Chapter 1 - Inventory of Facilities

One of the initial tasks in the preparation of an airport master plan is the collection of information on the condition of existing facilities and services. This inventory of data is necessary to not only evaluate the physical attributes of airside and landside infrastructure, but also to complete subsequent study tasks such as demand/capacity analyses and the determination of facility requirements. Information collected focuses on the use, size, quantity, type, area, operational intent, and other characteristics of the airside and landside components of an airport. Typical categories of information that are collected include history, physical infrastructure, regional setting, surrounding land uses, environmental features, historical aviation activity, business affairs, and socioeconomic demographics of the surrounding community.

Several sources of information were referenced to compile a comprehensive database of the facilities and services at the Hector International Airport (Airport). These included, but were not limited to, the previous Airport Master Plan, recent National Environmental Policy Act (NEPA) documents, the Hector International Airport website, Terminal Area Master Plan, Land Use Plan, and Airport Layout Plan (ALP). In addition, historical enplanements, aircraft operations, based aircraft, aircraft fleet mix, enplaned cargo, and automobile parking data were obtained from Federal Aviation Administration (FAA) databases and Airport records. Finally, an on-site visual inspection of the Airport was conducted to complete the inventory effort and verify any data discrepancies.

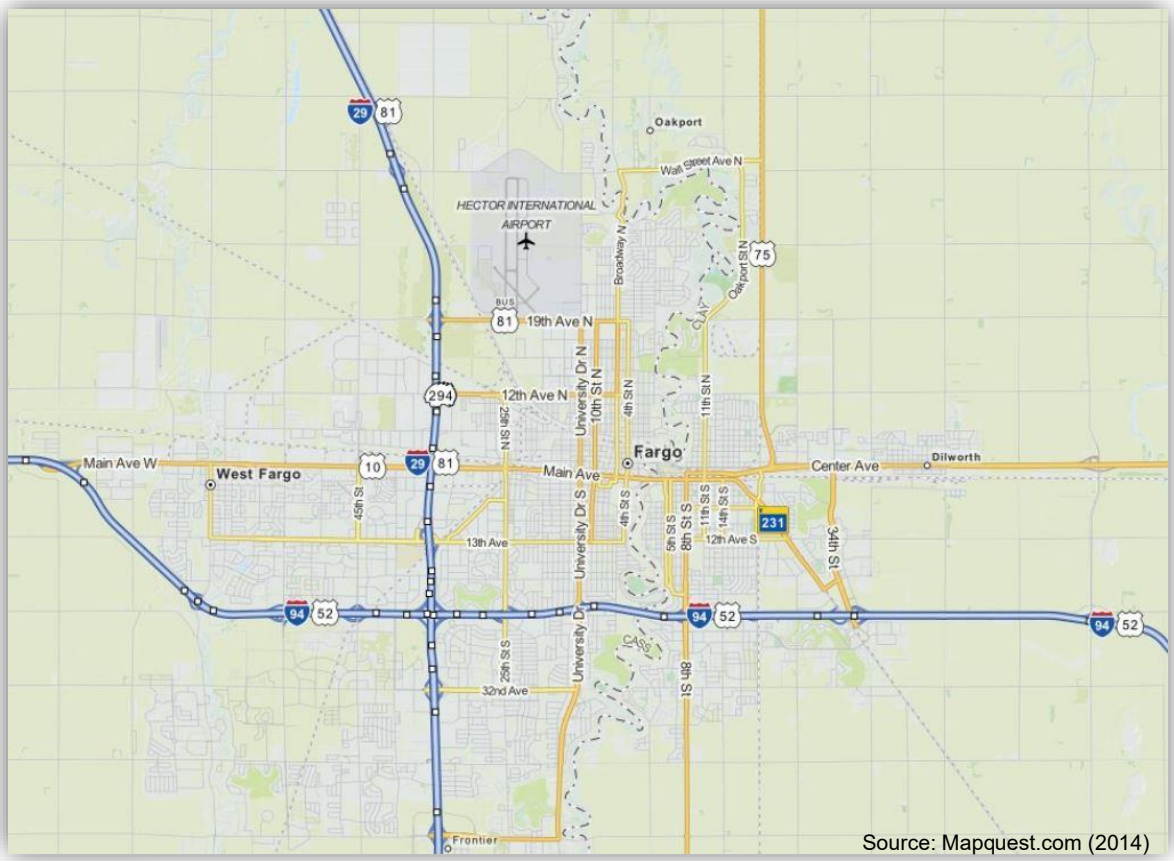
Organized by the following sections, this Chapter summarizes the data that was collected on the condition of existing Airport facilities and services:

1.1 General Description and Location Information

Hector International Airport is an important air transportation gateway for west central Minnesota and eastern North Dakota. It is classified in the National Plan of Integrated Airport Systems (NPIAS) as a primary, small hub commercial service airport that is significant to support the demands of the nation's aviation system. Within the state aviation system, the North Dakota Aeronautics Commission (NDAC) classifies the Airport as a Commercial Service airport. The Airport holds a Federal Aviation Regulation (FAR) Part 139 operating certificate, meeting the requirements of a Class I airport capable of serving scheduled and unscheduled operations of small and large air carrier aircraft. In addition, the Airport meets Aircraft Rescue and Fire Fighting (ARFF) Index C requirements for firefighting equipment and fire extinguishing agents.

The Airport is located in Cass County, in eastern North Dakota, on the north side of the City of Fargo (**Figure 1-1**). The Airport's property lies completely within the boundary of Reed Township.

Figure 1-1: Airport Regional Map



There are five publicly-owned, public use general aviation airports in proximity of Hector International Airport:

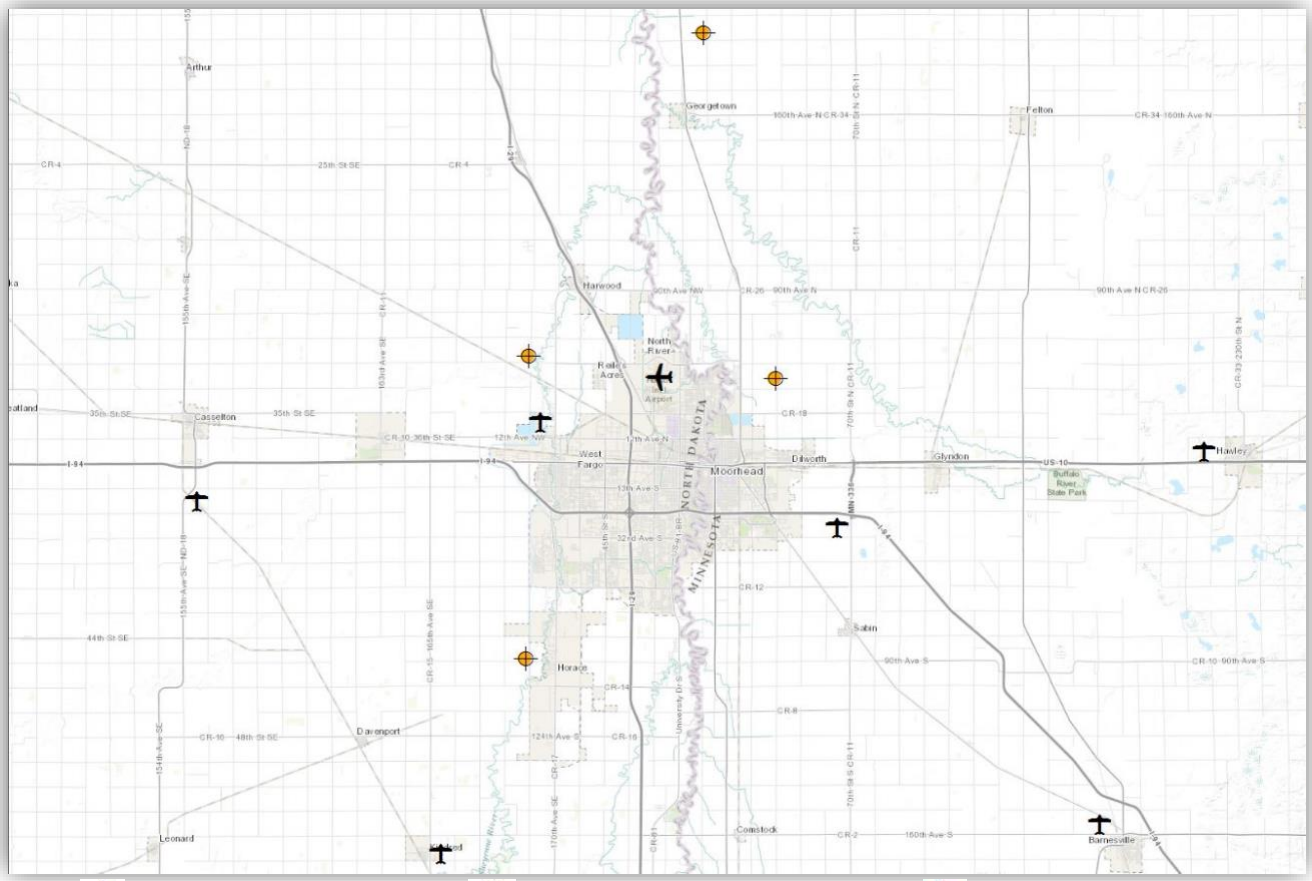
- ✓ West Fargo Municipal, in West Fargo (located approximately five miles to the west)
- ✓ Moorhead Municipal, near Moorhead (located approximately eight miles to the southeast)
- ✓ Robert Miller Regional, near Casselton (located approximately 19 miles to the southwest)
- ✓ Robert Odegaard Field, near Kindred (located approximately 20 miles to the southwest)
- ✓ Hawley Municipal, near Hawley (located approximately 22 miles to the east)
- ✓ Barnesville Municipal, near Barnesville (located approximately 25 miles to the southeast)

In addition, there are four privately-owned airports in vicinity of the Fargo Airport:

- ✓ Jerger's Field Airport, near Oakport (located approximately five miles to the east)
- ✓ Jacob Gust Airstrip, near Reile's Acres (located approximately five miles to the west)
- ✓ Bensen Airstrip, near Horace (located approximately 11 miles to the southwest)
- ✓ Mueller Airstrip, near Georgetown (located approximately 14 miles to the north)

Figure 1-2 illustrates the locations of the publicly-owned and privately-owned public use airports in proximity of the Hector International Airport.

Figure 1-2: Locations of Public Use Airports



Key: = Hector International Airport = Publicly-owned, public use airports = Privately-owned airports

Source: Mead & Hunt, Inc. (2014)

Commercial airline service at the Airport is provided by four airlines: Delta Air Lines, United Airlines, American Airlines, and Allegiant Air. As of April 2014, Delta Air Lines offers daily flights to Minneapolis and seasonal flights to Atlanta. United Airlines offers daily flights to Denver and Chicago-O'Hare, and American Airlines offers daily flights to Chicago and Dallas-Fort Worth. Allegiant Air has multiple flights per week to the destination cities of Las Vegas, Orlando, Los Angeles, Tampa, and Phoenix-Mesa. **Figure 1-3** illustrates the non-stop flights available from Fargo.

Figure 1-3: Locations of Non-Stop Destinations from Fargo Airport

Note: Destinations current as of April 2014
Source: www.fargoairport.com

Other airports offering commercial airline service in proximity to the Fargo region include:

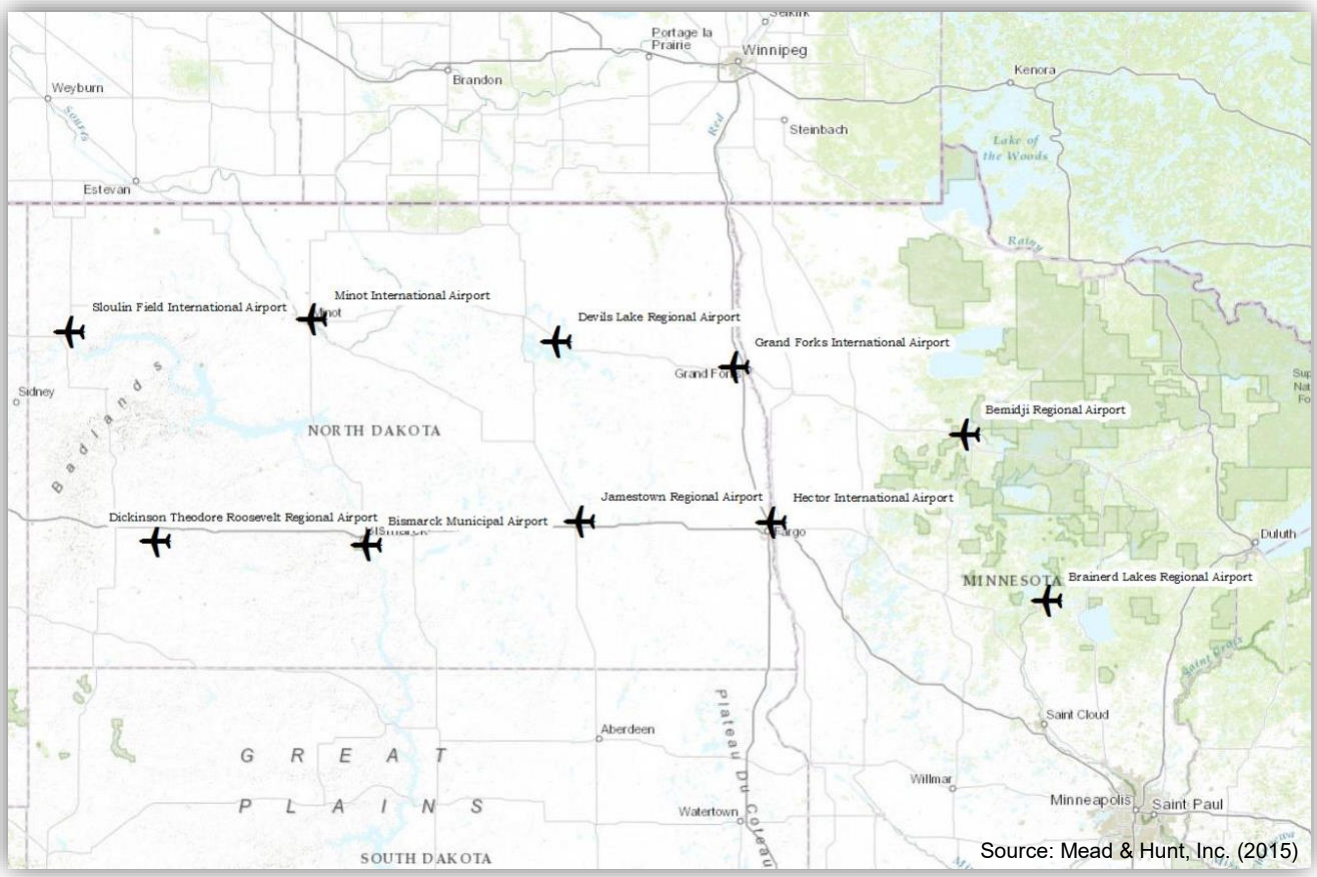
- ✓ Grand Forks International Airport, near Grand Forks (80 mile driving distance to the north)
- ✓ Jamestown Regional Airport, near Jamestown (98 mile driving distance to the east)
- ✓ Bemidji Regional Airport, near Bemidji (135 mile driving distance to the northeast)
- ✓ Brainerd Lakes Regional Airport, near Brainerd (146 mile driving distance to the east)
- ✓ Devils Lake Regional Airport, near Devils Lake (164 mile driving distance to the northwest)

It should be noted that the Jamestown Regional Airport, Bemidji Regional Airport, Brainerd Lakes Regional Airport, and Devils Lake Regional Airport, participate in the Essential Air Service (EAS) program and receive federal funds from the United States Department of Transportation (USDOT) to support commercial airline

operations at their facilities. The EAS was established to assist small communities served by certified air carriers prior to deregulation maintain a minimal level of scheduled air service. EAS subsidies are generally awarded as two-year contracts with renewal dependent upon several factors such as the average number of passengers enplaned daily at an airport. This is important to note since commercial airline service at these airports could be discontinued if EAS subsidies are not renewed in these communities.

It should also be noted that passengers in this region use Minneapolis-St Paul International Airport (a large hub airport located approximately 255 mile drive to the southeast) to access the region. **Figure 1-4** identifies the locations of commercial service airports that are used by travelers to access the Fargo region.

Figure 1-4: Locations of Nearby Commercial Service Airports



Fargo is in Eastern North Dakota, approximately 200 miles east of Bismarck, North Dakota and 250 miles northwest of Minneapolis. Interstate 29 (I-29) passes through Fargo linking it to Grand Forks and US Highway 2 (US-2) to the north and Sioux Falls and Interstate 90 (I-90) to the south. Other major interstate access to

Fargo is provided by Interstate 94 (I-94) which links Minneapolis and St. Paul to the southeast and Bismarck to the west.

In addition to being known for its relatively flat landscape, Fargo is also known as the home of North Dakota State University (NDSU) which was founded in 1890, and is one of the largest universities in the region. Often referred to as the "Red River Valley", Fargo, and the surrounding communities have evolved over time to serve their needs, and those of Sanford Health, which is the largest employer in the region. Likewise, other institutions including Essentia Health, the Fargo Area School District, Noridian Healthcare Solutions, and Microsoft have also grown to accommodate the needs of the community, becoming some of the largest employers in the region.

1.2 History

The Airport was founded in 1927 when Martin Hector leased a quarter-section of land to the City of Fargo for five years at the modest price of $1 per year. A few years later, Hector gifted this parcel of land to the City for the Airport. Over the next several years, other land donations from Hector totaled nearly 50 additional acres. Fargo's Municipal Airport, Hector Field, was dedicated on May 27, 1931. Northwest Airlines began scheduled passenger service into Fargo on February 3, 1931. Thirteen years later, in 1944, Hector's first control tower was completed. Over the next 30 years, many facility improvements were made to accommodate the increase in activity at the Airport. In 1969, the Municipal Airport Authority (MAA) was established to study, make recommendations, and oversee airport operations at the Hector International Airport. In 1986, a new terminal building was constructed to replace the old terminal which would now be used as an aviation office complex. In 2008, the commercial airline terminal building was renovated and expanded to meet an increased demand. Continual growth of the region over the next twenty years will require that the Airport continue to evolve its facilities to meet the air transportation needs of eastern North Dakota and west central Minnesota.

Northwest Airlines B-377 Stratocruiser – Early 1950's

1.3 Environment and Land Use

In order to plan for future Airport development, local environmental conditions and surrounding land uses must be well understood. Topography, soil type, and climate can all factor into determining future infrastructure needs and areas suitable for development while surrounding land uses can influence growth and expansion opportunities. As part of the inventory data collection effort, information was gathered on local environmental conditions and a review was conducted of surrounding land uses. This section summarizes the Airport's environs and adjacent land uses.

1.3.a Topography

Hector International Airport is located in the bed of a drained glacial lake within the area presently known as the Red River Valley, with the most prominent geographic feature being the Red River, located approximately 1 mile east of the Airport. The elevation of the Airport is 901 feet above mean sea level (MSL) and covers more than 2,500 acres of land surrounded by a variety of farmland and industrial and commercial areas. Land outside the immediate boundary of the Airport is comprised of land that has a very similar elevation to the Airport property.

1.3.b Soil

According to the United States Department of Agriculture (USDA) Web Soil Survey, most soil on and surrounding the Airport property is some form of silty clay which is a deep, poorly-drained soil that is formed in calcareous, clayey lacustrine sediments. The composition of this soil doesn't readily support surface water runoff, and frequent ponding is likely after rainfall. The soil has high moisture retention and is not considered prime farmland, however, many of these areas are still good soils for crop growth and are leased as such by local farmers. Some areas of the Airport are composed of Sinai silty clay and are considered prime farmland. These areas on Airport are also currently being leased to local farmers for low-profile crop production such as beans, wheat, and alfalfa. Other soil types surrounding the immediate proximity of Airport property include Fargo-Ryan silty clays, Fargo silty clays, and urban lands. Both types of Fargo silty clays are able to support agricultural operations and will sustain cereal and vegetable crops.

1.3.c Meteorological Conditions

Fargo has a humid continental climate that is characterized by seasonal temperature differences and year-round precipitation. Winters can be downright frigid with average temperatures in January reaching as low as 0 degrees Fahrenheit and as highs around 18 degrees Fahrenheit. Summers offer warmer temperatures with the average temperatures in July reaching a high of 83 degrees Fahrenheit and a low of 60 degrees Fahrenheit. Winds from the north and west are responsible for most of the weather patterns that affect the state, although summer storms from the southwest regularly affects weather patterns. On average, the area receives 22.58 inches of annual precipitation and 50 inches of annual snowfall.

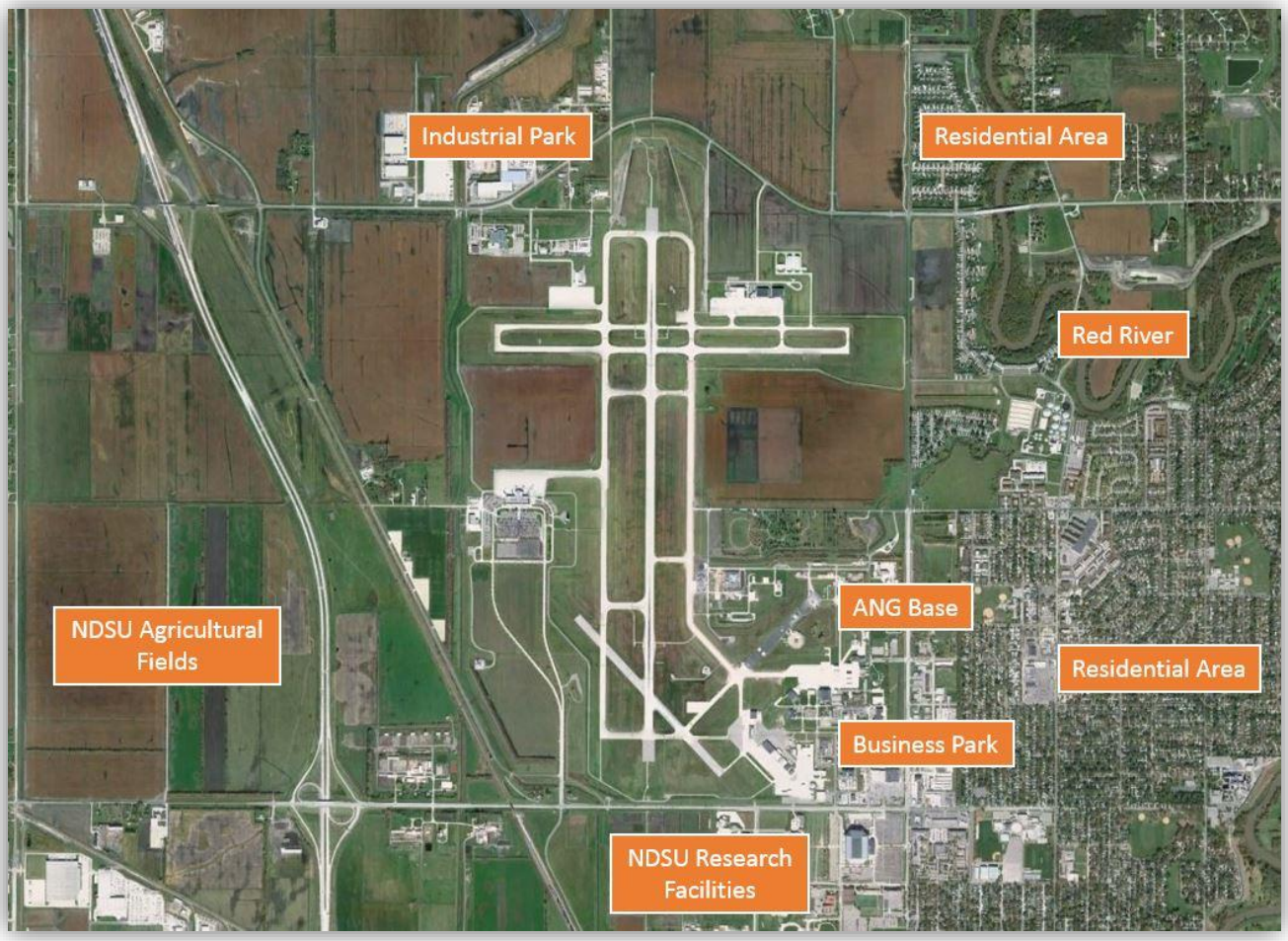
1.3.d Land Use

When studying and creating a plan for future development, the use of land that borders an airport should be reviewed to identify any possible issues if an expansion of facilities outside an airport's existing property line is needed. To the north and east of the airport, most use of land is for agricultural purposes with a few areas of low-density, single family housing. Commercial use is primarily found to the southeast with the exception of North Dakota State University's Research Facilities which includes areas focusing on nanotechnology programs, funded by the Department of Defense.

South of the Airport, most of the land is agricultural with some residential and commercial areas located between the Airport and Interstate 94. A North Dakota Air National Guard base on the on the southeastern portion of the airfield. There is also an Army Reserve facility located on the northwest end of the Airport property. Heavily treed residential and parks dominate land use northeast of the Airport, beyond which is

located the Red River. Interstate 29 runs north and south just west of the airport property line, and is surrounded by agricultural land on all sides. **Figure 1-5** illustrates the locations of land uses surrounding the Fargo Airport.

Figure 1-5: Surrounding Land Uses



Aerial: Google Maps (2014)

1.4 Socioeconomic Data

An understanding must be gained of the socioeconomic conditions within an Airport's primary service area before future aviation activity projections can be prepared to determine what infrastructure improvements will be needed over the next 20 years. Though a majority of the users reside in and around the City of Fargo, the Airport's service area encompasses Cass County in Eastern North Dakota and Clay County in Western Minnesota as illustrated in **Figure 1-6**. Socioeconomic data obtained by Woods & Poole Economics indicate the total population of the two counties that comprise the Airport's service area in 2013 was 214,304. Populations of the individual counties within the service area are summarized in **Table 1-1** which indicates that overall population grew by 15.93 percent from 184,862 in 2003 to 214,304 in 2013.

Figure 1-6: Airport Service Area

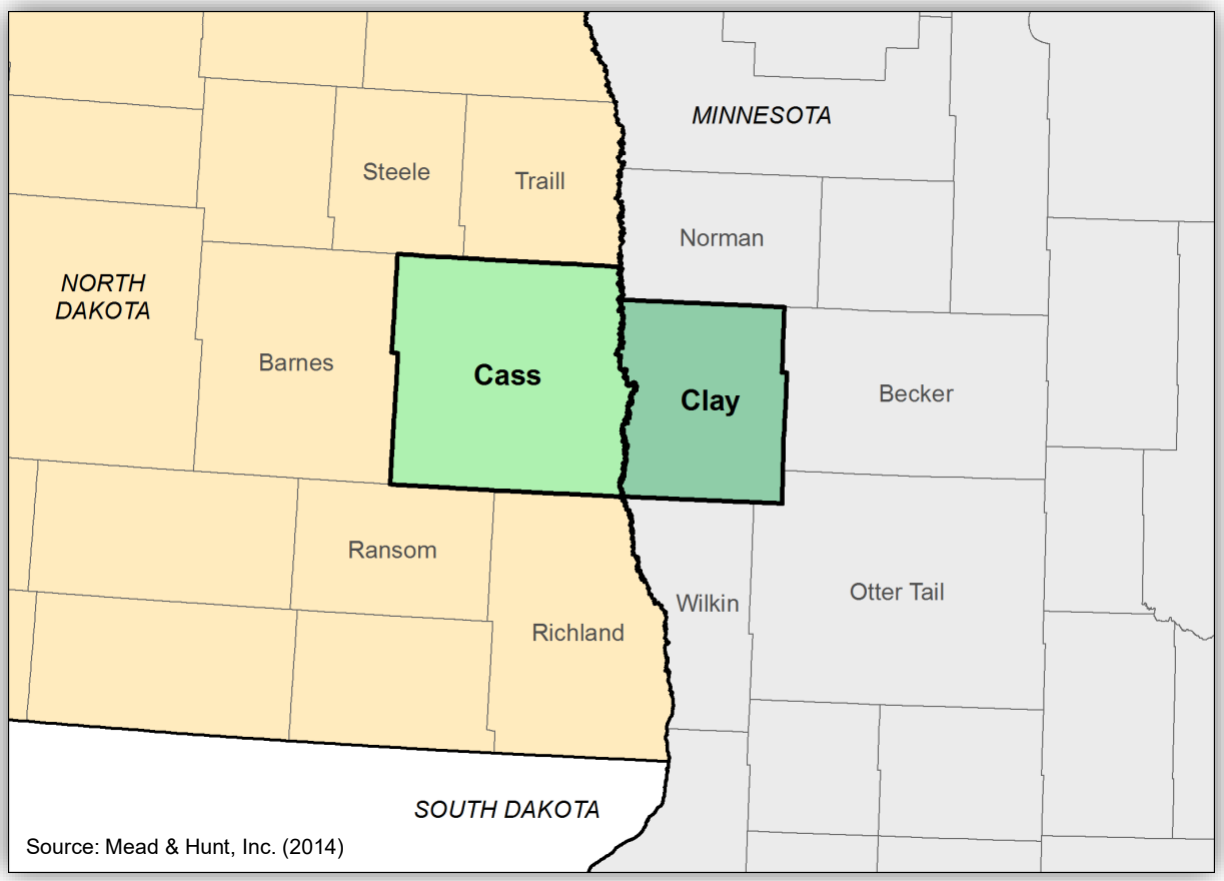


Table 1-1: Historical Population of Airport Service Area

County	2003 Population	2013 Population	% Change
Cass	131,396	154,112	17.29%
Clay	53,466	60,192	12.58%
Total	**184,862**	**214,304**	**15.93%**

Source: Woods & Poole Economics, Inc. (2014)

In addition to population, employment throughout a region offers another variable that can be used to understand the socioeconomic demographics of an airport's service area. **Table 1-2** summarizes the change in employment from 2003 to 2013 for Cass County and Clay County, surrounding the Airport. As illustrated in the table, overall employment rose 15.61 percent over the ten year period with both counties experiencing job growth Cass County (16.56%) in North Dakota and Clay County (11.59%) in Minnesota.

Table 1-2: Historical Employment of Airport Service Area

County	2003 Employment	2013 Employment	% Change
Cass	109,863	128,052	16.56%
Clay	25,756	28,742	11.59%
Total	**135,619**	**156,794**	**15.61%**

Source: Woods & Poole Economics, Inc. (2014)

In an effort to gain an accurate understanding of socioeconomic conditions throughout the service area, data was also obtained on the total retail sales for the two counties. As illustrated in **Table 1-3**, overall retail sales grew 13.26 percent from $3.06 billion in 2003 to $3.47 billion in 2013. Substantial growth was experienced in both Cass County (14.15%) and Clay County (9.61%).

Table 1-3: Retail Sales

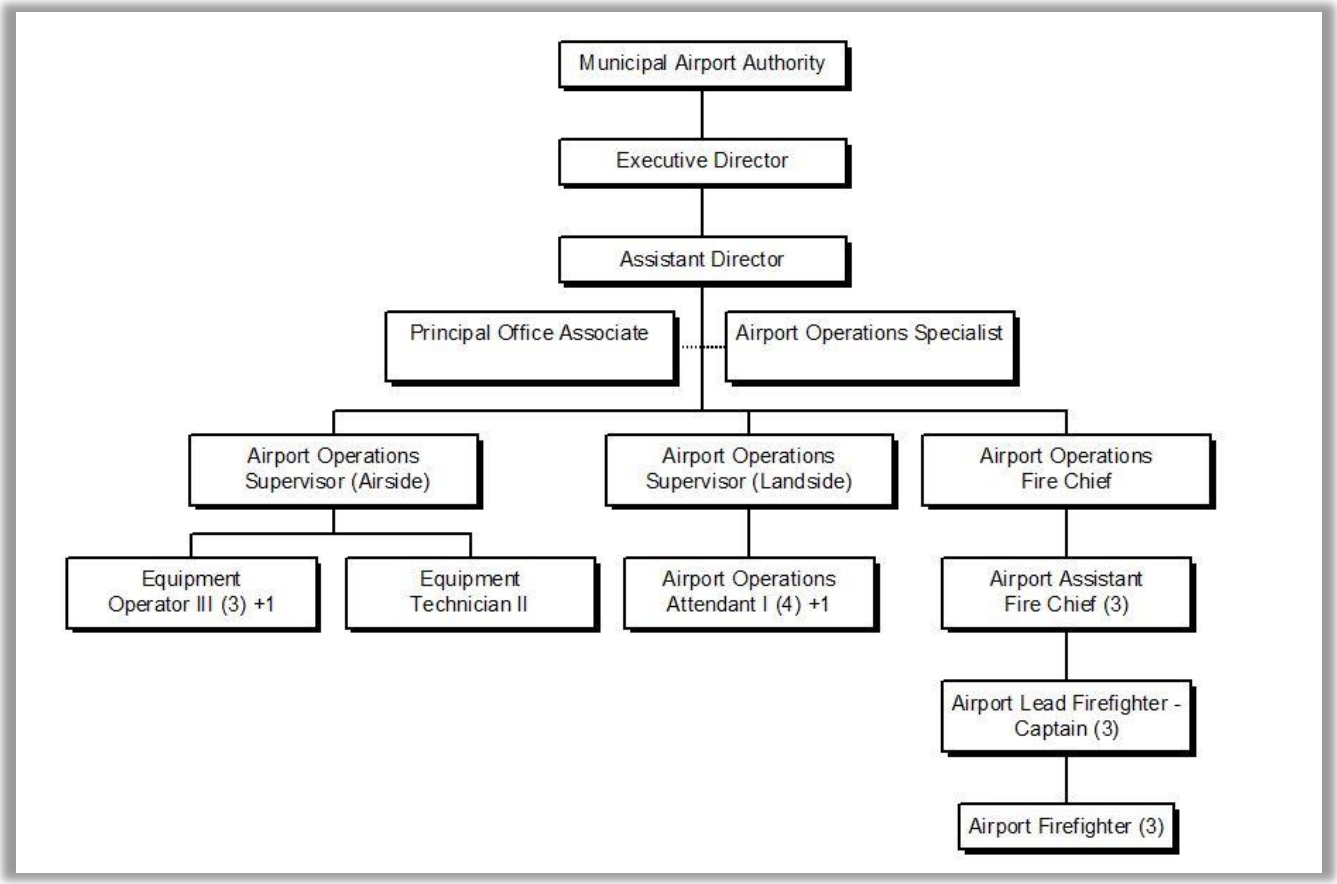
County	2003 Retail Sales	2013 Retail Sales	% Change
Cass	2,470,116,250	2,819,598,000	14.15%
Clay	597,268,750	654,648,000	9.61%
Total	**3,067,385,000**	**3,474,246,000**	**13.26%**

Source: Woods & Poole Economics, Inc. (2014)

1.5 Airport Management Structure

The Municipal Airport Authority (MAA) is the primary sponsor of the Airport who is responsible for overseeing all airside facilities (runways, taxiways, and aprons) and landside facilities including the commercial airline terminal building and rental car parking lots. The short and long term parking areas are owned by the Airport, but run by Standard Parking. Capital planning and development as well as administration duties associated with the Airport's Passenger Facility Charge (PFC) program and federal grant assurances are also the responsibility of The Municipal Airport Authority. It should be noted that The MAA is also responsible for coordinating with the Transportation Security Administration (TSA) for security of the entire Airport including commercial airline passenger screening in the commercial airline terminal building. Other airport management items that are the responsibility of the MAA include maintenance of all airfield surface pavements, snow removal, Aircraft Rescue and Fire Fighting (ARFF), as well as limited hangar and tenant leasing and rental negotiations. **Figure 1-7** illustrates the management organizational structure of The MAA staff at the Airport.

Figure 1-7: The Municipal Airport Authority Staff Management Organization Chart



Source: Hector International Airport (2016)

1.6 Existing Facilities

The inventory effort focused on the collection of information about the conditions of airside and landside facilities to help determine what improvements will be needed over the next 20 years to meet anticipated future aviation demand. A summary of the existing conditions of airside and landside infrastructure items such as the runway, taxiways, aprons, navigational aids, terminal buildings, hangars, air traffic control tower (ATCT), ARFF station, access roads, and parking lots is presented in this section.

1.6.a Runways

The main runway at the Airport, Runway 18/36, originally constructed during the inception of the airfield, is oriented in a north/south direction and is 9,001 feet in length and 150 feet in width. It is paved in concrete, grooved, and is considered to be in good condition. The latest reconstruction of this runway was completed in 2004. The runway's design meets Runway Design Code (RDC) category D-V standards, meaning it is primarily designed for aircraft with approach speeds between 141 and 166 knots and wingspans between 171 and 214 feet. A wide variety of aircraft types are capable of operating on the runway based on the weight bearing capacity of their main landing gear wheel configurations. The runway's pavement is rated to 100,000 pounds for aircraft with single wheel main landing gear configurations and 200,000 pounds for aircraft with dual wheel main landing gear configurations and 400,000 for duel-wheel tandem. The elevation of the Runway changes very little; the approach end of Runway 18 lies at an elevation of 899.6 feet MSL, while the approach end of Runway 36 lies at an elevation of 899.2 feet MSL.

The condition of pavement is evaluated using a system called the Pavement Condition Index (PCI), which categorizes pavement surface conditions using a variety of factors. Some of these factors can include skid resistance/hydroplaning potential, rate of deterioration, capacity, roughness, and structural integrity. On a scale of 0 to 100, pavements are rated using this PCI, with a score of 100 being in "excellent" condition, and a score under 10 considered to be "failed".

Another method to measure the condition of pavement is by assigning a Pavement Classification Number (PCN), which is a similar analysis to the PCI which determines pavement strength and condition. PCN is determined based on two methods: The "using" procedure in which the largest Aircraft Classification Number of aircraft permitted to operate on the pavement surface is used to calculate the PCN and the "technical" evaluation in which the PCN is determined based on the allowable load rating of aircraft operating on the surface which takes into account such factors as frequency of operation and permissible pavement stress levels. The standard PCN scale ranges from 5 (assigned to the weakest pavements) to 110 (assigned to the strongest pavements).

Applied Pavement Technology (APTech) was contracted as a part of the North Dakota PCI Study project team to prepare a PCI and PCN analysis of Runway 18/36 and all other airfield pavement surfaces. This analysis involved visual inspections of pavement surfaces, Falling Weight Deflectometer (FWD) testing, and an allowable load analysis of all airfield pavements. The analysis found Runway 18/36 has a PCI of 80-83 and a PCN of 95.

A summary of the data collected for Runway 18/36 is presented in **Table 1-4.**

Table 1-4: Runway 18/36 Data Summary

Length	9,001 feet
Width	150 feet
Surface	Concrete
Runway Design Code (RDC)	D-V
Weight Bearing Capacity	Single Wheel: 100,000 pounds
	Dual Wheel: 200,000 pounds
Pavement Condition Index (PCI) Rating	80-83
Pavement Classification Number (PCN) Rating	95

Sources: FAA 5010 Form, Airport Layout Plan, ND Aeronautics Website (2014)

The crosswind runway at the Airport, Runway 9/27, established in 1993, is oriented in an east/west direction and is 6,302 feet in length and 100 feet in width. It is paved in concrete, grooved, and is considered to be in good condition. The runway's design meets RDC category B-II standards, meaning it is primarily designed for aircraft with approach speeds between 91 and 121 knots and wingspans between 49 and 79 feet. A wide variety of aircraft types are capable of operating on the runway based on the weight bearing capacity of their main landing gear wheel configurations. The runway's pavement is rated to 60,000 pounds for aircraft with

single wheel main landing gear configurations and 100,000 pounds for aircraft with dual wheel main landing gear configurations. The approach end of Runway 9 lies at an elevation of 896.1 feet MSL, while the approach end of Runway 27 lies at an elevation of 898.4 feet MSL.

Applied Pavement Technology's (APTech) analysis found Runway 9/27 has a PCI of 94-99 and a PCN of 25.

A summary of the data collected for Runway 9/27 is presented in **Table 1-5.**

Table 1-5: Runway 9/27 Data Summary

Length	6,302 feet
Width	100 feet
Surface	Concrete
Runway Design Code (RDC)	C-III
Weight Bearing Capacity	Single Wheel: 60,000 pounds
	Dual Wheel: 100,000 pounds
Pavement Condition Index (PCI) Rating	94-99
Pavement Classification Number (PCN) Rating	25

Sources: FAA 5010 Form, Airport Layout Plan, ND Aeronautics Website (2014)

The crosswind runway at the Airport, Runway 13/31, constructed in 1973, is oriented in a northwest/southeast direction and is 3,802 feet in length and 75 feet in width. It is paved in concrete, grooved, and is considered to be in excellent condition. The runway's design meets RDC category B-II standards, meaning it is primarily designed for aircraft with approach speeds between 91 and 121 knots and wingspans between 49 and 79 feet. . The runway's pavement is rated to 26,000 pounds for aircraft with single wheel main landing gear configurations and 35,000 pounds for aircraft with dual wheel main landing gear configurations. The approach end of Runway 13 lies at an elevation of 901.1 feet MSL, while the approach end of Runway 31 lies at an elevation of 898.5 feet MSL.

APTech's analysis found Runway 13/31 has a PCI of 100 and a PCN of 17.

A summary of the data collected for Runway 13/31 is presented in **Table 1-6.**

Table 1-6: Runway 13/31 Data Summary

Length	3,802 feet
Width	75 feet
Surface	Concrete
Runway Design Code (RDC)	B-II
Weight Bearing Capacity	Single Wheel: 26,000 pounds
	Dual Wheel: 35,000 pounds
Pavement Condition Index (PCI) Rating	100
Pavement Classification Number (PCN) Rating	17

Sources: FAA 5010 Form, Airport Layout Plan, ND Aeronautics Website (2014)

1.6.b Taxiways

Taxiways are defined pavement surfaces that are used for aircraft to travel safely between the runway and other airfield destinations like hangars, terminals, and aprons. The taxiway system at the Airport is comprised of parallel taxiways that are located on both sides of Runway 18/36 and on the north side of 9/27. Several connector taxiways between the parallel taxiway and runways, as well as between the parallel taxiway and aprons, allow for movement to exterior areas of the airfield. **Figure 1-8** illustrates the taxiway system at the Airport.

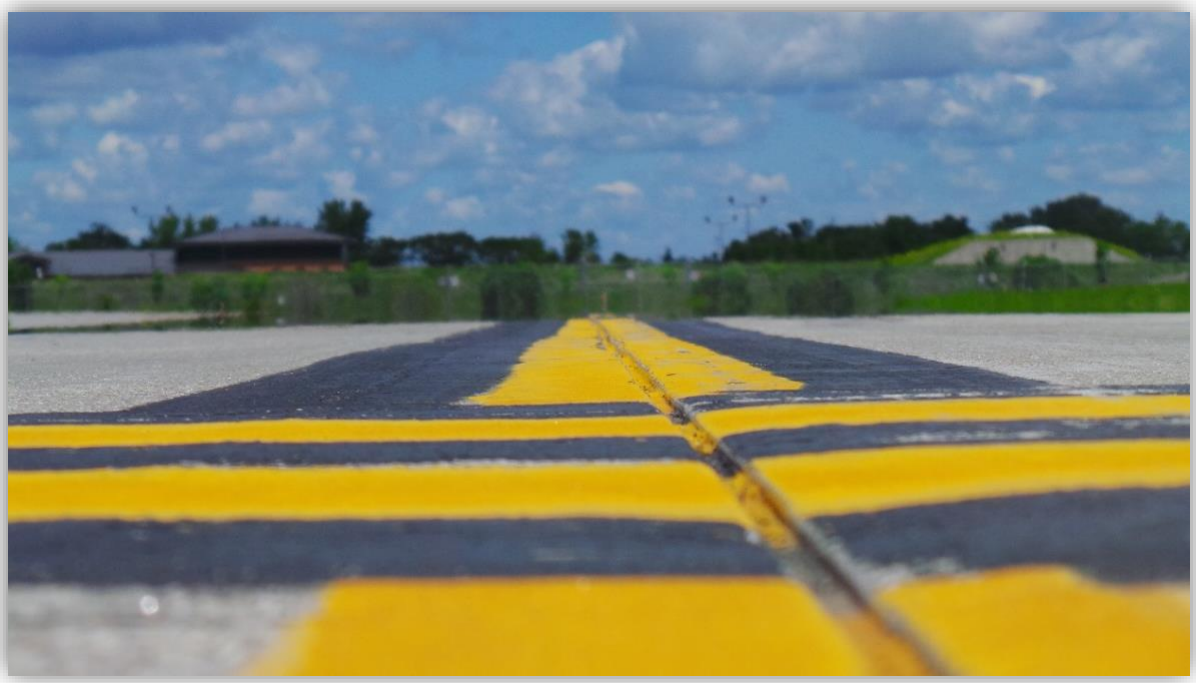
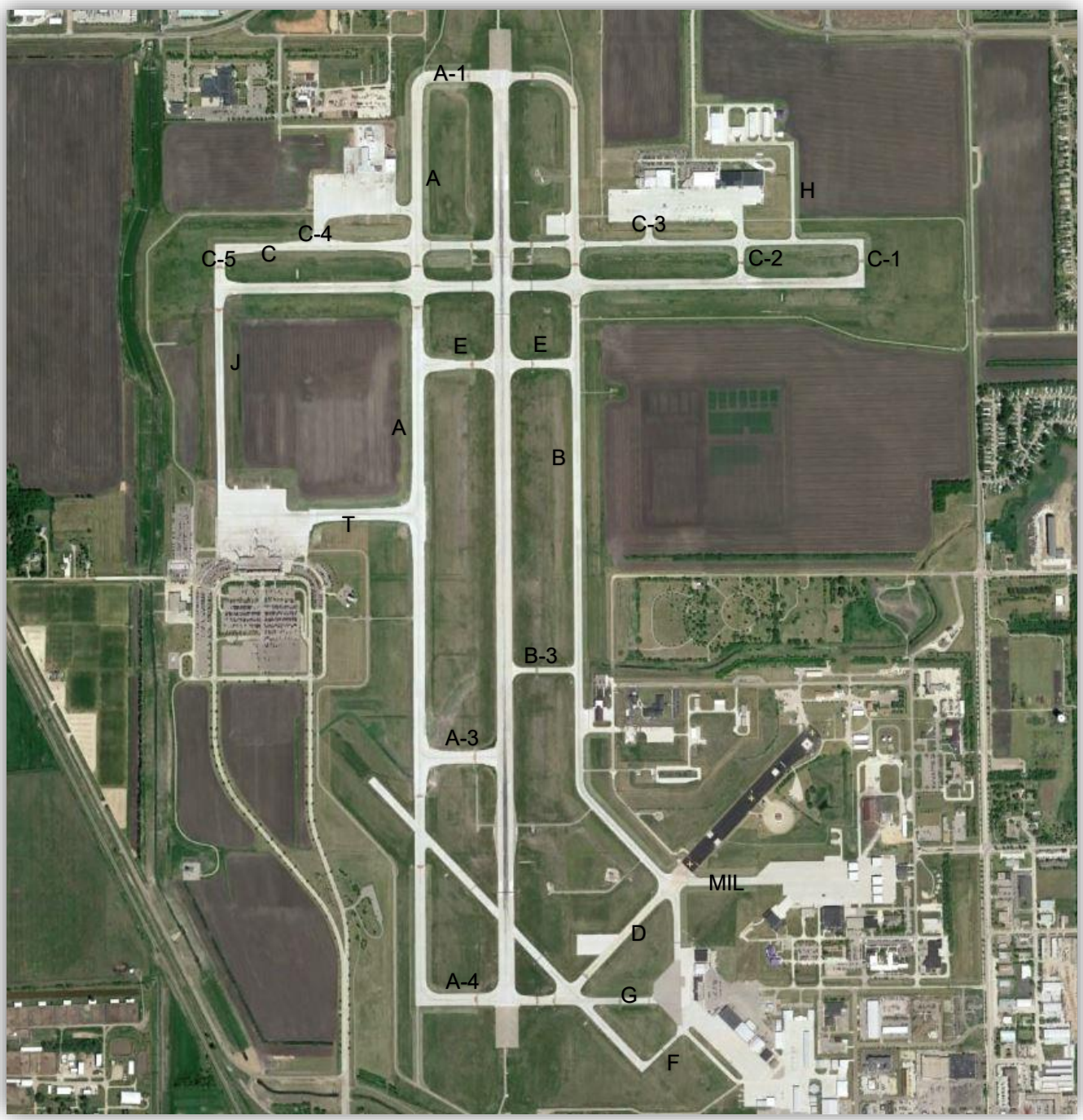


Figure 1-8: Taxiway Layout Diagram

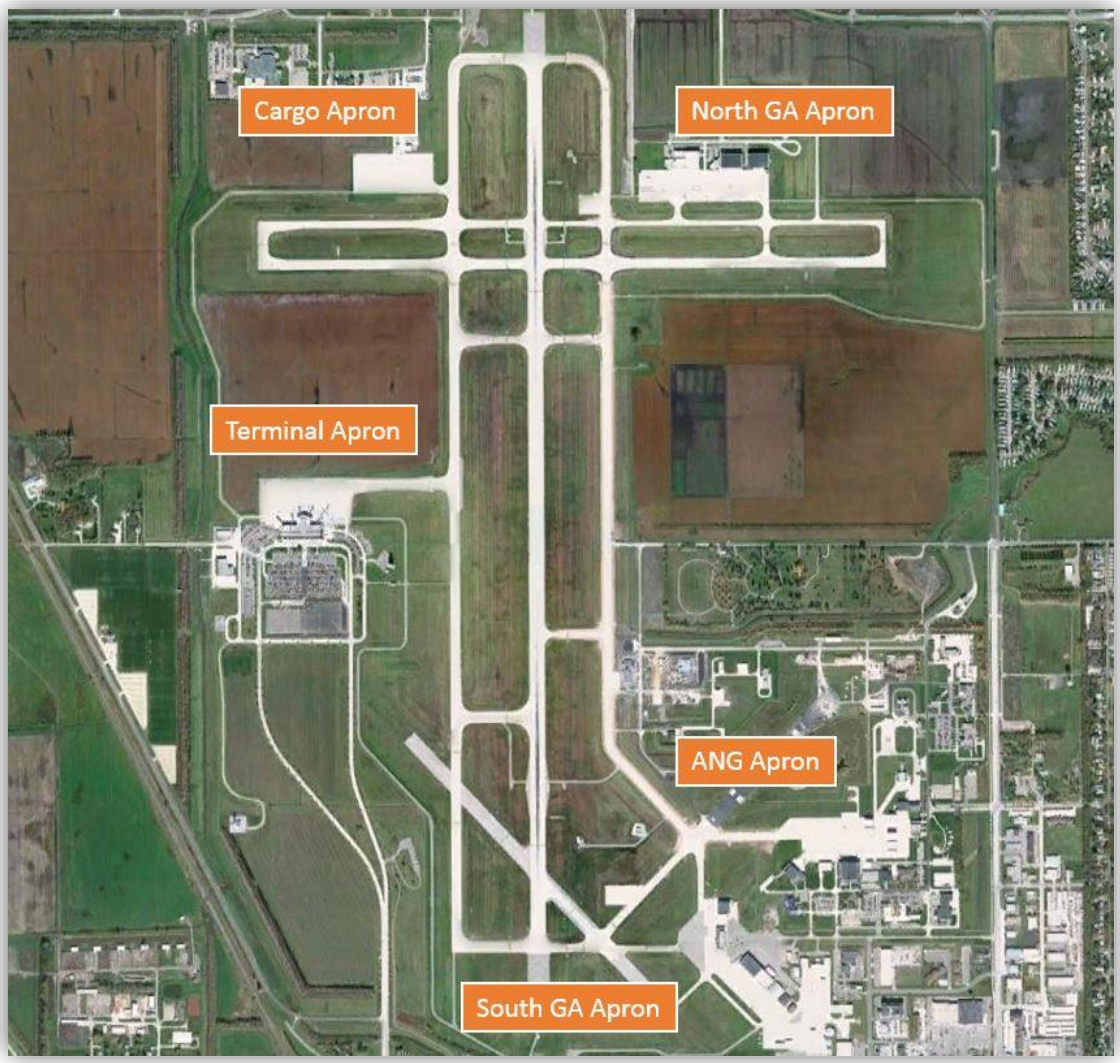


Aerial: Google Maps (2016)

1.6.c Aprons

Aprons, also known as ramps, are large surfaces that are specifically designed for the parking and servicing of aircraft. In addition, aprons provide aircraft access to hangars, fixed base operators (FBOs), terminals, and locations to transfer passengers and cargo as well as fueling and maintenance. There are four primary aprons at the Airport as identified in **Figure 1-9**. The terminal apron, located adjacent to the commercial airline terminal building, is approximately 526,300 square feet and is used exclusively by commercial airline and large charter aircraft for the transfer of passengers to and from the commercial airline terminal building.

Figure 1-9: Taxiway and Apron Layout



Aerial: Google Earth (2014)

The second primary apron, the north general aviation apron, is approximately 408,600 square feet and is located adjacent to the FBO buildings. This general aviation (GA) apron is used for a variety of purposes including the transfer of passengers and cargo between aircraft and the general aviation terminal building, parking for itinerant aircraft, and general aviation aircraft fueling. The third primary apron, the south general aviation apron, is located south of the Air National Guard (ANG) Base along Taxiway B. At approximately 575,000 square feet in area, the south GA apron is used for charter boarding (e.g. NDSU sports teams) and Life Flight operations as well as for itinerant and transient aircraft parking. The fourth primary apron, the

cargo apron, is located west of Runway 18/36, and north of Runway 9/27. At around 320,300 square feet, it is primarily used for large cargo operations such as Global Beef 747 cattle transfer operations, etc. In addition to the four primary aprons, a number of private or restricted aprons are located adjacent to hangars such as the ANG apron located north of the South GA apron and the Fargo Air Museum near the approach end of Runway 31.

1.6.d Navigational Aids

Navigational aids (NAVAIDs) are forms of visual devices and electronic equipment that assist pilots when navigating to and around an airport. NAVAIDs can be lights, signs, pavement markings, and antennas and are most beneficial when an aircraft is on approach to land and/or in conditions when visibility is limited such as during night and in inclement weather. While most NAVAIDs are ground-based equipment installed on an airfield, some are satellite-based that provide navigational signals through the Global Positioning System (GPS) to properly equipped aircraft. This section reviews both the ground-based and satellite-based visual and electronic NAVAID equipment that is used for aircraft operations at the Airport.

Visual NAVAIDs – Visual NAVAIDs are considered to be lights, signs, and pavement markings that provide visual navigational information to pilots when on approach to land and when taxiing after landing or prior to takeoff. The following section summarizes the visual NAVAIDs that are located at the Airport:

- **Rotating Beacon –** A rotating beacon is a high intensity light that rotates 360 degrees and is operated during low visibility situations such as at night and in inclement weather to assist pilots in identifying the location of an airport from the air. Rotating beacons are equipped with a green and white lens separated 180 degrees from each other so that alternating green and white flashes can be viewed from the air signaling to pilots that an airport is available for public use. The rotating beacon at the Airport is located on a freestanding tower in the southeast corner of the Airport, adjacent to the south general aviation apron.

- **Wind Indicators –** Wind Indicators (also known as wind socks or wind cones) are orange cone-shaped fabric devices that visually indicate wind strength and direction. Wind indicators are most beneficial to pilots prior to landing and during takeoff when aircraft are most impacted by surface winds; as such, wind indicators are required to be located approximately 1,000 feet from the end of a runway if it serves air carrier aircraft and lighted if an airport is open to commercial air carrier operations at night. Nine wind indicators are located at the Airport, four of them being lighted: one east of the cargo apron

near the Runway 18 end, one just south of Taxiway T to the west of Taxiway A, one south of Runway 13/31 near the Runway 36 end, and one west of the south GA apron near the Runway 31 end.

- **MALSR –** Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) assists in visually confirming the centerline of a runway prior to its threshold. MALSRs are typically equipped of with a series of light bars, each equipped with five lights that are preceded by a series of sequenced flashing lights. MALSRs are most beneficial during night, in inclement weather, when visibility is limited, and/or when lights from the surrounding environmental have the potential to make visual identification of the runway threshold challenging, such as when an airport is located in a metropolitan area. At the Airport, a MALSR is located at the approach ends of Runway 18 and 36.
- **Precision Approach Path Indicator (PAPI) –** Precision Approach Path Indicators (PAPIs) are approach lighting systems that indicate the correct glide slope to a runway through a series of angled white and red lights located adjacent to the touchdown zone aiming point marking on a runway. PAPIs are typically comprised of a two- or four-light unit in which combinations of the lights indicate if an aircraft is above, below, or on path with the correct glide slope. A four-light PAPI unit is located at each end of Runway 18/36 and Runway 9/27. A two-light PAPI unit is located at the ends of Runway 13/31. The PAPIs serving runway 18/36 are FAA-owned, while the rest are owned by the Municipal Airport Authority.
- **Runway Edge Lighting** – Runway edge lighting is an important visual navigational tool as it designates the edge of a runway pavement surface when conditions limit visibility such as during night and in inclement weather. Runway edge lights are white except for the final 2,000 feet of an instrument runway when lighting is amber in color to help pilots identify the end of the pavement surface. Runway edge lights are classified into three types of lighting systems based on the number of illumination intensity settings. High Intensity Runway Light (HIRL) systems have the greatest illumination intensity with five light settings while Medium Intensity Runway Light (MIRL) systems have three light intensity

settings. Low Intensity Runway Light (LIRL) systems offer only a single light intensity setting. Runway 18/36 is equipped with a HIRL system whose lighting intensity can be controlled by the ATCT. Runways 9/27 and 13/31 are equipped with MIRL systems and are controlled in a similar fashion.

- **Runway Pavement Markings –** While runway pavement markings are not typically considered as a NAVAID, they offer pilots with another visual confirmation of the touchdown zone, centerline, and boundaries of a runway surface. Runways with visual approaches many only require a few essential markings while runways with precision approaches may require additional markings to help pilots designate the touchdown zone and runway threshold. Each end of Runway 18/36 is equipped with precision pavement markings that include those identifying the threshold, runway designation, aiming point, touchdown zone, centerline, and the sides of the runway. Runway 9/27 is equipped with non-precision pavement markings that include the threshold, runway designation, aiming point, and centerline. Runway 13/31 is marked for visual approaches only. This includes runway designation and centerline markings only.
- **Airfield Signage –** Airfield signage is an important visual navigational aid that helps identify the locations of runways, taxiways, and aprons as well as provide information noise abatement instructions and other airfield information to pilots. Airfield signage at the Airport includes runway distance remaining signs, directional signs, runway holding signs, and surface-painted hold signs.
- **Taxiway Edge Lighting –** Taxiway edge lighting is similar to runway edge lighting in that is helps identify the edge of taxiway surfaces when visibility is limited such as during night and in inclement weather conditions. Taxiway edge lights are blue and are typically installed with three illumination intensity settings at airports that support commercial airline service. The taxiway edge lights installed at the Airport are a Medium Intensity Taxiway Light (MITL) system that is equipped with three illumination intensity settings.

- **Electronic NAVAIDs –** Electronic NAVAIDs are an important navigational tool in that they allow properly equipped aircraft to conduct landings when conditions impact the ability of a pilot to visually navigate a landing into an airport such when low cloud ceiling and/or inclement weather is presented. Electronic NAVAIDs are also used to complement visual NAVAIDs so that the capability for aircraft to arrive and depart from an airport can be maintained in both visual flight rules (VFR) and instrument flight rules (IFR) weather conditions. Electronic NAVAIDs operate by transmitting electronic signals that are received by avionics equipment installed in an aircraft. The signals transmitted by the electronic NAVAID may provide position, altitude, and speed information which allows a properly trained and certified pilot to navigate an aircraft to the Airport using only the instrumentation in the cockpit if needed. Electronic NAVAIDs range from ground based antennas installed at an airport to satellites transmitting GPS signals. The following section summarizes the electronic NAVAIDs that are utilized for aircraft landings at the Airport.

- **Instrument Landing System (ILS) –** An Instrument Landing System (ILS) is a series of two antennas that provide horizontal and vertical positioning guidance information to properly equipped aircraft on approach to land on a runway. The first antenna, a localizer, is positioned beyond the far end of a runway and transmits a signal down the length of the runway and beyond to help aircraft on approach to land to align horizontally with the runway centerline. The second antenna, a glide slope, transmits a signal that guides aircraft vertically with the correct glide slope towards the landing threshold. An ILS is the most precise electronic navigational guidance system of all electronic NAVAIDs. There are different categories of ILSs based upon the navigational accuracy of the transmitted signals, the allowable decision height at which visual confirmation of the runway is needed in order to land, and the minimum visibility needed to conduct an approach. The standard ILS, Category I, allows a properly equipped aircraft to conduct a landing with the cloud ceiling height is not lower than 200 feet and the

visibility is not lower than 1/2 mile. At the Airport, a Category I ILS is installed at the approach end of Runways 18 and 36.

- ✓ **Global Positioning System (GPS) –** The Global Positioning System (GPS) is a satellite based navigational system that transmits location signals to properly equipped aircraft so that location, altitude, direction of travel, and speed can be determined. GPS offers the ability for aircraft to conduct non-precision approaches to runways that are not equipped with ground based navigational equipment. At the Airport, Area Navigation (RNAV) GPS approaches can be conducted to Runways 18, 36, 9, and 27.
- ✓ **Very High Frequency Omni-directional Radio Range (VOR) –** A Very High Frequency Omni-directional Radio Range (VOR) antenna is a ground based navigational system that emits radio signals in Morse code to help an aircraft calculate its bearing. VORs are utilized for non-precision approaches and operate by directing an aircraft to the general vicinity of an airport upon which the pilot must be able to visually identify the airfield prior to maneuvering for a landing. The VOR used for navigational purposes at the Airport is located approximately 10.1 miles to the south near Horace. A VOR approach is available to the end of Runway 36.

1.6.e Weather Equipment

Weather observation equipment is often installed at an airport to record and disseminate accurate and timely weather conditions since aircraft operations can be directly impacted by local weather conditions. Two types of weather observation equipment are often installed at airports: Airport Surface Observation Systems (ASOSs) and Airport Weather Observation Systems (AWOSs) with the components of each system are relatively the same. At the Airport, a service level "C" ASOS unit is located adjacent to Taxiway B, south of Taxiway E. The ASOS unit is equipped to measure temperature, dew point, barometric pressure, density altitude, visibility, precipitation accumulation, cloud ceilings, sky cover, present weather conditions, thunderstorm detection, freezing rain, ice accumulation and wind data such as speed, direction, and gusts. This system also allows augmentation by observers for conditions such as smoke and volcanic ash.

1.6.f Commercial Airline Terminal

The nearly 100,000 sf commercial airline terminal building has a simple linear configuration; the security screening checkpoint, holding area, and aircraft boarding gates comprise the north half of the building's upper level, while the restaurant and gift shop comprise the southern portion of the upper level. The airline ticket counters, baggage claim, and rental car service counters comprise the southern lower level. At the north side of the building, on the secure side of the passenger screening checkpoint, a secure area offers departing passengers an area to wait for flights. Amenities include flight information boards, televisions,

vending machines, and a coffee/convenience shop. Gate areas along the length of the holding area provide passengers access to five boarding gate positions for commercial airline aircraft on the air carrier apron. On the public side of the passenger screening checkpoint, two restaurants and a gift shop are provided to fulfill passenger needs. In the lower level, five airline ticket counters are occupied by Delta Air Lines, United Airlines, Allegiant Air, Frontier, and American Airlines. The baggage claim area is west of the airline ticket counters and is comprised of three bag belts, and three rental car ticket counters. Public access to the building is made available by the main entrances along the airline ticket counters and the baggage claim area on the south side of the building. The Municipal Airport Authority and TSA offices are located above the baggage claim area on the second floor.

1.6.g General Aviation Terminal

The general aviation terminal is located on the north general aviation ramp and contains amenities for pilots, passengers, and offices for Fargo Jet Center and Weather Modification, Inc. staff. The interior design of the general aviation terminal building offers a large open atrium and modern furnishings with floor to ceiling windows facing towards the airfield. The floor plan is designed around a centralized passenger waiting area which includes couches, tables, chairs, carpeted floors, and a reception desk. The east wing of the building houses a pilot's lounge, restrooms, kitchen area, and a conference room available for use by customers while the offices of Fargo Jet Center staff and an executive conference room are located in the upper level of the building.

1.6.h Fixed Base Operator Services

Fixed Base Operator (FBO) services are considered to be aeronautical goods and services for pilots, general aviation passengers, and aircraft operators which includes, but is not limited to, fueling, aircraft rental, flight instruction, catering, aircraft maintenance and repair, deicing, and other aircraft ground handling services such as aircraft marshaling, lavatory services, and courtesy vehicles for flight crew members. Fargo Jet Center provides the following FBO services:

- ✓ Itinerant aircraft hangar parking
- ✓ Transient aircraft hangar storage
- ✓ Aircraft maintenance and repair
- ✓ Powerplant maintenance and repair
- ✓ Aircraft fueling
- ✓ Aircraft deicing
- ✓ Courtesy crew vehicle
- ✓ Flight training
- ✓ Aircraft sales
- ✓ Aircraft charter

Fargo Jet Center FBO staff also makes arrangements for rental cars and caterers, as well as assistance with lodging reservations through negotiated crew rates at area hotels. In addition to these FBO services, they also provide flight instruction, aircraft sales, and aircraft rental services at the Airport. The Fargo Flight School is a pilot training institution that offers flight instruction, aircraft rental, and provides flight and ground training instruction. Red River Aero and Vic's Aircraft Sales, LLC are further companies that provide FBO services at the Airport. These FBOs specialize in charter flights as well as aircraft maintenance and rental.

1.6.i Hangars

There are a variety of hangars at the Airport that are used by based and itinerant aircraft for recreational and business flying purposes. North of the north general aviation apron, five 30,000 square foot box-style hangars owned by Fargo Jet Center are used primarily to support FBO services such as itinerant aircraft parking, transient aircraft, and aircraft maintenance and repair. Northeast of Fargo Jet Center are two T-hangar structures that have a combined 20 T-style hangar units for single- and small twin-engine aircraft; surrounding these hangars are three private, standard, metal hangars that house owner's aircraft. Each hangar is roughly 6,400 square feet. On the east side, along 20th Street North and Jet Drive, is the 380 North hangar. This hangar houses three separate corporate aviation operations under one roof. Each has one third of the building's approximately 24,000 square feet of combined area. Each unit is equipped with secured landside entrances. On the south general aviation ramp, there are nearly 20 private, box-style hangars, two T-hangars with 26 total units, and one three unit row hangar, all with easy access to the approach end of Runway 31. The Fargo Air Museum owns 2 hangars on the South GA apron, sitting on around 37,500 square feet of real estate. This space is used to house a variety of display aircraft both flying and static. The next largest hangar belongs to Group VI. This is a corporate partnership that combines four flight departments into one 45,000 square foot hangar storage facility for their eight aircraft.

1.6.j Fuel Storage Facilities

There are two main aircraft fuel storage facilities at the Airport; the West Fuel Farm is located south of the SRE building and consists of two (2) 30,000 gallon Jet-A tanks, one (1) 1,000 gallon 100LL tank, and one (1) 10,000 gallon glycol tank. These products are primarily used for commercial operations on the terminal ramp, and are owned by Fargo Jet Center. The North Fuel Farm consists of one (1) 15,000 gallon 100 low lead (100LL) tanks, two (2) 15,000 gallon Jet-A tanks, one (1) 22,000 gallon Jet-A tank. These tanks are used and owned by Fargo Jet Center to service its customers on the North GA ramp. The fuel farm area located adjacent to the South GA ramp has 2 separate users. The first is the Fargo Air Members fuel coop that has approximately 20 members that share a stake in the system. This 2,000 gallon 100LL tank, on the north side of the farm, is a self-serve tank that members can use to fuel their aircraft. The other two tanks to the south, one (1) 10,000 gallon Jet-A tank, and (1) 5,000 gallon 100LL tank are owned by Group VI. Each fuel farm site has EPA-approved secondary containment measures to help contain fuel in the event of an accidental

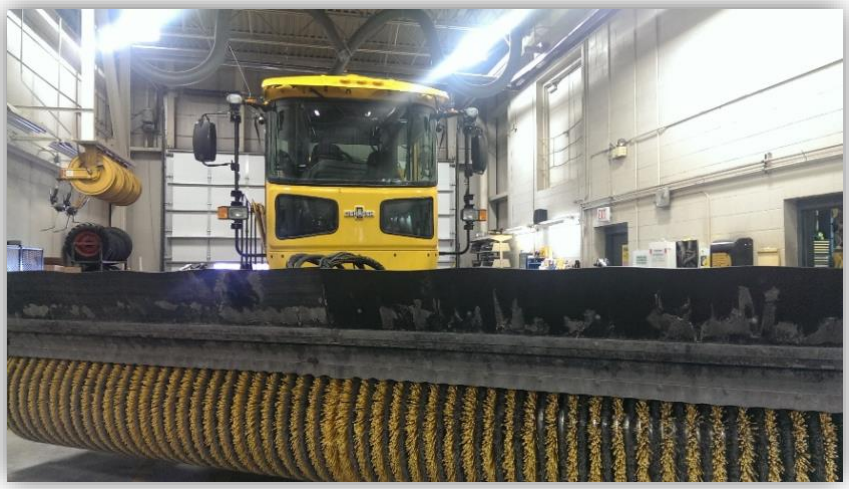
leakage. For transient aircraft, Jet-A and 100LL fuel at the Airport is available 24 hours per day, seven days a week, 365 days a year through the Airport's FBO staff.

1.6.k Air Cargo Facilities

A privately-owned shipping center and air cargo facility at the Airport for package services is located on the northwest cargo apron. The facility has been recently utilized primarily by Boeing 747 aircraft to transfer cattle between North Dakota and Kazakhstan. The facility/shipping center is now available for lease by a private company to sort and load packages at the Airport. Airside access to the facility is provided by Taxiways C4 and A, while landside access is made available via 31st Street N.

Since the initial authoring of this document, Fed Ex has been operating from this facility for more than a year. Along with a major remodel of existing facilities, they have also constructed a large new hangar that is used to store smaller feeder aircraft such as the Cessna Caravan 208. These feeder aircraft support the operation of two Airbus A-300 or Boeing 767 aircraft daily.

1.6.l Snow Removal Equipment Facility



The snow removal equipment (SRE) facility, located southwest of the terminal building adjacent to the long-term parking lot. It is used for the storage, servicing, and repair of vehicles and equipment utilized for maintaining the airfield. The SRE facility is large enough to hold nearly 20 vehicles, with access doors opening to the north and south. It houses many of the Airport's two blowers, three plows, two brooms, four tractors, three pickups, two sand trucks, and one Saab friction test vehicle. One additional vehicle bay, capable of holding the largest equipment available on today's market, is used for repair and maintenance. It is located at the east end of the building and also opens to the north and south. In addition to SRE equipment, the 25,000 square foot building offers room for operations personnel office areas, a kitchen/lounge area, restroom facilities, and locker rooms.

1.6.m Aircraft Rescue and Fire Fighting (ARFF) Facility

The Aircraft Rescue and Fire Fighting (ARFF) facility, built in 2010 is an 18,750 square foot building located adjacent to Taxiway Bravo just north of the South GA apron. It is equipped with six double-depth vehicle bays used for the storage of trucks and emergency vehicles. These bays currently house two new Oshkosh Striker vehicles - one 3,000 gallon and one 1,500 gallon. Additional storage areas are used for surplus equipment, supplies, and fire-fighting gear. The state of the art ARFF facility also has personnel areas such as locker rooms/shower, training room, exercise facilities, full kitchen area, and command offices.

1.6.n Airfield Electrical Vault & Generator

A constant supply of power to airfield lighting and navigational equipment is essential for an airport to support continual aircraft operations. Two elements that are necessary to supply a continual source of power to airfield electrical components are an airfield electrical vault and a power generator. Airfield electrical vaults are structures designed to house transformers, lighting panels, constant current regulators (CCRs), relays, and other electrical components necessary to keep an airfield's electrical infrastructure operational. Airfield power generators are typically diesel powered and provide a source of backup electricity in the event of an off-Airport public utility power failure.

Since airfield electrical vaults and generators are often connected to the same circuit, they are generally located in close proximity to one another to provide a centralized location for maintenance and accessibility. At the Airport, the airfield electrical vault and airfield generator are located in the same structure adjacent to the ATCT and Taxiway A which provides a convenient location for inspection and maintenance purposes. A separate backup generator for the Airline Terminal is located in the lower-west portion of the terminal building.

1.6.o Airport Access Roads

Most access to the Airport is provided from Dakota Drive north from 19th Avenue and also from Old Highway 81 via County Road 20. It should be noted that another access road is located on the west side of the Airport via 32nd Avenue North from Old Highway 81. Access to this perimeter road is gated and is not available for public use; instead, it is intended for Airport and emergency vehicles to access locations on the north side of the airfield. Access to the north air cargo facilities is gained via 31st Street North. This road is gated at the ramp, but is accessible by airport operations staff and those with business in that area. The North GA area is accessible by 20th Street North. This gives access to private and public hangar areas, as well as Fargo Jet Center's facility. The ANG Base is accessed from 32nd Avenue North, and is secured to keep out all but ANG staff and approved visitors. The facilities of the South GA and the East Terminal area are accessed via 23rd Avenue. Service roads to the radar, localizer, NAVAIDs and MALSR lighting systems are not available for public use.

1.6.p Automobile Parking

There are a number of automobile parking lots at the Airport. The airline terminal lots (2,024 spaces) are the main parking lots located generally south of the commercial airline terminal building and used for daily (1,460 spaces), economy (324 spaces), and hourly (240 spaces) parking. Other parking lots supporting activities of the terminal building include the employee lots (158 spaces) to the east (north and west of the ATCT) and the rental car lots (493 spaces) located on the west side of the terminal building.

Another major area of parking is near the North GA area, most notably Jet Center. There are a combined three separate lots with a total of 152 parking stalls. These lots serve the FBO, the Fargo Flight School, Weather Modification, Inc. and any other transient operations. The East Terminal/South GA area has a large lot with approximately 175 stalls that serves all of the activity in the area including Group VI, Dakota Air Parts, Spectrum Aero Med, etc.

In addition, there are a number of parking lots located adjacent to hangars and facilities including the Air Museum, the ANG base, and the Airport operations facility. **Table 1-7** summarizes many of the vehicle parking spaces at the Airport

Table 1-7: Automobile Parking Lot Capacities

Commercial Airline Terminal Building		General Aviation Facilities	
Parking Lot	**Spaces**	**Parking Lot**	**Spaces**
Hourly	240	North GA	152
Daily	1460	E. Terminal/South GA	175
Economy	324	North Cargo	34
Rental Car	493	Guard Base/ARFF	746
Employee	158	Air Museum	168
		Airport Ops./SRE	28

3,978 TOTAL PARKING SPOTS

Source: Municipal Airport Authority, Mead & Hunt, Inc. (2014)

1.7 Businesses and Tenants

There are several businesses and tenants at the Airport which conduct both aeronautical and non-aeronautical related activities. Within the commercial airline terminal building, the airlines (Delta Air Lines, Frontier Airlines, United Airlines, Allegiant Air, and American Airlines) and the rental car agencies (Avis/ Budget, Enterprise, National/Alamo, and Hertz) lease ticket counter and administrative office space for their operations. The Transportation Security Administration (TSA) also has administrative office space within the commercial airline terminal building to support its passenger and baggage screening operations. Other businesses leasing space in the commercial airline terminal building include Subway, a national sandwich chain offering food and drink items, and Marlin's, a regional restaurant that offers a variety of meal options. The Airport Gift Shop Place offers simple refreshments, gifts, souvenirs, and other travel needs. It also offers a wide variety of locally made products from the surrounding area. There are a few taxi and shuttle services which operate near the baggage claim.

A number of aeronautical-related business and entities are also located on the Airport. Dakota Air Parts (surplus helicopter parts), Vic's Aircraft Sales, LLC (aircraft sales and rental), and Spectrum Aero Med (medical beds for aircraft) all have aircraft and office space within private hangars on the South GA apron to support their businesses. A small portion of Airport property adjacent to the north cargo apron is leased to the Army National Guard and the North Dakota Armed Forces Reserve Center for the staging and storage of vehicles, personnel, and equipment in support of their role.

1.8 Airspace

In addition to information that was collected on physical infrastructure elements, an inventory was taken of the airspace surrounding the Airport which included information on the classification of airspace as designated by the FAA. The following section provides a summary of these airspace components and lists the dimensions, where appropriate, for airspace surfaces that are associated with Runway 18/36, 9/27, and 13/31.

1.8.a FAA Airspace Classification

Airspace over the United States can be classified into one of six separate categories by the FAA. The classification is based on different criteria, such as type of air traffic control (ATC) within the airspace, IFR and VFR flight requirements, and level of activity. There are certain operating rules, conditions, and restrictive circumstances that apply to each category of airspace. The following summarizes the six classifications of airspace and describes the operational criteria associated with each of them.

Class A – Class A airspace is located between the altitudes of 18,000 feet and 60,000 feet MSL and lies overtop of the entire United States. Aircraft operating in Class A airspace are required to file a flight plan with an FAA Flight Service Station (FSS) do so under IFR. All aircraft operating in this airspace must receive approval from ATC before entering and must maintain constant radio communication with ATC.

Class B – Class B airspace is located between ground level and rises to 10,000 feet MSL; generally, Class B airspace is designated around airports with high levels of air traffic. The horizontal dimensions of Class B airspace can vary based on the specific needs of an airport that include orientation of the runways, surrounding land uses, and arrival and departure procedures. Aircraft operating in this class of airspace are required to receive clearance from ATC prior to entering and are required to remain in constant radio communication.

Class C – Class C airspace is from ground level to an altitude of 4,000 feet MSL and is only associated with airports that have a control tower, radar approach control, and have a large number of IFR operations. The horizontal dimensions of Class C airspace will vary depending on the specific needs of an airport but generally is designed in a two-tier shape with an inner radius of five miles around an airport from ground level to an altitude around 1,200 feet MSL while the outer radius is ten miles and ranges from an altitude of 1,200 feet MSL to 4,000 feet MSL. Permission is required from ATC for an aircraft to enter Class C airspace; constant radio communication with ATC is also required as well.

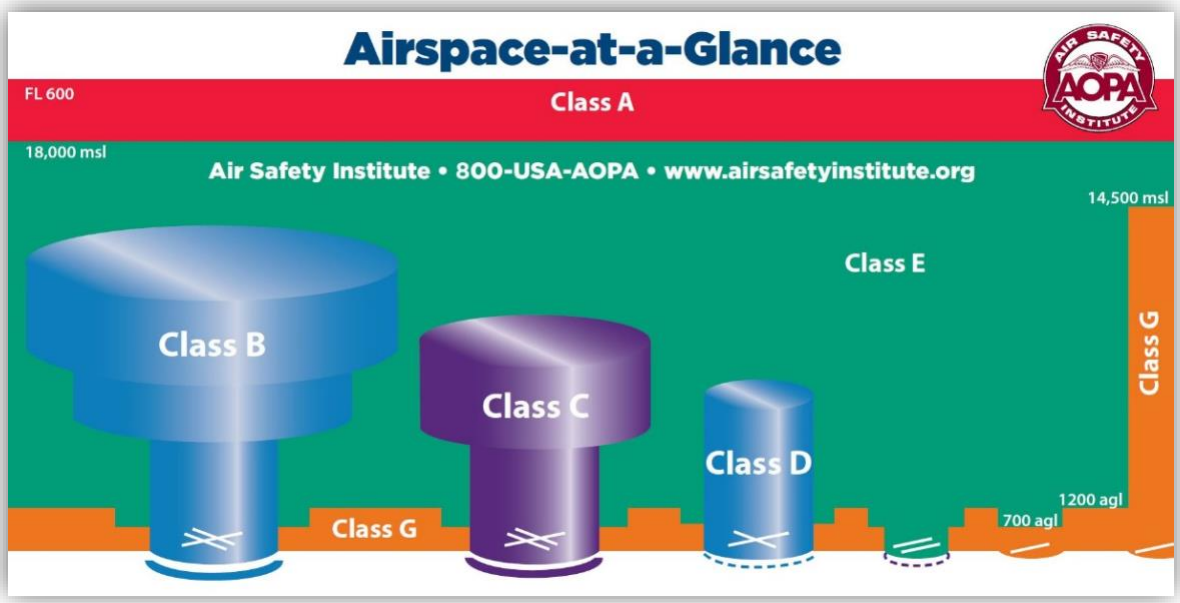
Class D – Class D airspace is located between ground level to an altitude of 2,500 feet MSL and is assigned around airports that have an air traffic control tower, but may not have radar approach control. The horizontal dimensions of Class D airspace vary based upon the specific needs of an airport such as types of arriving and departing aircraft, level of IFR/VFR activity, and aircraft approach and departure routes. Aircraft operating in Class D airspace must request permission to do so from ATC and must remain in constant radio communication.

Class E – Class E Airspace is located between ground level to 18,000 feet MSL and from 60,000 feet MSL to the upper operational ceiling of aircraft that is not classified as A, B, C, D, or G. Aircraft operating under IFR are required to maintain constant communication with ATC while within Class E airspace; aircraft operating under VFR are not required to contact ATC while in Class E airspace.

Class G – While Class G airspace is classified as being located between ground level up to an altitude of 14,500 feet MSL, it is generally assigned from ground level to an altitude of 1,200 feet MSL. This class of airspace is typically found around large, remote areas and does not require aircraft operating within it to contact ATC.

Figure 1-10 illustrates the six classifications of airspace.

Figure 1-10: Classes of Airspace

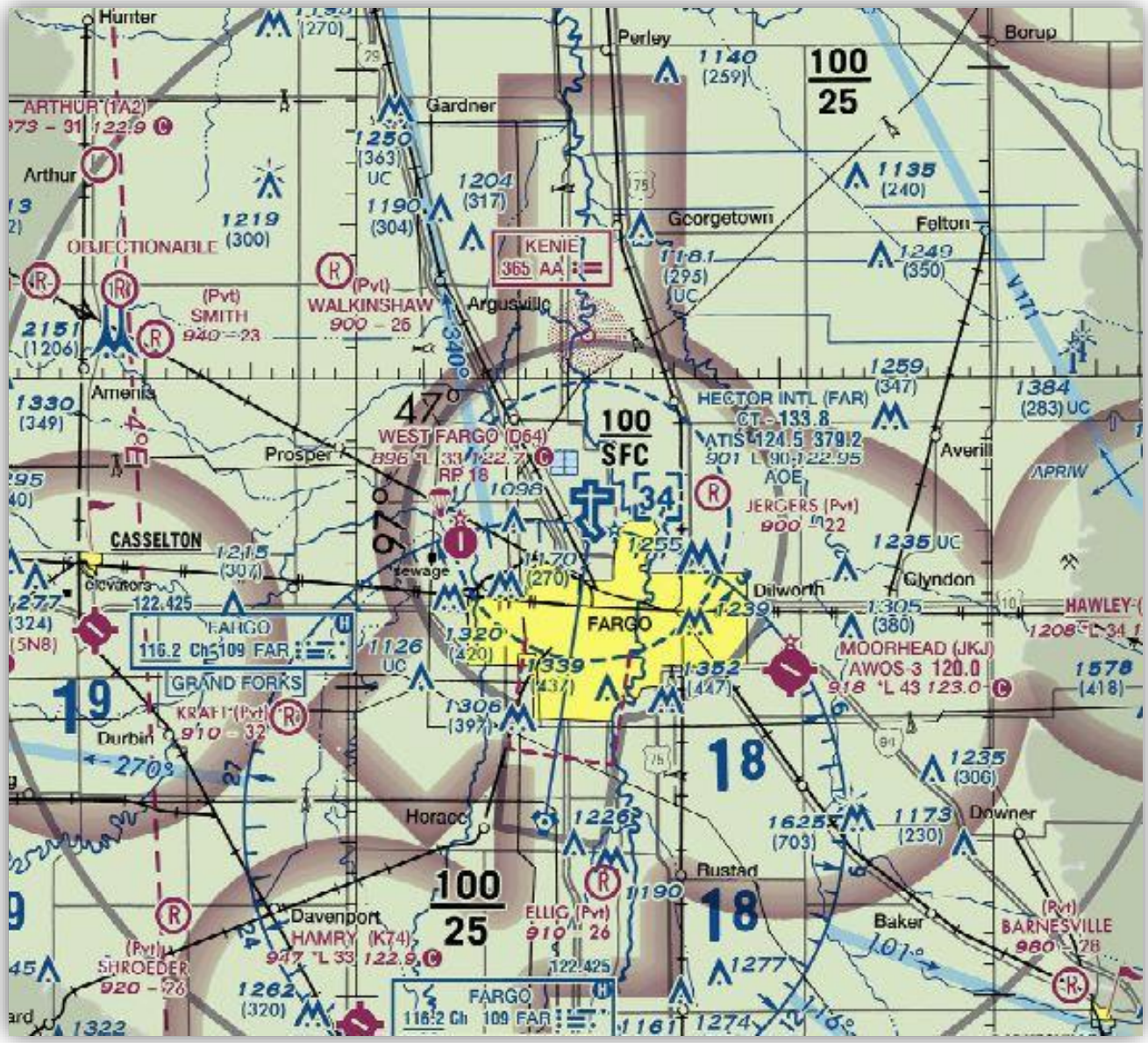


Source: Aircraft Owners and Pilots Association (AOPA) 2014

As illustrated in **Figure 1-11** on the following page, Class D airspace is centered at the Airport and extends 4.5 miles around the facility from ground level to an altitude of 3,400 feet MSL. Airspace extending to the south 3.4 nautical miles (NM) from the Class D 4.5 NM radius at a bearing of 179 degrees with a width of 3.4 NM located between ground level and 18,000 MSL and considered to be Class E airspace. Airspace extending to the north 9.3 miles from the Class D 4.5 mile radius at a bearing of 351 degrees with a width of 4.5 miles located between 700 feet MSL and 18,000 feet MSL is considered to be Class E airspace. Likewise, airspace extending to the southwest 6.2 miles from the Class D 4.5 mile radius at a bearing of 241 degrees with a width of 4.5 miles located between 700 feet MSL and 18,000 feet MSL is also considered to be Class E airspace. Airspace extending to the south 6.9 miles from the Class E to the surface at a bearing of 179 degrees with a width of 4.5 miles located between 700 feet MSL and 18,000 feet MSL is considered to be Class E airspace. This section intersects the Class E airspace of the Moorhead Municipal Airport in Moorhead, MN to the east.

Hector International is home to a Terminal Radar Service Area (TRSA) that allows pilots a rare opportunity to be under radar coverage in a Class D airspace. FAR is one of 31 remaining locations that have this capability, and is the only one in the tri-state area. In the past, many of these facilities have been converted to Class B or C airspace as traffic volumes have increased in these areas. TRSA does not fall under the FAA Part 71 airspace regulations, and as such, pilots are not required to participate in radar separation services while flying in VFR conditions.

Figure 1-11: Airspace Sectional Chart



Source: Federal Aviation Administration (2014)

1.8.b Part 77 Surfaces

The FAA established FAR Part 77 to protect aircraft operating in proximity to an airport from obstructions such as towers, buildings, and other tall objects through a set of defined surfaces centered on a runway's centerline. Through FAR Part 77, five surfaces are defined to protect aircraft arriving to, departing from, and maneuvering in the vicinity of an airport from obstructions and vary in dimension based on criteria such as type of runway, type of approach to the runway, and visibility minimums. The following section describes these surfaces and lists the dimensions for each as they are associated to the Airport's runways.

Primary Surface – The primary surface is centered longitudinally on the runway centerline at the same elevation as the runway and extends 200 feet beyond each end of a paved runway while the length is the same length as the runway for those that have turf surfaces. The width of a primary surface runway is:

- ✓ 250 feet for utility runways (designed for propeller driven aircraft of 12,500 pounds maximum gross weight or less) having only visual approaches
- ✓ 500 feet for utility runways having non-precision instrument approaches
- ✓ 500 feet for runways other than utility having only visual approaches
- ✓ 500 feet for non-precision instrument runways other than utility having visibility minimums greater than 3/4 statue mile
- ✓ 1,000 feet for non-precision instrument runways other than utility having a non-precision instrument approach with visibility minimums as low as 3/4 statue mile
- ✓ 1,000 feet for precision instrument approach runways other than utility

The width of the primary surface for Runway 18/36 is 1,000 feet since the width of a primary surface is to be that of the most precise approach found on either end of a runway according to Section 19 of FAR Part 77. The total length of Runway 18/36's primary surface is 9,400 feet since the surface extends 200 feet beyond each end of the runway.

Approach Surface – The approach surface is centered on the runway centerline and extends longitudinally upward and outward away from the primary surface at each end of a runway. The inner width of the approach surface is the same width as the primary surface and expands uniformly to a width of:

- ✓ 1,250 feet for the end of a utility runway with only visual approaches
- ✓ 1,500 feet for the end of a runway other than utility with only visual approaches
- ✓ 2,000 feet for the end of a utility runway with a non-precision instrument approach
- ✓ 3,500 feet for the end of a non-precision instrument runway other than utility having visibility minimums greater than 3/4 statue mile
- ✓ 4,000 feet for the end of a non-precision instrument runway other than utility having a non-precision instrument approach with visibility minimums as low as 3/4 statue mile
- ✓ 16,000 feet for precision instrument runways

The horizontal distance and slope of the approach surface is:

- ✓ 5,000 feet at a slope of 20:1 for all utility and visual runways
- ✓ 10,000 feet at a slope of 34:1 for all non-precision instrument runways other than utility
- ✓ 10,000 feet at a slope of 50:1 with an additional 40,000 feet at a slope of 40:1 for all precision instrument runways

The dimensions of the approach surfaces for Hector's runways are presented below in **Table 1-8**.

Table 1-8: Runway Approach Surface Dimensions

Dimension	Runway 18/36	Runway 9/27	Runway 13/31
Inner width	1,000 feet	500 feet	250 feet
Outer width	16,000 feet	4,000 feet	1,250 feet
Slope/Horizontal Distance	50:1 for 10,000 feet; then 40:1 for an additional 40,000 feet	34:1 for 10,000 feet	20:1 for 5,000 feet

Source: Mead & Hunt, Inc. (2014)

Transitional Surface – The transitional surface is centered on the runway centerline and extends outward and upward perpendicularly from the width of the primary surface at a slope of 7:1 until a height of 150 feet above an airport where it intersects with the horizontal surface. The dimensions of this surface are the same for all runways, regardless of type of runway, approach, or visibility minimums.

Horizontal Surface – The horizontal surface is a horizontal plane located 150 feet above an airport and intersects with the transitional and conical surfaces. The perimeter of the horizontal surface is formed by lines of tangent from arcs generated from each runway end. The radii of the arcs are:

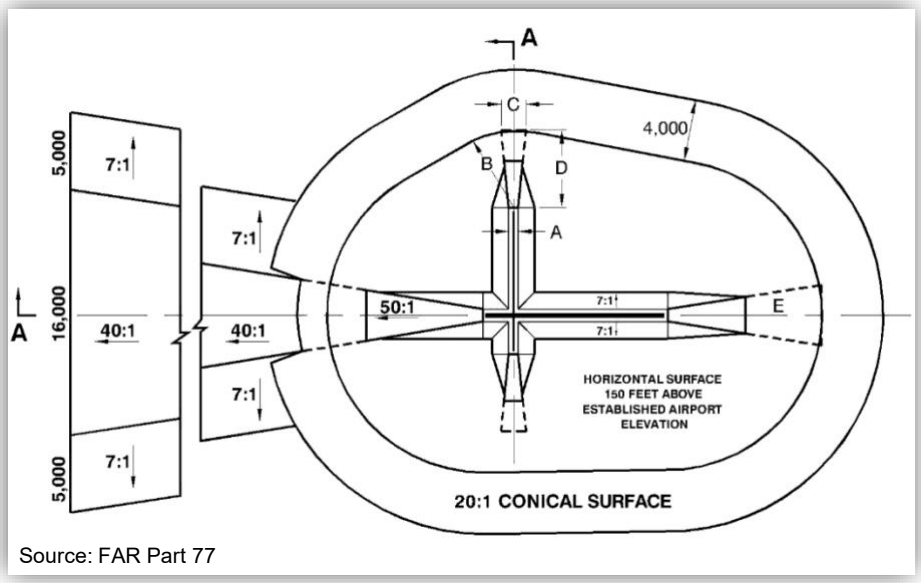
- ✓ 5,000 feet for all runways designated as utility or visual
- ✓ 10,000 feet for all other runways

In the event a 5,000 feet arc is encompassed by lines of tangent from two adjacent 10,000 feet arcs, the 5,000 feet arc shall be disregarded in the design of the horizontal surface perimeter. The radii of the arcs used in the establishing the perimeter of the horizontal surface is 10,000 feet for Runway 18/36, 10,000 feet for Runway 9/27, and 5,000 feet for Runway 13/31.

Conical Surface – The conical surface extends outward and upward from the perimeter of the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet. The dimensions of this surface are also the same for all runways, regardless of type of runway, approach, or visibility minimums.

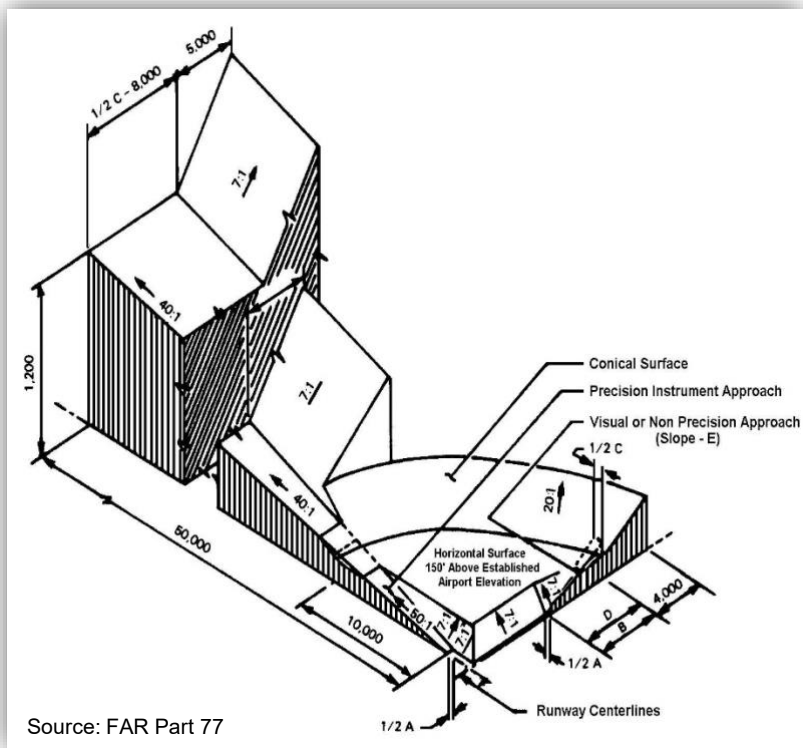
Figure 1-12 illustrates a plan view of the five FAR Part 77 surfaces while an isometric view is presented in **Figure 1-13**.

Figure 1-12: FAR Part 77 Surfaces – Plan View



Source: FAR Part 77

Figure 1-13: FAR Part 77 Surfaces – Isometric View



Source: FAR Part 77

1.9 Air Traffic Control and Approach Procedures

The inventory effort also reviewed how airspace is controlled around the Airport to gain a better understanding about how aircraft safely and efficiently maneuver for landing, takeoff, and taxi. This information will be beneficial for subsequent study tasks such as the demand/capacity analysis and evaluation of instrument approach procedures to help determine the air traffic control/approach procedure improvements that may be needed throughout the 20 year planning period. Information obtained as a part this task included a review of the airport traffic control tower and the existing instrument approach procedures that have been developed for the Airport. A summary of these elements for which information was obtained is presented in the following sections.

1.9.a Airport Traffic Control Tower (ATCT)

Airspace around the proximity of the Airport is controlled by a Federal Aviation Administration Air Traffic Control Tower (ATCT). FAA conducts their operations out of the ATCT located adjacent to the commercial airline terminal and Taxiway A. Controllers in the tower are responsible for the safe separation of aircraft on final approach, initial climb-out after departure, and both aircraft and vehicle traffic on the airfield 24 hours a day, seven days a week. Approach and departure control radar services of aircraft arriving to or departing from the Airport's airspace, is the responsibility of Fargo's ATCT.

Air traffic control services at the Airport are separated by operational discipline: ground control/clearance delivery and tower. Controllers assigned to each of these disciplines focus on the coordination of aircraft movements on the airfield or in the air while on approach to land or during takeoff. The following summarizes the two disciplines in more detail.

Ground Control/Clearance Delivery – Ground control/clearance delivery is responsible for the safe movement of aircraft, vehicles, and personnel on runways, runway safety areas, taxiways, and aprons located within the aircraft movement area. It is also responsible for filing flight plans, issuing flight plan clearances, sharing enroute weather information to pilots, and other pertinent information to pilots prior to taxiing for takeoff. All aircraft, vehicles, and personnel are required to be in constant radio contact with ground control while operating within the movement area on frequency 121.90 megahertz (MHz).

Tower – The tower controller position is responsible for the safe separation of arriving and departing aircraft from the Airport. Along with providing landing and takeoff clearances, the tower controller position also is responsible for the safe separation of aircraft operating within the traffic pattern. Tower controllers are contacted on frequency 133.80 MHz and approach/departure on 120.40 Mhz.

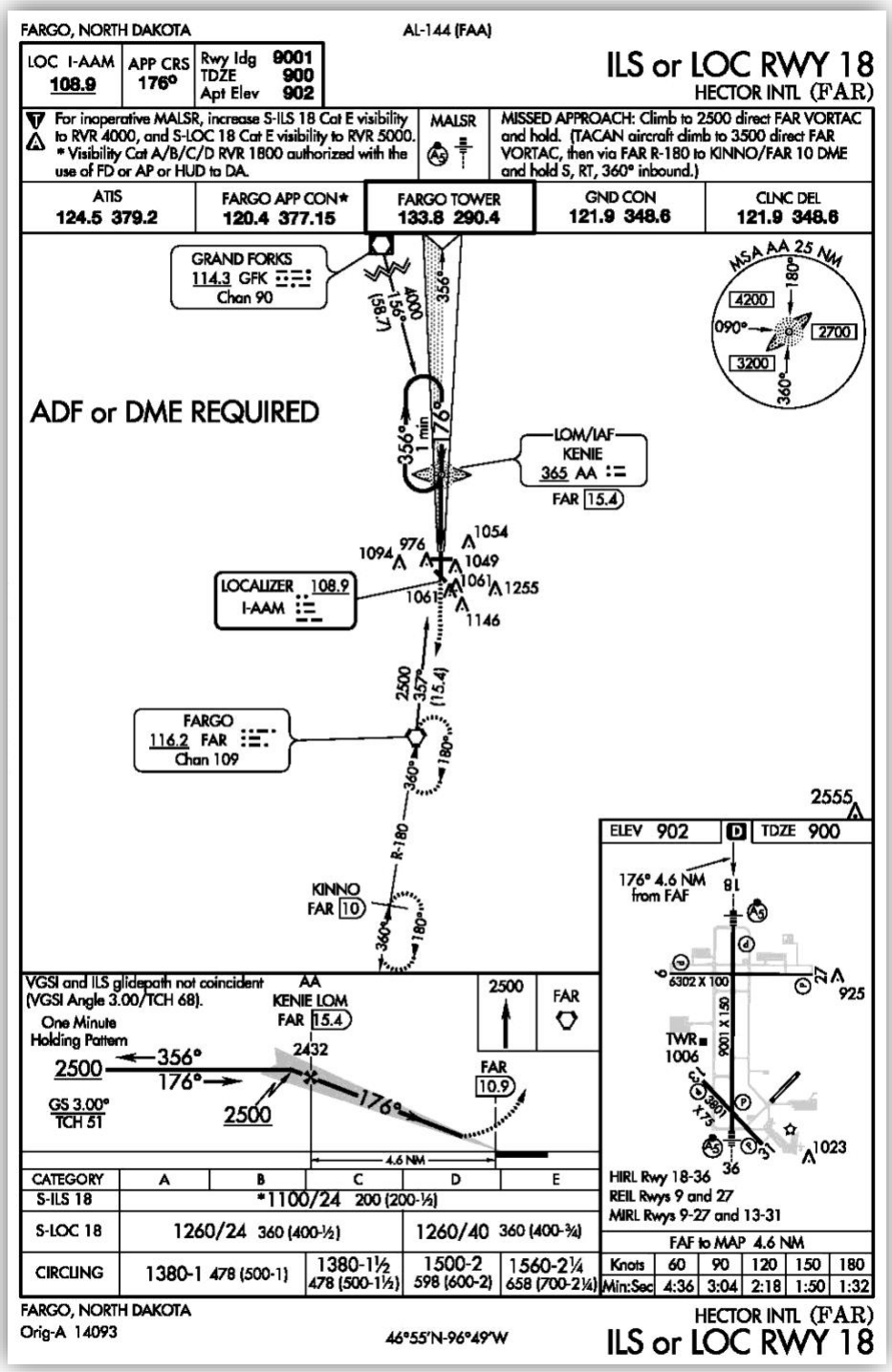
1.9.b Approach Procedures

Approach procedures provide pilots with a set of predetermined maneuvering instructions to successfully navigate a landing which are beneficial during conditions when visibility is limited such when low cloud ceilings are present or when inclement weather is present. Approach procedures are also developed to help management the flow of traffic in high volume areas as well as in situations when the flow of traffic needs to be controlled away from populated areas or for noise abatement purposes. Developed and published by the FAA, approach procedures are developed based on the type of navigational equipment installed on a runway. Precision instrument approaches offering the ability for pilots in properly equipped aircraft to conduct landings when low cloud ceiling heights and/or reduced visibility minimums are present are established for runways that are equipped with an ILS. Runways equipped with other NAVAID systems or with the capability to utilize GPS are assigned non-precision instrument approaches while runways that require a pilot be in constant visual contact of the airfield while on approach are assigned visual approaches.

At the Airport, eight approach procedures have been developed for arriving aircraft which are summarized below. The following pages illustrate the approach procedure plates that have been developed by the FAA for each type of approach as of June 2014.

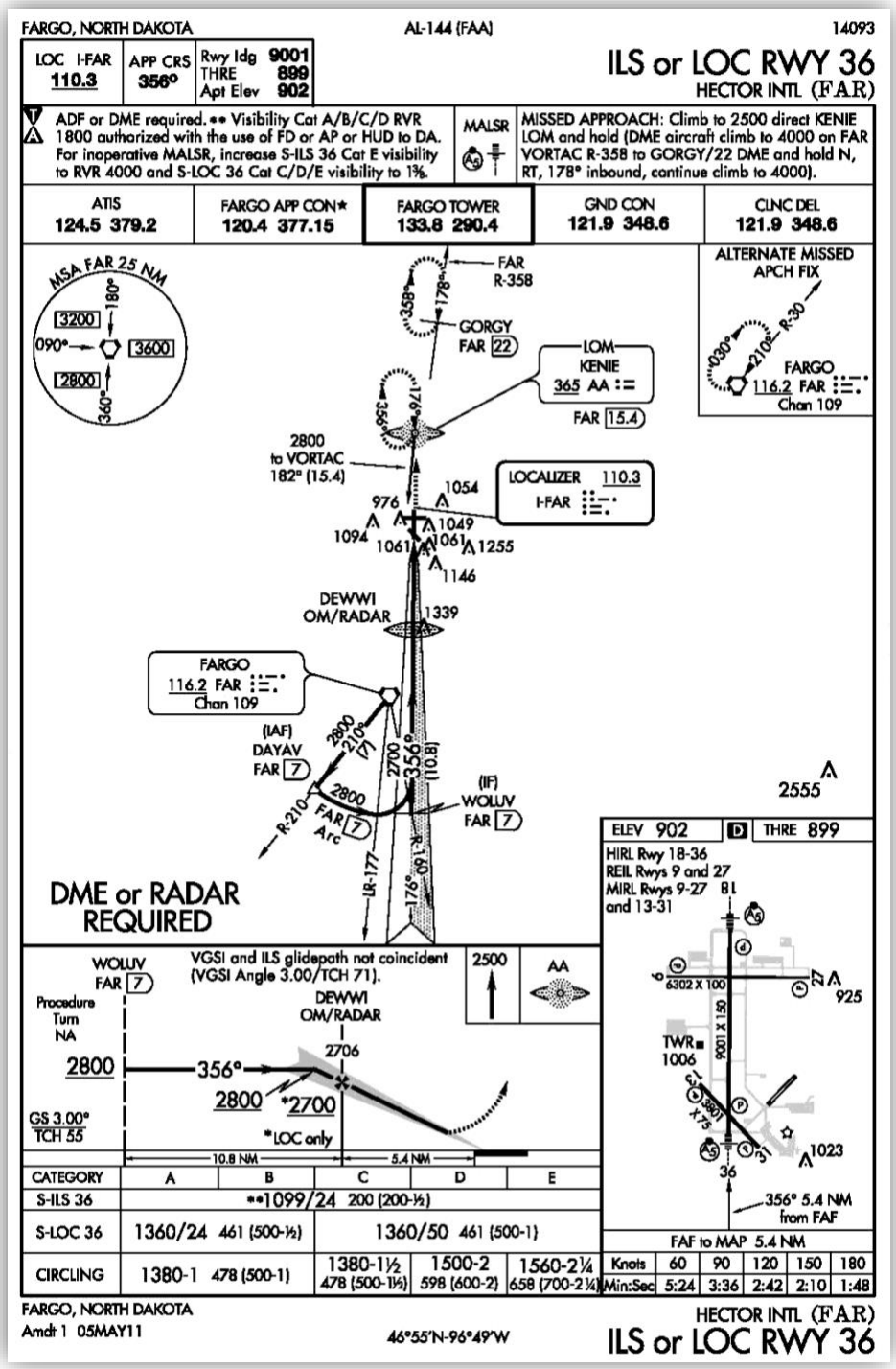
- ✓ ILS or LOC to Runway 18 (**Figure 1-14**)
- ✓ ILS or LOC to Runway 36 (**Figure 1-15**)
- ✓ RNAV (GPS) to Runway 18 (**Figure 1-16**)
- ✓ RNAV (GPS) to Runway 27 (**Figure 1-17**)
- ✓ RNAV (GPS) to Runway 36 (**Figure 1-18**)
- ✓ RNAV (GPS) to Runway 9 (**Figure 1-19**)
- ✓ VOR/DME or TACAN to Runway 36 (**Figure 1-20**)

Figure 1-14: ILS or LOC to Runway 18



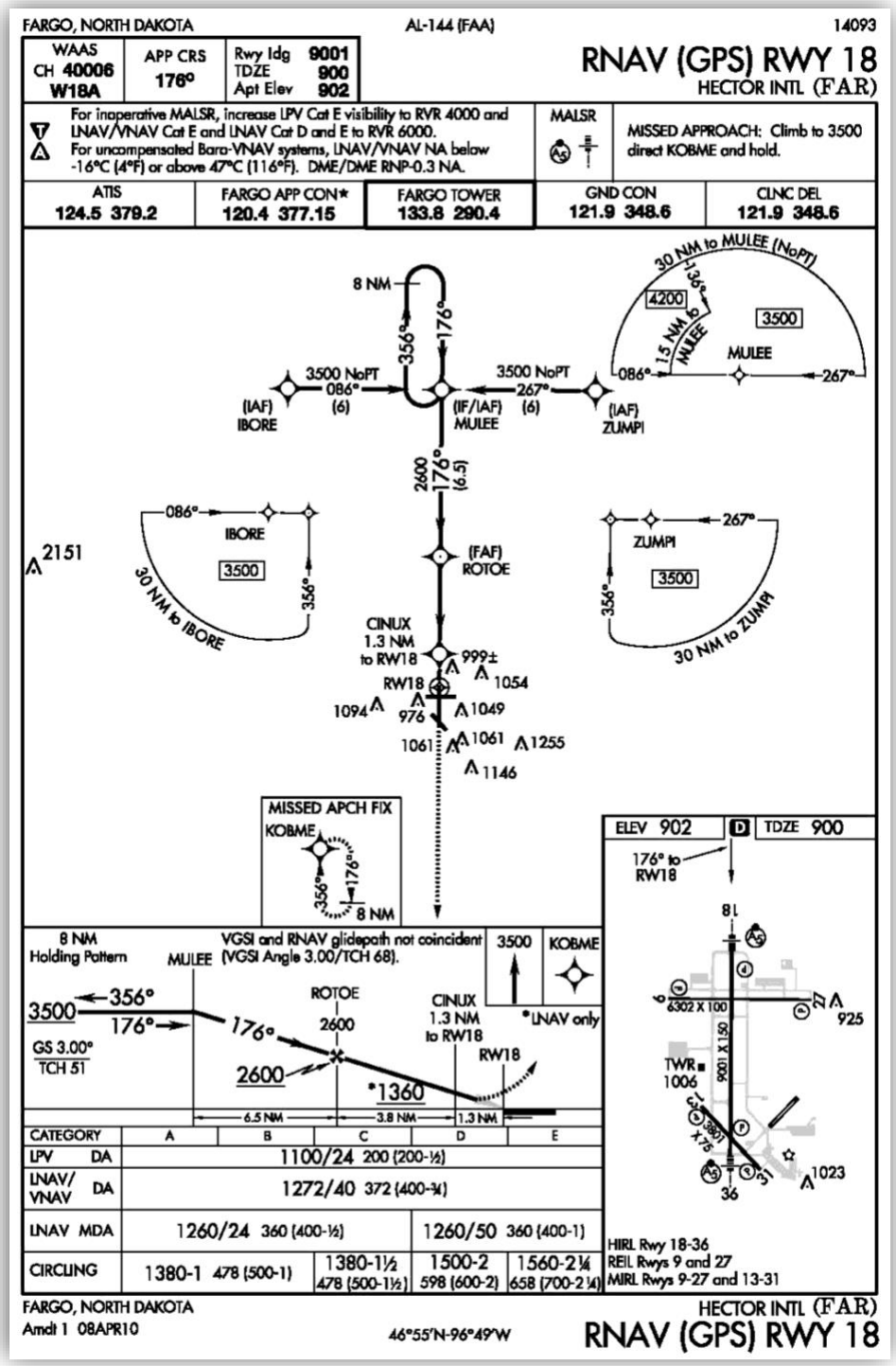
Source: Federal Aviation Administration (2014)

Figure 1-15: ILS or LOC to Runway 36



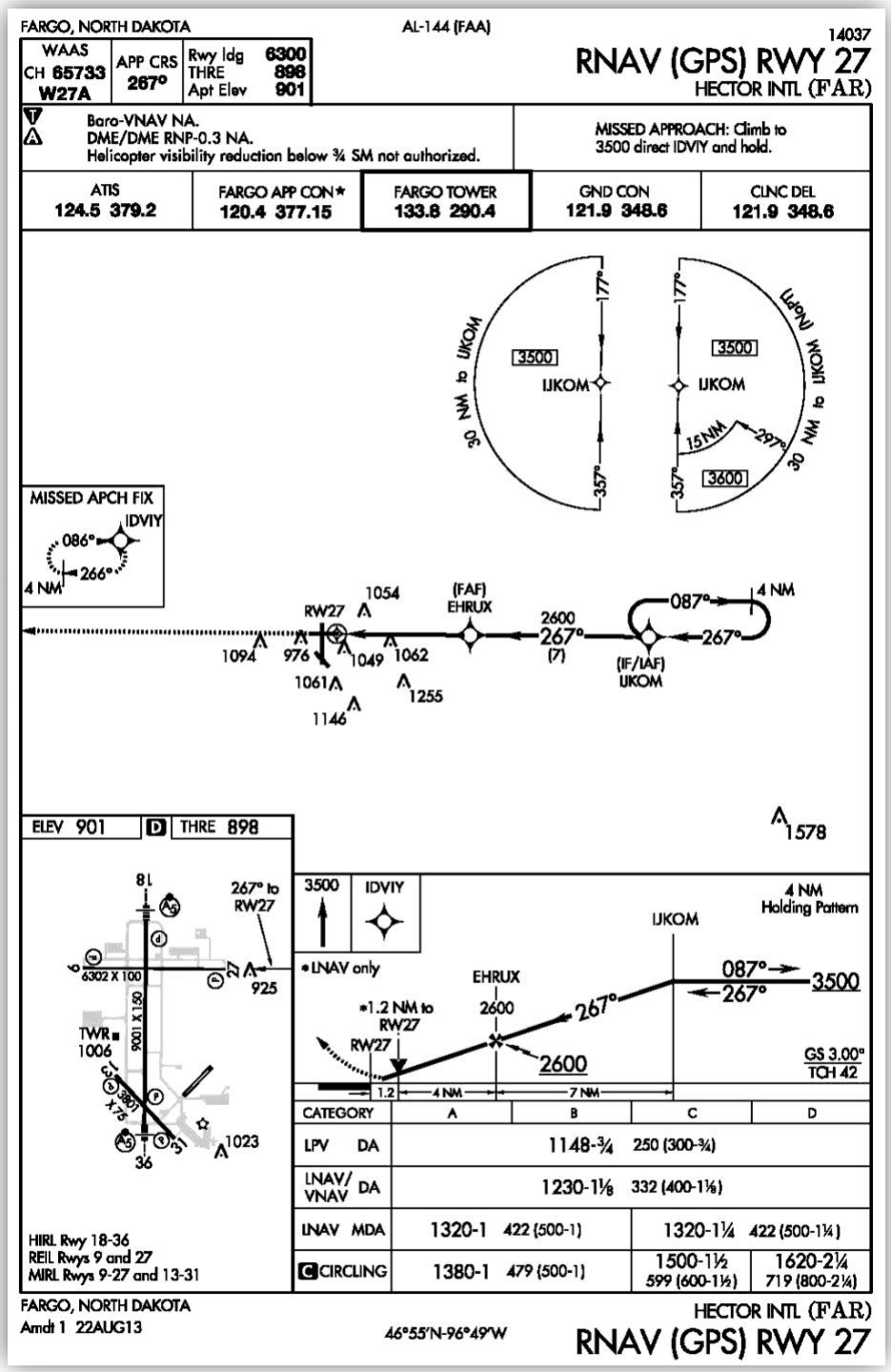
Source: Federal Aviation Administration (2014)

Figure 1-16: RNAV (GPS) to Runway 18



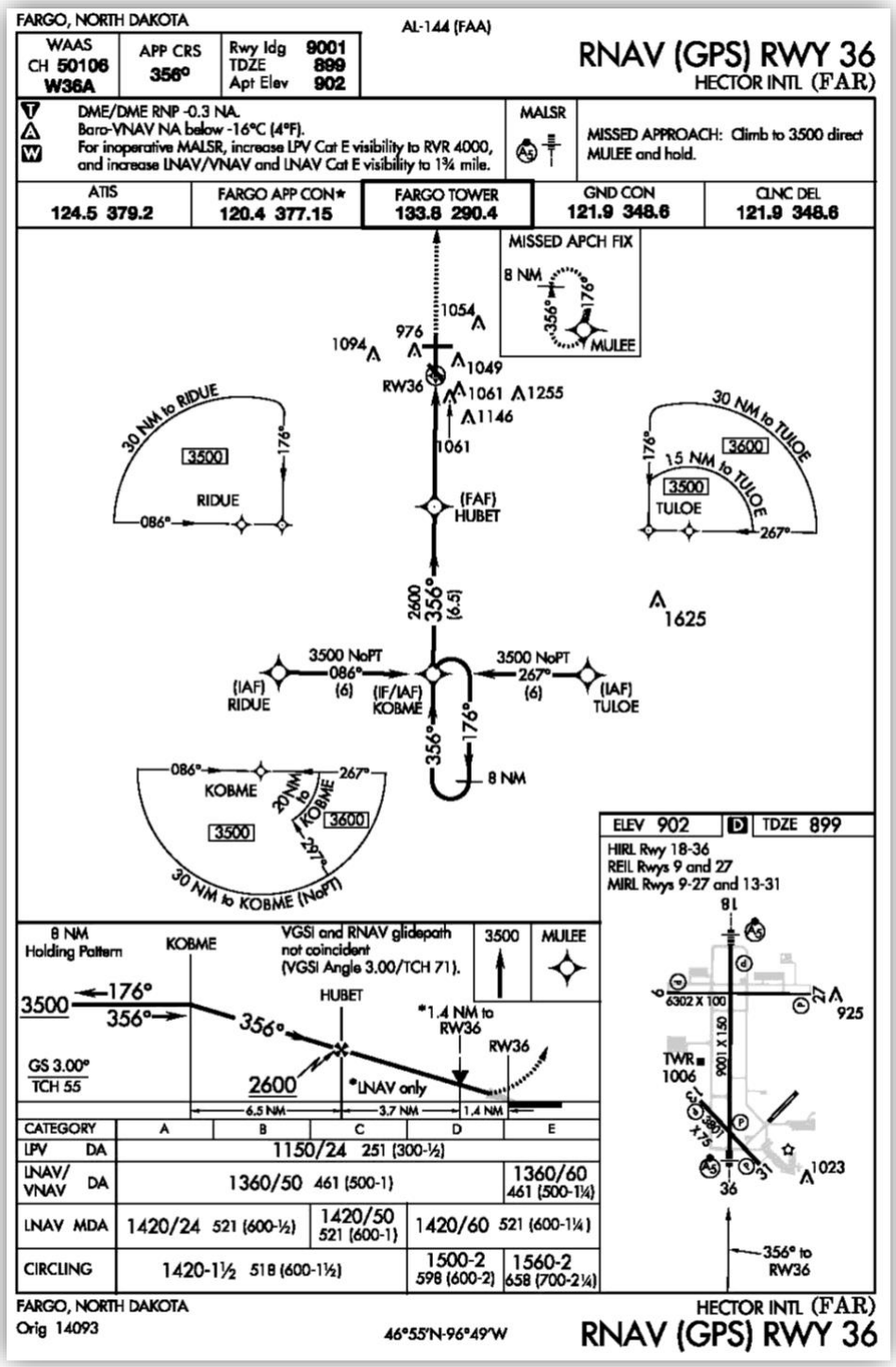
Source: Federal Aviation Administration (2014)

Figure 1-17: RNAV (GPS) to Runway 27



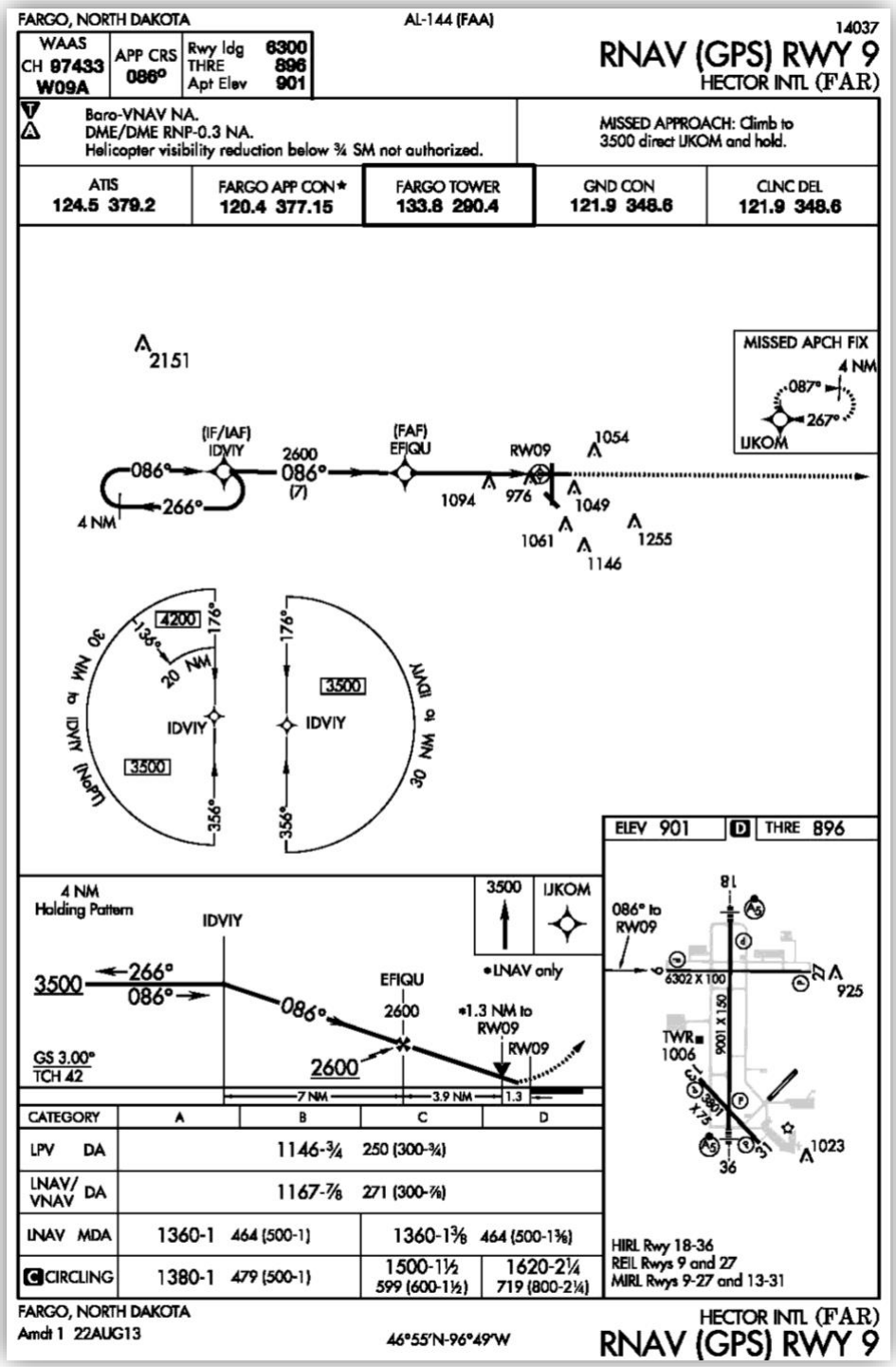
Source: Federal Aviation Administration (2014)

Figure 1-18: RNAV (GPS) to Runway 36



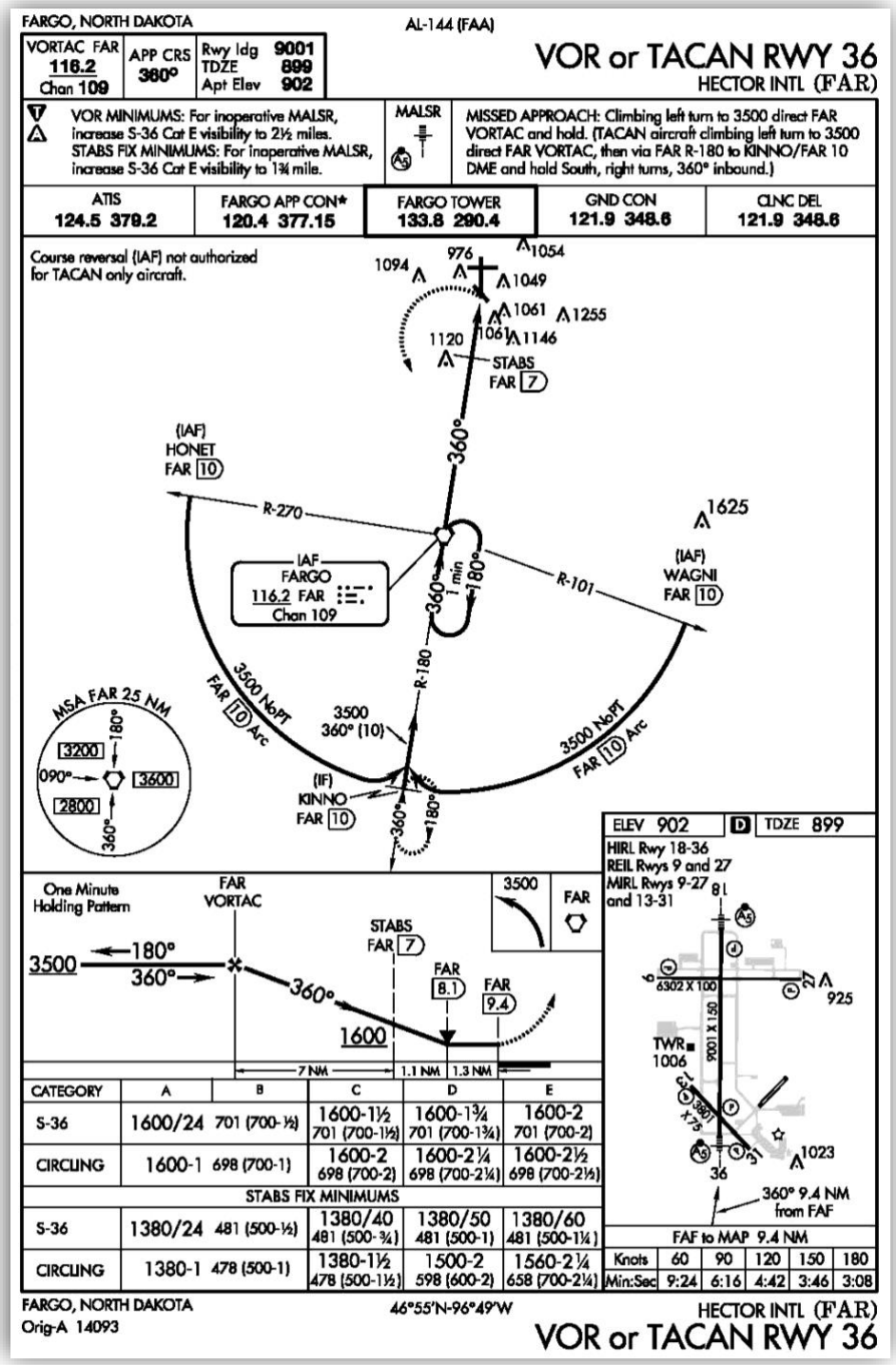
Source: Federal Aviation Administration (2014)

Figure 1-19: RNAV (GPS) to Runway 9



Source: Federal Aviation Administration (2014)

Figure 1-20: VOR/DME or TACAN to Runway 36



Source: Federal Aviation Administration (2014)

1.10 Summary

Information obtained during the inventory effort provides a baseline to evaluate how well existing facilities are capable of accommodating future demand. Through this evaluation, an understanding can be gained of the infrastructure improvements that will be needed for the Airport to meet the air transportation requirements of eastern North Dakota and west central Minnesota for the next 20 years. Completion of other study tasks such as the demand/capacity analysis, evaluation of alternatives, and the development of sustainability planning initiatives are also dependent upon information obtained through the inventory effort. With a history that spans nearly 90 years, the Airport has continually evolved to meet the demands of its users. This master plan will serve as a guide to help the Airport plan for future infrastructure development as well as strengthen its commitment to being a community-friendly business and vital transportation hub for the region.