

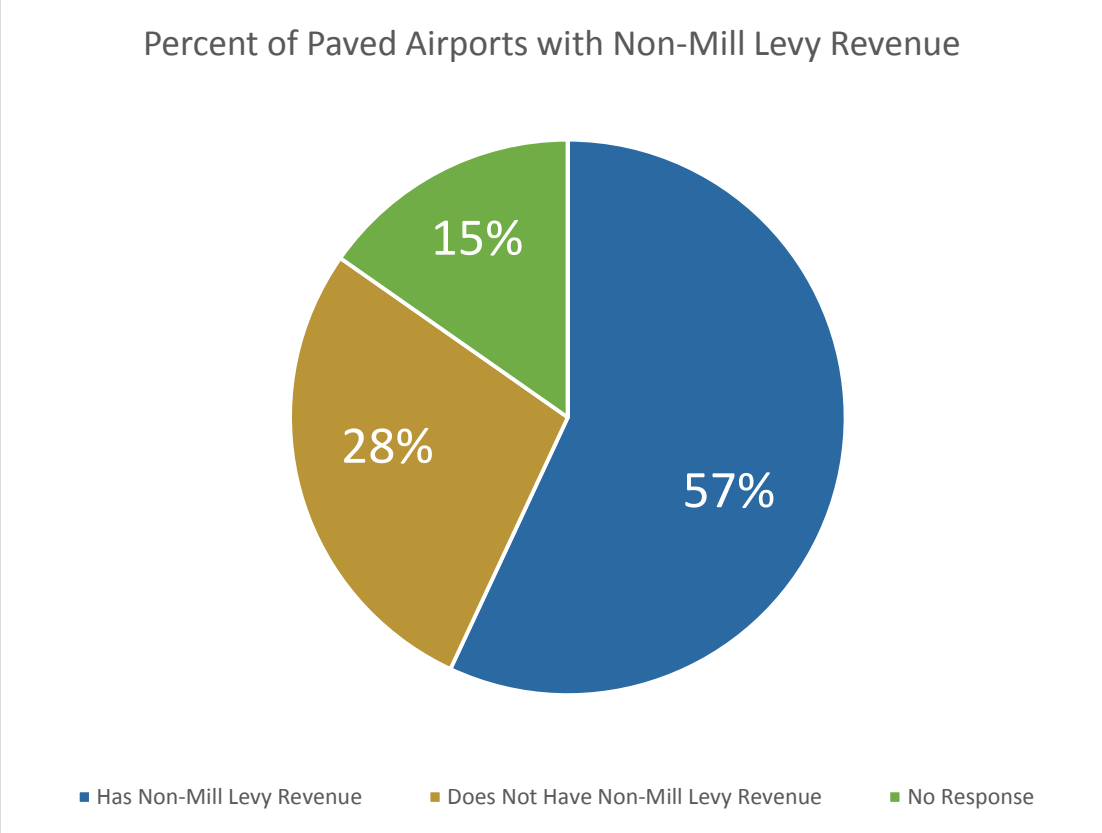
Benchmark: 100% of Airports with Paved Runways Should Have Non-Mill Levy Revenue
Performance: 57% of Airports with Paved Runways Have Non-Mill Levy Revenue

Table 5.20: Percent of Paved Airports with Non-Mill Levy Revenue

Non-Mill Levy Revenue	Number of Paved Airports	Percentage of Paved Airports
Has Non-Mill Levy Revenue	41	56.9%
Does Not Have Non-Mill Levy Revenue	20	27.8%
No Response	11	15.3%
Total Paved Airports	**72**	**100.0%**

Source: Airport Manager Survey

Figure 5.25: Percent of Airports with Non-Mill Levy Revenue



Source: Airport Manager Survey

Table 5:21: Paved Airports not Meeting the Non-Mill Levy Revenue Performance Measure

Bottineau (N)	Grand Forks (N)	New Rockford
Cavalier (N)	Jamestown (N)	Park River (N)
Devils Lake (N)	Kenmare (N)	Rolette
Dickinson (N)	Killdeer	Rugby (N)
Drayton	Langdon (N)	Williston (N)
Dunseith (N)	Leeds	Wishek
Garrison (N)	Maddock	
Paved Airports that did not Respond:		
Beulah	Lisbon (N)	St. Thomas
Bowman (N)	Minto	Wahpeton (N)
La Moure (N)	Napoleon	Washburn (N)
Larimore	Parshall (N)	

(N) = NPIAS airports
Note: Airports are listed by associated city.

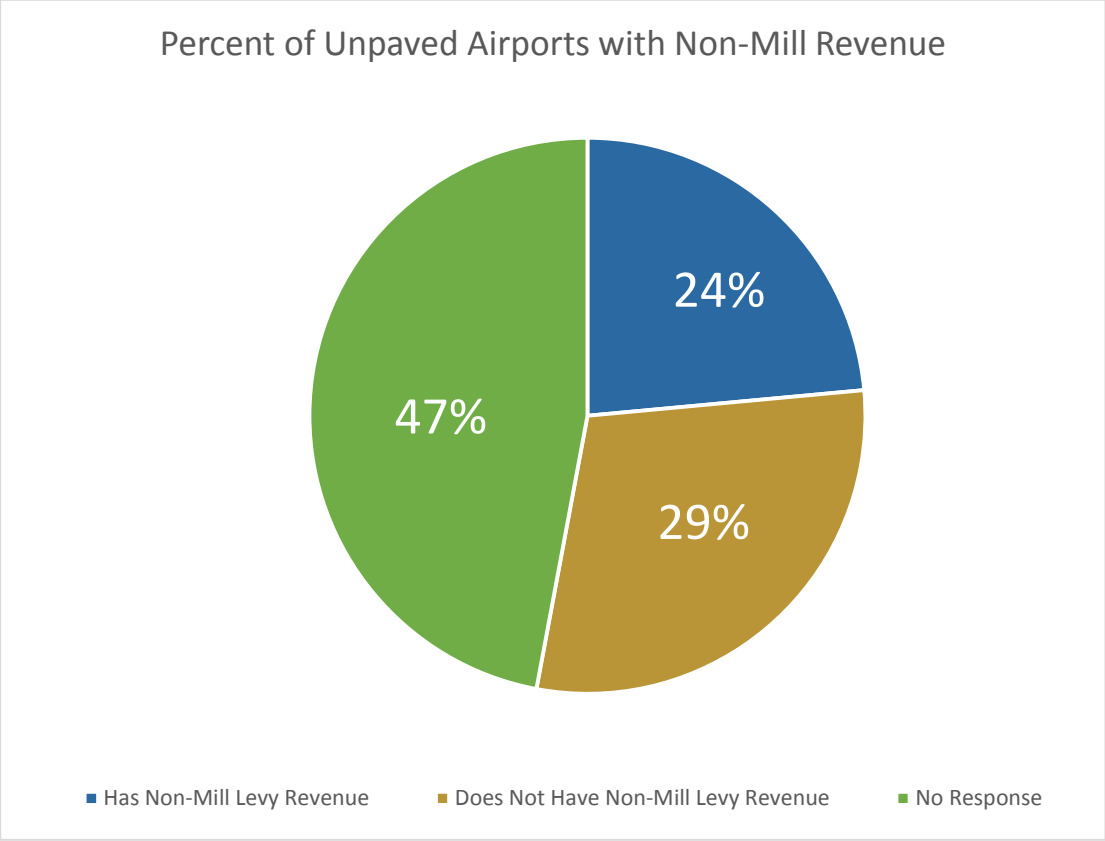
Although the benchmark for this performance measure applies only to paved airports, the presence of non-mill levy revenue was inventoried at airports with turf/gravel runways. Of the 17 unpaved airports in the system, four of them have non-mill levy revenue, shown in **Table 5.22** and **Figure 5.26**.

Table 5.22: Percent of Unpaved Airports with Non-Mill Levy Revenue

Non-Mill Levy Revenue	Number of Unpaved Airports	Percentage of Unpaved Airports
Has Non-Mill Levy Revenue	4	23.5%
Does Not Have Non-Mill Levy Revenue	5	29.4%
No Response	8	47.1%
Total Unpaved Airports	**17**	**100.0%**

Source: Airport Manager Survey

Figure 5.26: Percent of Unpaved Airports with Non-Mill Levy Revenue



Source: Airport Manager Survey

5.6.4 Percent of Airports Meeting State PCI Thresholds on Primary Runways (60+)

The Pavement Condition Index (PCI) rating system is used to assess the condition of pavement surfaces at airports, and assigns a score ranging from zero to 100. Pavements with higher PCIs are in better condition than those with lower PCIs. To maintain system pavements in good condition, NDAC has set a PCI threshold of 60 or greater for paved GA airports and 65 or greater for commercial service airports. System-wide, North Dakota has over 25 million square feet of runway pavement which has to be maintained. When other airport pavements are included (taxiways, aprons, etc.), the system has a total of nearly 52 million square feet of pavement. Information on the PCI of primary runways in the system was gathered from the NDAC 2012 Pavement Condition Index (PCI) Study. If a range was provided, the lowest score was used in this evaluation.

The benchmark for this performance measure is to have 100% of system airports meeting their state PCI threshold (60 for paved GA, and 65 for commercial service). In 2007, 65% of system airports were meeting state PCI thresholds. Currently, 73% of airports are meeting the state PCI threshold, shown in **Table 5.23**. A listing of airports not meeting this benchmark is provided in

Table 5.24. While it would appear that this benchmark is nearly being met, it must be noted that pavements continue to age and this benchmark is an important metric that must be investigated annually as pavements may drop several PCI points in a year. The performance of this specific measure is likely to fluctuate the most over the life span of the system plan.

Benchmark: 100% of Airports Should Meet the State PCI Threshold (60 for Paved GA, 65 for Commercial Service)
Performance: 73% of Airports Meet the State PCI Threshold

Table 5.23: Percent of Airports Meeting State PCI Threshold on Primary Runways*

PCI on Primary Runways	Number of System Airports	Percentage of System Airports
Primary Runway Meets PCI Threshold	65	73.0%
Primary Runway Does Not Meet PCI Threshold	7	7.9%
Not Applicable (unpaved runways)	17	19.1%
Total System Airports	**89**	**100.0%**

*Lowest values were used when a range was listed.
Source: North Dakota Aeronautics Commission 2012 Pavement Condition Index (PCI) Study

Table 5.24: Paved Airports not Meeting the State PCI Performance Measure

Ashley	La Moure (N)	Walhalla (N)
Bismarck (N)	Larimore	
Cooperstown (N)	Page	

(N) = NPIAS airports
Note: Airports are listed by associated city.
Source: North Dakota Aeronautics Commission 2012 Pavement Condition Index (PCI) Study

5.6.5 Percent of Airports with an ALP Approved in the Last Ten Years

ALPs depict existing, future, and ultimate development to meet existing and forecasted user demand. ALPs guide future development projects and help prioritize spending. They are used to coordinate land use, acquisition or release of land, and communicate with federal and local decision makers regarding development needs. Although having an updated ALP is beneficial for all airports, it is especially critical for airports included in the NPIAS to have recent ALPs as federal funding from the AIP can only be used for projects that are depicted on an airport's ALP. Information on the age and availability of ALPs at system airports was gathered through the airport manager survey effort and was supplemented by information from FAA records.

The benchmark for this performance measure is to have recently approved ALPs (not older than ten years) for all system airports in the NPIAS (53 airports). In 2007, the benchmark was to have 100% of system airports (regardless of NPIAS inclusion) with recent ALPs, and 54% of airports were meeting the benchmark. Currently, 91% of NPIAS airports in the State have recently approved ALPs, shown in **Table 5.25** and **Figure 5.27.** A listing of NPIAS airports not meeting this

benchmark is provided in **Table 5.26**. This benchmark is important because recent changes in FAA design standards should ideally be reflected in an up-to-date ALP which then provides clarity on areas of an airfield that may require improvements to meet these updated design standards.

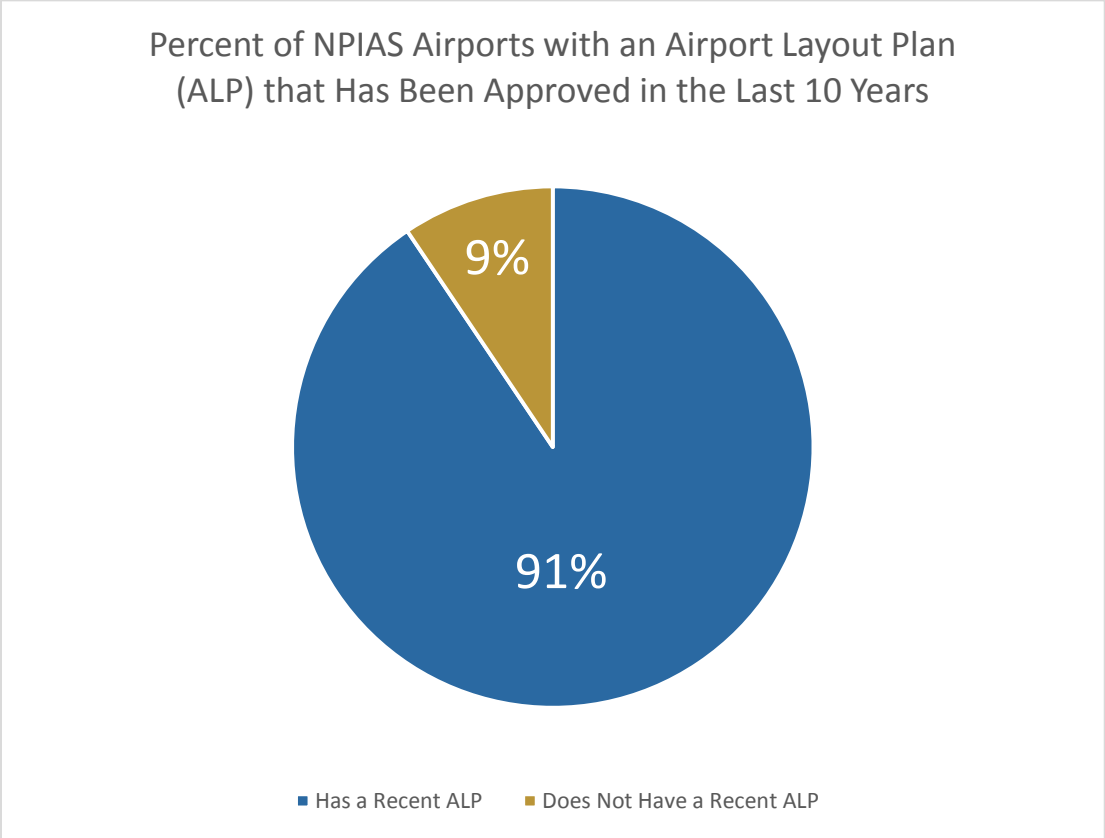
Benchmark: 100% of NPIAS Airports Should Have an Approved ALP within the Last 10 Years
Performance: 91% of NPIAS Airports Have an Approved ALP within the Last 10 Years

Table 5.25: Percent of NPIAS Airports with a Recent ALP*

Recent ALP (within past 10 years)	Number of NPIAS Airports	Percentage of NPIAS Airports
Has a Recent ALP	48	90.6%
Does Not Have a Recent ALP	5	9.4%
Total NPIAS Airports	**53**	**100.0%**

*Airports with ALPs in progress were counted as having a recent ALP.
Source: Airport Layout Plans, FAA database, and Airport Manager Survey

Figure 5.27: Percent of NPIAS Airports with a Recent ALP*



*Airports with ALPs in progress were counted as having a recent ALP.
Source: Airport Layout Plans, FAA database, and Airport Manager Survey

Table 5.26: NPIAS Airports not Meeting the Recent ALP Performance Measure

Cando (N)	Rolla (N)
Grafton (N)	Walhalla (N)
Jamestown (N)	

(N) = NPIAS airports
Note: Airports are listed by associated city.

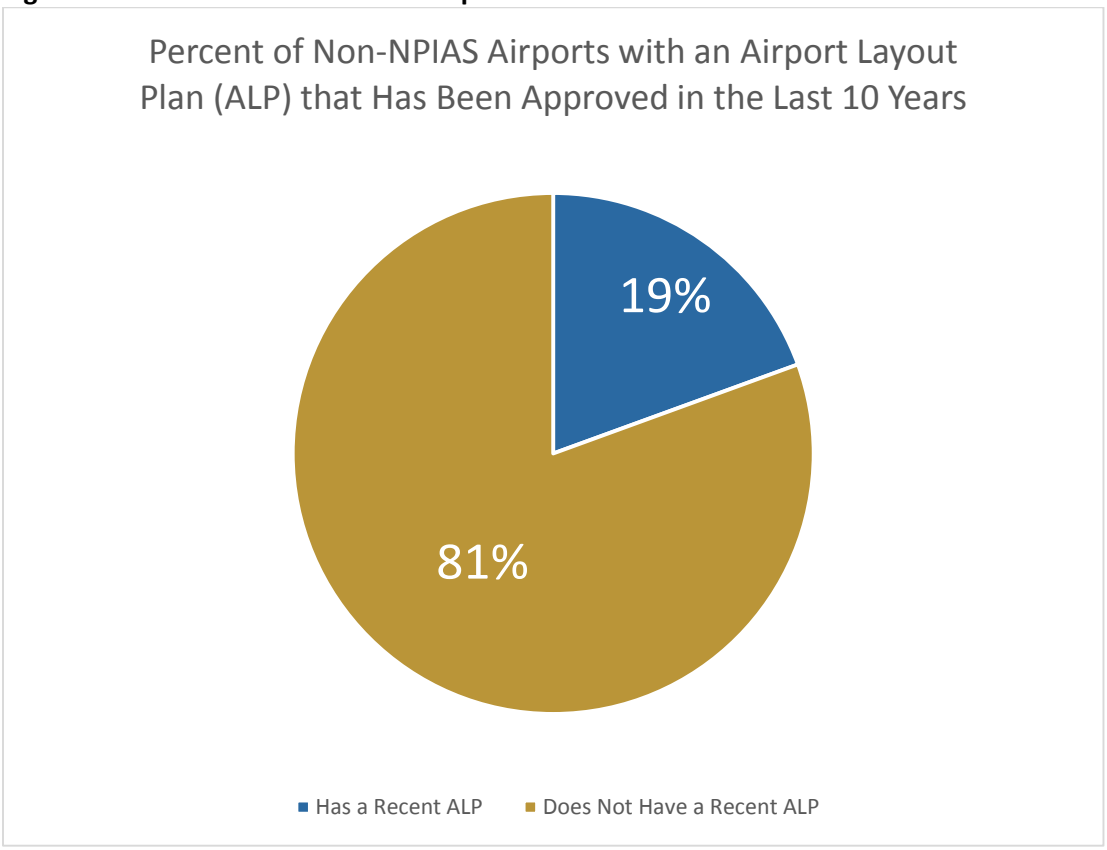
Although the benchmark for this performance measure applies only to NPIAS airports, the ALPs of non-NPIAS system airports were also inventoried. Of the 36 non-NPIAS airports in the system, seven of them have recent ALPs, shown in **Table 5.27** and **Figure 5.28**.

Table 5.27: Percent of Non-NPIAS Airports with a Recent ALP

Recent ALP (within past 10 years)	Number of Non-NPIAS Airports	Percentage of Non-NPIAS Airports
Has a Recent ALP	7	19.4%
Does Not Have a Recent ALP	29	80.6%
Total Non-NPIAS Airports	**36**	**100.0%**

Source: Airport Layout Plans, FAA database, and Airport Manager Survey

Figure 5.28: Percent of Non-NPIAS Airports with a Recent ALP



Source: Airport Layout Plans, FAA database, and Airport Manager Survey

5.6.6 Percent of Airports That Have Height Zoning Following FAR Part 77 Guidelines Adopted by a Local Zoning Board

Airports that coordinate with local officials to develop, enact, and enforce height zoning within proximity to the airport help protect runway approaches from obstructions (as required by Code of Federal Regulations [CFR] Title 14 Part 77 – Safe, Efficient Use and Preservation of the Navigable Airspace, also called FAR Part 77). Height zoning discourages the development of tall structures in flight paths and helps protect and preserve the continued operation of an airport. Information on the presence of airport height zoning was gathered through the airport manager survey effort.

The benchmark for this performance measure is for all system airports with paved runways to have adopted FAR Part 77 zoning. In 2007, the benchmark was to have 100% of all system airports (paved or not) with height zoning, and 32% of airports were meeting this benchmark. Currently, 24% of paved system airports are reporting to have adopted FAR Part 77 zoning and 25% of paved system airports indicated they are unsure if they have this zoning, shown in **Table 5.28** and **Figure 5.29**. A listing of paved airports not meeting this benchmark is provided in **Table 5.29**. This benchmark is not being met.

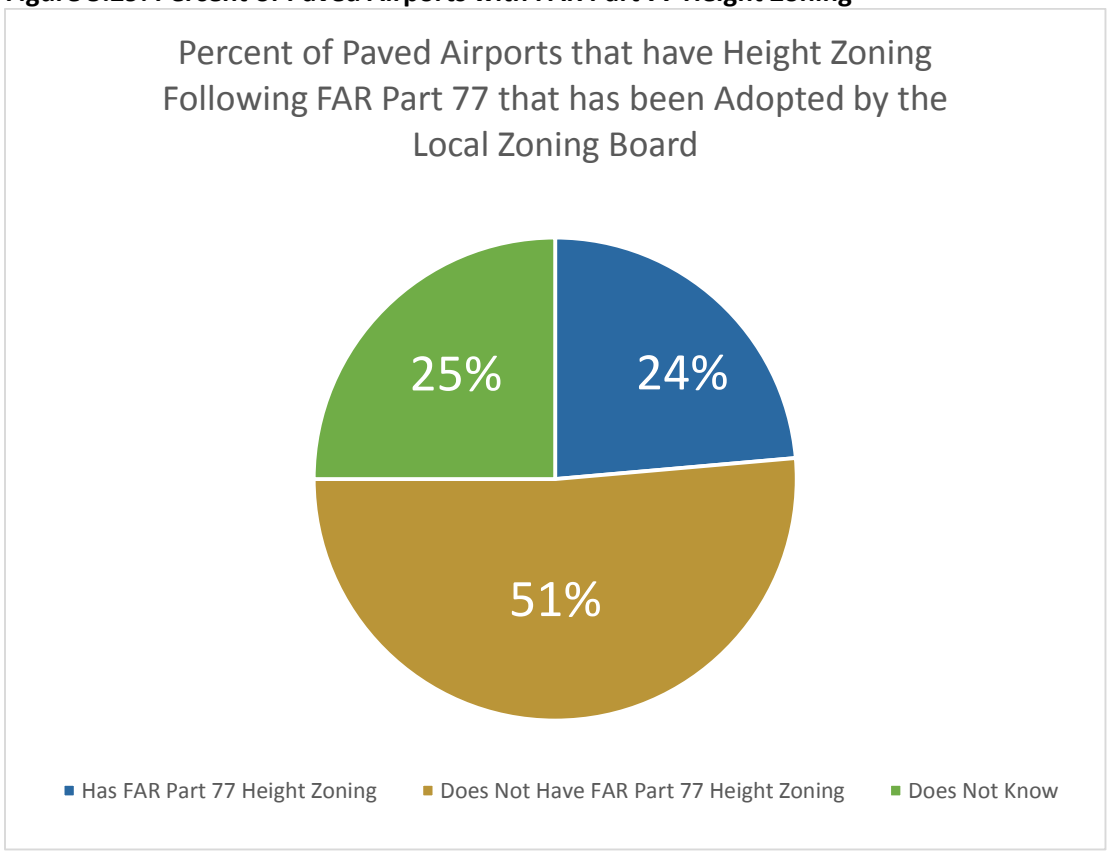
Benchmark: 100% of Airports with Paved Runways Should Have Adopted Part 77 Zoning
Performance: 24% of Airports with Paved Runways Should Have Adopted Part 77 Zoning

Table 5.28: Percent of Paved Airports with FAR Part 77 Height Zoning*

FAR Part 77 Height Zoning	Number of Paved Airports	Percentage of Paved Airports
Has FAR Part 77 Height Zoning	17	23.6%
Does Not Have FAR Part 77 Height Zoning	37	51.4%
Does Not Know	18	25.0%
Total Paved Airports	**72**	**100.0%**

*Airports with height zoning in progress were counted as having height zoning.
Source: Airport Manager Survey

Figure 5.29: Percent of Paved Airports with FAR Part 77 Height Zoning*



*Airports with height zoning in progress were counted as having height zoning.
Source: Airport Manager Survey

Table 5.29: Paved Airports not Meeting the FAR Part 77 Height Zoning Performance Measure

Ashley	Harvey (N)	Page
Beulah	Killdeer	Parshall (N)
Bowman (N)	La Moure (N)	Rolette
Carrington (N)	Langdon (N)	Rugby (N)
Cooperstown (N)	Larimore	St Thomas
Devils Lake (N)	Leeds	Tioga (N)
Dickinson (N)	Linton (N)	Wahpeton (N)
Drayton	Lisbon (N)	Washburn (N)
Dunseith (N)	Maddock	West Fargo
Edgeley (N)	Mayville	Westhope
Fort Yates (N)	Minto	Wishek
Garrison (N)	Napoleon	
Glen Ullin (N)	New Town	
Paved Airports that are unsure of Part 77 Height Zoning:		
Beach (N)	Enderlin	Northwood (N)
Bottineau (N)	Grafton (N)	Oakes (N)
Cando (N)	Hettinger (N)	Park River (N)
Casselton (N)	Lakota (N)	Pembina (N)
Crosby (N)	Mohall (N)	Rolla (N)
Ellendale (N)	New Rockford	Walhalla (N)

(N) = NPIAS airports
Note: Airports are listed by associated city.

Although the benchmark for this performance measure applies only to paved airports, the presence of height zoning at turf/gravel airports was also inventoried. Of the 17 unpaved airports in the system, none have FAR Part 77 zoning, shown in **Table 5.30**.

Table 5.30: Percent of Unpaved Airports with FAR Part 77 Height Zoning*

FAR Part 77 Height Zoning	Number of Unpaved Airports	Percentage of Unpaved Airports
Has FAR Part 77 Height Zoning	0	0.0%
Does Not Have FAR Part 77 Height Zoning	12	70.6%
Does Not Know	5	29.4%
Total Unpaved Airports	**17**	**100.0%**

*Airports with height zoning in progress were counted as having height zoning.
Source: Airport Manager Survey

5.6.7 Percent of Airports Meeting FAA Design Standards for Current Operations

It is important that airports support the use of the critical aircraft operating at their facility. As discussed in Chapter 3, the critical aircraft is the largest and most demanding aircraft making at least 500 operations annually at an airport. Airports that are not designed to handle the use of their critical aircraft can experience excessive and quicker wear of pavement (runways, taxiways, aprons, etc.) and other infrastructure strain. This scenario can occur when the mix of aircraft

using an airport changes from the mix that was using it when facilities were developed or expanded. Due to the increased use of system airports by existing and new users, some airports now have more demanding critical aircraft and primary runways that are designed for aircraft of a lower ARC. Information on the fleet and frequency of operations at system airports was gathered through the airport manager survey effort and calls to airport managers.

This performance measure is new for the 2014 NDSASP update. The benchmark for this performance measure is to have all system airports meeting the design standards for their critical aircraft. Currently, 94% of system airports are meeting this benchmark, shown in **Table 5.31**. A listing of airports not meeting this benchmark is provided in **Table 5.32**. This benchmark is nearly being met.

Benchmark: 100% of Airports Should Be Meeting Design Standards for Critical Aircraft Operating at Their Facilities
Performance: 94% of Airports are Meeting Design Standards for Critical Aircraft Operating at Their Facilities

Table 5.31: Percent of Airports meeting FAA Design Standards*

Meeting FAA Design Standards	Number of System Airports	Percentage of System Airports
Meets FAA Design Standards	87	94.4%
Does Not Meet FAA Design Standards	5	5.6%
Total System Airports	**89**	**100.0%**

*An airport is considered to be meeting design standards if it does not have aircraft making significant operations (500+ annually) by aircraft of a larger design classification than that for which the airport's infrastructure is designed.
Source: Airport Manager Survey and calls to Airport Managers

Table 5.32: Airports not Meeting the FAA Design Standards Performance Measure

Bottineau (N)	Page	Williston (N)
Dickinson (N)	Stanley (N)	

(N) = NPIAS airports
Note: Airports are listed by associated city.

5.7 Summary

This chapter includes the evaluation of the performance measures that were established in Chapter 2. Many of these measures were carried forward from the 2007 system plan, and have been re-evaluated with updated inventory data from 2014. The performance of the system analyzed in this chapter provides the base for system-wide recommendations, as well as airport-specific recommendations moving forward. These recommendations are provided in Chapter 7.

CHAPTER 6 – TRENDS & TECHNOLOGY

Changes in aviation trends and advancement in technology are expected to impact operations within North Dakota's aviation system over the planning period. One trend that is affecting all facets of aviation in the state is the oil boom. Additionally, changes in aircraft types, navigational systems, fuel types, and a national shortage of pilots are a few of the major factors anticipated to impact the system. Each of the following trends and technologies are discussed in more detail in this chapter:

6.1 Oil Boom Impacts

North Dakota's oil boom is driving economic and population growth in the state. North Dakota now ranks 2nd (behind Texas) in the ten most oil-rich states, according to *USA Today*. In 2013, the state accounted for more than 11.5% of total U.S. crude oil production; a 177% increase in production from 2010 to 2013. Proven oil reserves in the state have more than doubled in the last few years, and during the ten year period between 2003 and 2013, oil production in North Dakota increased by almost 1,000 percent.[11]

As a result of the oil boom in North Dakota, the number of oil-related jobs (production, gathering, fracking, drilling) continues to rise, and the state has consistently had the lowest unemployment rate in the U.S. since 2009.[12] The demand for air access to North Dakota has been boosted by oil-related businesses and employees, new residents, and visitors. North Dakota's aviation industry has seen tremendous growth in the number of licensed pilots, registered aircraft, based aircraft, operations, and enplanements.

Historically, the price of oil has generally been on the rise since the late 1990s, which has supported the increased drilling and oil production across the U.S. and abroad. Recently, however, a combination of rising world supply and weaker demand has caused the cost of oil to drop to a low of about $50 per barrel

[11] http://www.usatoday.com/story/money/business/2014/08/03/oil-rich-states/13443353/

[12] http://www.usatoday.com/story/money/business/2014/08/03/oil-rich-states/13443353/

in January 2015, which may cause some companies to reduce production in the U.S. in order to meet current demand. Although production may slow down temporarily in North Dakota, the oil boom continues to boost the state economy and drive additional aviation activity overall.

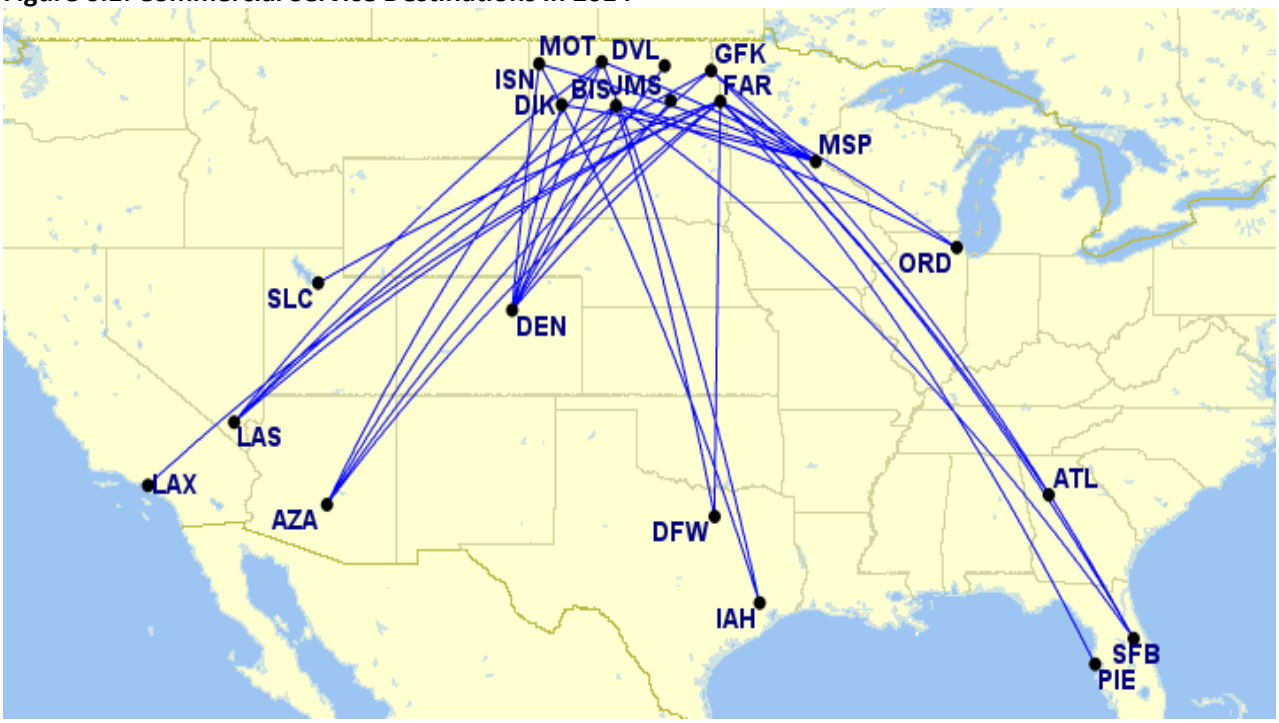
6.1.1 Expanded Commercial Service

As a result of the incredible population and economic growth, commercial air service in North Dakota has expanded at all eight commercial service airports in the system. All eight airports now have jet service by mainline air carriers and only two of them (Jamestown and Devils Lake) receive support through the Essential Air Service (EAS) program, compared to four in 2008. Unlike the national trends of fewer flights but with larger airplanes, North Dakota has experienced a continued increase in the number of flights from 2010 – 2014 as airlines began responding to the increase in demand as a result of economic and population growth. For perspective, in 2008 the state averaged 52 airline departures per day to six destination airports. Today, there is an average of 75 daily airline departures to 12 destination airports, shown in **Figure 6.1**.

Continued Commercial Growth

The eight commercial service airports in North Dakota posted a banner year in 2014 with over 1.2 million passengers total. January 2015 numbers show continued growth with a 4% increase in passengers over January 2014.

Figure 6.1: Commercial Service Destinations in 2014



Source: Airport websites as of December 2014 and Great Circle Mapper

Researchers studying the economic impact of oil and gas extraction and its potential impact on employment and population have forecast that the industry will continue to expand exploration and extraction activity well into the middle 2030s. With oil activity expected to continue for several years, it is anticipated that the demand for expanded air service in the state will continue as well. See Chapter 4 for additional information regarding the anticipated impacts of the oil boom on aviation activity in the state.

6.2 Fuel Lead Removal

Over the past 37 years, lead has been removed from various materials (paint, plumbing, solder, and automobile gasoline) due to the hazardous and toxic effects on humans, especially children. Aircraft fuel used by general aviation aircraft with piston engines (known as avgas or 100LL [low lead] fuel) is one of the few fuels in the U.S. that still contain lead, leaving it the single largest source of lead emissions in the country, according to the U.S. Environmental Protection Agency (EPA).[13] Rising concern over the harmful effects of 100LL has sparked significant research and efforts by the aviation and petroleum industries to remove lead from avgas. Unfortunately, no other chemical prevents uncontrolled detonation of the fuel that can damage aircraft engines during flight and threaten the safety of passengers onboard.

While some aircraft have been operating on unleaded auto fuel (called mogas) if it does not contain ethanol, many older piston engine aircraft aren't able to run on it and have to use the higher octane 100LL avgas. Additionally, fuel companies do not support the use of their automobile fuel as aircraft fuel, and it is rarely available at airports. Other replacement fuels have been developed and tested over the years, but none provide the level of performance that 100LL does and maintain the safety qualities such as vapor pressure, hot and cold starting capabilities, material compatibility, water separation, corrosiveness, storage stability, freeze point, toxicity, and other characteristics needed for a successful replacement fuel.[14] Some possible options for removing lead from avgas over time include slowly phasing lead out of avgas in tandem with necessary engine modifications, and continuing to provide a leaded fuel for the aircraft that need it until a safe replacement fuel has been developed.

While it is unknown how the avgas lead removal process will play out, it is sure to impact the aviation system in North Dakota. Airports may need to switch available fuels, carry additional types of fuel, and/or provide aircraft maintenance to make any engine modifications necessary to run off alternative fuels.

[13] U.S. Environmental Protection Agency. 40 CFR Part 87; Advance Notice of Proposed Rulemaking on Lead Emissions from Piston-Engine Aircraft Using Leaded Aviation Gasoline; Proposed Rule. Fed Reg 75(81):22439–22468 (2010)

[14] "Sunset for Leaded Aviation Gasoline?" *Environmental Heath Perspectives.* National Institute of Environmental Health Sciences. www.ehp.niehs.gov

6.3 Aircraft Trends

The types of aircraft operating in North Dakota's aviation system drive the facility and infrastructure needs of the 89 system airports. The aircraft weight, speed, size, turning radius, engine-type and other factors play a role in the way North Dakota's airports are developed and what services are made available at each. As aircraft trends change, the needs of the system change too. The next three sections discuss the major trends impacting, or anticipated to impact, system airports.

6.3.1 Light Sport Aircraft (LSA)

In July 2004, the Federal Aviation Administration (FAA) issued the light sport aircraft/sport pilot (LSA/SP) rule that opened the door for growth in the general aviation market. Aircraft can be certified as light sport aircraft if they fall within the weight specifications and other guidelines defined by the FAA. Such aircraft include powered and glider airplanes, gyroplanes, powered parachutes, weight-shift control trikes, free balloons, and airships. These aircraft are designed to reduce the costs associated with maintaining and operating a traditional recreational airplane, which in turn has the potential to benefit recreational aviation in North Dakota. Growth forecasted in this segment of general aviation has the potential to increase aviation activity levels even further throughout the state.

6.3.2 Unmanned Aerial Vehicles (UAV) or Unmanned Aerial Systems (UAS)

UAVs or UAS are becoming a larger player in the aviation industry as civilian uses increase. UAVs are aircraft that are operated remotely (one of many varieties is shown in **Figure 6.2**). In addition to military applications, UAVs can perform a wide variety of tasks in civilian environments including remote sensing, transport, scientific research, and search and rescue operations. Local and state agencies can use UAVs to monitor engineering sites, waterways, pipelines, high crime areas, crowded settings, traffic, security situations, pollution levels, forest fire movement and crop surveillance, among many other applications. Rules and regulations on the use of UAVs are still under development and until the FAA finalizes and publishes guidance on UAV/UAS operation, it is unknown what specific measures for which airports will be responsible.

Figure 6.2: Unmanned Aerial Vehicles in Flight

Source: Mead & Hunt, Inc.

Given the increased interest in utilizing these aircraft for civilian purposes, it is anticipated that UAV use will increase in North Dakota (and nationwide), which will require airports, pilots, and UAV controllers to coordinate with each other and be aware of ongoing operations. The state was recently chosen as one of six FAA UAS test sites, where research will be conducted to identify how to best integrate UAS into the national airspace system (the Northern Plains UAS Test Site is headquartered in Grand Forks).

6.3.3 Airline Fleet Changes

Unlike the national trends of fewer flights but with larger airplanes, North Dakota is experiencing a continued increase in the number of flights on regional jet aircraft (shown in **Figure 6.3**), in response to the increase in demand due to economic and population growth. While the U.S. has been experiencing a steady increase in the number of seats per flight flown, North Dakota experienced a slight decline – from 64 to 57 seats per departure – between January 2010 and April 2011. This reflects the use of smaller, regional aircraft for many of these flights. In 2014, the number of flights has leveled off and even declined slightly. At the same time, the number of seats per operation is climbing back up – indicating a shift by commercial carriers to larger capacity aircraft that are now making their way into the state's commercial aviation system. Commercial service airports in the state should be prepared to handle the continued use of regional jet aircraft, and even larger commercial aircraft at the biggest and busiest airports (such as Bismarck, Fargo, Grand Forks and Minot).

Figure 6.3: Example of Regional Jet Aircraft Operating at North Dakota's Commercial Service Airports

Source: Mead & Hunt, Inc.

6.4 Pilot Shortage

The U.S. is experiencing a shortage in airline pilots that is impacting regional as well as mainline carriers. Impacts from this shortage are being seen in North Dakota, most notably the discontinuation of regional service in North Dakota by Great Lakes Airlines. The airline discontinued service to Devils Lake and Jamestown in January 2014, and service to Dickinson and Williston in March 2014, due to a lack of pilots.[15]

This pilot shortage is occurring for several reasons: a long-anticipated wave of pilot retirements; recent changes in training requirements for new pilots (1,500 hours of flight experience instead of 250); rest requirements; and minimal compensation that regional airlines are able to offer new pilots. Reduction in new-pilot availability has impacted mainline carriers who are recalling furloughed pilots in an effort to replace those who are retiring. The rate of retirement is only expected to increase over the next several

[15] http://www.usatoday.com/story/todayinthesky/2014/03/20/great-lake-airs-long-run-in-north-dakota-will-end/6651579/

years as thousands of senior pilots at major airlines hit the mandatory retirement age of 65.[16] Schools like the University of North Dakota (UND) are helping to solve this issue by training new pilots. However, reaching the threshold of 1,500 hours of flight experience will continue to be an issue for the foreseeable future.

In addition to suspension or discontinuation of service in select markets, reduction in route frequency and financial hardship for smaller carriers could occur across the U.S. as a result of this industry-wide pilot shortage. Fortunately, demand for commercial air travel to North Dakota's airports is strong and mainline air carriers have added new regional 50-100 seat aircraft service to the airports that were previously served by Great Lakes. [17]

6.5 NextGen and ADS-B

NextGen is the transformation of the National Airspace System (NAS) from a ground-based system of air traffic control to a satellite-based system of traffic management. When NextGen becomes fully developed, the system will allow a larger number of aircraft to safely fly closer together on more direct routes, resulting in reduced delays and unprecedented benefits for both the economy and the environment through reduced carbon emissions and fuel consumption. It will take several years to fully complete the transformation of the NAS to NextGen; however, progress is being made every day through equipment installation, testing, and research.

One of the technologies supporting the NextGen system includes Automatic Dependent Surveillance – Broadcast (ADS-B). ADS-B allows pilots in the cockpit of equipped aircraft and air traffic controllers on the ground to track aircraft traffic with more accuracy than other systems, specifically radar. ADS-B relies on the Global Navigation Satellite System to determine an aircraft's precise location. The position data is combined with other information such as aircraft type, speed, altitude, and flight number. The information is converted into a digital message and broadcasted via a radio transmitter.

The FAA's *NextGen Update: 2014* notes the FAA's completion of baseline deployment of 634 ground stations in March 2014. As of June 2014, ADS-B was integrated into automation platforms at 17 en route air traffic control facilities nationwide, which control traffic at high altitudes. As of September 2014, North Dakota has seven operational ADS-B radio stations (Carrington, Casselton, Killdeer, Larimore, Mohall, Mandan, and Minot) and four ADS-B terminal service volumes (Bismarck, Fargo, Grand Forks, and Minot). As the NextGen system continues to develop across the U.S., it is anticipated that additional ADS-B

[16] http://online.wsj.com/articles/SB10001424052702304851104579361320202756500

[17] http://online.wsj.com/articles/SB10001424052702304851104579361320202756500

stations will be added in the state, providing greater access to the new navigational technology. An important element of ADS-B is that aircraft will need to be equipped with ADS-B-transformers/receivers to fully benefit from the system.

6.6 Airports GIS

The FAA implemented the Airports Geographic Information System (Airports GIS) Program in 2010, which is aimed at creating standard formats for the collection and input of aviation data for individual airports. The standardization and centralization of data into a single shared electronic location is anticipated to improve the FAA's overall operational efficiency and provide enhanced access to data for analysis and decision making. It is expected to enhance and support collaboration between the FAA, state transportation agencies, and airport sponsors on airport planning and development projects, as well as streamline data sharing among agencies within the industry.

The Airports GIS is a web-based information repository for survey data, which is managed jointly by the FAA, and the airport sponsor. By establishing a standardized methodology to capture survey data for submission into Airports GIS and to validate the information for use on multiple projects, the system introduces a centralized data source capable of supporting the needs of both the FAA and airport sponsors. This system is being used currently for the development of electronic Airport Layout Plans (eALPs) at specific airports (a sample screen capture is shown in **Figure 6.4**), and will serve as a platform to enable data sharing for both the planning and engineering required by NextGen. As Airports GIS continues to evolve, more airports will begin to use the system for information storage and development planning. The end result will be a standardized GIS presentation of the ALP drawing set, a query driven airport database, and an active archiving of previous eALP data sets.

Figure 6.4: Screen Capture of Airports GIS System

Source: Mead & Hunt, Inc.

6.7 Sustainability

Sustainability has been a recent focus for many airports as they look for ways to reduce, reuse, and recycle available resources to limit the impact on the environment, as well as reduce financial needs. The idea of sustainability as it relates to aviation is generally focused around construction material recycling, reduction in energy consumption through energy efficient utilities, green building construction, and use of alternative energy sources.

While there are differing opinions on the definition of sustainability, the FAA defines sustainable actions as those that:

- Reduce environmental impacts.
- Help maintain high and stable levels of economic growth.
- Help achieve "social progress," a broad set of actions that ensure organizational goals are achieved in a way that is consistent with the needs and values of the local community.

As advances continue to be made in sustainable infrastructure and technology, it is anticipated that sustainability will remain an important focus for airports in the coming years. The following sections address some common sustainability practices that are being used/can be used in North Dakota.

6.7.1 Construction Material Recycling and Reuse

Construction and demolition waste constitutes approximately 40% of the total solid waste stream in the U.S. Reusing and recycling building materials can significantly reduce the consumption of virgin materials, as well as the amount of waste sent to landfills.[18] One common example of material recycling is the grinding of old pavement previously in use at an airport, which is then used as a base layer prior to new pavement application. This ground up concrete and asphalt can also be used in the making of new pavement.

Beyond recycling construction materials, existing pavement can be used for alternate types of operations as improvements are made. For example, a common re-use of pavement includes the conversion of existing runways into taxiways when new runways are constructed. While this pavement still needs to be properly maintained throughout its useful life, re-using it reduces the total amount of required material, excavation, and mobilization needed for the new construction. By recycling and reusing existing materials, development costs can be reduced and resources can be conserved and used elsewhere for infrastructure development and maintenance.

6.7.2 Airfield Lighting

Airfield lighting is responsible for a significant portion of an airport's energy consumption. In recent years, implementation of Light Emitting Diodes (LEDs) has occurred at a number of airports both in the U.S. and worldwide (**Figure 6.5**). LEDs typically have a much longer service life than that of traditional halogen bulbs and require far less energy to operate. Although the initial cost to implement LED lighting is higher than traditional lighting types, LED lighting can be cost-effective for airports in North Dakota over the long run, especially at airports that must keep their airfield lighting on for extended periods of time.

[18] ACRP Synthesis 10 *Airport Sustainability Practices*

Figure 6.5: Example of LED Airfield Lighting

Source: Mead & Hunt, Inc.

6.7.3 Green Building Construction

According to the Environmental Information Administration, buildings account for approximately 40% of the primary energy use in the U.S. In order to reduce this energy consumption, the concept of "green building" design was established (an example of a "green building" is shown in **Figure 6.6**). Green buildings are designed, constructed, and operated to improve environmental, economic, health, and productivity performance. Some common benefits of green building practices include decreased water use and waste, reduced maintenance and operating costs, energy savings, and improved indoor air quality.[19]

Figure 6.6: Example of a LEED Platinum-Certified General Aviation Terminal Building

Source: Mead & Hunt, Inc.

Sustainable design standards, such as those identified by the Leadership in Energy and Environmental Design (LEED) rating system, provide the framework for efficient, more environmentally mindful practices that can be used in building development. Even if not seeking LEED certification, green building concepts can be incorporated into airport building designs and remodels. Some common green design elements include:

[19] ACRP Synthesis 10 *Airport Sustainability Practices*

Automated building controls – Controls reducing the level of heating, ventilating, and air conditioning (HVAC) during periods when a building is unoccupied can contribute to lower energy consumption.

Electric powered ground support equipment – Ground support equipment powered by electricity instead of gasoline can reduce or eliminate carbon emissions produced from these devices.

Energy audit – Performing an energy audit can help identify areas where energy conservation can be realized through improvements to utilities, building design, and insulation.

Geothermal heating and cooling – Use of geothermal processes to heat and cool a building can reduce dependence from outside energy sources.

Landfill diversion program – Recycling programs can reduce or eliminate the solid waste stream generated as a result of day-to-day airport activities.

Lighting/lamp replacement – Use of LED lighting to replace traditional forms of building lighting filaments can reduce energy consumption.

Native landscaping – Installation of landscaping composed of native plant and tree species that are grown locally can decrease the amount of water needed for landscape maintenance and require little long-term maintenance.

Natural lighting – Use of natural lighting in building design can reduce energy used for artificial lighting.

Occupancy/daylighting sensors – Devices such as timers and sensors can reduce or shut off power to areas during periods of inactivity.

Photovoltaic solar panels – Harnessing the sun's renewable energy to power various building utilities can reduce dependence on outside energy sources.

Solar thermal – Energy gained from sunlight can be converted to thermal energy and used to heat water or air for commercial use.

Thermal storage – Storing thermal energy obtained through renewable resources can provide a method to use renewable energy at a later time.

These design elements can be used in the remodel/retrofitting process of existing buildings and new construction design. Integrating green building practices at airports in North Dakota can allow buildings in the aviation system to be more energy efficient, benefiting the environment and reducing operating costs.

6.7.4 Sources of Alternative Energy

Solar, wind, geothermal, and other sources of alternative energy are becoming increasingly important as utility costs increase and airports work to reduce emissions and reduce carbon footprints. Airports in the U.S. have successfully used small wind turbines, solar panels, and geothermal energy with careful planning and implementation.

In 2008, Boston Logan International Airport had 20 small wind turbines installed atop the Logan Center that generate approximately 100,000 kilowatt-hours annually, according to the City of Boston's Department of Environmental and Energy Services. While this type of energy can likely be harnessed at airports across North Dakota (ranked as the sixth "windiest state" according to a study by the National Renewable Energy Laboratory)[20], it is important to carefully plan the placement of the turbines and install hazard lighting so they do not interfere with safe aircraft operations.

In addition to wind, the capturing of energy from the sun has become a popular topic at airports in recent years. Numerous airports across the U.S. have installed solar panels on airport property (such as on top of terminal buildings), which store energy used to power a variety of elements at an airport. As solar technology continues to advance, the cost of capturing this alternative energy source is reducing and solar energy is becoming a viable option for airports that at one time could not afford to install the costly panel systems.

It is important for airports that use solar technology to consider the possible glare that can be emitted from solar panels and place panels at an acceptable angle so that pilots can navigate without being blinded. The FAA issued a guidance document in 2010 for airports to use when implementing solar technologies called "Technical Guidance for Evaluating Selected Solar Technologies on Airports." This guidance has since been placed under review due to new information and field experience. Airports are encouraged to use the interim policy issued by the

[20] http://www.energynd.com/resources/wind/

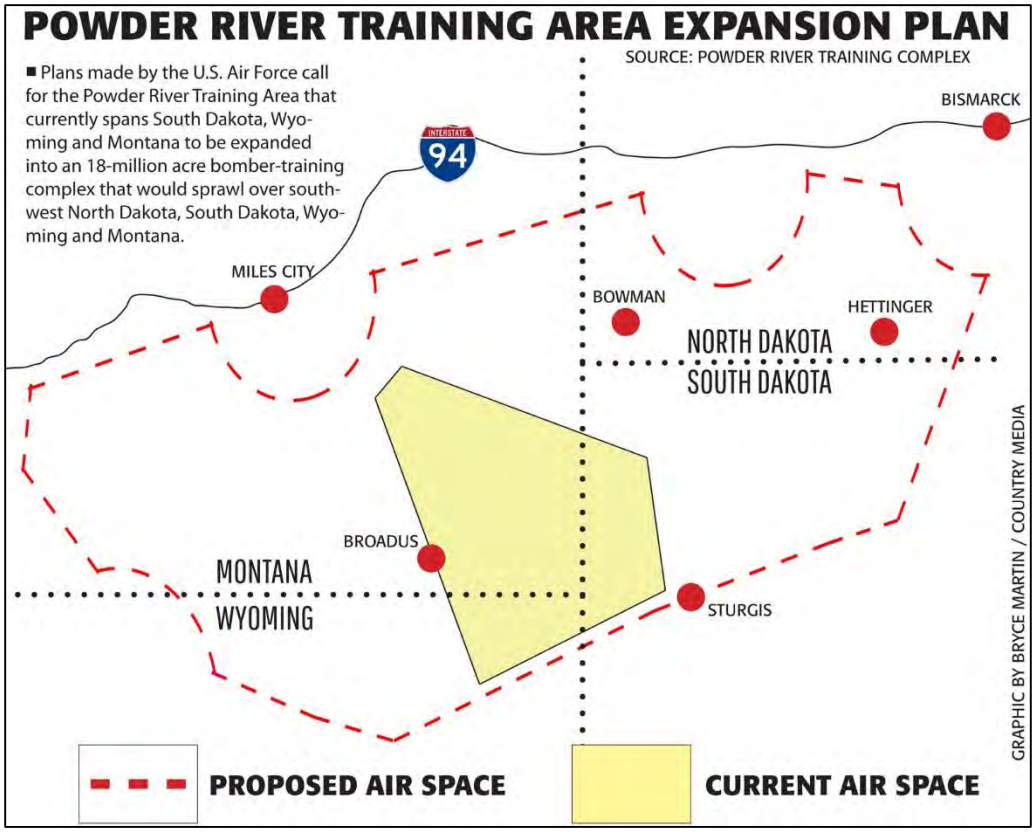
FAA instead (*FAA Review of Solar Energy System Projects on Federally Obligated Airports*) until the original guidance is updated and re-issued.

Other technologies that could be considered at airports in North Dakota include the use of electric and propane powered airport vehicles. Additionally, some U.S. airports are using geothermal technologies to heat and cool terminal buildings, which is also an alternative for airports within the state.

6.8 Airspace – Powder River Training Complex

The airspace in North Dakota is used for commercial, private, and military aviation on a daily basis. Specific sections of the airspace (known as "classes") are reserved for various types of operations in order to accommodate use by a variety of aircraft at any given time. In some instances, sections of the airspace can be reserved for use by the military, often for training operations. Operations by non-military aircraft in these reserved areas are restricted in order to provide a clear area for military activity.

Figure 6.7: Proposed Expansion of the Powder River Training Complex



Source: Bowman County Pioneer

A proposal to expand one of these training areas known as the Powder River Training Complex is being reviewed by the U.S. Air Force (USAF) and the FAA. If expanded, the training area would reach into the

southwestern portion of North Dakota and could interrupt the increased traffic around several GA airports (including the new Bowman Regional Airport) as well as the GA and commercial service traffic in and out of Dickinson. As proposed, the expanded training area could be used three to six hours a day, 240 days a year, which would restrict numerous operations in southwest North Dakota. The North Dakota Aeronautics Commission (NDAC) is providing the USAF and FAA with comments regarding their concerns about these possible impacts.

6.9 Summary

The trends and technologies presented in this chapter will impact the future of aviation in North Dakota. While some of them are impacting aviation currently, others will affect (or continue to affect) the system in the future. It is critical that airports are well poised to address these changing trends and technologies so that the state's aviation system can continue to serve the flying public. By identifying the likely impacts, the NDAC is preparing the system to adjust to industry changes.

CHAPTER 7 – RECOMMENDATIONS

With aviation use at an all-time high in North Dakota, it is critical that the system be maintained and developed to support continued use by existing and future users. An evaluation of current system performance (see Chapter 5) identified areas for improvement for each system goal. The recommendations provided in this chapter are goal-oriented, and can be found in the following sections:

7.1 Goal: Strive to Attain Safety and Security
7.2 Goal: Accommodate Accessibility Needs
7.3 Goal: Enhance Air Access to Airports
7.4 Goal: Support North Dakota's Economy
7.5 Goal: Enhance Quality of Life
7.6 Goal: Preserve North Dakota Airport Assets

In addition to these areas of improvement, recommended changes to airport classifications and additions to the National Plan of Integrated Airport Systems (NPIAS) are provided in these sections:

7.7 Recommended Airport Classification Changes
7.8 Airports Recommended for NPIAS Inclusion

The data presented in this chapter is a snapshot of the inventory data gathered as of May 2014. Changes to this data have occurred since the inventory was conducted, and are noted as such throughout this chapter as applicable. **Appendix B** contains the detailed system inventory and includes airport-specific data related to the recommendations provided in this chapter. Chapter 5 provides detail on the importance of each system goal and performance measure upon which these recommendations are based. Full page versions of the maps contained in this chapter can be found in **Appendix C**.

7.1 Goal: Strive to Attain Safety and Security

As development continues to encroach upon airports across the country, appropriate airport land use planning efforts are more critical than ever before. Since development near airports impacts aircraft operations and vice versa, it is advantageous to plan appropriately to encourage compatible development near airports by performing the following tasks:

- Clearing approaches to primary runway ends
- Mitigating incompatible land uses within Runway Protection Zones (RPZs)
- Gaining control of land within RPZs
- Developing wildlife management plans

The following sections outline recommendations to promote and support the safety and security of North Dakota's aviation system.

7.1.1 Clear Approaches to Primary Runway Ends

Clearing approaches of obstructions helps protect the safety of operations at an airport and preserve approach minimums, which increases the usability of an airport during times of reduced visibility. **Table 7.1** lists system airports that do not have primary runways with clear 20:1 approaches. It is recommended that these airports work with the North Dakota Aeronautics Commission (NDAC) staff and the Federal Aviation Administration (FAA) to clear trees and other structures that are penetrating their approaches to protect operations and support the continued use of their facility. These clearing projects should be reflected in individual airport Capital Improvement Plans (CIPs) so that adequate funding can be planned to accomplish their projects.

Table 7.1: Airports without Clear 20:1 Approaches to Primary Runway Ends

Arthur	Larimore	Park River (N)
Beulah	Leeds	Riverdale
Bowbells	Lidgerwood	Rolette
Columbus	McClusky	Towner
Dunseith (N)	McVille	West Fargo
Enderlin	Milnor	Westhope
Hazelton	Minto	Wishek
La Moure (N)	New Rockford	
Airports now with clear 20:1 approaches:*		
Bowman (N)	Fort Yates (N)	Mayville
Cavalier (N)	Killdeer	New Town
Devils Lake (N)	Maddock	

*These airports have achieved clear 20:1 approaches on their primary runway ends since the inventory was conducted; consequently, this table does not match exactly the information in Chapters 3 and 5.
(N) = NPIAS airports
Note: Airports are listed by associated city

7.1.2 Mitigate Incompatible Land Uses within RPZs

Mitigating incompatible land uses within RPZs can help minimize the damage to persons and property in the event of an aircraft overrun or undershoot. Incompatible uses include structures, wetlands – and recently – roads. Since roads were previously considered compatible, numerous airports have them within their RPZs. As a result, a large portion of system airports (95.5%) have uses that are considered incompatible. Chapter 5, Section 5.1.2, provides a more detailed evaluation of incompatible uses. **Table 7.2** lists airports with incompatible land use(s) within their RPZs. While mitigating certain infrastructure (such as roads) may not be feasible, mitigating other types of incompatible uses should be a priority for these airports.

Table 7.2: Airports with Incompatible Uses in Runway Protection Zones

Arthur	Gwinner (N)	Northwood (N)
Ashley	Harvey (N)	Oakes (N)
Beach (N)	Hazelton	Page
Beulah	Hazen (N)	Park River (N)
Bismarck (N)	Hettinger (N)	Parshall (N)
Bottineau (N)	Hillsboro (N)	Plaza
Bowbells	Jamestown (N)	Richardton
Bowman (N)	Kenmare (N)	Riverdale
Cando (N)	Kindred (N)	Rolette
Carrington (N)	La Moure (N)	Rolla (N)
Casselton (N)	Lakota (N)	Rugby (N)
Columbus	Langdon (N)	St Thomas
Cooperstown (N)	Larimore	Stanley (N)
Crosby (N)	Leeds	Tioga (N)
Devils Lake (N)	Lidgerwood	Towner
Dickinson (N)	Linton (N)	Turtle Lake
Drayton	Lisbon (N)	Valley City (N)
Dunseith (N)	Maddock	Wahpeton (N)
Edgeley (N)	Mandan (N)	Walhalla (N)
Elgin	Mayville	Washburn (N)
Ellendale (N)	McClusky	Watford City (N)
Enderlin	McVille	West Fargo
Fargo (N)	Milnor	Westhope
Fessenden	Minot (N)	Williston (N)
Fort Yates (N)	Minto	Wishek
Gackle	Mohall (N)	
Garrison (N)	Mott (N)	
Glen Ullin (N)	Napoleon	
Grafton (N)	New Rockford	
Grand Forks (N)	New Town	

*Airport has achieved compatible uses within Runway Protection Zones since the inventory was conducted; consequently, this table does not match exactly the information in Chapters 3 and 5.
(N) = NPIAS airports
Note: Airports are listed by associated city.

7.1.3 Gain Control of Land within RPZs

Establishing and maintaining compatible land uses within RPZs can be less challenging when an airport owns or has the authority to control the land within each RPZ. Therefore, it is ideal for all system airports to have control over this property. **Table 7.3** lists airports that do not have complete control over the land within their RPZs (some of these airports have partial control). The 29 airports that did not respond to this survey question are also listed separately. It is recommended that airport sponsors review options for acquiring the land within their RPZs in the future, whether it be through easement or fee simple acquisition. Including acquisition projects on a CIP is important to plan for the resources needed to complete the process.

Table 7.3: Airports without Complete Control of RPZs

Arthur	Garrison (N)	Minto
Ashley	Harvey (N)	New Rockford
Beulah	Hazelton	Plaza
Bottineau (N)	Hillsboro (N)	Richardton
Bowbells	Killdeer	Rolette
Bowman* (N)	La Moure (N)	St. Thomas
Columbus	Mayville	Watford City (N)
Drayton	McVille	West Fargo
Dunseith (N)	Milnor	Williston (N)
Airports that did not Respond:		
Beach (N)	Jamestown (N)	Oakes (N)
Cooperstown (N)	Kulm	Parshall (N)
Crosby (N)	Langdon (N)	Riverdale
Devils Lake (N)	Larimore	Towner
Edgeley (N)	Leeds	Turtle Lake
Elgin	Lidgerwood	Valley City (N)
Fessenden	Maddock	Walhalla (N)
Gackle	McClusky	Westhope
Grafton (N)	Minot (N)	Wishek
Gwinner (N)	Napoleon	

*Airport has achieved complete control of Runway Protection Zones since the inventory was conducted; consequently, this table does not match exactly the information in Chapters 3 and 5.
(N) = NPIAS airports
Note: Airports are listed by associated city.

7.1.4 Develop Wildlife Management Plans

Wildlife management plans help protect airports by outlining processes and procedures for handling wildlife threats and concerns. It is recommended airports classified as Local or larger develop and implement wildlife management plans. **Table 7.4** lists airports classified as Local or larger that do not have a wildlife management plan in place. These airports should include developing a wildlife management plan on their CIP so necessary resources can be allocated to develop and implement one.

Table 7.4: Recommended* Airports without Wildlife Management Plans

Bottineau (N)	Hettinger (N)	Wahpeton (N)
Casselton (N)	Kindred (N)	Watford City (N)
Cavalier (N)	Mohall (N)	
Garrison (N)	Tioga (N)	

*Recommended airports include those classified as Primary or Non-Primary Commercial Service, National, Regional and Local.
(N) = NPIAS airports
Note: Airports are listed by associated city.

7.2 Goal: Accommodate Accessibility Needs

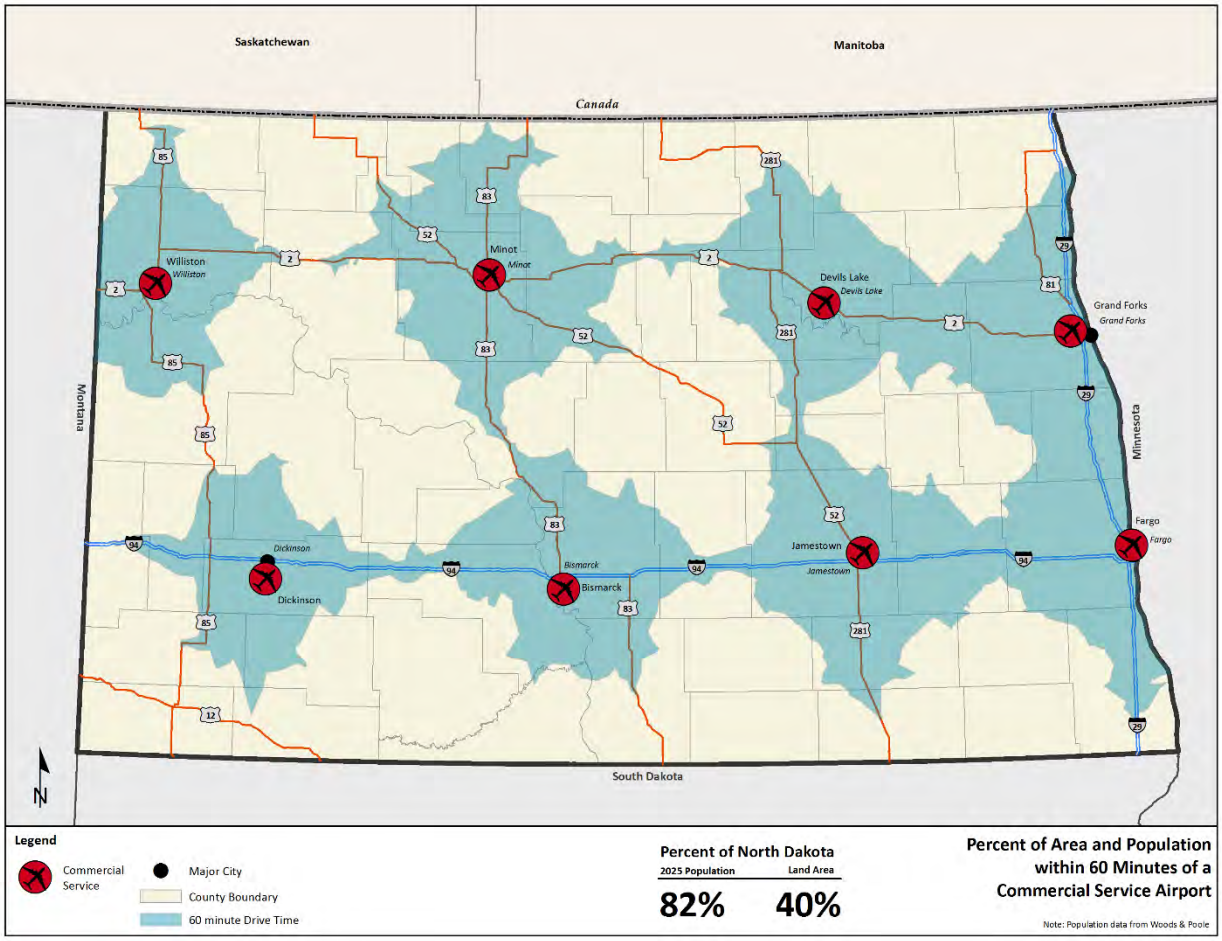
Enhancing ground access to system airports is important for all types of airport users. Providing access to a variety of classifications of airports within a reasonable drive time within North Dakota encourages use of the system for a variety of operations.

In many cases, the coverage of area and population by these airports is meeting or nearly meeting the benchmarks established and evaluated in Chapter 5. Specific recommendations for enhancing access to North Dakota's aviation system are included in the following sections.

7.2.1 Commercial Service Airports

The benchmark for this performance measure is coverage of 50% of the area and 90% of the population within a 60-minute drive time. Currently, 40% of the area and 80% of the population are covered. Although the coverage is not meeting the benchmark, the major metropolitan centers are covered and additional commercial service airports are not recommended at this time. To establish another commercial service airport would require extensive resources and is impractical at this time. Population is expected to shift and grow in the population centers over time, as shown in **Figure 7.1** which illustrates coverage anticipated by 2025. Due to continued growth in the population centers, it is anticipated that the population coverage benchmark will be met in the future with the existing eight commercial service airports.

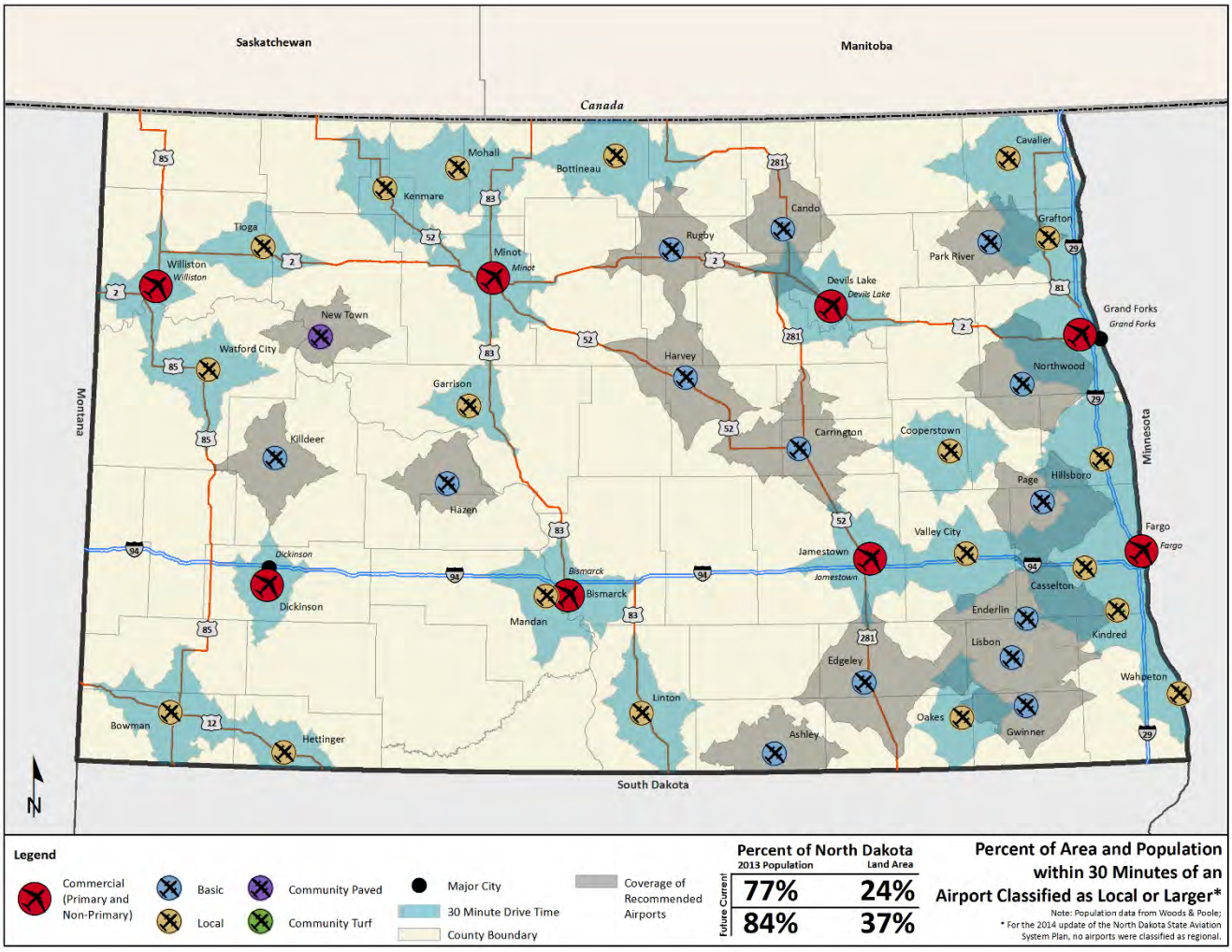
Figure 7.1: 2025 Percent of Area and Population within 60 Minutes of Commercial Service Airports



7.2.2 Local and Larger Airports

The benchmark for this performance measure is coverage of 90% of the population within a 30-minute drive time. Currently, 77% of the population is being covered. With the incredible growth that North Dakota airports are experiencing, it is anticipated that some airports currently classified as Basic will move up to a Local classification, which will increase the population coverage. Specifically, Gwinner, Rugby, Hazen, New Town, Killdeer, Ashley, Cando, Carrington, Edgeley, Lisbon, Park River, Enderlin, Northwood, Page, and Harvey are expected to meet the Local classification criteria soon and are recommended for classification change upon doing so. **Figure 7.2** illustrates current population coverage (in blue) as well as anticipated coverage (in grey) should the airports noted move up to the Local classification. An additional seven percent population coverage and 13 percent area coverage would be achieved if/when these 15 airports change classification.

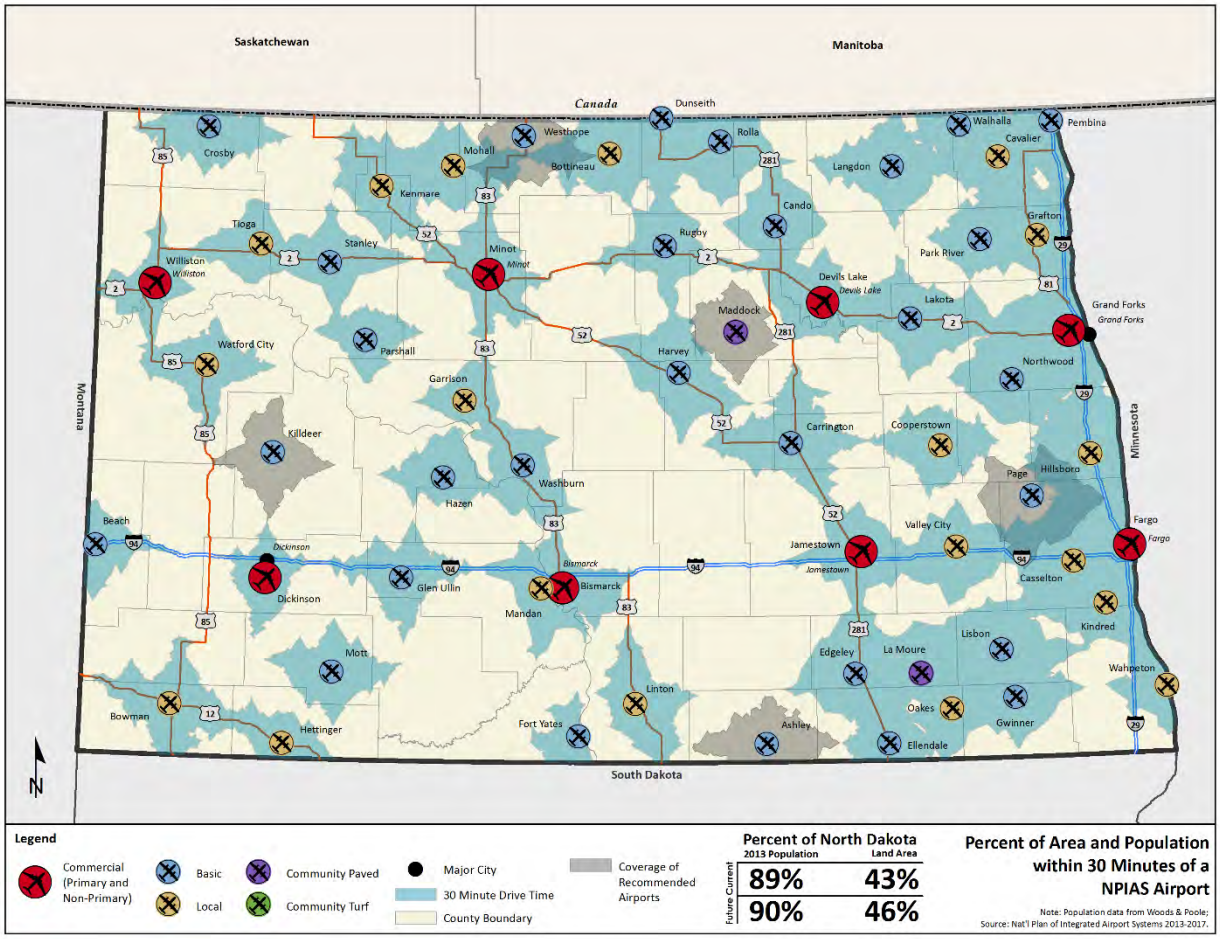
Figure 7.2: Current and Recommended Population Coverage within 30 Minutes of Local or Larger Airports



7.2.3 NPIAS Airports

Currently, the population coverage of NPIAS airports (89%) is nearly meeting the performance measure benchmark of 90% coverage. Several existing non-NPIAS airports are now meeting (or are close to meeting) the criteria for entry into the NPIAS (10+ based aircraft and 30-minute-plus drive time from the nearest NPIAS airport). It is anticipated that the addition of the Page, Westhope, Ashley, Maddock, and Killdeer airports will provide the coverage needed to meet the benchmark coverage. **Figure 7.3** illustrates the anticipated population coverage (90%) should these airports (in grey) be accepted into the NPIAS. A more detailed discussion of airports recommended for NPIAS inclusion is provided in Section 7.8.

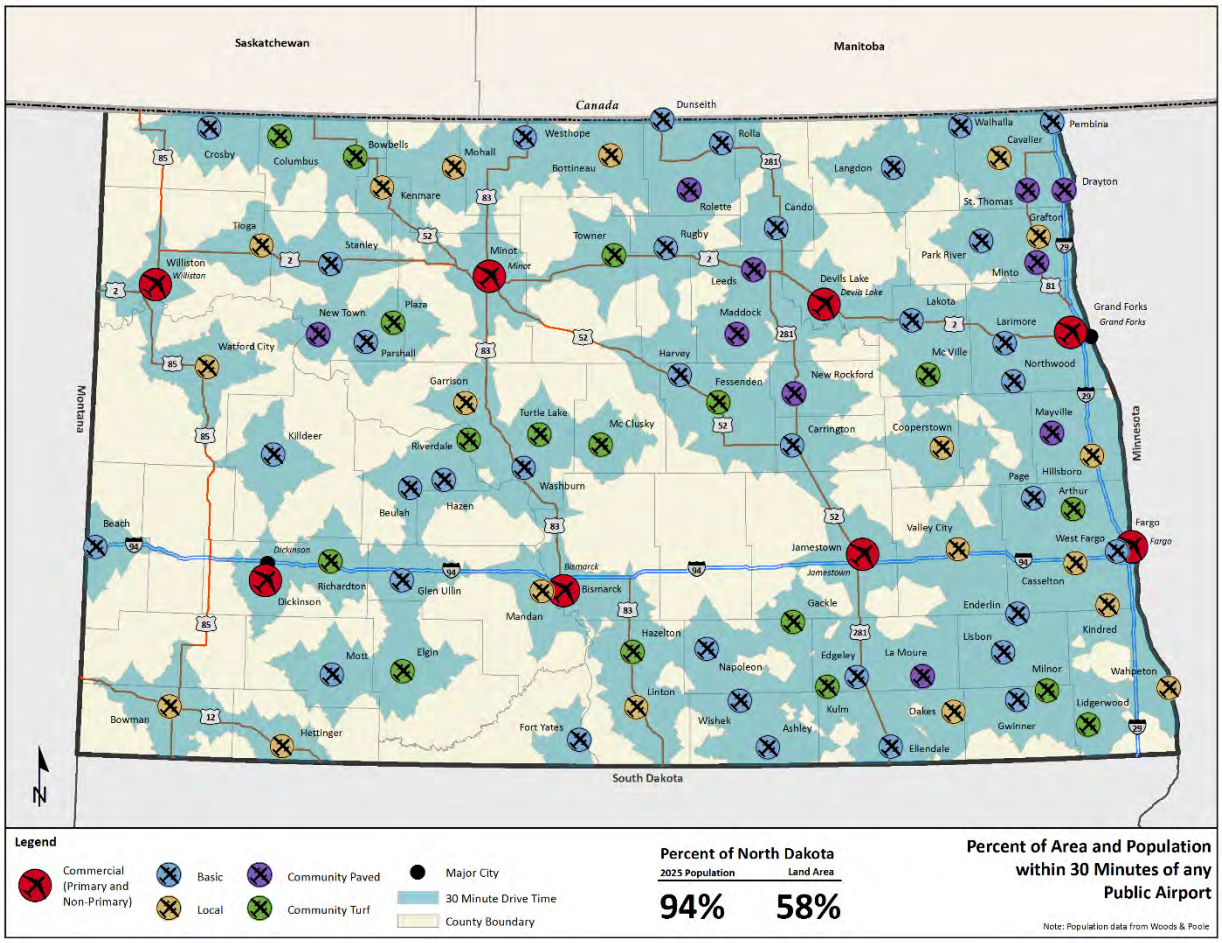
Figure 7.3: Current and Recommended Population Coverage within 30 Minutes of NPIAS Airports



7.2.4 All Public Use System Airports

Since there are a significant number of public use airports spread across the state of North Dakota, the benchmark for population coverage is 95% within a 30-minute drive. Currently, the system is covering 93% of the population, just two percent from meeting the benchmark. Natural shifting in the state's population over time will likely increase the population coverage to meet the benchmark as individuals move toward the larger cities. **Figure 7.4** illustrates the increase in anticipated coverage by 2025. No recommendations are warranted at this time.

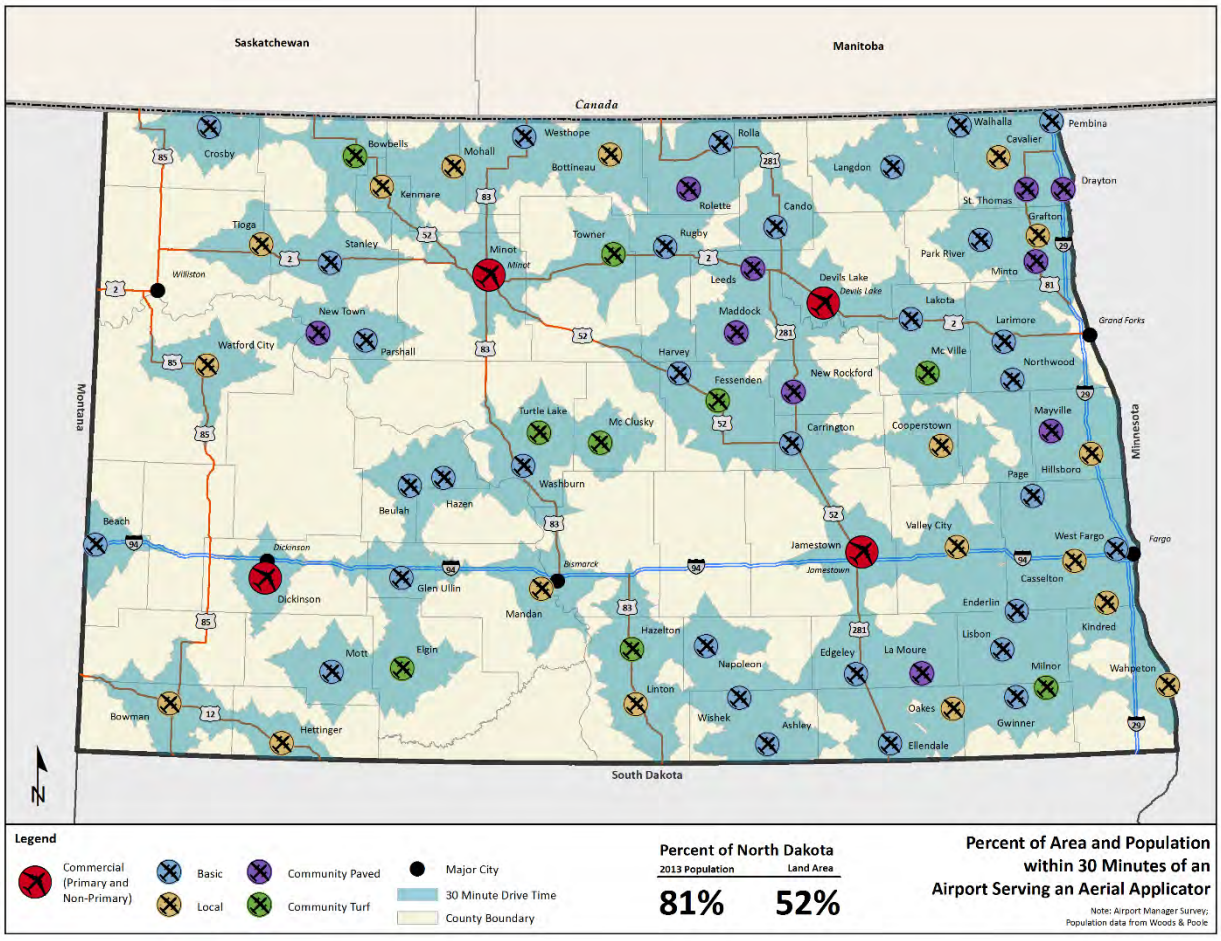
Figure 7.4: 2025 Percent of Population within 30 Minutes of Any Public Airport



7.2.5 Airports Serving Aerial Applicators

The area coverage benchmark for this performance measure is 80% within 30 minutes of an airport that accommodates aerial applicator operations. Currently, 52% of the land area is covered within 30 minutes of the 73 system airports that indicated they serve based and/or transient aerial applicators. When rangeland and other land that cannot be used for agricultural use are considered, the current coverage provided by airports is sufficient. As such, airports are encouraged to support agricultural spraying operations, but no specific recommendations are being made at this time. **Figure 7.5** illustrates the current area coverage of airports that support based or transient aerial applicators.

Figure 7.5: 2013 Percent of Area and Population within 30 Minutes of Airports Serving Aerial Applicators



Source: Airport Manager Survey

7.3 Goal: Enhance Air Access to Airports

Providing access to airports with the following facilities and services that enhance safety and convenience before, during, and after flight is essential:

- Weather reporting
- Non-precision approaches
- Vertically-guided approaches
- Adequate terminal capacity

The weather reporting benchmark is being met and therefore no recommendations are necessary at this time. To review the coverage of this performance measure, see **Figure 5.13** in Chapter 5. Recommendations for the remaining facilities and services are provided in the following sections.

7.3.1 Establish Non-Precision Approaches

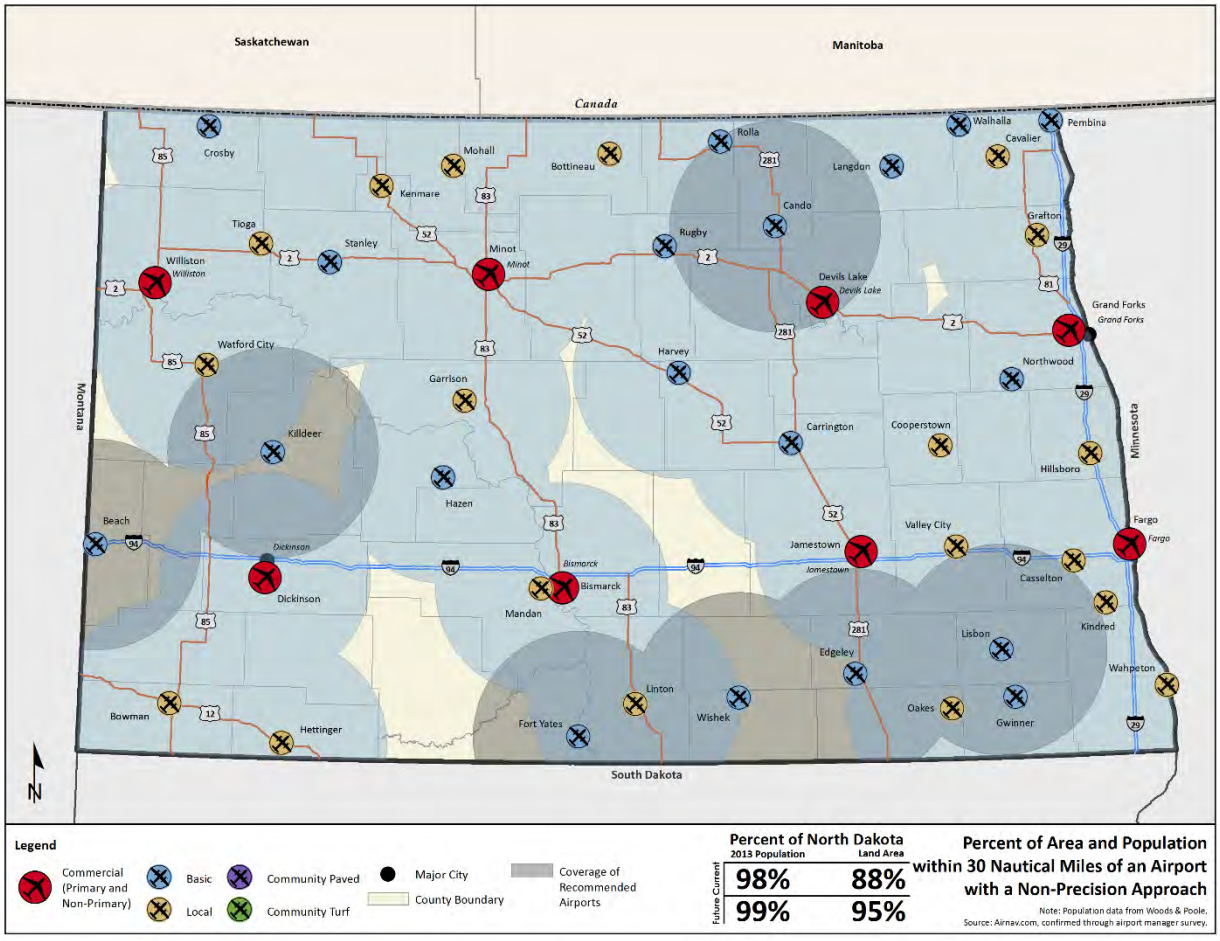
The benchmarks for this performance measure are 90% area coverage and 100% population coverage within 30 nautical miles of airports with non-precision approaches. With current coverage of 88% of the area and 98% of the population, these benchmarks are just two percent shy of being met. A non-precision approach (without vertical guidance) is planned for Beach Airport in 2015 according to the FAA's latest information, which will provide coverage on the western side of the state. It is recommended that Wishek develop a non-precision approach due to the medical flight operations served, and Fort Yates, as it is home to the Standing Rock Agency Field Office of the Bureau of Indian Affairs, which serves the Standing Rock Sioux Tribe. Non-precision approaches with vertical guidance (discussed in Section 7.3.2) are planned for Hettinger, Hillsboro, Edgeley, Lisbon, and Cando in the next two years, and are recommended at Bowman and Killdeer (for medical operations) and Rugby (due to location). A non-precision approach with vertical guidance is currently under development at Bowman. **Table 7.5** lists planned and recommended approaches (with and without vertical guidance), while **Figure 7.6** illustrates the anticipated coverage (in grey) should the airports listed establish non-precision approaches. Note that Hillsboro, Hettinger, Bowman, and Rugby are already providing non-precision approaches (without vertical guidance) and are shown in the following map as providing existing coverage (in blue). Should the seven airports shown in **Figure 7.6** establish non-precision approaches, the area coverage exceeds the benchmark at 95% and the population coverage reaches 99%, just one percent shy of meeting the benchmark.

Table 7.5: Planned and Recommended Non-Precision Approaches

Non-Precision Approaches			
Beach* (N)	Fort Yates* (N) (recommended)	Wishek* (recommended)	
Non-Precision Approaches with Vertical Guidance			
Cando* (N)	Hettinger (N)	Killdeer* (recommended)	Bowman (N) (under development)
Edgeley* (N)	Hillsboro (N)	Lisbon* (N)	Rugby (N) (recommended)

*Currently has visual approach
(N) = NPIAS airports
Note: Airports are listed by associated city.

Figure 7.6: Current and Recommended Area and Population Coverage within 30 Nautical Miles of Airports with Non-Precision Approaches



Source: Airnav.com, confirmed through Airport Manager Survey

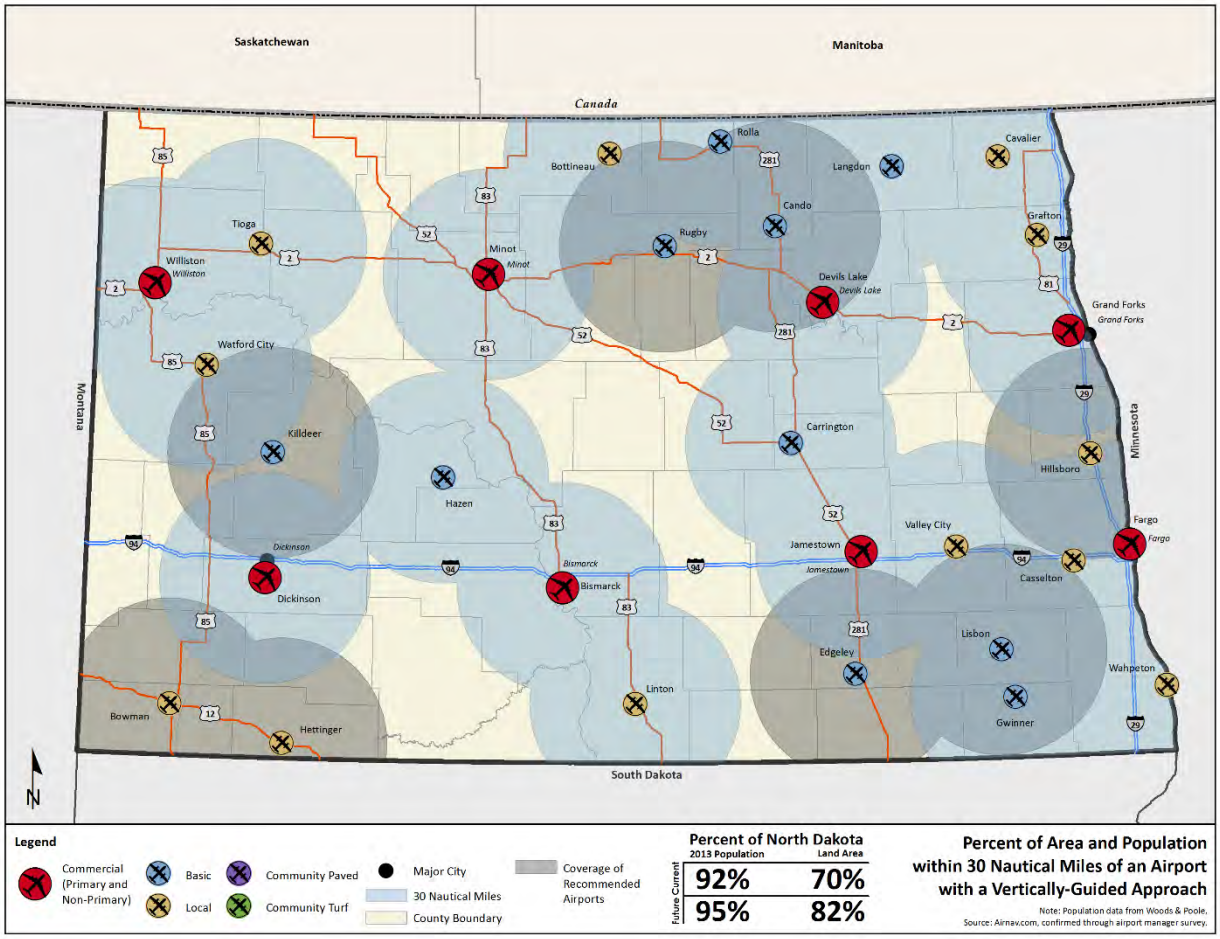
7.3.2 Establish Vertically-Guided Approaches

Coverage benchmarks for area and population are 80% and 90%, respectively, for airports providing vertically-guided approaches. The system is falling short in area coverage by ten percent (currently at 70%) and is exceeding population coverage by two percent (currently at 92%). As technology continues to advance, the implementation of vertically-guided approaches is expected to increase across the country. As noted in Section 7.3.1, additional vertically-guided approaches are planned for the following airports in the next two years according to the FAA's latest information:

- Hettinger
- Hillsboro
- Edgeley
- Lisbon
- Cando

Additionally, vertically-guided approaches are recommended at Bowman and Killdeer (for medical operations) and Rugby (due to location). When the coverage of these additional eight airports is considered, the benchmarks are met for area and population at 82% and 95%, respectively. **Figure 7.7** illustrates the current coverage (in blue) and recommended coverage (in grey). A non-precision approach with vertical guidance is currently under development at Bowman.

Figure 7.7: Current and Recommended Area and Population Coverage within 30 Nautical Miles of Airports with Vertically-Guided Approaches



Source: Airnav.com, confirmed through Airport Manager Survey

7.3.3 Provide Adequate Terminal Capacity

Providing terminals that can support current passenger demand, as well as future growth, at all of the airports in the system is important for continued growth. GA airports without terminals were not considered to have adequate capacity. Forty-eight of the 89 system airports have general aviation (GA) terminals with adequate capacity to support passenger demand. **Table 7.6** lists the airports with GA terminals that cannot support passenger demand. Additionally, six of the eight commercial service airports currently have adequate capacity to support passenger demand in their commercial service terminals. **Table 7.7** lists the two commercial service airports that are not meeting this benchmark. In-progress/upcoming terminal projects at Minot and Williston were considered to be completed in this analysis and therefore are not included in **Table 7.7**.

The airports listed in **Tables 7.6** and **7.7** should work with the FAA and NDAC to address capacity issues and to plan for solutions, such as terminal expansions. These terminal projects should be reflected on airport CIPs for funding support.

Table 7.6: Airports without Adequate GA Terminal Capacity

Arthur	Killdeer	New Town
Ashley	Kindred (N)	Northwood (N)
Bottineau (N)	La Moure (N)	Plaza
Bowbells	Leeds	Richardton
Columbus	Lidgerwood	Riverdale
Drayton	Maddock	Rolette
Dunseith (N)	Mandan (N)	Rolla (N)
Elgin	Mayville	St. Thomas
Fessenden	McClusky	Tioga (N)
Fort Yates (N)	McVille	Towner
Gackle	Minot (N)	Turtle Lake
Garrison (N)	Mott (N)	Westhope
Harvey (N)	Napoleon	Williston (N)
Hazelton	New Rockford	

*GA airports without GA terminals are counted as not having adequate terminal capacity.
(N) = NPIAS airports
Note: Airports are listed by associated city.

Table 7.7: Commercial Service Airports without Adequate Commercial Terminal Capacity

Dickinson (N)	Grand Forks (N)

*future or in-progress terminal projects at Williston and Minot were considered to be completed for this evaluation.
(N) = NPIAS airports
Notes: Airports are listed by associated city.

7.4 Goal: Support North Dakota's Economy

Providing the following facilities and services is especially important to support aviation operations that support the State's economy:

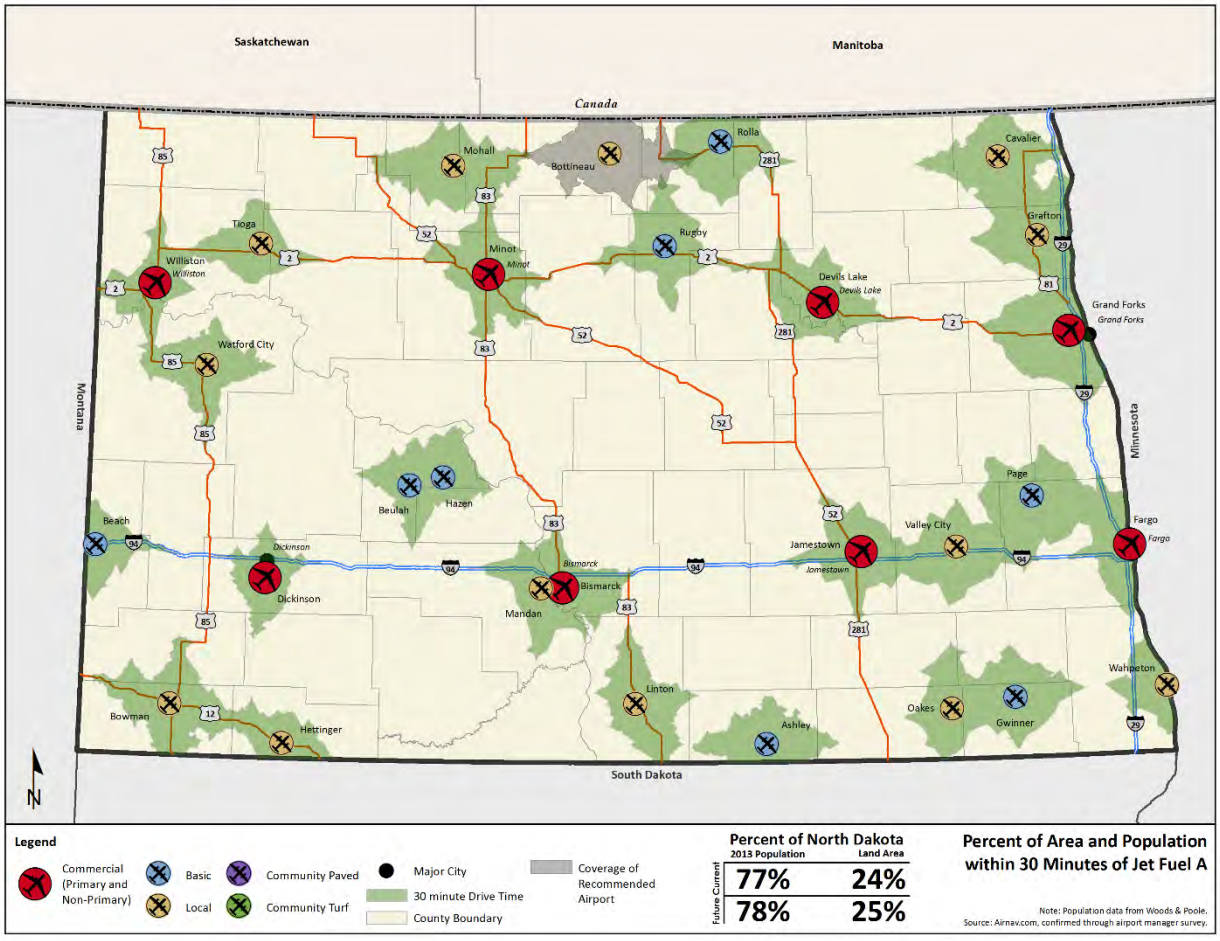
- Jet A Fuel
- 100 Low Lead (100LL) Fuel
- Large Aircraft Runways
- Ground Transportation
- Support King Air Aircraft

Whether through fuel taxes, ground transportation revenue, or landing fees, the facilities and services included in this section generate revenue and attract and support use by businesses and other entities that use aviation. System recommendations related to supporting the state economy are provided in the following sections.

7.4.1 Provide Jet A Fuel

The coverage benchmarks for Jet A fuel are 30% of the area and 75% of North Dakota's population within a 30-minute drive time to airports with Jet A. Currently the population coverage is being met at 77%; however, the area coverage (presently 24%) is six percent shy of meeting the benchmark. As such, it is recommended that Jet A be available at more airports in the system so that additional coverage can be achieved. Due to location and frequency of use by jets, it is recommended that Bottineau establish Jet A fuel service. **Figure 7.8** illustrates the increased coverage (in grey), should Jet A fuel service be established at Bottineau. This additional service would provide a total coverage of 25% of the area and 78% of the population. Although the coverage would still fall slightly short of the benchmarks, current operations at other airports do not necessitate the establishment of Jet A fuel service at this time.

Figure 7.8: Current and Recommended Area and Population Coverage within 30 Minutes of Airports with Jet A Fuel

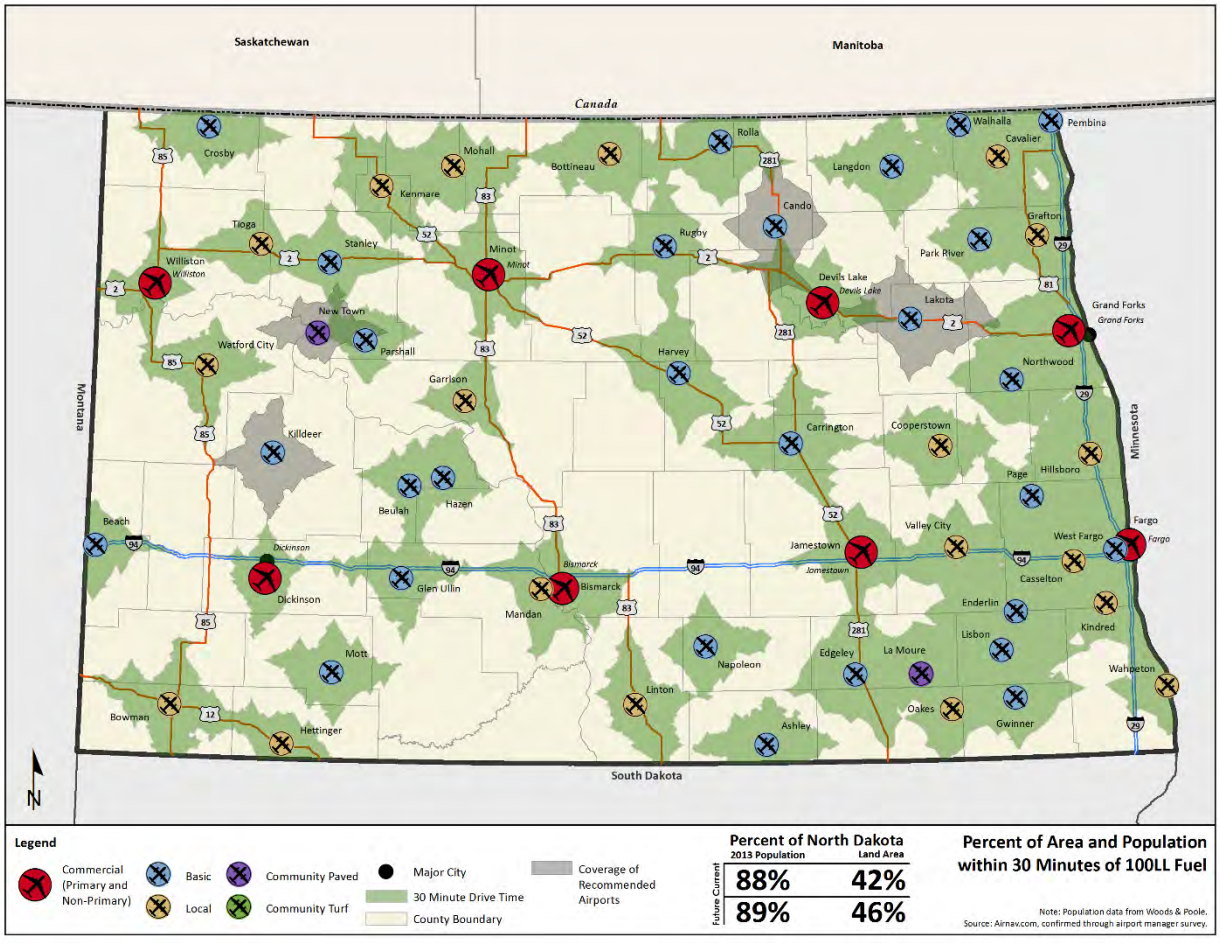


Source: Airnav.com, confirmed through Airport Manager Survey

7.4.2 Provide 100LL Fuel

The coverage benchmarks for 100LL fuel are 60% of the area and 90% of North Dakota's population within a 30-minute drive time to airports with 100LL. Currently, the area coverage is at 42% and the population coverage (88%) is two percent shy of meeting the benchmark. As such, it is recommended that 100LL be available at a few more airports in the system so that adequate area coverage can be achieved. Suggested airports for 100LL fuel service include Killdeer, New Town, Lakota, and Cando due to location and frequency of use by aircraft that require this type of fuel. **Figure 7.9** illustrates the increased coverage (in grey), should 100LL fuel service be established at the airports listed. Additional coverage provided by these four airports brings the total area and population coverage to 46% and 89%, respectively. Although the coverage would still fall short of the benchmarks, current operations at other airports do not necessitate the establishment of 100LL fuel service at this time.

Figure 7.9: Current and Recommended Area and Population Coverage within 30 Minutes of Airports with 100LL Fuel

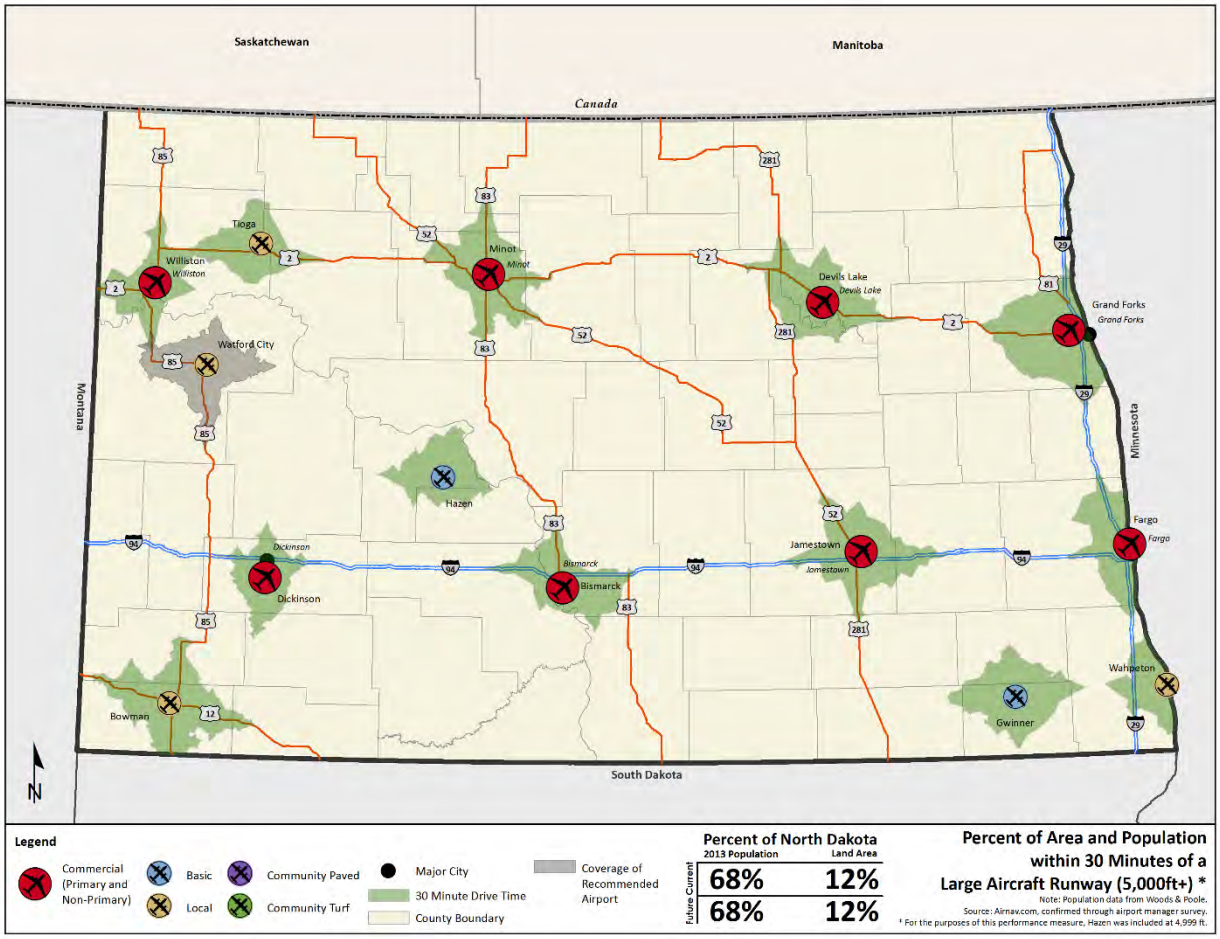


Source: Airnav.com, confirmed through Airport Manager Survey

7.4.3 Provide Runways Capable of Supporting Large Aircraft (5,000ft+)

The population coverage benchmark is 75% within 30 minutes of airports with paved runways 5,000 feet or longer. Currently, the population coverage is falling short by seven percent (presently 68 percent). As such, it is recommended that a potential runway extension be considered at Watford City, which is experiencing higher volumes of oil-related traffic by aircraft that need longer runway lengths to operate (such as smaller business jets). **Figure 7.10** illustrates increased coverage (in grey), should a runway extension be developed at Watford City. Note: due to rounding of the coverage percentages, the coverage with and without the recommendation at Watford City appear to be the same. In 2013 the population coverage is 67.8% and the area coverage is 11.52% and with the recommended addition of Watford City, the population coverage increases to 68.4% and area coverage increases to 12.4%. Although the population benchmark is not being met with the recommendation, current usage at other airports does not necessitate any additional runway extensions at other airports at this time.

Figure 7.10: Current and Recommended Area and Population Coverage within 30 Minutes of Airports with Large Aircraft Runways



Source: Airnav.com, confirmed through Airport Manager Survey

7.4.4 Provide Ground Transportation

Ground transportation is an important service to provide to visiting passengers and pilots. Whether it be rental cars, taxis, or courtesy cars, ground transportation services are recommended for all system airports with paved runways (72 airports). Currently, only 44 airports with paved runways offer ground transportation services. As such, it is recommended that the airports listed in **Table 7.8** explore options for providing ground transportation options to meet this benchmark.

Table 7.8: Paved Airports not Meeting the Ground Transportation Performance Measure

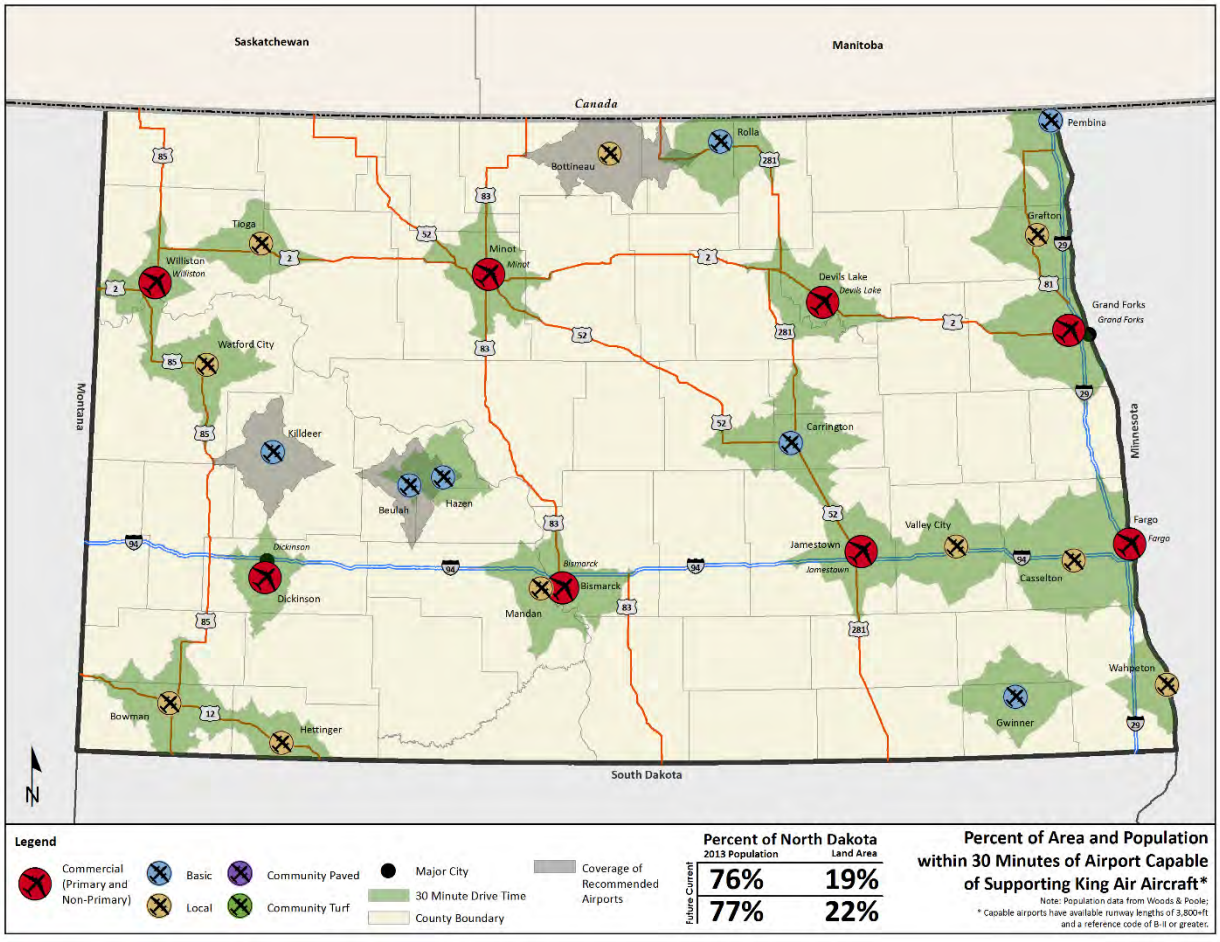
Ashley	Harvey (N)	New Rockford
Beach (N)	Killdeer	Park River (N)
Cando (N)	La Moure (N)	Parshall (N)
Cooperstown (N)	Lakota (N)	Rolette
Crosby (N)	Leeds	St. Thomas
Drayton	Lisbon (N)	Walhalla (N)
Dunseith (N)	Maddock	Washburn (N)
Edgeley (N)	Minto	Westhope
Fort Yates (N)	Mohall (N)	
Glen Ullin (N)	Napoleon	

(N) = NPIAS airports
Note: Airports are listed by associated city.

7.4.5 Meet Needs of King Air Aircraft

The population coverage benchmark is 90% within 30 minutes of airports that can support the use of King Air (or similar) aircraft (runway length of 3,800+ feet and an Airport Reference Code [ARC] of B-II or greater). Currently, these airports are only covering 76% of the population. As such, it is recommended that Bottineau, Killdeer, and Beulah explore options to increase runway length and enhance associated infrastructure to support the use of these larger GA aircraft. These airports have been identified due to location and/or current and anticipated use by larger and more demanding aircraft. **Figure 7.11** illustrates the increased population coverage (in grey), should enhancements in infrastructure be made at the airports listed to support use by King Air aircraft. Additional coverage provided by these three airports brings total population coverage to 77%. Although the coverage would still fall slightly short of the benchmark, current operations at other airports do not necessitate longer runways and associated infrastructure enhancements at this time.

Figure 7.11: Current and Recommended Population Coverage within 30 Minutes of an Airport able to Support King Air Aircraft



Source: Airnav.com and Airport Layout Plans, confirmed through Airport Manager Survey

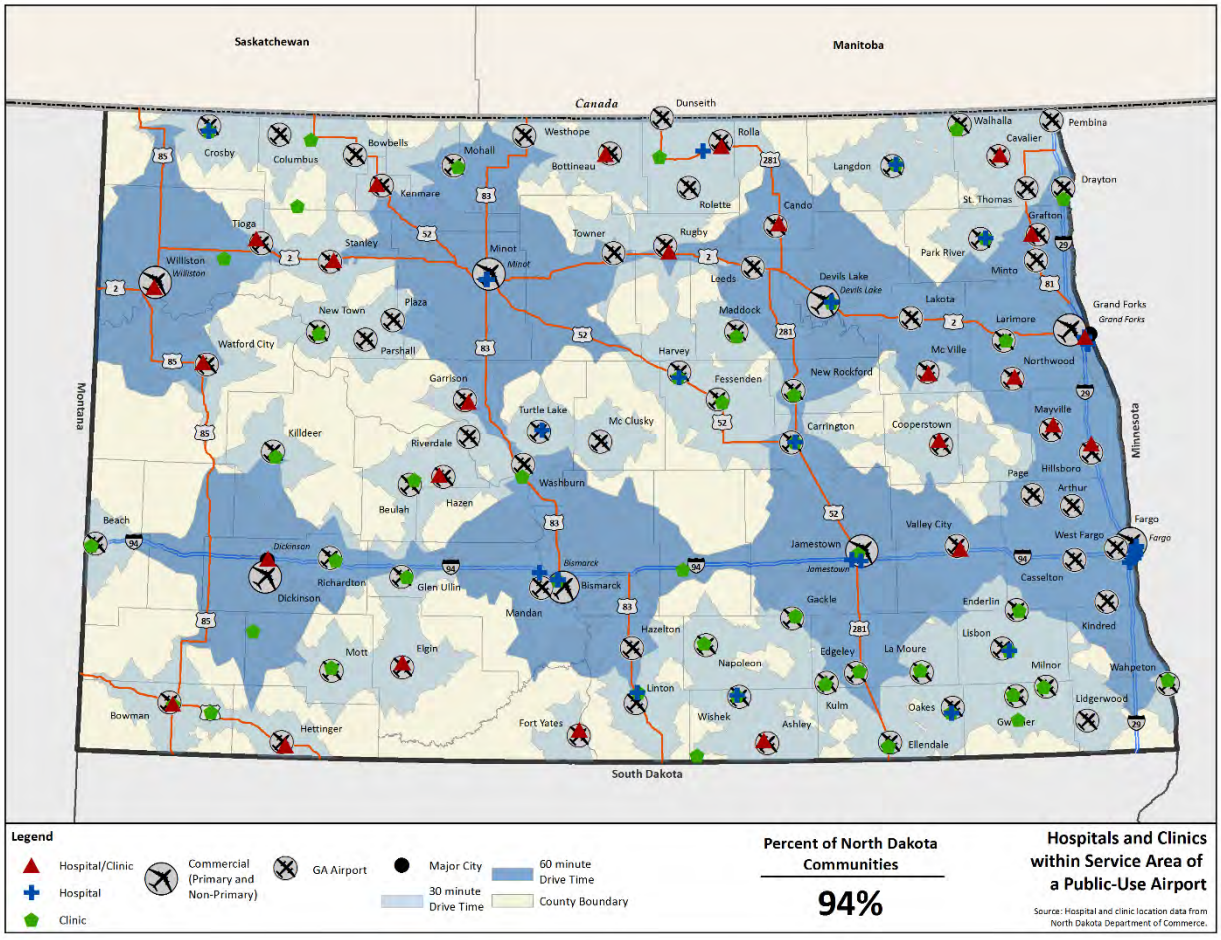
7.5 Goal: Enhance Quality of Life

North Dakota's aviation system is used to conduct life-saving operations and provide health care access across the state. Supporting the link between airports and health care facilities helps to enhance the quality of life for North Dakotans. Recommendations for these performance measures are included in the following sections.

7.5.1 Provide Airport Coverage of Hospitals/Clinics

The benchmark for providing coverage of hospitals and clinics is 100%. Currently, the system covers 94% of hospitals and clinics within either a 30-minute drive time of GA airports, or a 60-minute drive time of commercial service airports (shown in **Figure 7.12**). While ideally 100% of the medical facilities would be covered within these drive times, the establishment of an additional airport(s) to cover the couple outlying facilities (one north east of Tioga, and one west of Ashley) is not feasible. No recommendation for this performance measure is warranted at this time.

Figure 7.12: 2013 Percent of Communities with a Hospital and/or Clinic within Service Area of a Public Use Airport

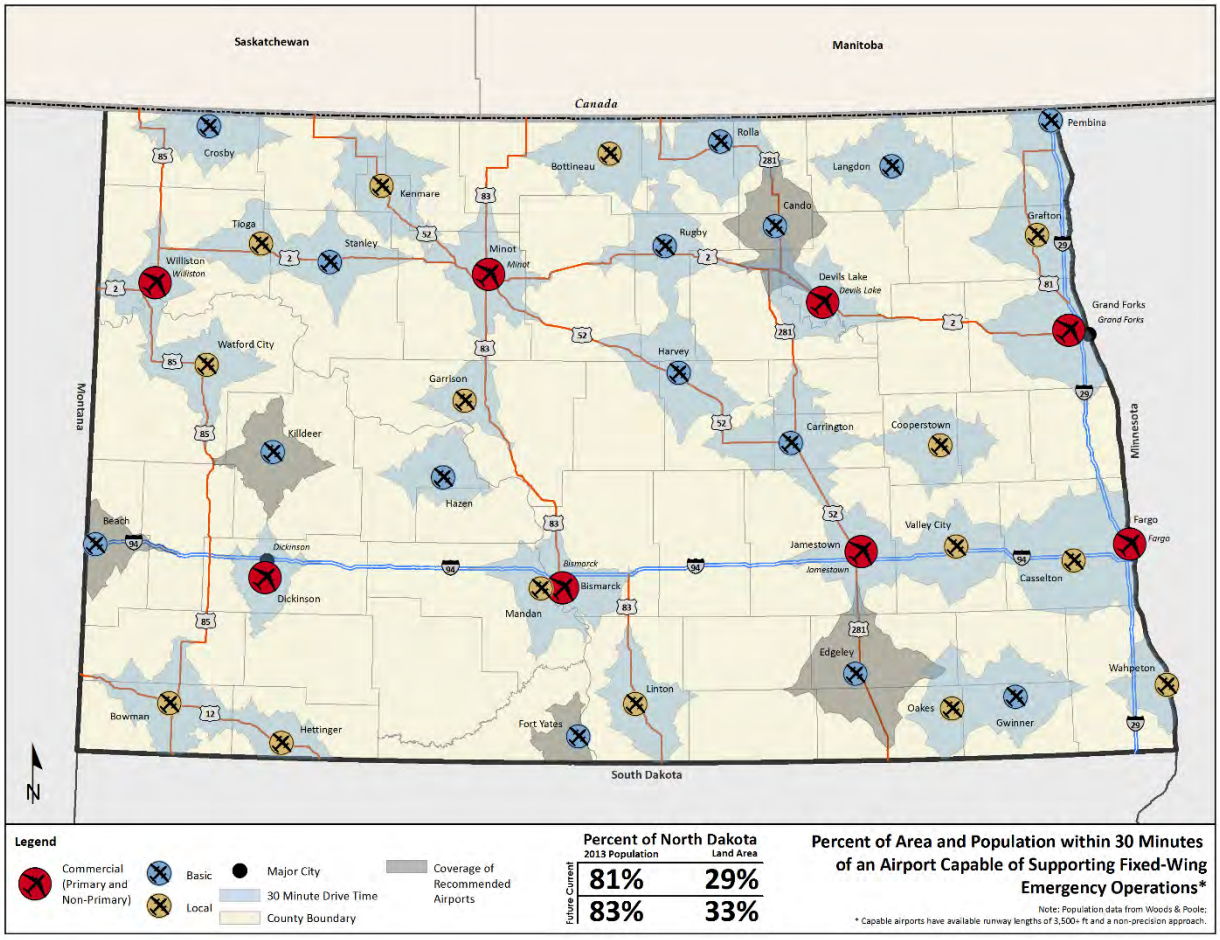


Source: Hospital and clinic location data from North Dakota Department of Commerce

7.5.2 Support Fixed-Wing Emergency Operations

The coverage benchmark is 90% of the population within 30 minutes of an airport capable of supporting fixed-wing emergency operations (such as operations by the Pilatus aircraft, etc.). A runway length of 3,500+ feet and a non-precision approach are required for an airport to be considered capable of supporting these operations, based upon the system definitions. Currently, only 81% of the population is covered by airports meeting this criteria. Should the airports listed in Section 7.3.1 get non-precision approaches (Beach and Ft. Yates) and the airports listed in Section 7.3.2 get non-precision approaches with vertical guidance (Edgeley, Killdeer, and Cando), they will meet the criteria for supporting fixed-wing emergency operations and will increase the population coverage to 83%, shown in **Figure 7.13**. Hettinger, Bowman, and Rugby are already meeting the criteria and therefore are shown in blue in the following map. Note: although Wishek is also recommended for a non-precision approach, and Lisbon and Hillsboro are recommended for non-precision approaches with vertical guidance, they do not meet the runway length criteria and therefore are not shown on the following map.

Figure 7.13: Current and Recommended Population Coverage within 30 Minutes of Airports Capable of Supporting Fixed-Wing Emergency Aircraft



Source: Airnav.com, confirmed through Airport Manager Survey

7.6 Goal: Preserve North Dakota Airport Assets

Much investment has been made in the facilities and infrastructure of airports in North Dakota. Protecting and preserving that investment is critical for the continued operation of the aviation system. The following recommendations are discussed in this section:

- Establish Local Mill Levy
- Establish County-Wide Mill Levy
- Establish Non-Levy Revenue
- Meet Pavement Condition Index (PCI) Thresholds on Primary Runways
- Develop/Update Airport Layout Plan (ALP)
- Adopt Federal Aviation Regulation (FAR) Part 77 Height Zoning
- Meet FAA Design Criteria for Current Operations

7.6.1 Establish Local Mill Levy

Funds raised through local mill levies can be used to meet local match requirements for state and federal grants that are used to improve airport facilities. Airports that are supported by this dedicated funding source can also use the funds to cover operation costs. **Table 7.9** lists the airports that do not have a local mill levy in place, as well as the airports that did not provide a response to the survey question. It is recommended that airports in the table below work with the local municipal entity to explore options for establishing a mill levy to generate revenue for infrastructure maintenance and improvement at the local airport.

Table 7.9: Airports not Meeting the Local Mill Levy Performance Measure

Arthur	Garrison (N)	New Rockford
Beach (N)	Hettinger (N)	New Town
Bismarck (N)	Killdeer	Richardton
Cooperstown (N)	Kindred (N)	Riverdale*
Dunseith* (N)	Langdon (N)	Rolette
Edgeley (N)	McClusky	Towner
Fessenden	Minot (N)	Valley City (N)
Fort Yates (N)	Mott (N)	
Airports that did not respond:		
Cando (N)	Gackle	Lidgerwood
Elgin	Hazen (N)	Parshall (N)

*Airports are state-owned and do not levy mills.
(N) = NPIAS airports
Note: Airports are listed by associated city.

7.6.2 Establish County-Wide Mill Levy

Similar to local levies, funds raised through county mill levies can be used to meet local match requirements for state and federal grants that can be used to improve airport facilities. Airports supported by this dedicated funding source can also use the funds to cover operation costs. **Table 7.10** lists the airports that do not have a county-wide mill levy in place, as well as the airports that did not provide a response to the survey question. It is recommended that airports in the table below work with the local county to explore options for establishing a mill levy to generate revenue for infrastructure maintenance and improvement.

Table 7.10: Airports not Meeting the County-Wide Mill Levy Performance Measure

Beach (N)	Fargo (N)	Minto
Bismarck (N)	Glen Ullin (N)	Mohall (N)
Cooperstown (N)	Grafton (N)	Napoleon
Dunseith* (N)	Harvey (N)	Page
Fort Yates (N)	Hazelton	Plaza
Garrison (N)	Kenmare (N)	Riverdale*
McClusky	Kulm	Rugby (N)
Minot (N)	La Moure (N)	St. Thomas
New Rockford	Lakota (N)	Turtle Lake
Beulah	Larimore	Wahpeton (N)
Bowbells	Lisbon (N)	Washburn (N)
Carrington (N)	Mandan (N)	Watford City (N)
Columbus	Mayville	West Fargo
Enderlin	McVille	
Airports that did not respond:		
Casselton (N)	Gackle	Parshall (N)
Elgin	Lidgerwood	Williston (N)

*Airports are state-owned and do not levy mills.
(N) = NPIAS airports
Note: Airports are listed by associated city.

7.6.3 Establish Non-Levy Revenue

In addition to levy revenues, other sources of revenue should be pursued to increase the resources available and diversify revenue types. Airports can generate revenue from hangar rental charges, fuel surcharges, landing fees, etc. It is recommended that airports with paved runways establish some form of non-levy revenue (72 airports). **Table 7.11** lists the airports that have paved runways that do not currently have non-levy revenue, as well as the airports that did not provide a response to the survey question. It is recommended that airports in the table work with the FAA and NDAC to explore options for collecting revenues through existing (and future) infrastructure and services to meet local grant matches for development and to help cover operational costs.

Table 7.11: Paved Airports not Meeting the Non-Mill Levy Revenue Performance Measure

Bottineau (N)	Grand Forks* (N)	New Rockford
Cavalier (N)	Jamestown* (N)	Park River (N)
Devils Lake* (N)	Kenmare (N)	Rolette
Dickinson* (N)	Killdeer	Rugby (N)
Drayton	Langdon (N)	Williston* (N)
Dunseith (N)	Leeds	Wishek
Garrison (N)	Maddock	
Paved Airports that did not respond:		
Beulah	Lisbon (N)	St. Thomas
Bowman (N)	Minto	Wahpeton (N)
La Moure (N)	Napoleon	Washburn (N)
Larimore	Parshall (N)	

*Commercial service airports do have non-mill levy revenue, which was not indicated in the inventory process; consequently, this table does not match exactly the information in Chapters 3 and 5.
(N) = NPIAS airports
Note: Airports are listed by associated city.

7.6.4 Meet PCI Thresholds on Primary Runways (60+)

NDAC has established state PCI thresholds for primary runways in the aviation system (60 for GA airports, and 65 for commercial service airports) to maintain and preserve this critical infrastructure. Most of the system airports are meeting the appropriate PCI threshold, with the exception of seven airports listed in **Table 7.12**. It is recommended that the airports listed in the table below work with the FAA and NDAC to plan for necessary runway rehabilitation or reconstruction to improve the condition of their primary runways. Any applicable projects should be included on individual CIPs so adequate resources can be allocated if available.

Table 7.12: Paved Airports not Meeting the State PCI Performance Measure

Ashley	La Moure (N)	Walhalla (N)
Bismarck (N)	Larimore	
Cooperstown (N)	Page	

(N) = NPIAS airports
Notes: Airports are listed by associated city. If a PCI range was given, the lowest value was used.
Source: North Dakota Aeronautics Commission 2012 Pavement Condition Index (PCI) Study

7.6.5 Develop/Update ALP

ALPs guide the future development of airports by graphically depicting existing infrastructure and planned changes to the airport facilities. It is important for ALPs to be updated as projects are completed so the most recent development is illustrated on the plan. In addition to having an up to date drawing set of current facilities, any planned projects must be illustrated on the future and ultimate ALP sheets to be eligible for federal Airport Improvement Program (AIP) funding. Since NPIAS airports are eligible for AIP funding, it is recommended that all NPIAS airports in the system (53 airports) have ALPs that have been updated and approved within the last ten years. **Table 7.13** lists the NPIAS airports in the system that have ALPs older than ten years. It is recommended that these six airports work with the FAA and NDAC to plan for an ALP update on their individual CIPs.

Table 7.13: NPIAS Airports not Meeting the Recent ALP Performance Measure

Cando (N)	Rolla (N)
Grafton (N)	Walhalla (N)
Jamestown (N)	

(N) = NPIAS airports
Notes: Airports are listed by associated city. Airports with ALPs in progress were counted as having a recent ALP.

7.6.6 Adopt FAR Part 77 Height Zoning

Height zoning that aligns with FAR Part 77 surfaces helps protect the critical operational areas around an airport (such as approach and departure surfaces and local flight pattern areas) from tall structures and other obstructions. It is recommended that height zoning that aligns with FAR Part 77 be adopted and implemented by the local municipalities around each of the 89 system airports to protect these operational areas. **Table 7.14** lists the system airports that do not have local airport height zoning in place, along with the airports that did not provide a response to the survey question. It is recommended that the airports in the table below work with FAA, NDAC, and local municipalities to explore options for drafting, adopting, and implementing airport-related height zoning.

Table 7.14: Paved Airports not Meeting the FAR Part 77 Height Zoning Performance Measure

Ashley	Harvey (N)	Page
Beulah	Killdeer	Parshall (N)
Bowman (N)	La Moure (N)	Rolette
Carrington (N)	Langdon (N)	Rugby (N)
Cooperstown (N)	Larimore	St Thomas
Devils Lake (N)	Leeds	Tioga (N)
Dickinson (N)	Linton (N)	Wahpeton (N)
Drayton	Lisbon (N)	Washburn (N)
Dunseith (N)	Maddock	West Fargo
Edgeley (N)	Mayville	Westhope
Fort Yates (N)	Minto	Wishek
Garrison (N)	Napoleon	
Glen Ullin (N)	New Town	
Paved Airports that are unsure of Part 77 Height Zoning:		
Beach (N)	Enderlin	Northwood (N)
Bottineau (N)	Grafton (N)	Oakes (N)
Cando (N)	Hettinger (N)	Park River (N)
Casselton (N)	Lakota (N)	Pembina (N)
Crosby (N)	Mohall (N)	Rolla (N)
Ellendale (N)	New Rockford	Walhalla (N)

(N) = NPIAS airports

Notes: Airports are listed by associated city. Airports with height zoning in progress were counted as having height zoning.

7.6.7 Meet FAA Design Standards for Current Operations

As North Dakota airports continue to experience an increase in operations by existing and new users, it is crucial that the airports are able to meet the design standards for the critical aircraft operating at their facility. Since different (and often times larger) aircraft are operating at system airports that have historically catered to smaller aircraft, some airports have a different set of criteria they were designed for that does not match that of the larger aircraft utilizing the facility. It is recommended that all 89 airports meet the design standards for the critical aircraft operating at their facilities. **Table 7.15** lists airports that are not meeting these standards based upon the operational information provided on the airport manager survey. It is recommended that these six airports work with the FAA and NDAC to evaluate options for enhancing infrastructure to support the use of these different aircraft.

Critical Aircraft

The critical aircraft is the most demanding aircraft making at least 500 annual operations at an airport.

Table 7.15: Airports not Meeting the FAA Design Standards Performance Measure*

Bottineau (N)	Page	Williston (N)
Dickinson (N)	Stanley (N)	

*An airport is considered to be meeting design standards if it does not have aircraft making significant operations (500+ annually) by aircraft of a larger design classification than what the airport's infrastructure is designed for.
(N) = NPIAS airports
Note: Airports are listed by associated city.

7.7 Recommended Airport Classification Changes

Due to the growth that the aviation system in North Dakota is experiencing, some airports will soon be reaching the criteria for alternate classifications. Chapter 2 includes a detailed discussion of NDSASP airport classifications and criteria, along with a listing of all system airports by current classification. At this time, it is anticipated that La Moure, Maddock, Mayville, and New Town will be achieving "Basic" criteria soon (with 10+ based aircraft) and will move from the Community Paved classification up to the Basic classification.

Additionally, as noted in Section 7.2.2, it is anticipated that some airports currently classified as Basic will move up to a Local classification. Specifically, Gwinner, Rugby, Hazen, Killdeer and New Town are expected to meet the Local classification criteria soon and are recommended for classification change upon meeting that criteria (10+ instrument operations and 15+ based aircraft or 2,500+ passenger enplanements).

An evaluation of airports that meet the top two GA classifications – National and Regional – was conducted as a part of this study. Currently, none of the GA airports in North Dakota's aviation system meet the National criteria. However, Robert Odegaard Field in Kindred is meeting the Regional criteria

with its location in a Metropolitan Statistical Area (MSA) and one based jet. When removing the MSA component, Bottineau also meets the Regional criteria with one based jet. An investigation into the number of instrument operations and domestic flights over 500 miles will be required to determine if any other system airports meet the Regional criteria, as shown in **Table 7.16**.

Table 7.16: National and Regional Classification Criteria

National	Regional
• 5,000+ instrument operations, 11+ based jets, 20+ international flights, or 500+ interstate departures; or • 10,000+ enplanements and at least 1 charter enplanement by a large certificated air carrier, or • 500+ million pounds of landed cargo weight	• Metropolitan Statistical Area (Metro or Micro) and 10+ domestic flights over 500 miles, 1,000+ instrument operations, 1+ based jet, or 100+ based aircraft; or • The airport is located in a metropolitan or micropolitan statistical area, and the airport meets the definition of commercial service.

Source: *FAA General Aviation Airports: A National Asset, 2012*.

7.8 Airports Recommended for NPIAS Inclusion

Inclusion in the NPIAS makes an airport eligible for federal AIP funding, which helps pay for airport improvement and maintenance projects. According to FAA Order 5090.3C *Field Formulation of the National Plan of Integrated Airport Systems (NPIAS)*, the following criteria will be used to qualify general aviation airports for entry into the NPIAS:

> …
> b. An existing airport that is included in an accepted state aviation system plan (SASP) or metropolitan airport system plan (MASP) may be included in the NPIAS if it:
>
> (1) has at least 10 based aircraft, and
>
> (2) serves a community located 30 minutes or more average ground travel time (for the purpose of systems analysis, a 20 mile radius is often used as the equivalent of 30 minutes ground travel time) from the nearest existing or proposed NPIAS airport.
>
> c. A proposed airport located 30 minutes or more average ground travel time from the nearest existing NPIAS airport may be included if there is clear evidence that at least 10 aircraft will be based at the airport within the first year of its operation.
>
> d. An existing or proposed airport not meeting the criteria in paragraphs 2-5a, b, or c may be included in the NPIAS if it meets all four of the following requirements:
>
> (1) It is included in an accepted SASP and/or MASP, assuming one exists, and
>
> (2) It serves a community more than 30 minutes from the nearest existing or proposed NPIAS airport, and
>
> (3) It is forecast to have 10 based aircraft during the short-range planning period (within 5 years), and
>
> (4) There is an eligible sponsor willing to undertake the ownership and development of the airport.

Currently, Ashley, Page, and Westhope are meeting the criteria for NPIAS inclusion and are therefore recommended for submission to the FAA for consideration (**Table 7.17**). Additionally, Maddock and Killdeer are recommended for NPIAS inclusion as they are meeting location requirements and will soon meet based aircraft requirements. To see the coverage of NPIAS airports should these five airports be accepted, see **Figure 7.3** at the beginning of this chapter.

Table 7.17: Airports Recommended for NPIAS Inclusion

Associated City	Airport	Identifier	Public/Private	Type	10+ Based Aircraft?	Ground Travel Time
Ashley	Ashley Municipal	ASY	Public	GA	Yes (12)	46 minutes to Eureka Municipal Airport (South Dakota)
Killdeer	Weydahl Field	9Y1	Public	GA	No (0)	62 minutes to Watford City Municipal Airport
Maddock	Maddock Municipal	6D3	Public	GA	No (9)	44 minutes to Harvey Municipal Airport
Page	Page Regional	64G	Public	GA	Yes (14)	43 minutes to Hillsboro Municipal Airport
Westhope	Westhope Municipal	D64	Public	GA	Yes (12)	37 minutes to Mohall Municipal Airport

It should be noted that the popular tourist destination of Medora, ND has been included in the NPIAS as a site for a proposed airport in the future. Through discussions with city leaders, NDAC, and the FAA, it was determined that an airport in Medora will not be pursued at this time. As such, it is a recommendation of this system plan to remove Medora from the NPIAS.

7.9 Summary

The recommendations provided in this chapter are intended to enhance the current aviation system by providing the facilities and services necessary to meet system goals (established in Chapter 2). Growth in the system is putting a strain on infrastructure and the capacity of existing facilities, and as a result, extensive resources are needed just to maintain the system as-is. Many of the recommendations provided in this chapter are not maintenance-based. Therefore, it is critical that airports plan ahead and work with the FAA and NDAC (as appropriate) to allocate resources for these projects. If these projects are not included on CIPs or considered in other resource planning efforts, it is unlikely that they will be realized and the system could continue to fall short of the benchmarks established.

CHAPTER 8 – FUNDING & CAPITAL IMPROVENT PLAN (CIP) EVALUATION

North Dakota is fortunate to have a solid network of airports across the state, a total of 89 open for public use. These airports are being used more than ever before thanks to leading industries in the state, such as agriculture and oil. Maintaining this robust and efficient air transportation system requires resources, as noted by Governor Jack Dalrymple in a statement to the press, "Airports in western North Dakota are experiencing record increases in boardings and activity, requiring additional investment in new and expanded terminals, runways and other maintenance needs."[21]

This increase in use is being experienced across the state – not just those in the western region. Several airports are at capacity and cannot support this additional traffic without major improvements being completed. In addition to new development, resources are needed to maintain what facilities and infrastructure already exist at many of these airports statewide.

The availability of funding is essential to the continued operation of North Dakota's aviation system. Of the 89 airports in the system, 53 (60%) of them are eligible for federal funding from the Federal Aviation Administration (FAA) to assist with the costs of eligible projects. To be eligible for FAA funding, an airport must be included in the National Plan of Integrated Airport Systems (NPIAS), which is the national plan for the development of public-use airports in the United States. An airport must meet specific criteria to be included in the NPIAS. The remaining 36 airports in the system that are non-NPIAS rely solely on funding assistance from other federal agencies, the state, local municipalities, and private entities.

NPIAS airports are required to develop and annually update a Capital Improvement Plan (CIP) for their facility that outlines desired projects over the next ten years. Although non-NPIAS airports are not required to complete a CIP, some of them draft a plan for future development. To understand the system-wide funding needs over the next ten years, 56 CIPs from North Dakota's airports were reviewed and analyzed in three timeframes – 2015 through 2016 (two years – the next legislative biennium), 2015 through 2019 (five years), and 2015 through 2024 (ten years).

The projects and associated costs needed to meet the demands of the system users are presented in this chapter in several different formats. Initially, they are summarized by timeframe to give context to the timing of anticipated construction. The projects are also summarized geographically by those counties

[21] Dan Vnuk, "Oil Boom Creates Bonanza for North Dakota Airports," Airport Improvement Magazine, November-December, 2013. http://www.airportimprovement.com/content/story.php?article=00534

most influenced by the oil production and those that are in the eastern region. Additionally, projects are summarized by type of airport to look at the needs of commercial service airports compared to general aviation airports.
This section is organized as noted below:

8.1 Special Considerations

When reviewing the information provided in this chapter, it is important to keep in mind that all funding amounts are presented in 2014 dollars and do not account for inflation. Therefore, the costs shown for individual projects may actually be higher when the projects are completed.

Also, major projects over the next ten years (such as the construction of Williston's new airport and major infrastructure development in Dickinson) require significant funding over the planning period. The resources will be provided in part by the FAA, the State of North Dakota, and local municipalities; however, these anticipated funds will not cover the entire cost of the projects. As such, a shortfall is anticipated (shown in red in **Tables 1, 2,** and **3**). This shortfall is based solely on what is reflected on the airports' CIPs and does not account for additional funding sources (such as private and public entities, bonding, sale of land, etc.) that are expected to help bridge the gap. As a result, the actual shortfall amount may be less than what is shown in these tables, but is not known today.

8.2 Project Categories

The projects included on the CIPs were grouped into 14 general categories for evaluation. In some instances, a large project may include more than one general category; in those instances, the category with the largest portion of the project was used.

Apron – Projects related to the construction/maintenance of the pavement area where aircraft are parked (usually visitors) while not in use.

Build Equip – Projects related to the construction/maintenance of buildings that store equipment, such as snow removal equipment and firefighting equipment.

Equip – Equipment that is necessary to keep an airport operational, such as snow removal and firefighting equipment.

Fuel – Projects related to the construction/maintenance of fueling systems, such as tanks, credit card readers, etc.

Hangar – Projects related to the construction of covered and secure storage for aircraft.

Ground Trans – Projects related to the provision of ground transportation, such as rental car lots, entrance roads, parking lots, etc.

Land – Projects related to the purchase of land for approach preservation or future development.

Lighting – Projects related to the purchase/installation of lighting on the airport, such as runway, taxiway, or apron lighting.

Maintenance – Projects related to the upkeep of existing infrastructure and facilities.

Other – Projects that cannot be categorized into one of the other 13 categories, such as wildlife fencing.

Planning – Projects related to the long-term management of airport development and safety and efficiency procedures such as master plans, Airport Layout Plans (ALPs), Wildlife Mitigation Plans, Land Use Plans, etc.

Runway – Projects related to the construction/maintenance of the takeoff and departure surfaces.

Terminal – Projects related to the construction/expansion of passenger terminal facilities.

Taxiway – Projects related to the construction/maintenance of the pavements that connect runways, aprons, taxilanes, etc. and allow aircraft to maneuver around the airfield.

8.3 Summary of Proposed Aviation Development Statewide

This summary provides a snapshot of the 2015 CIP program for the 56 public airports in North Dakota that participated (as of May 2014). Airport CIP data changes continually as projects come under contract, change scope, or are abandoned. Consequently, these figures are a snapshot in time. In addition, the availability of federal, state, and local funding varies. Although listing a project on a CIP is the first step toward funding, that funding is not guaranteed for the projects listed. **Tables 8.1, 8.2,** and **8.3** show the anticipated funding to be received over three timeframes, as well as the shortfall between funding and what has been requested via submitted CIPs. The three timeframes reflect several different important milestones. The first timeframe includes 2015-2016, which is the next legislative biennium for the North Dakota State Legislature. This window is important as there is substantial state funding being sought for the projects outlined in this study. The second window includes 2015-2019, which covers a five-year period also to support interaction with the state legislature. Finally, the third time frame, 2015-2024 covers a ten year window for development, which provides a longer horizon more typically associated with a system planning effort. It should be noted that the anticipated value of state funding shown in **Tables 8.1, 8.2,** and **8.3** does not match what is shown in the 2014 NDSASP Executive Summary document due to the increased allocation from the state legislature in early 2015.

8.3.1 Capital Projects 2015-2016

In the next legislative biennium (2015-2016), a total of nearly $360 million has been shown by North Dakota's airports on their CIPs (see **Figure 8.1**). This funding is requested from a variety of sources at the federal, state, and local levels. When historical and anticipated funding levels are considered (nearly $200M for this timeframe), a shortfall of approximately $160 million exists between what is requested and what is anticipated, as shown in **Table 8.1.** Special Note: For large projects (such as the new Williston airport) additional funding sources beyond those listed in **Table 8.1** are anticipated, which is expected to reduce the overall shortfall shown in **Table 8.1**.

The following airports are requesting the most funding during the 2015-2016 timeframe:

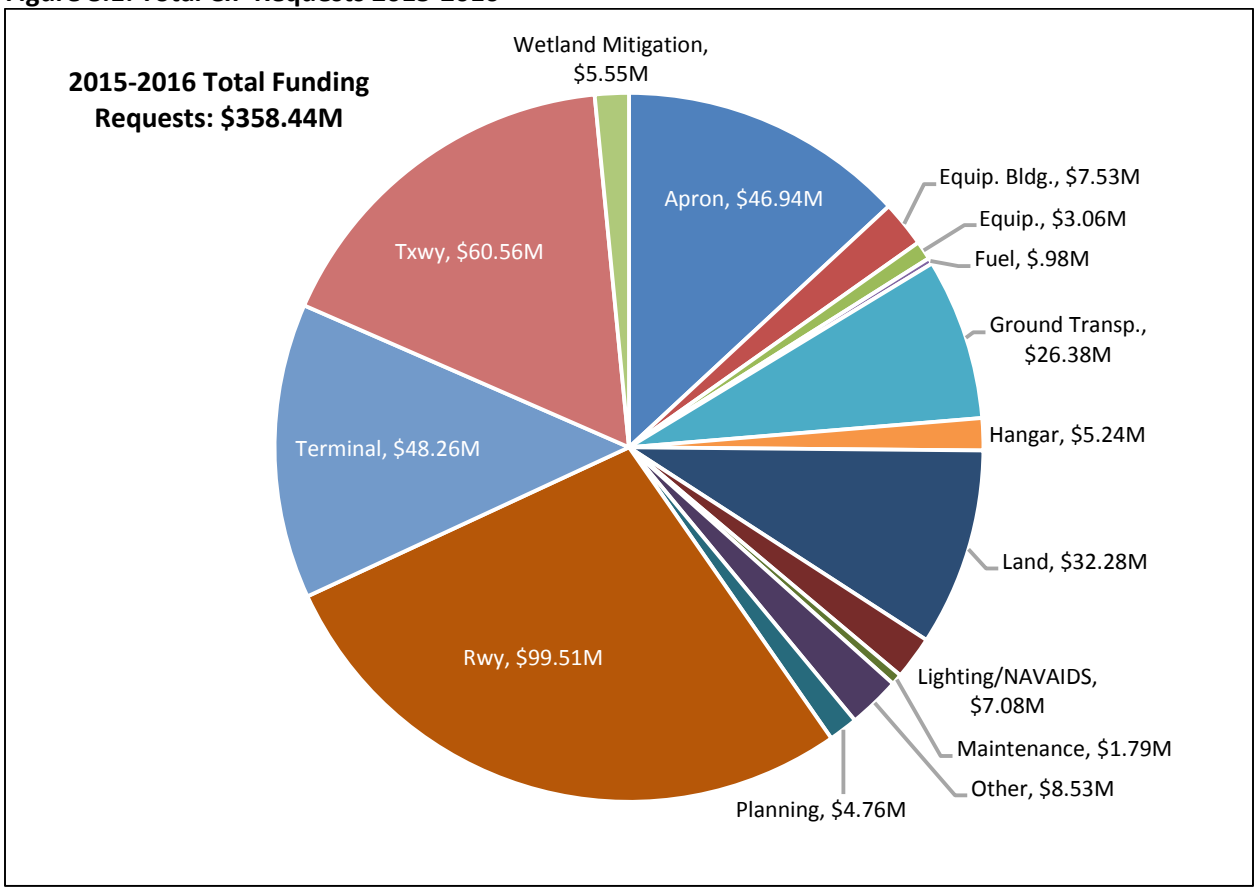
Williston	New airport construction	$208.1M
Bismarck	Various improvement projects, including rehabilitation of runways and taxiway, purchase of land and more	$44.5M
Minot	Various improvement projects, including those related to the construction of the new terminal	$26.7M
Fargo	Taxiway A reconstruction projects	$23.9M
Grand Forks	Various improvement projects, including terminal and apron expansion	$14.0M

Table 8.1: 2015-2016 Total Funding Requests: $358.44M

North Dakota Airports Anticipated Funding			
2015-2016	Federal Funds (Entitlements)	$	40,000,000
	Federal Funds (Discretionary & LOI)	$	60,000,000
	State Funds	$	54,000,000
	Local Funds	$	30,933,987
	Local (Passenger Facility Charge)	$	13,000,000
	Shortfall	$	160,510,428
	Total Funds	$	358,444,415

Source: 2014 Airport CIPs, North Dakota Aeronautics Commission, FAA

Figure 8.1: Total CIP Requests 2015-2016



Source: 2014 Airport CIPs

8.3.2 Capital Projects 2015-2019

Between 2015 and 2019, a total of more than $590 million in projects is being planned by North Dakota's airports on their CIPs (see **Figure 8.2**). This funding is requested from a variety of sources at the federal, state, and local levels. When historical and anticipated funding levels are considered (about $411M for this timeframe), a shortfall of nearly $180 million exists between what is requested and what is anticipated, as shown in **Table 8.2.** Special Note: For large projects (such as the expansion of the Dickinson airport) additional funding sources beyond those listed in **Table 8.2** are anticipated, which is expected to reduce the overall shortfall shown in **Table 8.2**.

The following airports are requesting the most funding during the 2017-2019 timeframe:

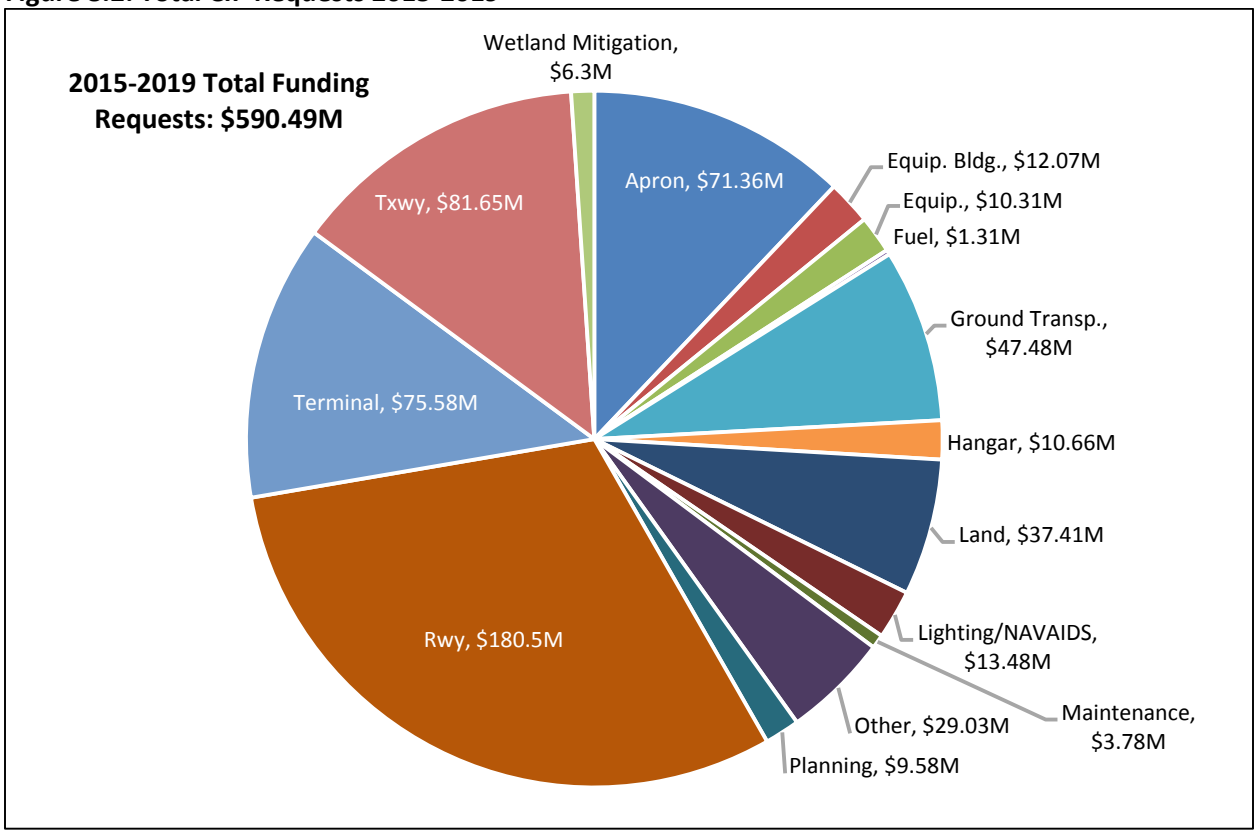
Dickinson	Various improvement projects, including construction of new terminal, apron, runway and more	$114.7M
Bismarck	Various improvement projects, including expansion of apron, and runway/equipment building/terminal building/taxiway rehab and more	$39.1M
Minot	Various improvement projects, including runway threshold relocation, apron construction, General Aviation (GA) access road/parking lot construction and more	$23.7M
Grand Forks	Various improvement projects, including apron reconstruction/rehabilitation, taxiway construction/rehabilitation and more	$14.6M
Williston	Rental car quick turnaround facility construction	$1.8M

Table 8.2: 2015-2019 Total Funding Requests: $590.67M

North Dakota Airports Anticipated Funding			
2015-2019	Federal Funds (Entitlements)	$	100,000,000
	Federal Funds (Discretionary & LOI)	$	165,000,000
	State Funds	$	63,000,000
	Local Funds	$	50,839,872
	Local (Passenger Facility Charge)	$	32,500,000
	Shortfall	$	179,154,210
	Total Funds	$	590,494,082

Source: 2014 Airport CIPs, North Dakota Aeronautics Commission, FAA

Figure 8.2: Total CIP Requests 2015-2019



Source: 2014 Airport CIPs

8.3.3 Capital Projects 2015-2024

Between 2015 and 2024, a total of nearly $850 million in projects has been planned by North Dakota's airports on their CIPs (see **Figure 8.3**). As with the previous time periods, this funding is requested from a variety of sources at the federal, state, and local levels. When historical and anticipated funding levels are considered (nearly $752M for this timeframe), a shortfall of about $92 million exists between what is requested and what is anticipated, as shown in **Table 8.3.** This reduction in shortfall is a result of less funding being requested in the 2020 – 2024 year timeframe, which reduces the overall gap. It is important to note that this is likely a result of more limited planning efforts for this timeframe, since it is covering a ten year window, and that the actual projects and funding needed for this timeframe are anticipated to be much greater than what is reflected on the CIPs as of 2014. Special Note: For large projects (such as the extension and expansion of runways at the Grand Forks airport) additional funding sources beyond those listed in **Table 3** are anticipated, which is expected to reduce the overall shortfall shown in **Table 8.3**.

The following airports are requesting the most funding during the 2020-2024 timeframe:

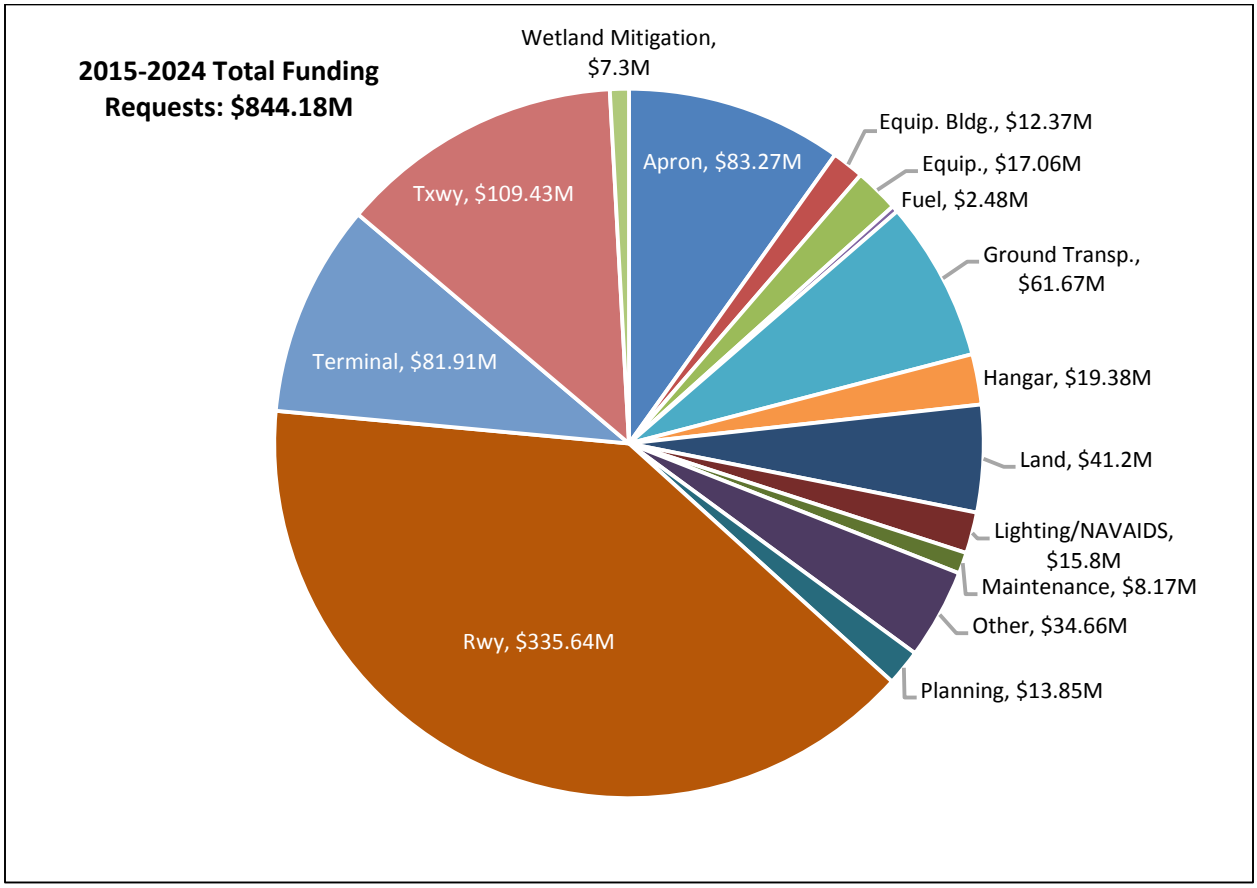
Grand Forks	Various improvement projects, including the extension and rehabilitation of runways and more	$70.9M
Bismarck	Various improvement projects, including runway extension and rehabilitation and expansion of terminal building and more	$42.6M
Fargo	Runway construction, extension, and widening	$30M
Dickinson	Various projects, including taxiway/taxilane/access road construction and more	$15.8M
Jamestown	Rehabilitation of crosswind runway, airfield crack sealing, and more	$3.8M

Table 8.3: 2015-2024 Total Funding Requests: $844.36M

North Dakota Airports Anticipated Funding			
2015-2024	Federal Funds (Entitlements)	$	200,000,000
	Federal Funds (Discretionary & LOI)	$	340,000,000
	State Funds	$	78,000,000
	Local Funds	$	68,803,209
	Local (Passenger Facility Charge)	$	65,000,000
	Shortfall	$	92,380,258
	Total Funds	$	844,183,467

Source: 2014 Airport CIPs, North Dakota Aeronautics Commission, FAA

Figure 8.3: Total CIP Requests 2015-2024

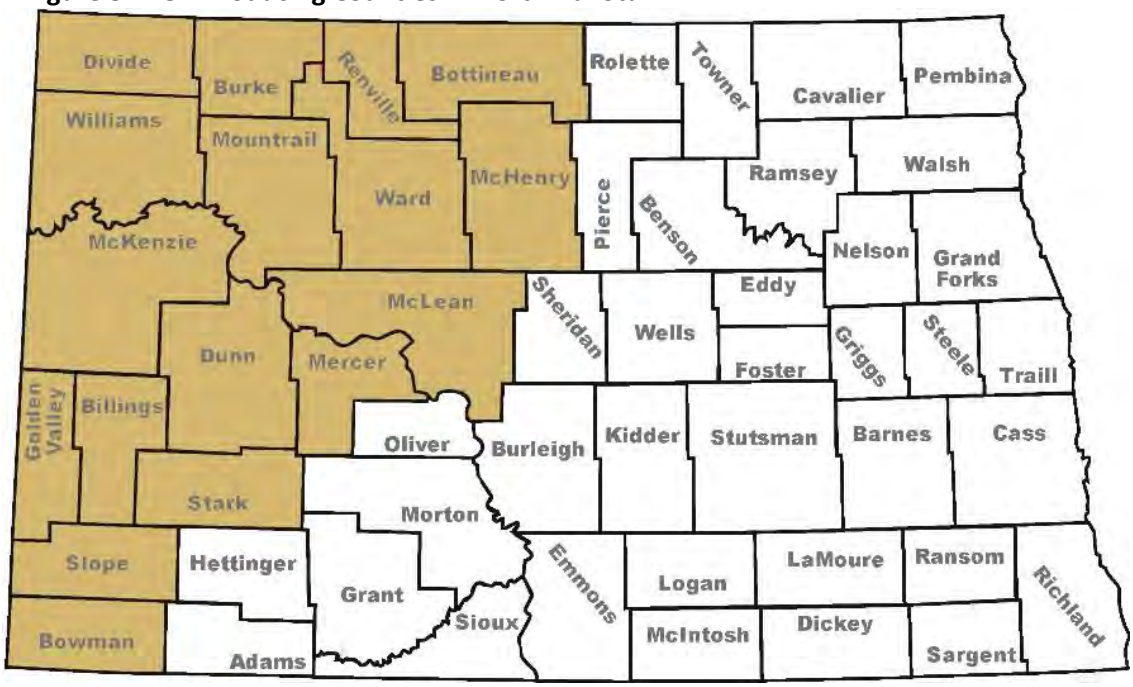


Source: 2014 Airport CIPs

8.4 Summary of Proposed Development in Oil-Producing Counties

Airports in the oil-producing counties of North Dakota are experiencing significant growth. Reviewing the funding requests for both commercial service and GA provides insight into the infrastructure needs of each group. The following sections review requested funding for both types of airports. **Figure 8.4** highlights the North Dakota counties that are considered to be oil-producing in tan.

Figure 8.4: Oil-Producing Counties in North Dakota



Source: North Dakota Aeronautics Commission

8.4.1 General Aviation Airports

Airports that are within the oil-producing counties are experiencing great pressure from increased GA operations in the western region of the state. As a result, several projects are included on the CIPs of these impacted airports that are a direct result of increased traffic. **Figures 8.5, 8.6,** and **8.7** show the requested funding by project type for each of the three time periods previously noted. **Table 8.4** lists the funding requested by GA airports in the oil-producing counties.

Findings:

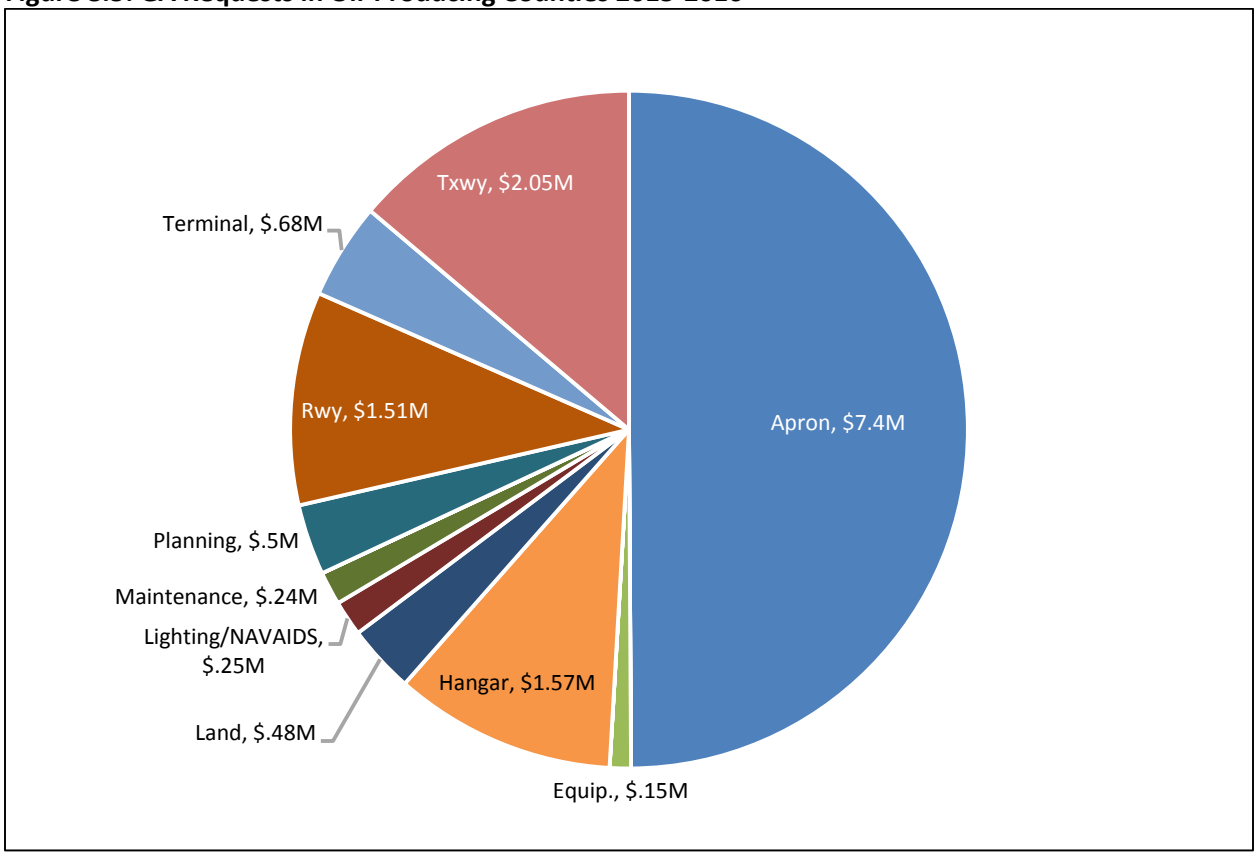
- **Pavement projects are being requested at a number of airports to increase operational capacity (runways, taxiways, taxilanes, etc.).**
- **Apron projects are also common to support an increase in transient (visitor) traffic.**

Table 8.4: General Aviation CIP Requests in Oil-Producing Counties

2015-2016	Requested Federal Funds	$	3,569,376
	Requested State Funds	$	3,295,285
	Requested Local Funds	$	1,824,285
	Unidentified Funding Source	$	6,139,554
	Total Requested Funds	$	14,828,500
2015-2019	Requested Federal Funds	$	9,574,376
	Requested State Funds	$	5,955,685
	Requested Local Funds	$	2,838,685
	Unidentified Funding Source	$	10,807,754
	Total Requested Funds	$	29,176,500
2015-2024	Requested Federal Funds	$	16,992,839
	Requested State Funds	$	20,432,735
	Requested Local Funds	$	5,516,735
	Unidentified Funding Source	$	24,535,191
	Total Requested Funds	$	67,477,500

Source: 2014 Airport CIPs

Figure 8.5: GA Requests in Oil-Producing Counties 2015-2016



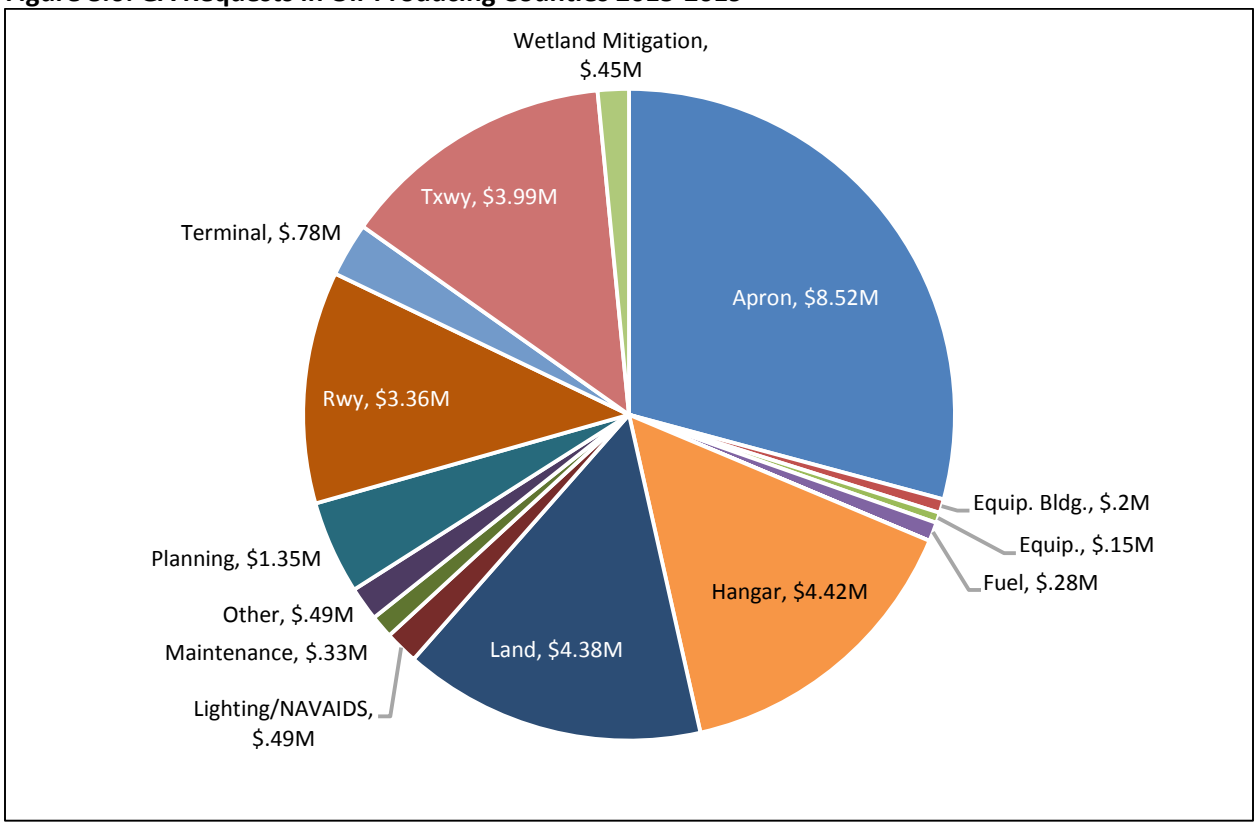
Source: 2014 Airport CIPs

Total Requests: $14.83M

Largest Project Requests

Tioga – Construct Apron/Txwy/Taxilane $5.5M
Killdeer – Apron Construct $1.8M
Garrison – Overlay Rwy $1.5M
Watford City – Construct Hangar Taxilane $1M
Crosby – Taxilane Ext/Turf Connector $800K

Figure 8.6: GA Requests in Oil-Producing Counties 2015-2019



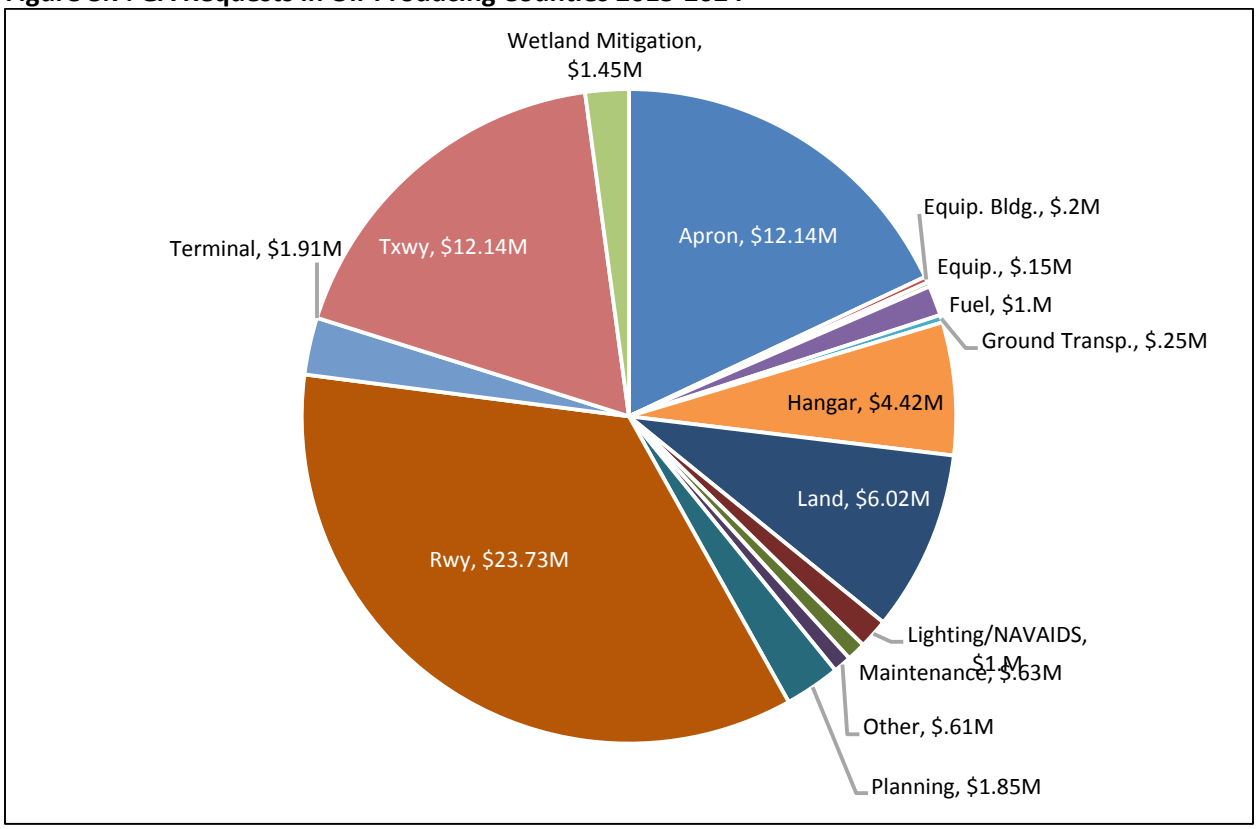
Source: 2014 Airport CIPs

Total Requests: $29.18M

Largest Project Requests

Crosby – Construct Rwy/Txwy Overlay $1.2M
Bowman – Grade/Pave Txwy Ext. $1M
Watford City – Land Acq. Phase I $1M
Watford City – Land Acq. Phase I $1M
Stanley – Land Purchase for Rwy Ext. $1M

Figure 8.7: GA Requests in Oil-Producing Counties 2015-2024



Source: 2014 Airport CIPs

Total Requests: $67.48M

Largest Project Requests

Watford City – Rwy Realign/Extension $10M
Parshall – Rwy Extension $2.5M
Tioga – Parallel Txwy Phase I $2.5M
Tioga – Parallel Txwy Phase II $2.5M
Stanley – Rwy Ext Phase II $2M

8.4.2 Commercial Service Airports

Similar to GA airports, the three commercial service airports in the oil-producing counties (Dickinson, Minot, and Williston) are feeling the pressure of increased operations. At these three airports, there has been a significant increase in GA operations, as well as commercial service operations due to expanded air service options. Enplanements recorded at these airports are exponential and the level of activity is far exceeding the capacity of current infrastructure. As a result, numerous projects are listed on these airports' CIPs that, once completed, will increase the capacity at each. The requested funding for these three airports alone far exceeds the funding requested by the other five commercial service airports in the central and eastern regions of the state. **Figures 8.8, 8.9,** and **8.10** show the requested funding by project type for each of the three time periods. **Table 8.5** lists the funding requested by commercial service airports in the oil-impacted counties.

Findings:

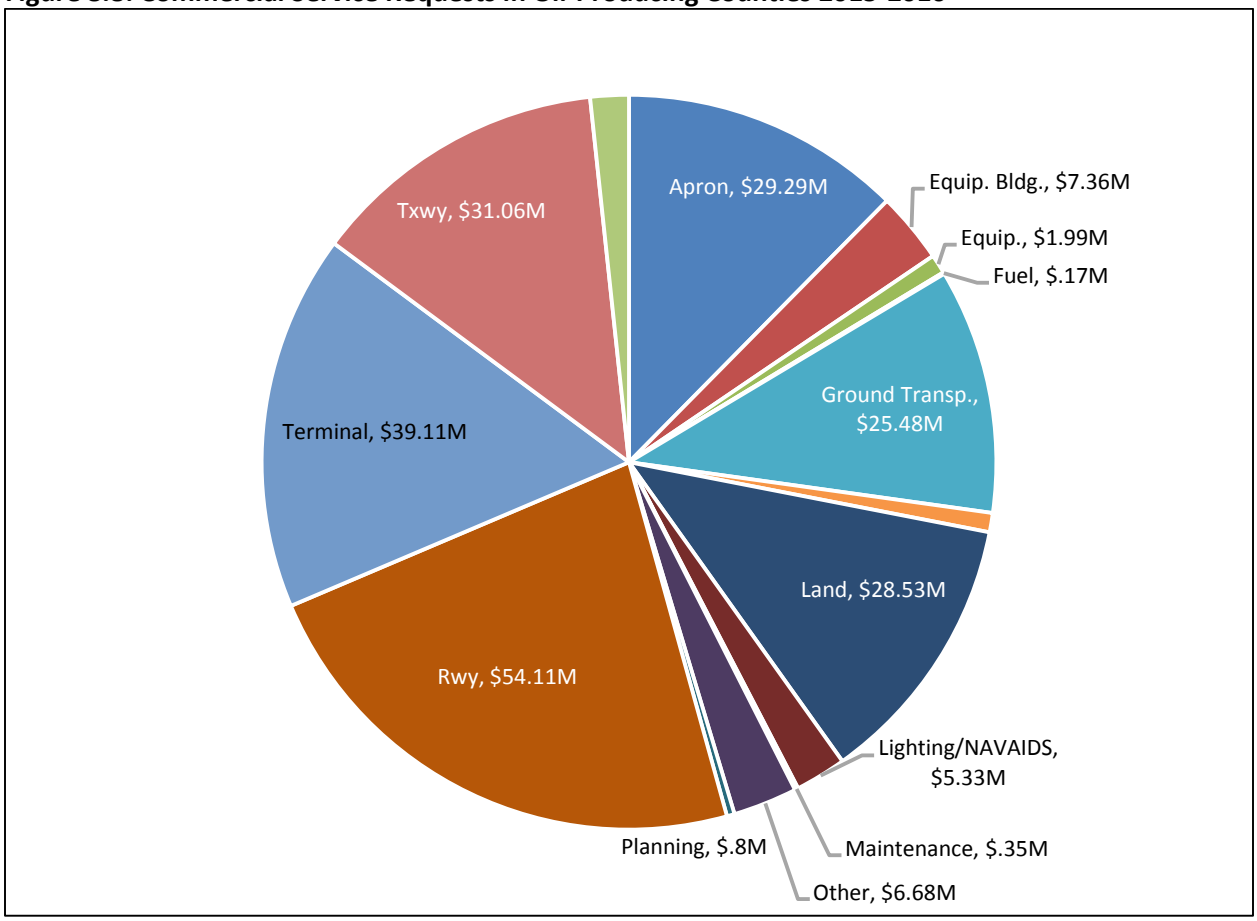
- **Williston's airport is constrained by nearby development and cannot expand its current location to meet the needs of increased traffic. An entirely new airport will need to be constructed on a new site to provide the facilities required to support the increase in use.**
- **Minot's commercial service terminal is significantly undersized to handle the increase in passengers they are experiencing. As such, a new terminal is planned for construction that can accommodate the passengers on multiple flights at once. The terminal has been fully funded and is anticipated to be open to the public in early 2016.**
- **Dickinson's airport needs a new commercial service terminal building to handle the increase in enplanements, as well as enhanced airfield infrastructure to support the increase in use by both the GA and commercial service users.**

Commercial Service (CS) - Oil Impacted Airports CIP Requests[illegible]cing Counties

2015-2016	Requested Federal Funds	$	177,526,157
	Requested State Funds	$	35,907,370
	Requested Local Funds	$	22,344,387
	Unidentified Funding Source	$	476,000
	Total Requested Funds	$	236,253,914
2015-2019	Requested Federal Funds	$	236,585,157
	Requested State Funds	$	42,885,620
	Requested Local Funds	$	33,672,637
	Unidentified Funding Source	$	63,505,500
	Total Requested Funds	$	376,648,914
2015-2024	Requested Federal Funds	$	244,875,900
	Requested State Funds	$	43,451,191
	Requested Local Funds	$	34,238,208
	Unidentified Funding Source	$	72,350,000
	Total Requested Funds	$	394,915,299

Source: 2014 Airport CIPs

Figure 8.8: Commercial Service Requests in Oil-Producing Counties 2015-2016



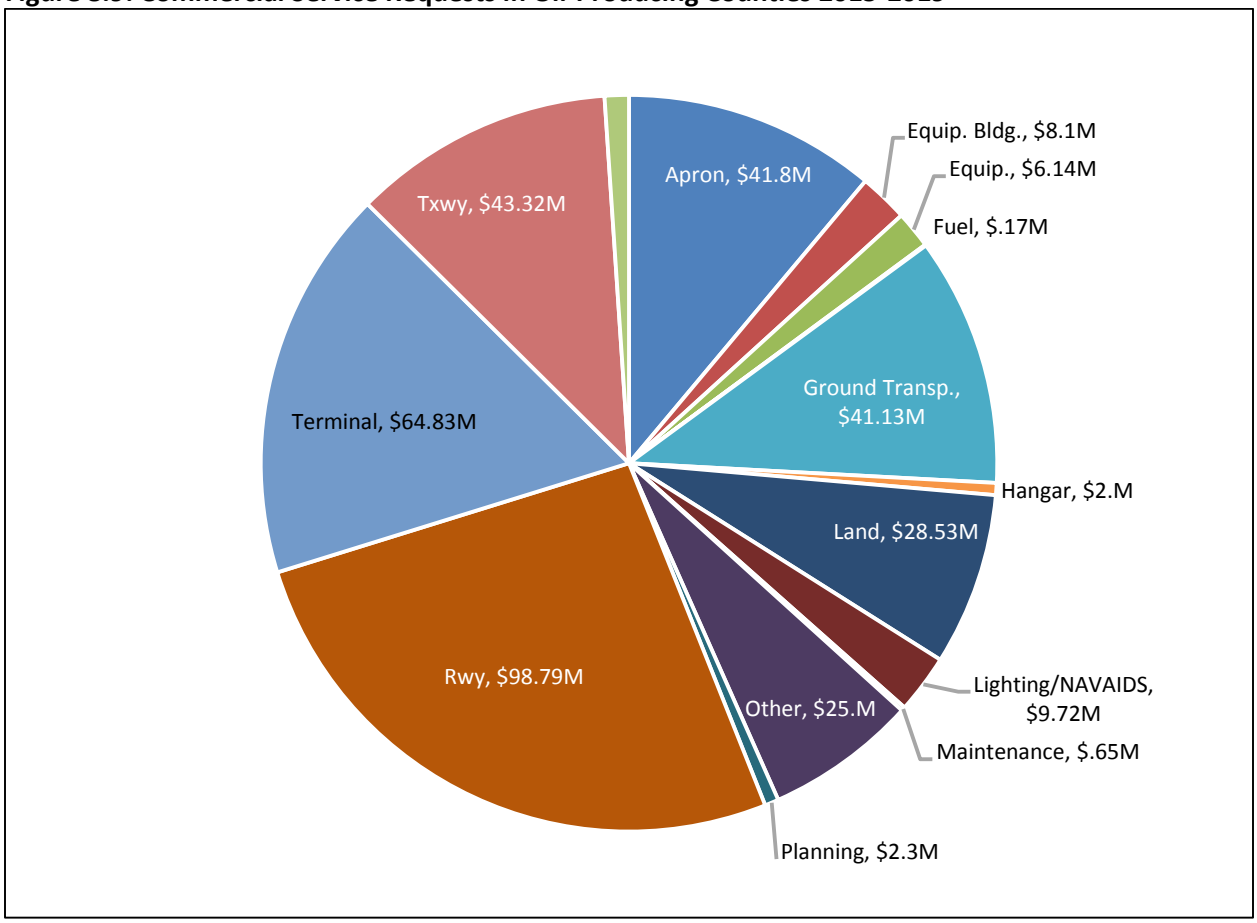
Source: 2014 Airport CIPs

Total Requests: $236.25M

Largest Project Requests

Williston – Const. Primary Rwy Pvmts $35.4M
Williston – Construct Terminal $34.6M
Williston – Land Acquisition $27.7M
Williston – Parallel Taxiway $22.6M
Williston – Construct Site Grading $13.1M

Figure 8.9: Commercial Service Requests in Oil-Producing Counties 2015-2019



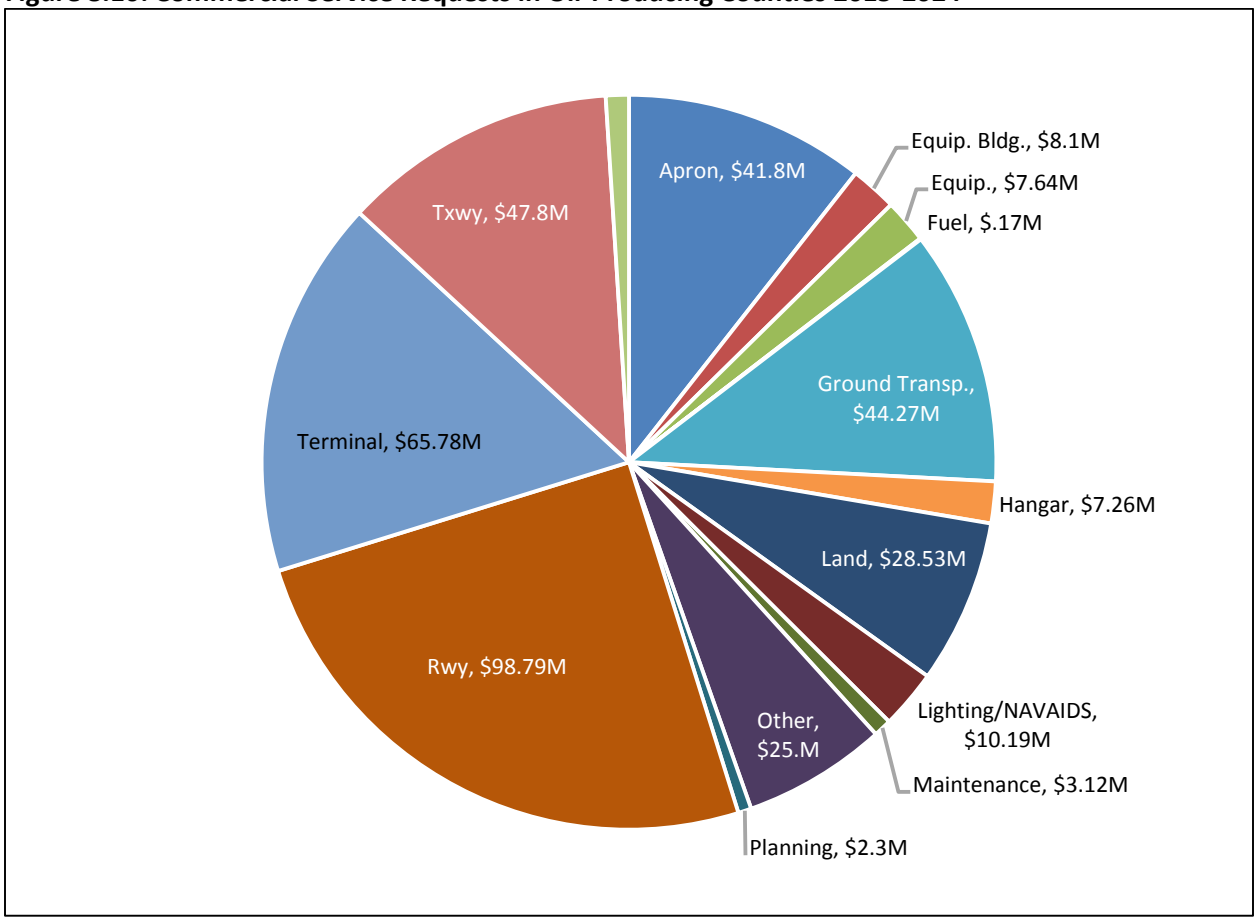
Source: 2014 Airport CIPs

Total Requests: $376.65M

Largest Project Requests

Dickinson – Relocate/Extend Rwy $37.1M
Dickinson – Com. Serv. Terminal Bldg $24.4M
Dickinson – Parallel Txwy $12.3M
Dickinson – Const. Com. Apron/Txwy $9M
Dickinson – Com. Serv. Term. Pkng/Access Rds $7.6M

Figure 8.10: Commercial Service Requests in Oil-Producing Counties 2015-2024



Source: 2014 Airport CIPs

Total Requests: $394.92M

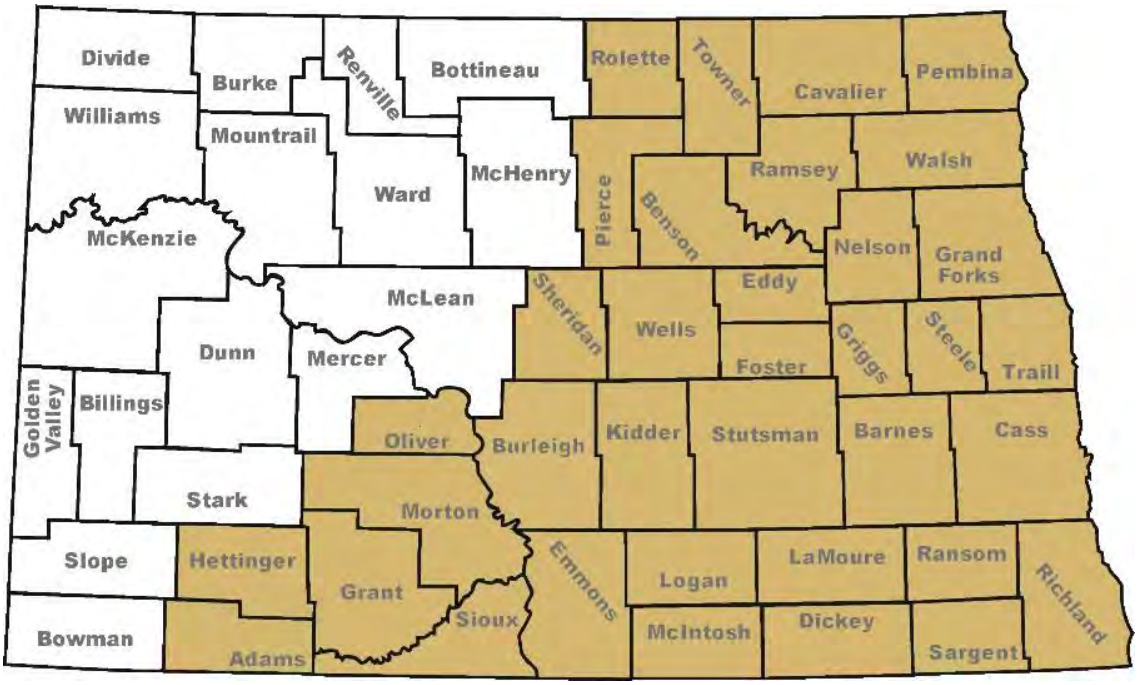
Largest Project Requests

Dickinson – Xwind Parallel Taxiway $2.6M
Dickinson – Corporate Hangar Rds/Pkng $2.3M
Dickinson – Corporate Hangar Taxilane $1.7M
Dickinson – Reconfigure Old Terminal $0.95M
Dickinson – GA Hangar auto access roads/pkng $0.87M

8.5 Summary of Proposed Development in Eastern Counties

Airports in the eastern counties of the state are also experiencing growth from the oil industry as well as general economic development. The commercial service and GA airports in this area are also seeking significant funding for infrastructure development. The following sections review requested funding for both types of airports. **Figure 8.11** highlights the eastern counties in the state.

Figure 8.11: Eastern Counties in North Dakota



8.5.1 General Aviation Airports

Although the 57 GA airports located in the eastern counties are not located within what are considered the oil-producing counties, they are still experiencing continued growth by existing users as well as new users (some of whom are related to the oil boom). **Figures 8.12, 8.13,** and **8.14** show the requested funding by project type for the three time periods between 2015 and 2024. **Table 8.6** lists the funding requested by GA airports in the eastern counties.

Findings:

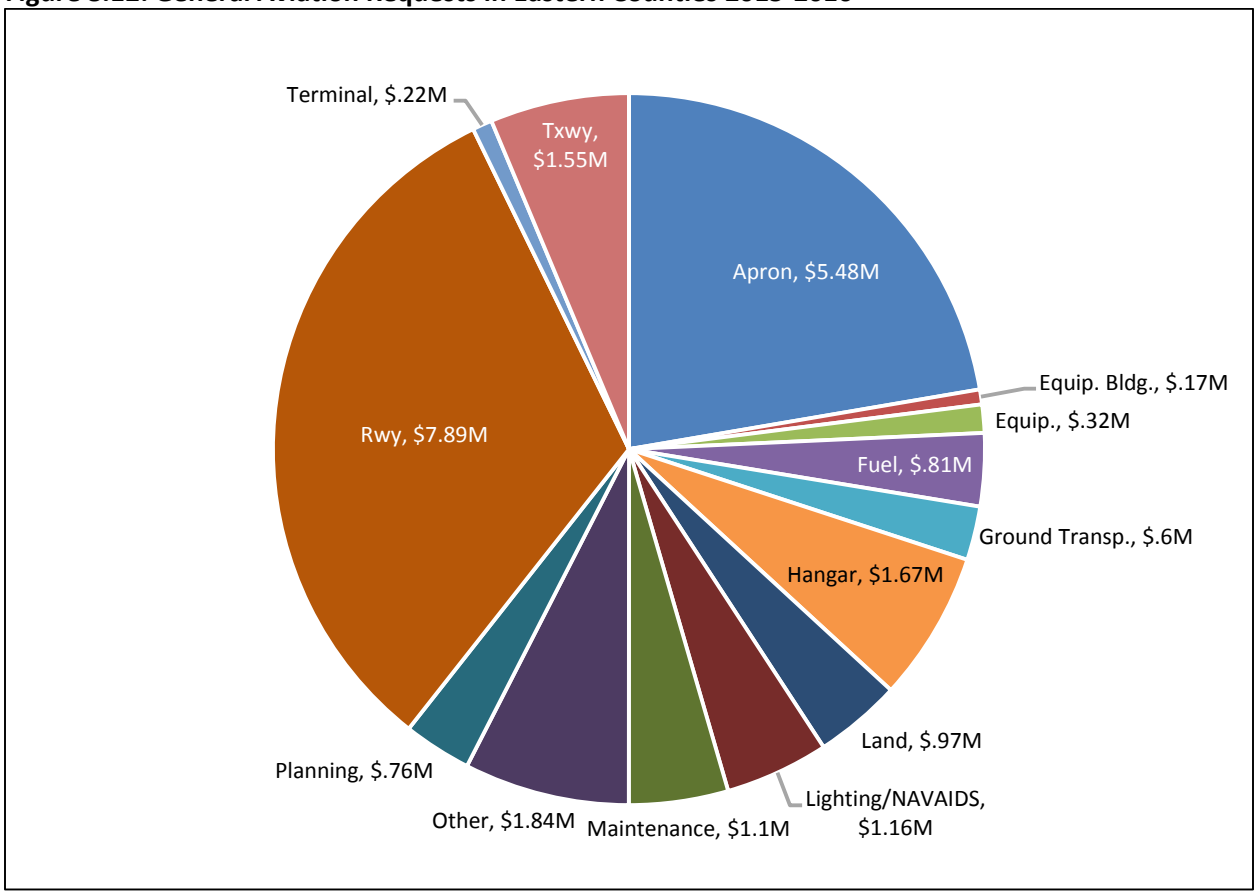
- **The funding requested by airports in this category is much greater, due to the larger number of airports that are included in this physical area.**
- **Major projects requested by these airports are focused on the maintenance of existing pavements, rather than the construction or extension of new.**

Table 8.6: General Aviation CIP Requests in Eastern Counties

2015-2016	Requested Federal Funds	$	13,323,553
	Requested State Funds	$	1,172,216
	Requested Local Funds	$	1,810,315
	Unidentified Funding Source	$	8,230,917
	Total Requested Funds	$	24,537,001
2015-2019	Requested Federal Funds	$	26,556,638
	Requested State Funds	$	2,196,198
	Requested Local Funds	$	2,932,300
	Unidentified Funding Source	$	13,583,532
	Total Requested Funds	$	45,268,668
2015-2024	Requested Federal Funds	$	54,820,638
	Requested State Funds	$	4,606,914
	Requested Local Funds	$	5,747,016
	Unidentified Funding Source	$	26,716,100
	Total Requested Funds	$	91,890,668

Source: 2014 Airport CIPs

Figure 8.12: General Aviation Requests in Eastern Counties 2015-2016



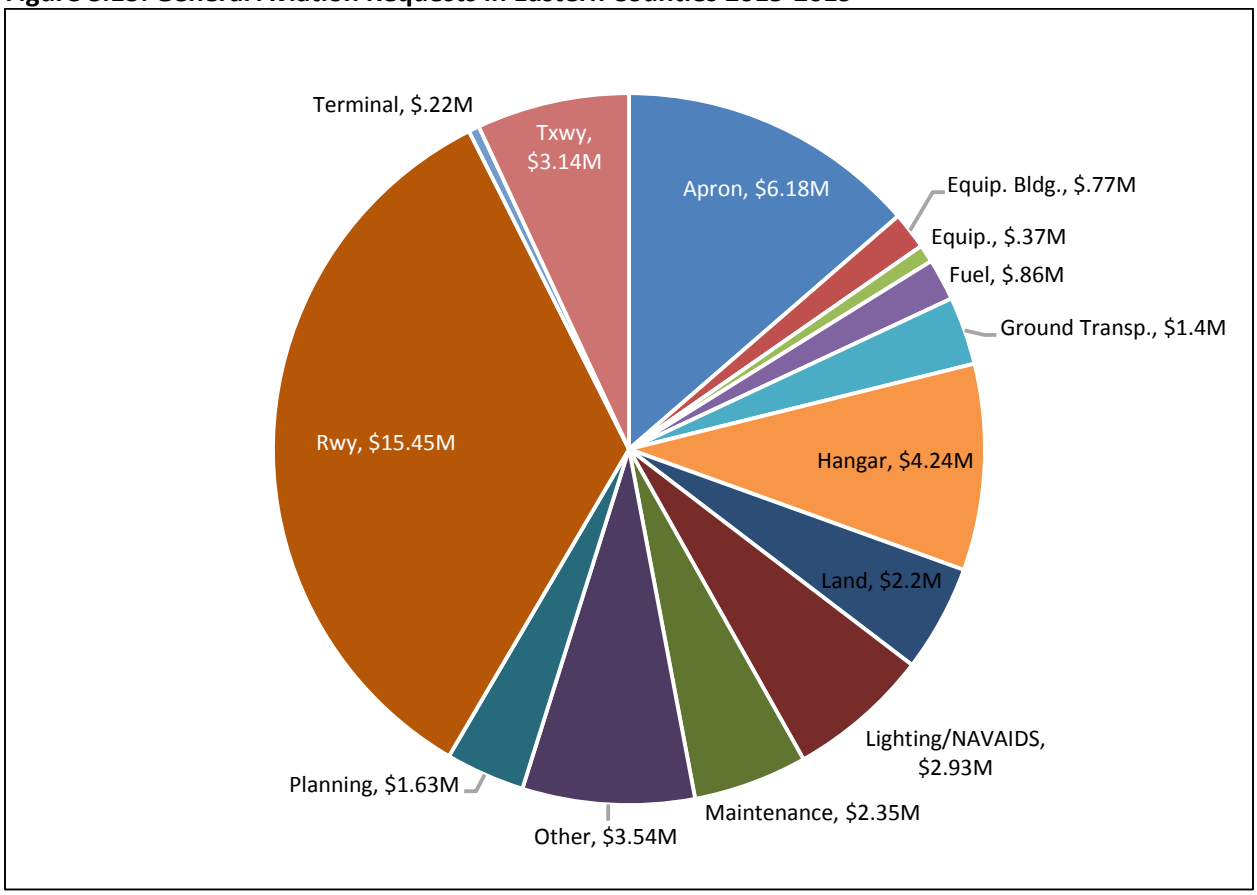
Source: 2014 Airport CIPs

Total Requests: $24.54M

Largest Project Requests

Wahpeton – Ramp/Txwy Reconst. $3.5M
Hillsboro – Rwy/Txwy Reconstruction $2.4M
Linton – Rwy Overlay/Parallel Txwy $1.5M
Edgeley – Rehab Rwy/Txwy/Apron $1.5M
La Moure – Rwy Reconstruct $1.2M

Figure 8.13: General Aviation Requests in Eastern Counties 2015-2019



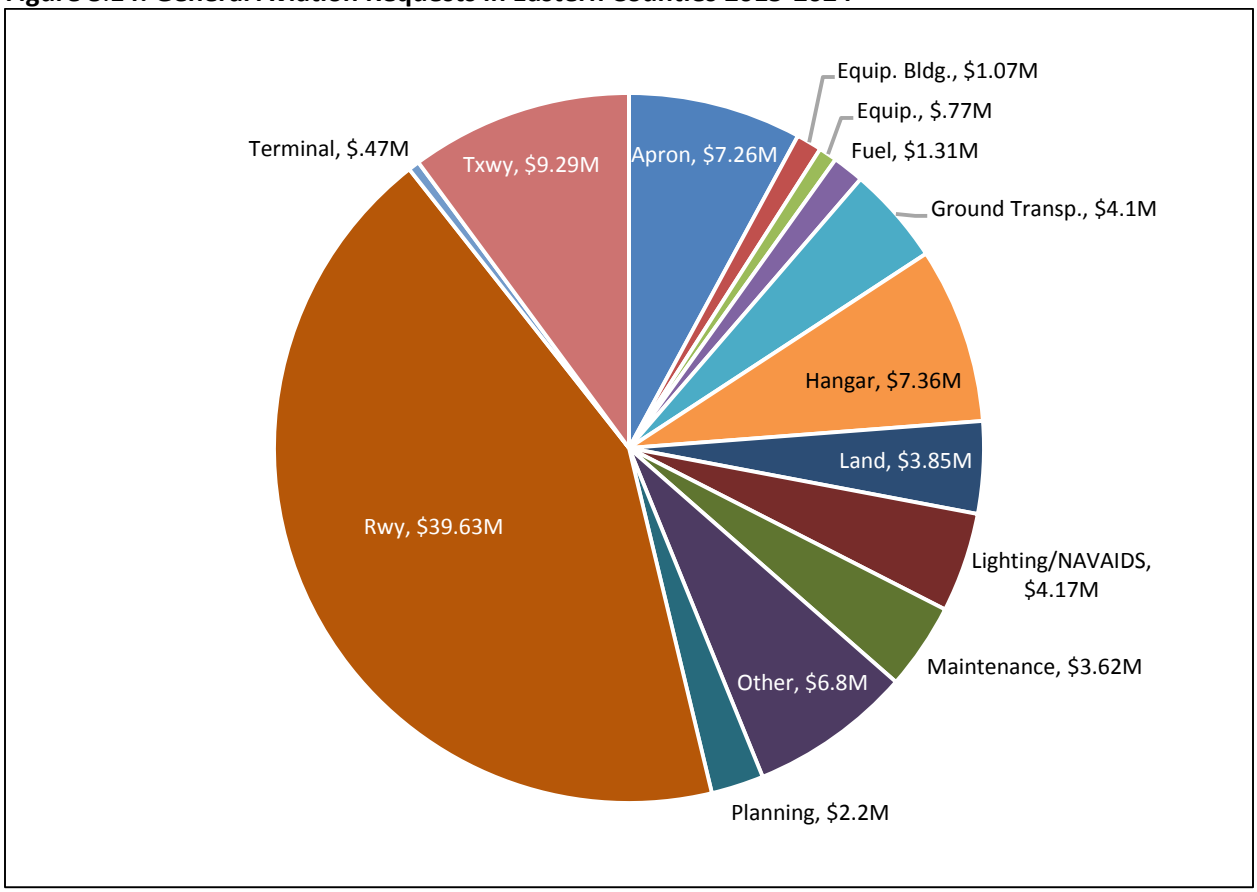
Source: 2014 Airport CIPs

Total Requests: $45.27M

Largest Project Requests

Mandan – Rwy 31 Extension $4.2M
Northwood – Pavement Rehab $1.5M
Cando – Overlay Pvmts $1M
Casselton – T-Hangar $1M
Hillsboro – Parallel Txwy $700K

Figure 8.14: General Aviation Requests in Eastern Counties 2015-2024



Source: 2014 Airport CIPs

Total Requests: $91.89M

Largest Project Requests

Northwood – EA/Land/New Rwy #1 $3.5M
Northwood – EA/Land/New Rwy #2 $3.5M
Hettinger – Rwy Rehab Construction $3M
Carrington – Rwy/Txwy Rehab $2.5M
Mandan – Realign Parallel Txwy $2M

8.5.2 Commercial Service Airports

Five of North Dakota's eight commercial service airports are located in the eastern counties of the state (Bismarck, Devils Lake, Fargo, Grand Forks, and Jamestown). Similar to the GA airports in this region, these airports are experiencing an increase in use despite their location outside of the oil-producing counties. With an increase in both GA and commercial service traffic, these airports have included both airside (runways, taxiways, etc.) and landside (terminals, parking lots, etc.) projects on their CIPs. **Figures 8.15, 8.16,** and **8.17** show the requested funds by project type for each of the three time periods. **Table 8.7** lists the funding requested by commercial service airports in the eastern counties.

Findings:

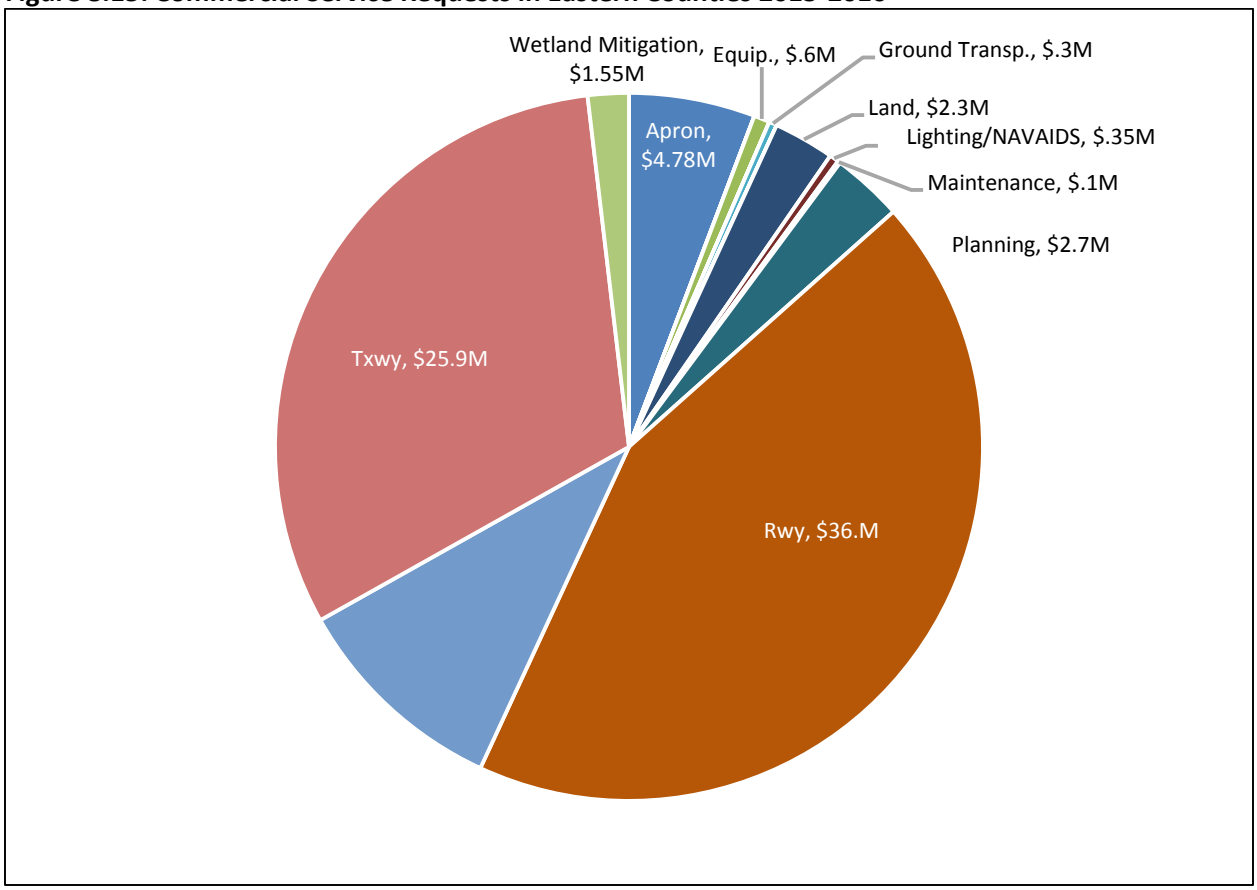
- **The two busiest airports in the state (Fargo and Bismarck) are included in this category.**
- **Both maintenance projects and new construction projects are requested by these five airports to meet the increase in use.**
- **Most of the major projects requested by these airports are pavement rehabilitation projects, however Grand Forks needs a commercial service terminal expansion to handle their increase in enplanements.**

Table 8.7: Commercial Service CIP Requests in Eastern Counties

2015-2016	Requested Federal Funds	$	30,303,500
	Requested State Funds	$	11,728,500
	Requested Local Funds	$	4,928,000
	Unidentified Funding Source	$	35,865,000
	Total Requested Funds	$	82,825,000
2015-2019	Requested Federal Funds	$	43,663,500
	Requested State Funds	$	22,208,500
	Requested Local Funds	$	11,378,000
	Unidentified Funding Source	$	62,325,000
	Total Requested Funds	$	139,575,000
2015-2024	Requested Federal Funds	$	109,088,500
	Requested State Funds	$	65,288,500
	Requested Local Funds	$	23,283,000
	Unidentified Funding Source	$	92,415,000
	Total Requested Funds	$	290,075,000

Source: 2014 Airport CIPs

Figure 8.15: Commercial Service Requests in Eastern Counties 2015-2016



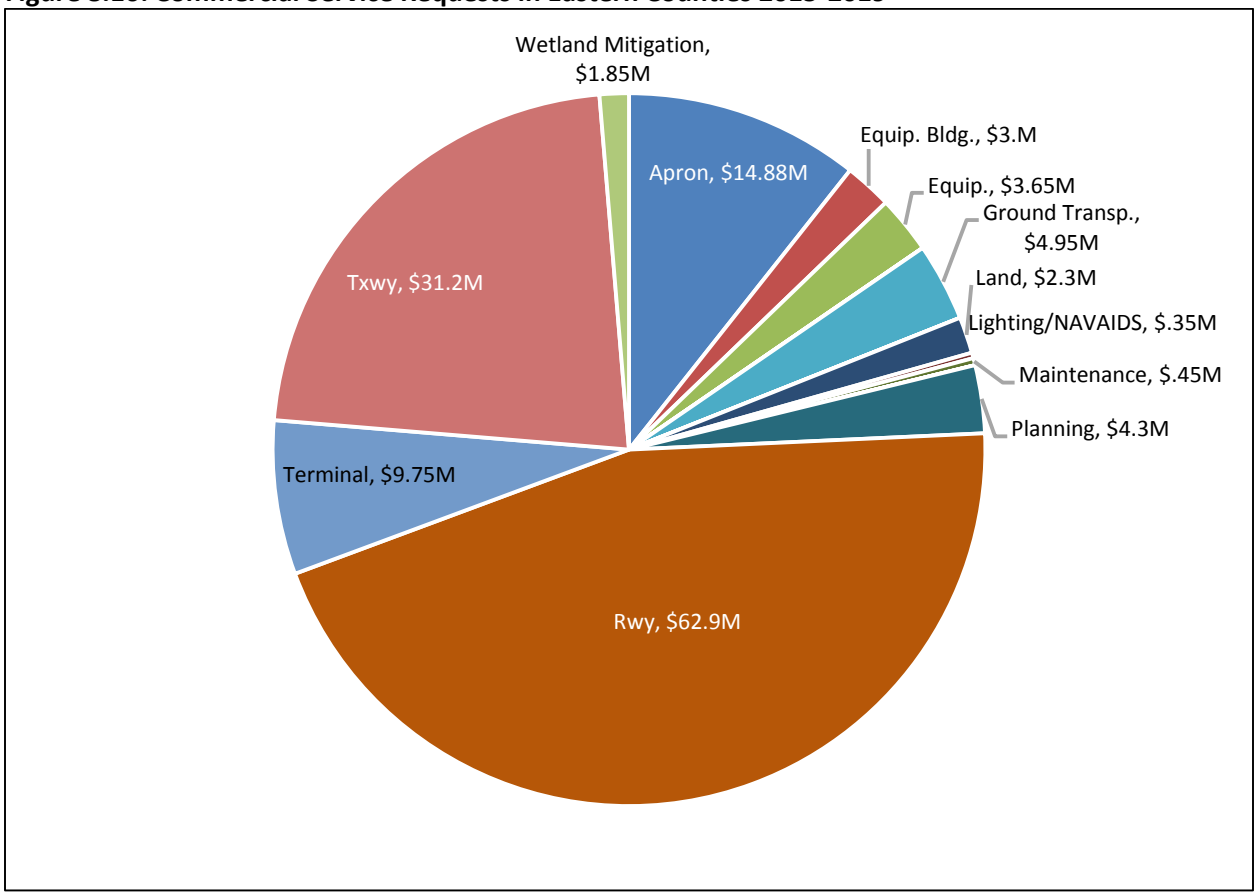
Source: 2014 Airport CIPs

Total Requests: $82.83M

Largest Project Requests

Bismarck – Rehab Rwy $26M
Fargo – Txwy Reconstruction Phase II $11.9M
Bismarck – Rehab/Widen Rwy $10M
Grand Forks – Expand Terminal $8M
Fargo – Txwy Reconstruction Phase IV $7M

Figure 8.16: Commercial Service Requests in Eastern Counties 2015-2019



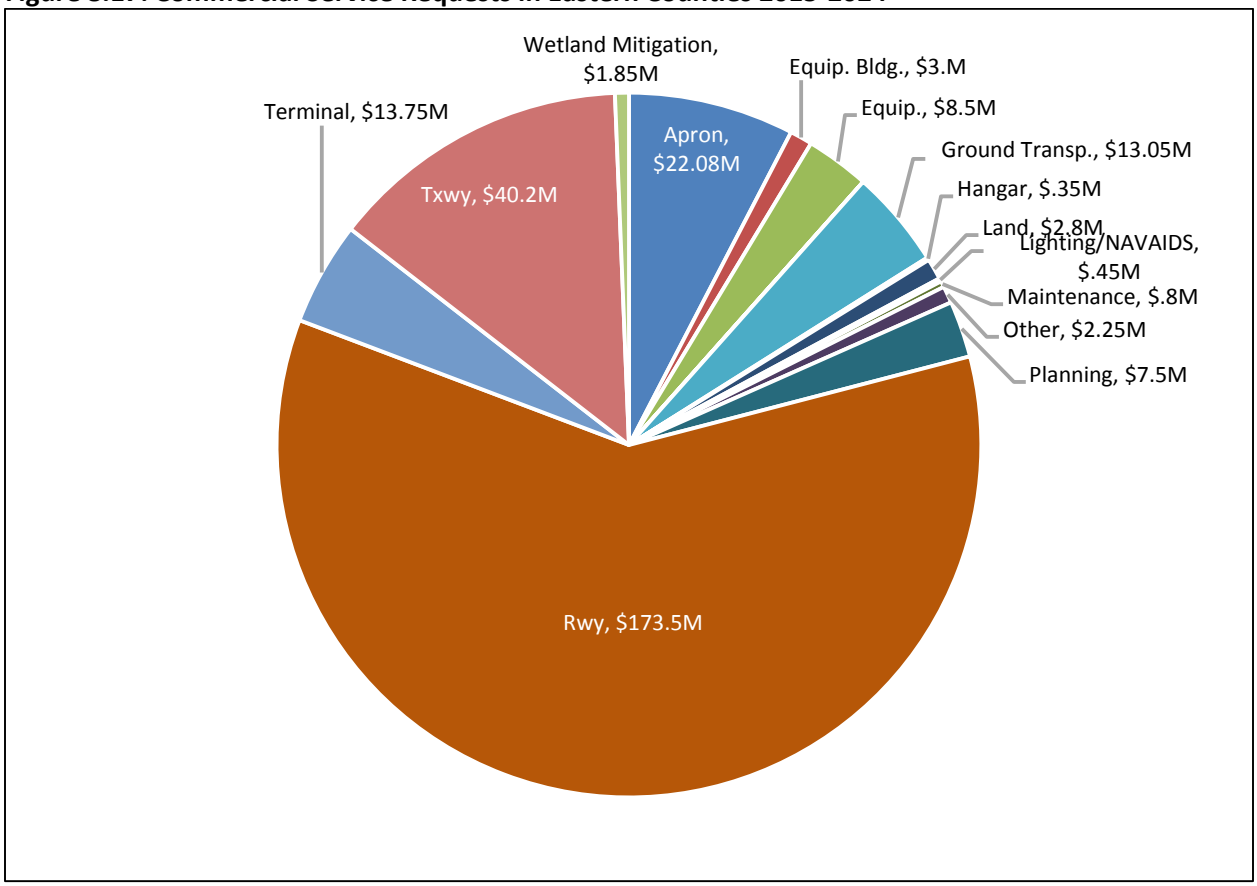
Source: 2014 Airport CIPs

Total Requests: $139.58M

Largest Project Requests

Bismarck – Rehab Rwy $26M
Grand Forks – Reconst./Expand Apron $5.5M
Bismarck – Expand GA Apron $2M
Grand Forks – Const. Txwy/Taxilanes $2M
Grand Forks – Rehab Apron $2M

Figure 8.17: Commercial Service Requests in Eastern Counties 2015-2024



Source: 2014 Airport CIPs

Total Requests: $290.08M

Largest Project Requests

Grand Forks – Extend Rwy $40M
Grand Forks – Reconstruction Rwy $25M
Bismarck – Rehab/Extend Rwy $20M
Fargo – Rwy Extension/Widening $12M
Fargo – Parallel Txwy Construction $9M

8.6 Summary of Pavement Projects

Pavement projects comprise a significant portion of the overall requested funds by both commercial service and GA airports. Whether the projects are related to the maintenance of existing pavement, or the construction of new, these projects comprise over 50% of the total requests by airports in all three time periods. Between 2015 and 2016, pavement projects encompass 57% of the total requested funds, between 2015 and 2019 they account for 56% of requested funds, and between 2015 and 2024 they comprise a total of 54% of the requested funds.

8.6.1 General Aviation Airports

Major pavement projects are requested by airports in both the oil-producing counties, and the eastern counties. **Figures 8.18, 8.19,** and **8.20** show pavement requests for GA airports for all three time frames. **Table 8.8** lists the funding requested by GA airports in the state for pavement projects.

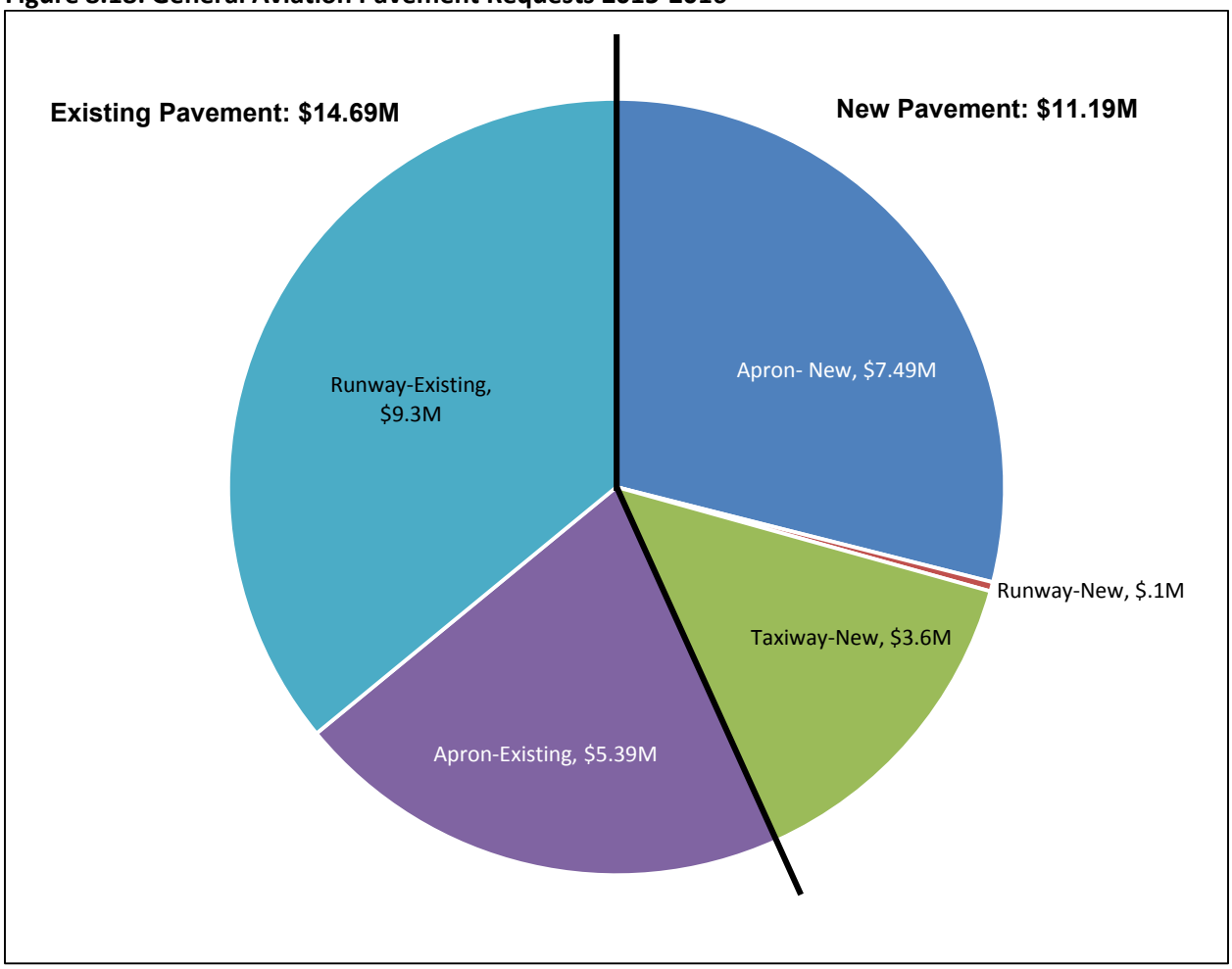
Findings:

- **In the next biennium (2015-2016) the majority of funds requested for pavement projects are to maintain existing pavement.**
- **In years following 2016, the majority of requested funding transitions are to include new pavement projects.**

General Aviation (GA) Airports CIP Requests for Pavement Projects			
2015-2016	Requested Federal Funds	$	9,701,179
	Requested State Funds	$	3,498,950
	Requested Local Funds	$	1,535,950
	Unidentified Funding Source	$	11,141,421
	Total Requested Funds	$	25,877,500
2015-2019	Requested Federal Funds	$	16,748,679
	Requested State Funds	$	4,749,450
	Requested Local Funds	$	2,275,450
	Unidentified Funding Source	$	16,853,921
	Total Requested Funds	$	40,627,500
2015-2024	Requested Federal Funds	$	38,100,542
	Requested State Funds	$	19,791,116
	Requested Local Funds	$	5,991,116
	Unidentified Funding Source	$	40,294,726
	Total Requested Funds	$	104,177,500

Source: 2014 Airport CIPs

Figure 8.18: General Aviation Pavement Requests 2015-2016



Source: 2014 Airport CIPs

Total Requests: $25.88M

Largest Project Requests

New

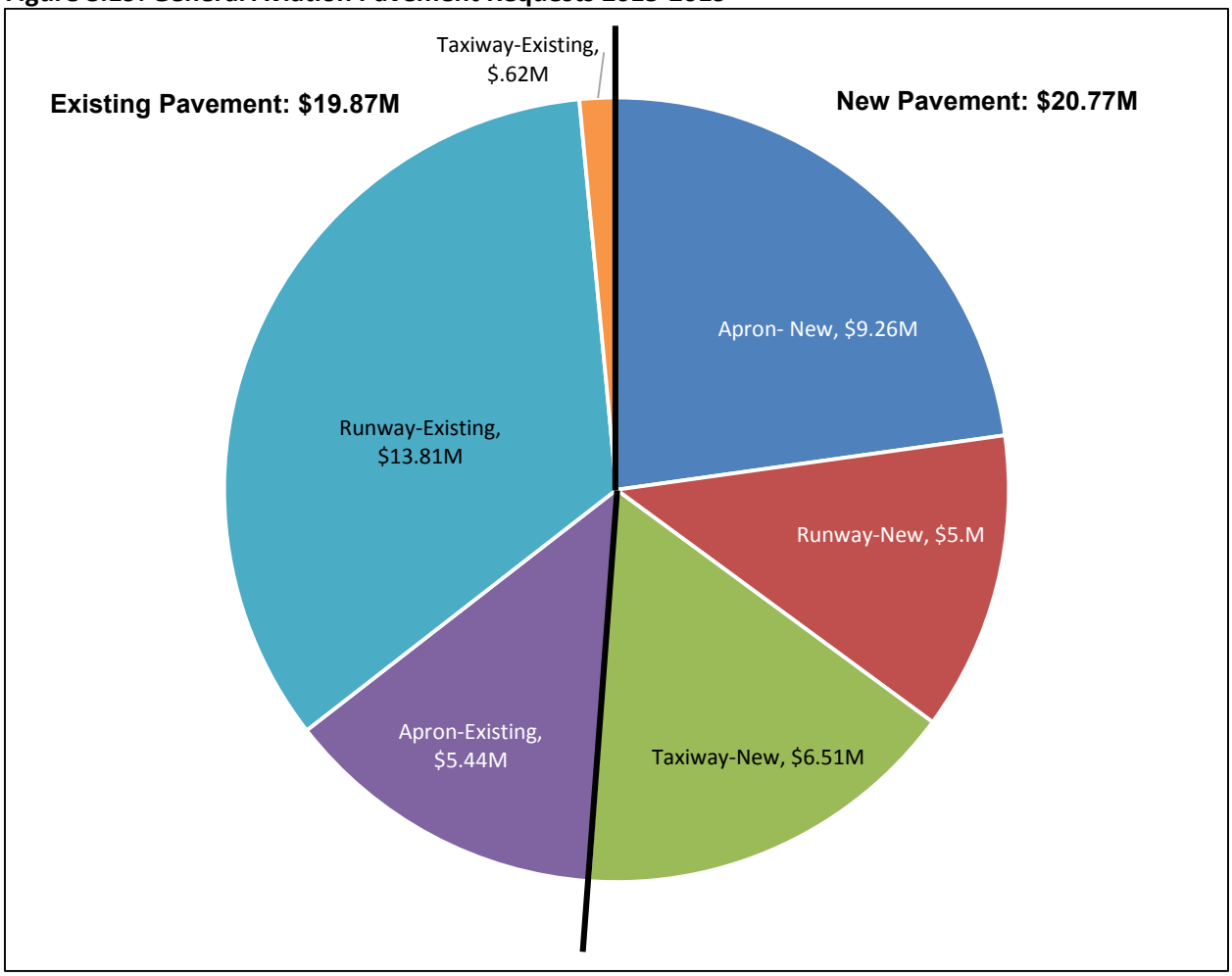
Tioga – Construct Apron/Txwy/Taxilane $5.5M

Existing

Wahpeton – Ramp/Txwy Reconstruct $3.5M

Hillsboro – Rwy/Txwy Reconstruct $2.4 M

Figure 8.19: General Aviation Pavement Requests 2015-2019



Source: 2014 Airport CIPs

Total Requests: $40.63M

Largest Project Requests

New

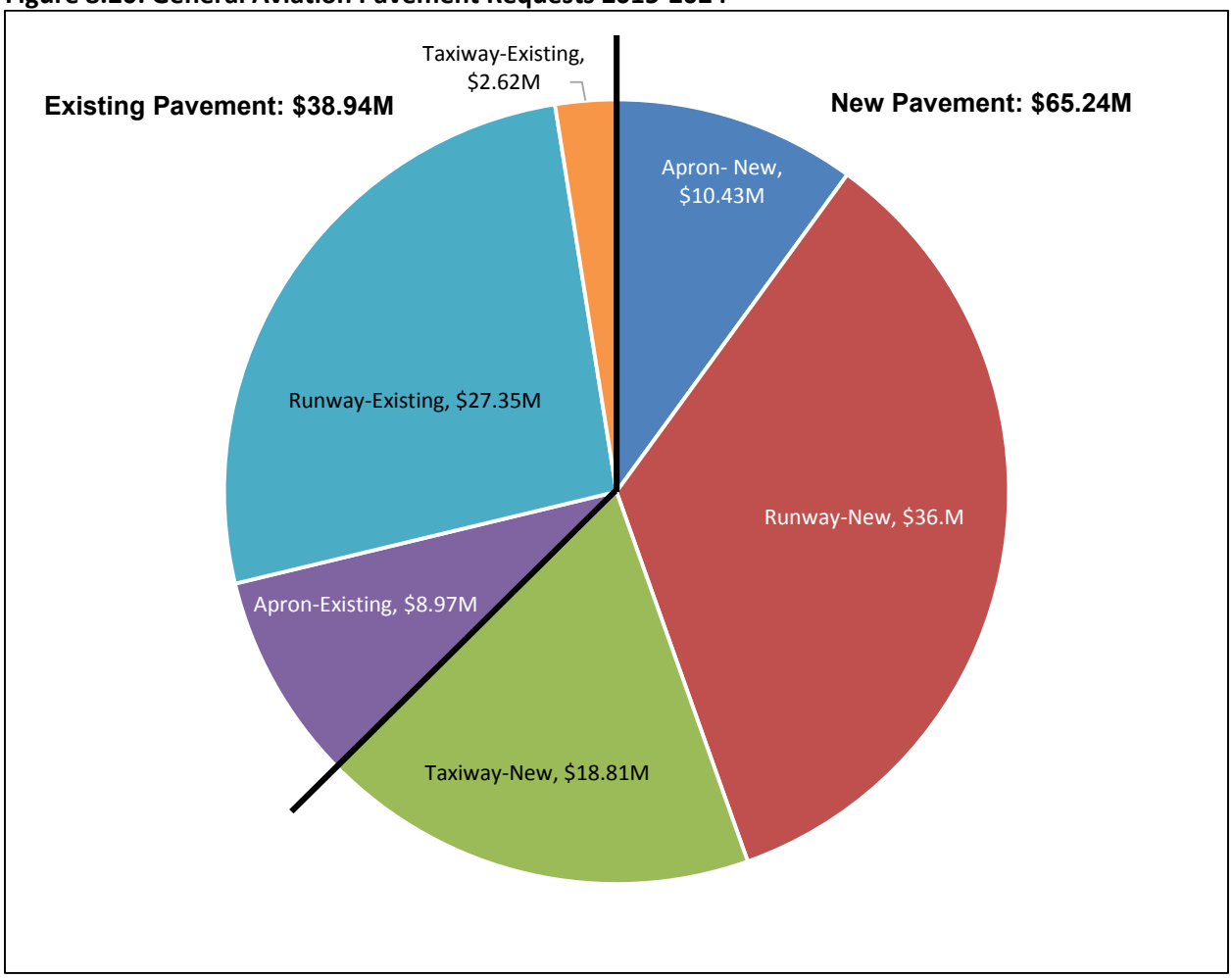
Mandan – Rwy 31 Extension $4.2M

Existing

Northwood – Pavement Rehab $1.5M

Crosby – Construct Rwy/Txwy Overlay $1.2M

Figure 8.20: General Aviation Pavement Requests 2015-2024



Source: 2014 Airport CIPs

Total Requests: $104.18M

Largest Project Requests

New

Watford City – Rwy Realign/Extension $10M
Northwood – EA/Land/New Rwy #1 $3.5M
Northwood – EA/Land/New Rwy #2 $3.5M
Hettinger – Rwy Rehab Construction $3M

8.6.2 Commercial Service Airports

The funds requested for pavement projects at commercial service airports far exceed those requested at the GA airports in the state. This is due in part to the amount of pavement at each of the eight commercial service airports that needs to be maintained. With the increase in traffic at all of these airports, their requested pavement projects are even more critical to complete as their pavements are deteriorating at a much faster rate than before. **Figures 8.21, 8.22** and **8.23** show pavement requests for commercial service airports for the three time periods. **Table 8.9** lists the funding requested by commercial service airports in the state for pavement projects.

Findings:

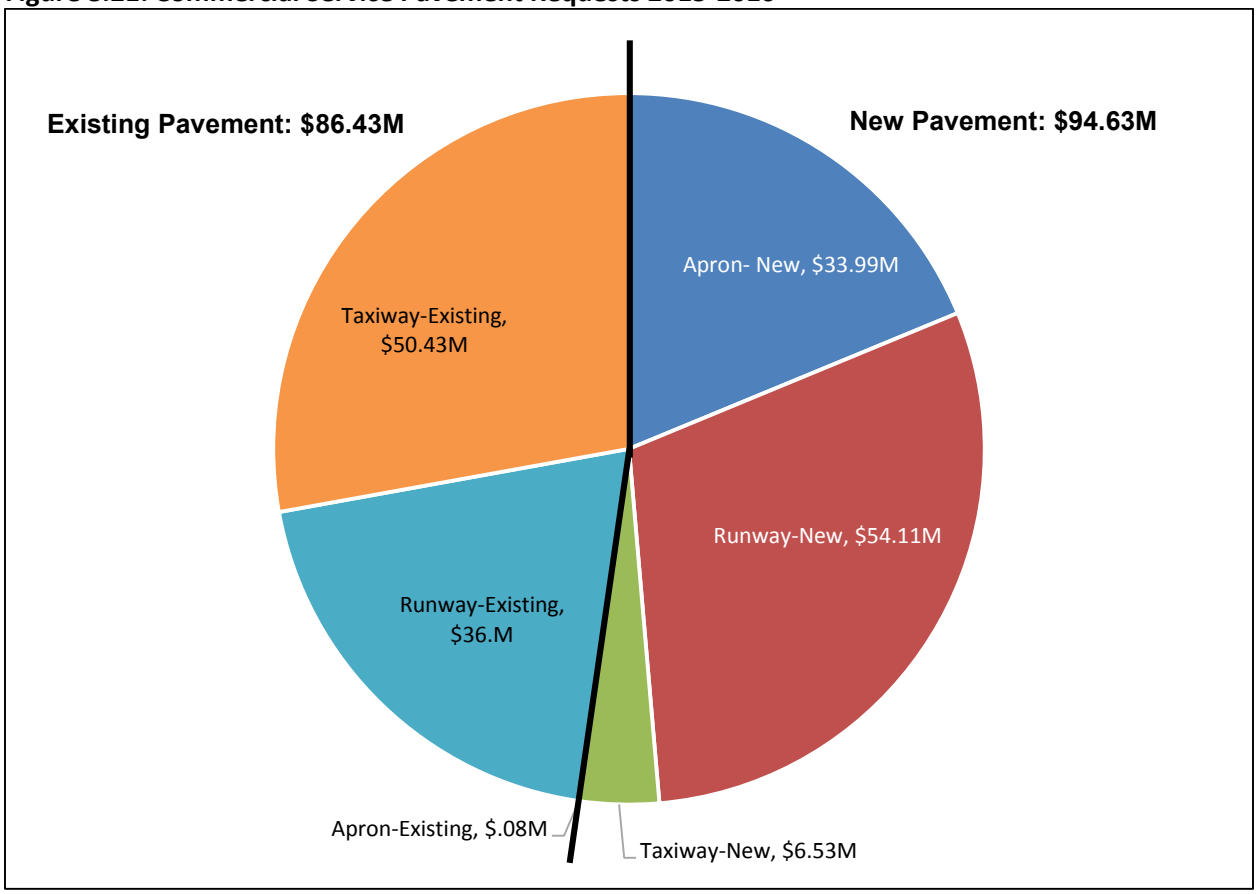
- **The funds requested for new pavement projects exceed what is requested for maintenance projects in all three time periods evaluated.**
- **Runway pavement projects make up the majority of pavement projects, followed by taxiways, and then apron projects.**
- **Williston and Dickinson have new runway construction projects requested 2015 and 2018, respectively.**

Table 8.9: Commercial Service CIP Requests for Pavement Projects

2015-2016	Requested Federal Funds	$	132,007,547
	Requested State Funds	$	10,345,725
	Requested Local Funds	$	7,865,224
	Unidentified Funding Source	$	30,911,000
	Total Requested Funds	$	181,129,496
2015-2019	Requested Federal Funds	$	177,235,047
	Requested State Funds	$	22,419,475
	Requested Local Funds	$	13,808,974
	Unidentified Funding Source	$	79,591,000
	Total Requested Funds	$	293,054,496
2015-2024	Requested Federal Funds	$	239,140,547
	Requested State Funds	$	64,823,475
	Requested Local Funds	$	21,162,974
	Unidentified Funding Source	$	99,207,500
	Total Requested Funds	$	424,334,496

Source: 2014 Airport CIPs

Figure 8.21: Commercial Service Pavement Requests 2015-2016



Source: 2014 Airport CIPs

Total Requests: $181.13M

Largest Project Requests

New

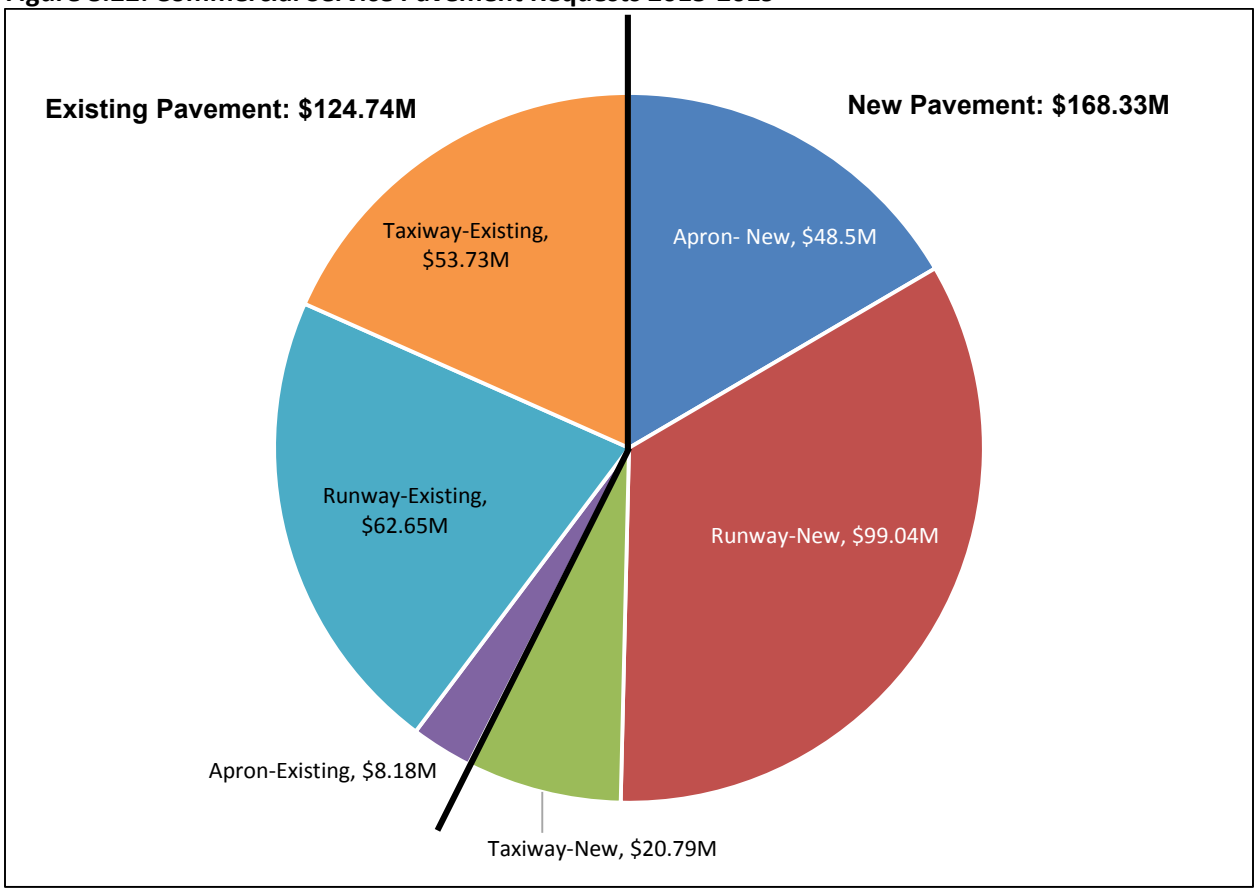
Williston – Const. Primary Rwy Pvmts $35.4M

Williston – Const. Parallel Txwy $22.6M

Existing

Bismarck – Rehab Rwy $26M

Figure 8.22: Commercial Service Pavement Requests 2015-2019



Source: 2014 Airport CIPs

Total Requests: $293.05M

Largest Project Requests

New

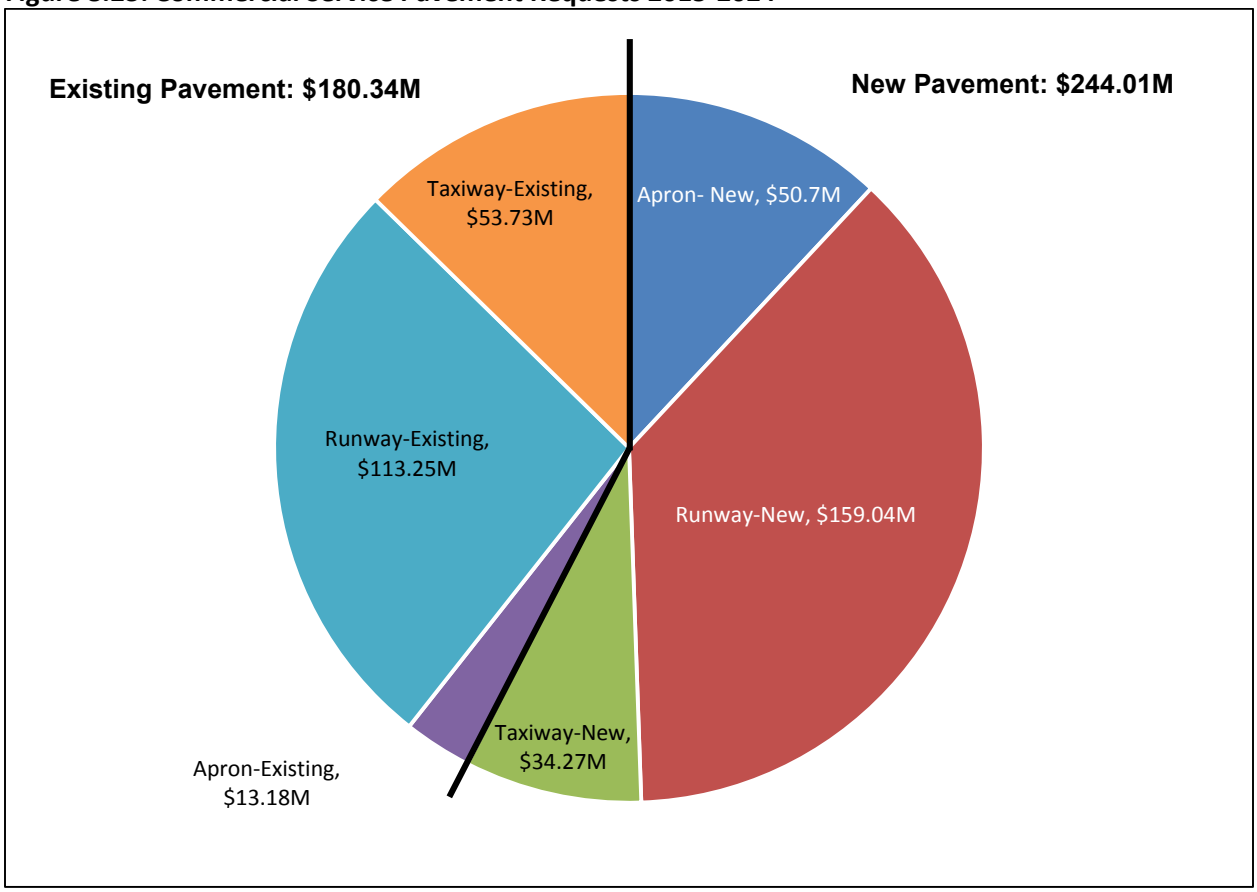
Dickinson – Relocate/Extend Prim. Rwy $37.1M

Dickinson – Parallel Txwy $12.3M

Existing

Bismarck – Rehab Rwy $26M

Figure 8.23: Commercial Service Pavement Requests 2015-2024



Source: 2014 Airport CIPs

Total Requests: $424.33M

Largest Project Requests

Existing

Grand Forks – Extend Rwy $40M
Grand Forks – Reconstruct Rwy $25M
Bismarck – Rehab/Extend Rwy $20M
Fargo – Rwy Extension/Widening $12M

8.7 System Recommendations

The analysis presented in Sections 8.3 – 8.6 helps illustrate the funding needs of the system, based upon the projects listed within the 56 individual airport CIPs that were provided to NDAC in 2014. It is important to note however, that some projects necessary to support the state system are not listed on specific airport CIPs at the time of this study. This section outlines projects that are recommended in Chapter 7 but are not captured on existing CIPs, along with a general cost estimate (where possible), for each. Note: All cost estimates provided in this section are for general planning purposes only and do not reflect any detailed site specific costs of the projects. The costs for some of the recommendations discussed in the following pages are not easy to define due to a variety of factors (size, scope, location, etc.). For these recommendations, general project cost estimates are not provided, but should be considered when planning for future funding needs. The evaluation of CIPs for recommended projects is presented by system goal in the following sections:

As mentioned at the beginning of this chapter, of the 89 airports in North Dakota's aviation system, 56 provided CIPs to NDAC for evaluation (53 from NPIAS airports and three from non-NPIAS airports). The remaining 33 airports in the system are not included in the NPIAS and either do not have a CIP or chose not to provide one for this study. It is important to note that all of the recommendations for the non-NPIAS airports will require local and state funding as those airports are not eligible to receive federal AIP funding through the FAA.

8.7.1 Goal: Strive to Attain Safety and Security

A review of the recommendations for all four performance measures is included in the following sections.

Clear Approaches to Primary Runway Ends

Of the 25 airports identified in Chapter 7 that do not have clear 20:1 approaches to their primary runways, Cavalier is the only one already accounting for the approach clearing needed on their existing CIP. Twenty-one of the airports are non-NPIAS and will not receive federal Airport Improvement Program (AIP) funding assistance for the recommended clearing projects. The remaining three airports are included in the NPIAS (Dunseith, Park River, and La Moure); however,

they are not showing any clearing projects on their current CIPs. Consequently, the funding needed to remove obstructions at 24 of the 25 airports is not accounted for in the needs shown in Sections 8.3, 8.4, and 8.5. Although cost estimates for these projects are not provided, the additional resources needed to implement the NDSASP approach clearing recommendations should be considered.

Mitigate Incompatible Land Uses within Runway Protection Zones (RPZs)

Of the 84 airports that are recommended to clear the incompatible land uses in their RPZs, only 21 of them are already accounting for this effort on their existing CIPs. Thirty-three of the airports did not submit CIPs to NDAC because they are non-NPIAS and the remaining 30 airports that are included in the NPIAS are not currently accounting for incompatible land use mitigation within their RPZs on their existing CIPs. As a result, the costs to mitigate the existing incompatible land uses at 63 of the recommended airports is not being accounted for in the needs shown in Sections 8.3, 8.4, and 8.5. Cost estimates are not provided for this recommendation as costs vary from case to case, however the additional funding needed to meet this system recommendation should be considered. Note: many of the incompatible uses in the RPZs at these airports are roads, and it is unlikely that they would be moved due to cost.

Gain Control of Land within RPZs

Only seven of the 26 airports that are recommended to achieve complete control of the land within their RPZs are accounting for this acquisition on their existing CIPs. Fifteen of the recommended airports did not submit CIPs to the NDAC because they are non-NPIAS and the remaining four airports (Garrison, Hazelton, Killdeer, and La Moure) are not showing RPZ acquisition projects on their CIPs. The resources needed for land acquisition at the 19 airports that are not accounted for in Sections 8.3, 8.4, and 8.5 should be considered to meet this NDSASP recommendation. Cost estimates for acquisitions are not provided as they can fluctuate greatly, depending on a variety of factors (land value, legal counsel fees, etc.).

Develop Wildlife Management Plans

Of the ten airports that are recommended to develop Wildlife Management Plans, two of them (Kindred and Tioga) are already accounting for this effort on their CIPs. The other eight airports (Bottineau, Casselton, Cavalier, Garrison, Hettinger, Mohall, Wahpeton and Watford City) have not included this project on their existing CIPs. Wildlife Management Plans range in price from $30,000 to $200,000 depending on a variety of factors. This general cost provides a broad idea of the additional resources needed to complete this NDSASP recommendation, which provides a possible range of costs from $240,000 to approximately $1.6 million. This should be considered in addition to the funding needs shown in Section 8.3, 8.4, and 8.5.

8.7.2 Goal: Accommodate Accessibility Needs

The recommendations made for this goal are related to the changing of airport classifications, and do not have any associated project/value to review. See Chapter 7 for specific recommendations.

8.7.3 Goal: Enhance Air Access to Airports

Only one of the recommendations for this goal lends itself to a CIP evaluation as the other recommendations do not have any associated costs.

Provide Adequate Terminal Capacity

As noted in Chapter 7, 43 airports are recommended to increase their terminal capacity. Ten of these airports are already accounting for this effort on their existing CIPs. Twenty-three did not submit CIPs to the NDAC because they are non-NPIAS. The remaining ten airports, which are included in the NPIAS, are not showing terminal expansion projects on their CIPs. There is a significant amount of funding needed to complete terminal capacity expansion projects at these 33 airports that is not already accounted for in the needs shown in Sections 8.3, 8.4, and 8.5. Due to a variety of factors, such as size, location, and types of airport users, individual cost estimates are not provided for these recommended terminal projects.

8.7.4 Goal: Support North Dakota's Economy

A review of the recommendations for four of the five performance measures is included in the following section.

Provide Jet A Fuel

Bottineau is the only airport recommended in Chapter 7 to provide Jet A Fuel. This project is included on their existing CIP and the cost is accounted for in Sections 8.3 and 8.4. No additional funding (beyond what is already shown in previous sections) is needed for this recommendation.

Provide 100LL Fuel

Of the four airports that are recommended in Chapter 7 to provide 100LL fuel (Killdeer, New Town, Lakota, and Cando), all four of them are already accounting for this recommendation on their CIPs. These costs can be seen in Sections 8.3, 8.4, and 8.5, and no additional costs are needed beyond what is shown.

Provide Runways Capable of Supporting Large Aircraft (5,000ft+)

A runway extension is recommended for Watford City and is accounted for on their existing CIP and shown in Sections 8.3 and 8.4.

Meet Needs of King Air Aircraft

Three airports are recommended for a runway extension in order to support the use by King Air aircraft. Only Bottineau is accounting for an extension on their existing CIP. Beulah did not submit a CIP to the NDAC because they are non-PIAS. Killdeer is also non-NPIAS, but did submit a CIP without a runway extension shown. The funding for the runway extension projects at these two airports would need to come from a local source, or possibly state funding. The cost for a runway extension fluctuates with the type of pavement, length of extension needed and width of the current runway, environmental impacts, etc., therefore cost estimates are not provided. However, the cost of runway extensions at both Beulah and Killdeer should be considered in addition to the needs discussed in Sections 8.3 and 8.4.

8.7.5 Goal: Enhance Quality of Life

The recommendations made for this goal do not have any associated project/value to review. See Chapter 7 for specific recommendations.

8.7.6 Goal: Preserve North Dakota Airport Assets

Only three of the recommendations for this goal lend themselves to a CIP evaluation as the other recommendations do not have associated costs.

Meet Pavement Condition Index (PCI) Thresholds on Primary Runways (60+)

Of the seven airports that are recommended to complete pavement rehabilitation projects based on current PCI values on their primary runways, five of them are showing rehabilitation projects on their existing CIPs. The other two airports did not submit CIPs to the NDAC as they are non-NPIAS (Larimore and Page). The cost to rehabilitate or reconstruct the primary runway pavement at these two airports is not included in the funding needs shown in Sections 8.3, 8.4, and 8.5 and should be considered as an additional cost to meet the NDSASP recommendation. The cost to rehabilitate or reconstruct runway pavement is dependent on a variety of factors (length, width, pavement type, etc.).

Develop/Update ALP

Five airports are recommended to update their ALPs as they are older than ten years. Two of these airports (Rolla and Grafton) are already accounting for this effort on their CIPs. The remaining three airports (Cando, Jamestown and Walhalla) are not showing an ALP update on their existing CIPs, and therefore the cost to complete the ALP updates is not reflected in Sections 8.3 and 8.5. Costs to complete an ALP update range depending on many factors (such as the size of the airport), but generally range between $50,000 and $200,000. These costs would suggest a

range of $150,000 for very basic planning ALPs to more than $600,000 to accomplish these projects.

Adopt Federal Aviation Regulation (FAR) Part 77 Height Zoning

Of the 37 airports that are recommended to establish and adopt FAR Part 77 height zoning, only one airport (Dickinson) is showing this project on their CIP. Fifteen of the airports did not submit CIPs to the NDAC because they are non-NPIAS, and the remaining 21 airports, which are included in the NPIAS, are not showing height zoning or land use projects on their existing CIPs. Therefore, the funding needed to establish and implement airport height zoning at 36 of the recommended airports is not reflected in the needs shown in Sections 8.3, 8.4, and 8.5 This additional funding should be considered to meet the NDSASP recommendation. It is likely that a statewide effort to develop general guidance on this issue may be beneficial to assist with the implementation, along with possible state funding to accomplish the development of actual zoning ordinances.

8.8 Summary

The incredible growth that the state of North Dakota is experiencing in terms of economic development as well as aviation use is an important element in the evaluation of the state aviation system. With near-term needs projected at over $358.44 million and long-term needs at $844.36 million (shown in **Table 8.10**), it is easy to see that there is a tremendous demand for infrastructure improvements and investment at the 89 airports across the state. Evaluating the needs from either a chronological perspective, geographic location or even by type of airport, it becomes evident that there is significant need across a wide range of project types to adequately address the system functionality looking toward the next ten years.

Table 8.10: Total System CIP Requests

2015-2016	Requested Federal Funds	$	224,722,586
	Requested State Funds	$	52,103,371
	Requested Local Funds	$	30,933,987
	Unidentified Funding Source	$	50,684,471
	Total Requested Funds	$	358,444,415
2015-2019	Requested Federal Funds	$	316,222,171
	Requested State Funds	$	73,237,253
	Requested Local Funds	$	50,839,872
	Unidentified Funding Source	$	150,194,786
	Total Requested Funds	$	590,494,082
2015-2024	Requested Federal Funds	$	425,620,377
	Requested State Funds	$	133,770,590
	Requested Local Funds	$	68,803,209
	Unidentified Funding Source	$	215,989,291
	Total Requested Funds	$	844,183,467

Source: 2014 Airport CIPs