
Appendix C. Minnesota Navigational Aids

C.1. Introduction

The Minnesota Department of Transportation, Office of Aeronautics (MnDOT Aeronautics) maintains the largest systems of state-owned and/or -managed navigational aids (NAVAIDs) and weather reporting stations (Automated Weather Observing Systems [AWOS]/Automated Surface Observing Systems [ASOS]) in the United States (U.S.). This equipment provides critical information to pilots flying at night or during inclement weather conditions during which time specialized instrumentation is required. While helpful to pilots flying for any purpose, the ability to fly with navigational assistance can be pivotal for medical air transport, search and rescue operations, and other types of potentially life-saving activities. During outreach conducted during the 2022 Minnesota State Aviation System Plan (2022 MnSASP or MnSASP), several air medical transport providers reported that the availability of Instrument Approach Procedures (IAPs) and on-site weather reporting were required to operate at an airport. Additionally, NAVAIDs and weather reporting stations often support economic activities including scheduled and unscheduled commercial service, air cargo, and aerial agriculture. Minnesota Statute 360.013 §39 offers a key foundation for MnDOT Aeronautics' ongoing support for NAVAIDs and weather reporting equipment by recognizing that the "operation and maintenance of airports is an essential public service."

MnDOT Aeronautics annually allocates approximately \$3.0 million via the NAVAIDs Program to operate and maintain this equipment, including the utility costs required for their operation. Host airport sponsors are only responsible for a small portion of maintenance and capital improvement needs. The MnSASP conducted several tasks to support MnDOT Aeronautics' NAVAIDs Program to provide additional details about the existing system, including its relationship with the federal NAVAID program managed by the Federal Aviation Administration (FAA). This chapter is organized into the following sections:

- Minnesota NAVAIDs (**Section C.2**)
- Instrument Landing System Location Details (**Section C.3**)
- Automated Weather Station Visual Assessment (**Section C.4**)

C.2. Minnesota NAVAIDs

MnDOT Aeronautics is responsible for over 450 NAVAIDs and 80 AWOS located at Minnesota airports, hospital heliports, and seaplane bases owned by public and private entities. The system dates back several decades, with initial installation conducted by a variety of operators and managers over that time. MnDOT Aeronautics maintains an inventory of this equipment that was used to conduct several tasks associated with assessing their role in supporting aircraft operations in Minnesota.

C.2.1. NAVAIDS COVERAGE AREA VISUALIZATION

NAVAIDs provide details about the precise location of aircraft in space as well as information to support safe maneuvering during aircraft operations. The broadcast range of equipment can vary based on a variety of factors including the location in which is installed (e.g., terrain, obstacles), performance characteristics inherent to the equipment itself (e.g., age, type, condition), and the physical distance

between the NAVAID and aircraft. This task looked specifically at the latter two factors by depicting the statewide coverage provided by equipment at various altitudes. A statewide map was generated using a geographic information system (GIS) to model coverage by equipment class and type at various altitudes. The map is provided as a spatial layer within the MnSASP Hub (referred to as the Minnesota NAVAIDs service buffer spatial layer).¹ **Table C.1** summarizes the service buffers analyzed by class; **Table 3** describes the NAVAIDs included in the scope of the assessment by type.

Table C.1. VOR/VORTAC/TACAN NAVAIDS: Normal Usable Altitudes and Radius Distances

Class	Normal Usable Altitude	Radius Distance (Miles)
T	12,000 at ground level (AGL) and below	25
L	Below 18,000 AGL	40
H	Below 14,500 AGL	40
H	14,500 – 17,999 AGL	100
H	18,000 AGL - flight level (FL) 450	130
H	Above FL 450	100

Source: FAA Order JO 7110.65Z (change 1), Air Traffic Control (effective December 2, 2021)

Table C.2. VOR/VORTAC/TACAN NAVAIDS Description

Type	Definition	Purpose
TACAN	Tactical air navigation system	A system of navigation that uses ultrahigh frequency signals to determine the distance and bearing of an aircraft from a transmitting station
VOR/DME	Very high frequency omnidirectional range/Distance measuring equipment	VOR/DME is a radio beacon that combines a VHF omnidirectional range (VOR) with a distance measuring equipment (DME). The VOR allows the receiver to measure its bearing to or from the beacon, while the DME provides the slant distance between the receiver and the station.
VORTAC	Co-located VOR and TACAN	See definitions above

Source: Kimley-Horn, 2022

The full list of attributes provided in the Hub’s Minnesota NAVAIDs service buffer spatial layer is as follows:

- Type
- Latitude
- Longitude
- Magnetic variation
- Facility name
- Elevation (feet)
- City
- Validation Data
- FAA Region
- Owner²

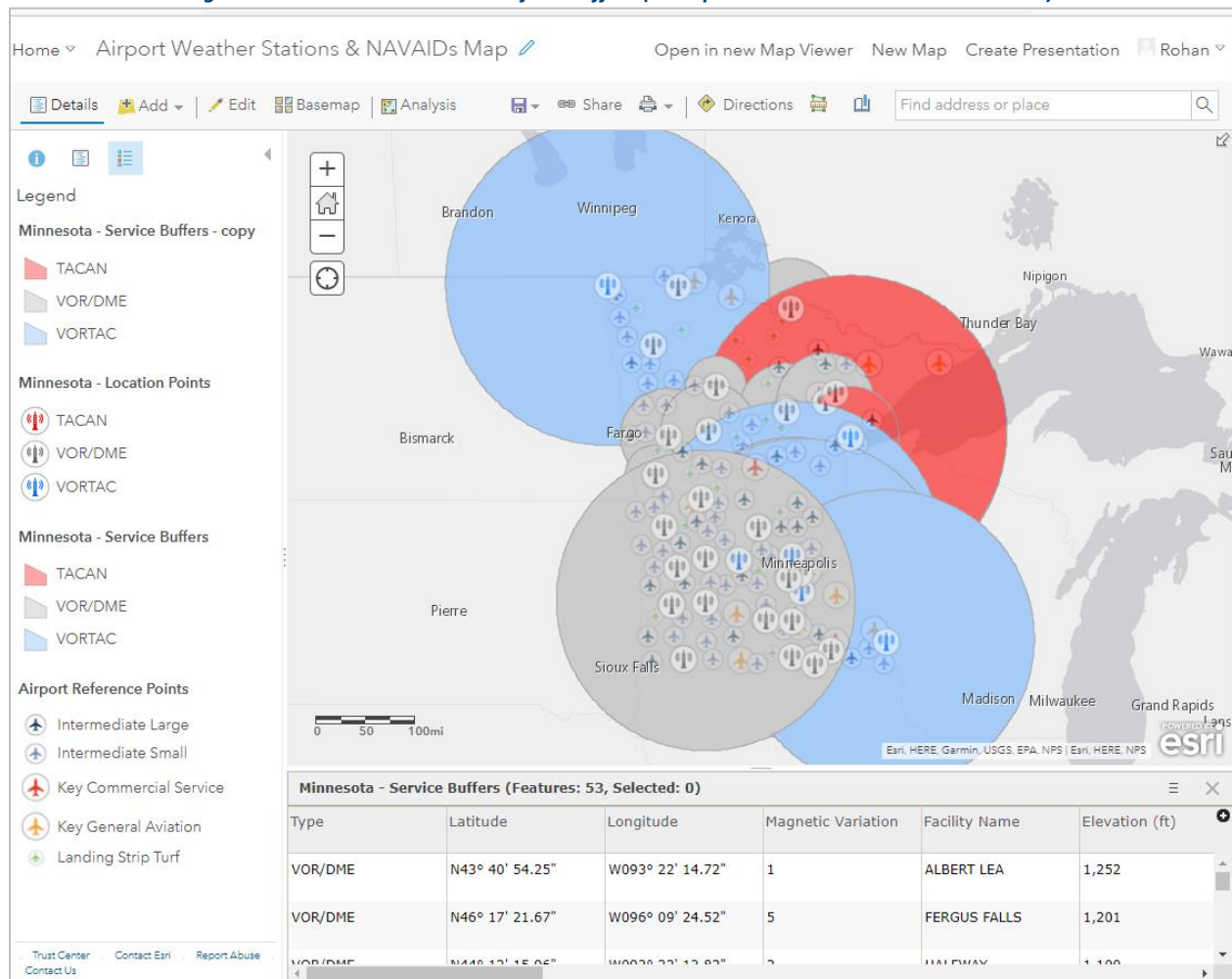
¹ The Hub is an ArcGIS platform serving as a comprehensive online data repository of key tabular and spatial data inventoried and analyzed as part of the 2022 MnSASP. The Hub can be accessed at <https://mnsasp-mndot.hub.arcgis.com/> with full details provided in **Chapter 6. Continuous Aviation Planning**.

² Minnesota NAVAIDs are owned by the state, FAA, municipalities, and the U.S. Air Force (USAF).

- Class
- Hours of operation
- Air Route Traffic Control Center (ARTCC)
- Channel
- Frequency
- Status³
- Buffer distance (nm)
- Minimum elevation (feet)
- Maximum elevation (feet)
- Ownership type (i.e., city, state, federal, military)

An example screenshot of the Hub’s Minnesota NAVAIDs service buffer spatial layer is provided in **Figure C.1**. Reference Hub at <https://mnsasp-mndot.hub.arcgis.com/> to view the full application.

Figure C.1. Minnesota NAVAID Surface Buffers (Example Screenshot with Attribute Table)



Sources: MnDOT Aeronautics, 2021; Kimley-Horn, 2021; FAA, 2021

³ Status is defined in terms of “Restriction” or “IFR.” IFR means that the equipment has been certified for IFR operations. Restricted means the equipment has coverage limitations. For example, a mountain could impede VOR coverage between a wedge of radials below a certain altitude.

C.2.2. FEDERAL MINIMAL OPERATION NETWORK

In addition to MnDOT Aeronautics' state-managed NAVAIDs Program, the FAA maintains equipment within the VOR Minimum Operational Network (MON) Program. The MON Program represents the FAA's efforts to streamline the VOR system while still allowing for continuous coverage; as such, the MON Program makes recommendations for facilities to either remain active or be decommissioned due to overlapping coverage or other factors. The FAA is transitioning the National Airspace System (NAS) away from ground-based NAVAIDs to Performance Based Navigation (PBN). PBN relies on Global Positioning Systems (GPS) to provide precise spatial information to pilots. The VOR MON Program maintains conventional VOR infrastructure to provide backup navigational service in the case of a GPS outage, enabling aircraft to land via ground-based NAVAIDs should GPS service be unavailable.

The network provides VOR signal coverage at 5,000 feet AGL anywhere within the contiguous U.S.; coverage may exist but may not be continuous at lower altitudes. Airports within the VOR MON Program are located within 100 nautical miles (nm) of one another. The network is designed to provide pilots with access to an airport where aircraft can land under Instrument Flight Rules (IFR) without the use of GPS within 100 nm of any point within the contiguous U.S.⁴

Federally-owned VOR at airports not included in the MON are being discontinued, with the goal of decommissioning approximately 34 percent of existing VORs in the contiguous U.S. by fiscal year 2030. The final MON is anticipated to comprise 509 VOR configurations including 16 VOR, 215 VOR/DME, and 359 VORTAC. Minnesota airports currently in the MON include:⁵

- Chandler Field (AXN) – Alexandria, MN
- Austin Municipal Airport (AUM) – Austin, MN
- Hibbing/Range Regional Airport (HIB) – Hibbing, MN
- Falls International Airport (INL) – International Falls, MN
- Airlake (LVN) – Minneapolis, MN
- Thief River Falls Regional Airport (TVF) – Thief River Falls, MN

Airports in Minnesota with a VOR that has been or will be decommissioned in the near future include:⁶

- Worthington Municipal Airport (OTG) – Worthington, MN (scheduled for March 2022)
- Park Rapids Municipal Airport (PKD) – Park Rapids, MN (February 2021)
- Baudette International Airport (BDE) – Baudette, MN (September 2020)
- Ely Municipal Airport (ELO) – Ely, MN (March 2020)
- Fairmont Municipal Airport (FRM) – Fairmont (June 2019)
- Brainerd Lakes Regional Airport (BRD) – Brainerd (July 2018)

⁴ FAA VOR MON Program Update (October 26, 2021). "Presentation to the Aeronautical Charting Meeting." Available online at https://www.faa.gov/air_traffic/flight_info/aeronav/acf/media/Presentations/21-02-VOR-MON-Program-Etienne.pdf (accessed March 2022).

⁵ FAA (March 2022). "Chart Supplement, North Central U.S: Effective 0901Z, 24 Mar 2022, to 9091Z, 19 May 2022," p. 429. Available online at https://www.faa.gov/air_traffic/flight_info/aeronav/Digital_Products/dafd/ (accessed March 2022).

⁶ Ibid.

C.2.3. IDENTIFICATION OF APPROACHES THAT REQUIRE NAVAIDS

The FAA MON is designed to provide resiliency and redundancy by providing aid to pilots seeking to land using instrumentation in the event of a GPS outage. The 100-nm coverage radius at 5,000 feet AGL is established to effectively provide a safe and viable option for pilots to land their aircraft regardless of where they are flying in the contiguous 48 states. However, the MON does not consider factors that may require ground-based NAVAIDs. The MON provides the ability to safely transition aircraft from the sky to the ground, but it does not mean that pilots and their passengers will always arrive at their destination airport of choice. A pilot may need to land at a specific facility due to economic, emergency service, or other reasons. For example, a flight school may want VOR coverage at their facility to offer students the opportunity to practice landing using this type of technology. An air medical operator may want the redundancy offered by a VOR due to the importance of landing near specialized medical facilities. In these cases, NAVAIDs owned and/or operated by state or local authorities may ensure a specific facility can fulfill its role in the community and/or region in which it is located.

As a related issue, IAPs may require the use of a NAVAID that is not designated within the federal MON. The MnSASP reviewed IAPs at all Minnesota state system airports to identify NAVAIDs utilized in approach procedures regardless of MON inclusion. The results of this evaluation are presented in **Table C.3**. Details about the methodology used to conduct this evaluation are presented in **Chapter 6. Continuous Aviation Planning**. Two Minnesota NAVAIDs are not used in the published approach procedures of any state system airport:

- Eveleth-Virginia Municipal Airport (EVM) – Eveleth, MN
- Fairmont Municipal Airport (FRM) – Fairmont, MN

These facilities may be used by military aircraft, important for an airspace designation, or used in the International Civil Aviation Organization (ICAO) Air Navigation Plans. Further evaluation may be warranted to identify how various user groups may rely on equipment located at these facilities.

Table C.3. IAPs Dependent on Minnesota NAVAIDs by Airport

Type of Equipment	Airport Location of Equipment: FAA ID ¹	Name of Equipment	Location of Equipment: City	Owner of Equipment	Operator of Equipment	Operational Status of Equipment	Dependent Airports for VOR Approaches	Dependent Airports for Instrument Landing System (ILS)/ Localizer (LOC) Approaches	Standard Terminal Arrival (STAR) Procedures for Airports Dependent on Approach	IFR Chart
VOR/DME	AEL	Albert Lea	Albert Lea	State of Minnesota	FAA	IFR	- Albert Lea Municipal Airport (AEL)	- Austin Municipal Airport (AUM)	- None	No
VOR/DME	AXN	Alexandria	Alexandria	FAA	FAA	Restricted	- Alexandria Municipal Airport (Chandler Field) (AXN) - Glenwood Municipal Airport (GHW) - Morris Municipal Airport (MOX)	- Alexandria Municipal Airport (Chandler Field) (AXN) - Fergus Falls Municipal Airport (Einar Mickelson Field) (FFM) - Saint Cloud Regional Airport (STC)	- ANE (Minneapolis Anoka County/Blaine Airport (Janes Field)) - MIC (Minneapolis Crystal Airport) - FCM (Minneapolis Flying Cloud Airport) - MSP (Minneapolis/St. Paul International Airport) - STP (Saint Paul Downtown Airport (Holman Field))	Yes
DME	BDE	Baudette	Baudette	FAA	FAA	Restricted	- None	- Baudette International Airport (BDE)	- None	Yes
VOR/DME	BDH	Wilmar	Wilmar	City of Wilmar	FAA	IFR	- Wilmar Municipal Airport (BDH)	- Wilmar Municipal Airport (BDH)	- None	No
VORTAC	DWN	Darwin	Darwin	FAA	FAA	IFR	- Hutchinson Municipal Airport (Butler Field) (HCD) - Litchfield Municipal Airport (LJF) - Maple Lake Municipal Airport & Seaplane Base (MGG) - Willmar Municipal Airport (BDH)	- Willmar Municipal Airport (BDH)	- None	Yes
VOR/DME	DTL	Detroit Lakes	Detroit Lakes	State of Minnesota	FAA	IFR	- Detroit Lakes Airport (Wething Field) (DTL)	- Detroit Lakes Airport (Wething Field) (DTL)	- None	No
VORTAC	DLH	Duluth	Duluth	FAA	FAA	Restricted	- Duluth International Airport (DLH)	- Duluth International Airport (DLH)	- STP (Saint Paul Downtown Airport (Holman Field))	Yes
DME	ELO	Ely	Ely	FAA	FAA	Restricted	- None	- None	- None	None
VOR/DME	EVM	Eveleth	Eveleth	State of Minnesota	FAA	IFR	- None	- None	- None	No
VOR/DME	FCM	Flying Cloud	Minneapolis	FAA	FAA	Restricted	- Minneapolis Airlake Airport (LVN) - Minneapolis Flying Cloud Airport (FCM)	- Minneapolis Flying Cloud Airport (FCM) - Saint Paul Downtown Airport (Holman Field) (STP)	- Glencoe Municipal Airport (Vernon Perschau Field) (GYL) - Maple Lake Municipal Airport & Seaplane Base (MGG) - Minneapolis Anoka County/Blaine Airport (Janes Field) (ANE) - MIC (Minneapolis Crystal Airport) - Minneapolis Flying Cloud Airport (FCM) - Minneapolis/St. Paul International Airport (MSP) - Saint Paul Downtown Airport (Holman Field) (STP) - Saint Paul-Lake Elmo Airport (21D) - South St. Paul Municipal Airport (Fleming Field) (SGS)	No
VOR/DME	FFM	Fergus Falls	Fergus Falls	State of Minnesota	State of Minnesota	Restricted	- Fergus Falls Municipal Airport (Einar Mickelson Field) (FFM)	- Fergus Falls Municipal Airport (Einar Mickelson Field) (FFM)	- None	No

Type of Equipment	Airport Location of Equipment: FAA ID ¹	Name of Equipment	Location of Equipment: City	Owner of Equipment	Operator of Equipment	Operational Status of Equipment	Dependent Airports for VOR Approaches	Dependent Airports for Instrument Landing System (ILS)/ Localizer (LOC) Approaches	Standard Terminal Arrival (STAR) Procedures for Airports Dependent on Approach	IFR Chart
VORTAC	FGT	Farmington	Farmington	FAA	FAA	IFR	- Minneapolis Airlake Airport (LVN)	- Minneapolis Airlake Airport (LVN) - Minneapolis/St. Paul International Airport (MSP) - Owatonna Degner Regional Airport (OWA) - Red Wing Regional Airport (RGK) - Saint Paul Downtown Airport (Holman Field) (STP)	- Glencoe Municipal Airport (Vernon Perschau Field) (GYL) - Maple Lake Municipal Airport & Seaplane Base (MGG) - Minneapolis Anoka County/Blaine Airport (Janes Field) (ANE) - Minneapolis Crystal Airport (MIC) - Minneapolis Flying Cloud Airport (FCM) - Minneapolis/St. Paul International Airport (MSP) - Saint Paul Downtown Airport (Holman Field) (STP) - Saint Paul-Lake Elmo Airport (21D) - South St. Paul Municipal Airport (Fleming Field) (SGS)	Yes
VOR/DME	FOW	Halfway	Morristown	State of Minnesota	FAA	Restricted	- Faribault Municipal Airport (FBL) - Mankato Municipal Airport (MKT) - Owatonna Degner Regional Airport (OWA)	- Mankato Municipal Airport (MKT) - Owatonna Degner Regional Airport (OWA)	- Minneapolis/St. Paul International Airport (MSP)	No
DME	FRM	Fairmont	Fairmont	FAA	FAA	IFR	- None	- Fairmont Municipal Airport (FRM)	- None	Yes
VORTAC	GEP	Gopher	Minneapolis	FAA	FAA	IFR	- Buffalo Municipal Airport (CFE) - Maple Lake Municipal Airport & Seaplane Base (MGG) - Minneapolis Anoka County/Blaine Airport (Janes Field) (ANE) - Minneapolis Flying Cloud Airport (FCM) - Saint Cloud Regional Airport (STC)	- Minneapolis Anoka County/Blaine Airport (Janes Field) (ANE) - Minneapolis Flying Cloud Airport (FCM) - Red Wing Regional Airport (RGK) - Saint Cloud Regional Airport (STC) - Saint Paul Downtown Airport (Holman Field) (STP)	- Minneapolis Anoka County/Blaine Airport (Janes Field) (ANE) - Minneapolis Crystal Airport (MIC) - Minneapolis Flying Cloud Airport (FCM) - Minneapolis/St. Paul International Airport (MSP) - Saint Paul Downtown Airport (Holman Field) (STP)	Yes
VOR/DME	GPZ	Grand Rapids	Grand Rapids	FAA	FAA	Restricted	- Grand Rapids-Itasca County Airport (Gordon Newstrom Field) (GPZ)	- Grand Rapids-Itasca County Airport (Gordon Newstrom Field) (GPZ)	- None	Yes
VOR/DME	HIB	Hibbing	Hibbing	FAA	FAA	Restricted	- Eveleth-Virginia Municipal Airport (EVM) - Grand Rapids-Itasca County Airport (Gordon Newstrom Field) (GPZ)	- Duluth International Airport (DLH) - Grand Rapids-Itasca County Airport (Gordon Newstrom Field) (GPZ) - Hibbing-Chisholm-Hibbing Municipal Airport (HIB)	- None	Yes
VORTAC	HML	Humboldt	Humboldt	FAA	FAA	IFR	- Hallock Municipal Airport (HCO)	- None	- None	Yes
VOR/DME	INL	International Falls	International Falls	FAA	FAA	IFR	- Falls International Airport (INL)	- Baudette International Airport (BDE) - Falls International Airport (INL)	- None	Yes
VOR/DME	IDJ	Lake Bemidji	Bemidji	State of Minnesota	State of Minnesota	IFR	- Bemidji Regional Airport (BJI)	- Bemidji Regional Airport (BJI)	- None	No
VOR/DME	JAY	Austin	Austin	City of Austin	City of Austin	IFR	- Austin Municipal Airport (AUM)	- Austin Municipal Airport (AUM)	- None	No

Type of Equipment	Airport Location of Equipment: FAA ID ¹	Name of Equipment	Location of Equipment: City	Owner of Equipment	Operator of Equipment	Operational Status of Equipment	Dependent Airports for VOR Approaches	Dependent Airports for Instrument Landing System (ILS)/ Localizer (LOC) Approaches	Standard Terminal Arrival (STAR) Procedures for Airports Dependent on Approach	IFR Chart
VOR/DME	MKT	Mankato	Mankato	FAA	FAA	IFR	- Mankato Municipal Airport (MKT)	- Mankato Municipal Airport (MKT)	- Minneapolis Anoka County/Blaine Airport (Janes Field) (ANE) - Minneapolis Crystal Airport (MIC) - Minneapolis Flying Cloud Airport (FCM) - Minneapolis/St. Paul International Airport (MSP) - Saint Paul Downtown Airport (Holman Field) (STP)	No
VOR/DME	MML	Marshall	Marshall	State of Minnesota	FAA	IFR	- Marshall-Southwest Minnesota Regional Airport-Marshall/Ryan Field (MML)	- Marshall-Southwest Minnesota Regional Airport-Marshall/Ryan Field (MML)	- None	
VOR/DME	MSP	Minneapolis	Minneapolis	FAA	FAA	Restricted	- None	- Minneapolis/St. Paul International Airport (MSP) - Saint Paul Downtown Airport (Holman Field) (STP)	- Glencoe Municipal Airport (Vernon Perschau Field) (GYL) - Maple Lake Municipal Airport & Seaplane Base (MMG) - Minneapolis Anoka County/Blaine Airport (Janes Field) (ANE) - Minneapolis Crystal Airport (MIC) - Minneapolis Flying Cloud Airport (FCM) - Minneapolis/St. Paul International Airport (MSP) - Saint Paul Downtown Airport (Holman Field) (STP) - Saint Paul-Lake Elmo Airport (21D) - South St. Paul Municipal Airport (Fleming Field) (SGS)	No
VOR/DME	MVE	Montevideo	Montevideo	State of Minnesota	FAA	Restricted	- Granite Falls Municipal Airport (Lenzen-Roe Memorial Field) (GDB) - Montevideo-Chippewa County Airport (MVE)	- None	- None	No
VOR/DME	MOX	Morris	Morris	State of Minnesota	FAA	IFR	- Glenwood Municipal Airport (GHW) - Morris Municipal Airport (MOX)	- None	- None	No
VORTAC	ODI	Nodine	Nodine	FAA	FAA	IFR	- Caledonia-Houston County Airport (CHU) - Rushford Municipal Airport (55Y)	- Winona Municipal Airport (Max Conrad Field) (ONA)	- Minneapolis/St. Paul International Airport (MSP)	Yes
VOR/DME	OTG	Worthington	Worthington	FAA	FAA	Restricted	- Worthington Municipal Airport (OTG)	- Worthington Municipal Airport (OTG)	- None	Yes
VOR/DME	PKD	Park Rapids	Park Rapids	FAA	FAA	IFR	- None	- Park Rapids Municipal Airport (PKD)	- None	No
VOR/DME	RWF	Redwood Falls	Redwood Falls	FAA	FAA	Restricted	- Granite Falls Municipal Airport (Lenzen-Roe Memorial Field) (GDB) - Marshall-Southwest Minnesota Regional Airport-Marshall/Ryan Field (MML) - Olivia Regional Airport (OVL)	- Marshall-Southwest Minnesota Regional Airport-Marshall/Ryan Field (MML)	- Minneapolis/St. Paul International Airport (MSP)	Yes

Type of Equipment	Airport Location of Equipment: FAA ID ¹	Name of Equipment	Location of Equipment: City	Owner of Equipment	Operator of Equipment	Operational Status of Equipment	Dependent Airports for VOR Approaches	Dependent Airports for Instrument Landing System (ILS)/ Localizer (LOC) Approaches	Standard Terminal Arrival (STAR) Procedures for Airports Dependent on Approach	IFR Chart
							- Redwood Falls Municipal Airport (RWF) - Springfield Municipal Airport (D42)			
VOR/DME	RST	Rochester	Rochester	FAA	FAA	IFR	- Austin Municipal Airport (AUM) - Dodge Center Municipal Airport (TOB)	- Austin Municipal Airport (AUM) - Owatonna Degner Regional Airport (OWA) - Rochester International Airport (RST) - Winona Municipal Airport (Max Conrad Field) (ONA)	- Minneapolis/St. Paul International Airport (MSP)	Yes
VOR/DME	ROX	Roseau	Roseau	FAA	FAA	Restricted	- Roseau Municipal Airport (Rudy Billberg Field) (ROX)	- None	- None	Yes
VOR/DME	STC	St. Cloud	St. Cloud	State of Minnesota	FAA	IFR	- Maple Lake Municipal Airport & Seaplane Base (MGG) - Saint Cloud Regional Airport (STC)	- Saint Cloud Regional Airport (STC)	- None	No
VOR/DME	TVF	Thief River Falls	Thief River Falls	FAA	FAA	Restricted	- Thief River Falls Regional Airport (TVF)	- Thief River Falls Regional Airport (TVF)	- None	Yes

Note: (1) Some NAVAIDs included in the scope of this analysis are not located at a Minnesota state system airport. Accordingly, the FAA ID and NAVAID name may not correspond with an airport facility referenced in other MnSASP tasks. Sources: Kimley-Horn, 2021; ADIP, 2021

C.2.4. NEXT STEPS

MnDOT Aeronautics manages the largest network of non-federal NAVAIDs in the country. In many cases, the state is responsible for ongoing maintenance needs, including the cost of utilities required for their operation. Much of the equipment is past its useful life and replacement parts are becoming increasingly unavailable. The state must rely on parts obtained from decommissioned equipment located across the U.S.

In summary, the maintenance and operation of state-managed NAVAIDs in Minnesota is a costly endeavor in terms of equipment and specialized labor. Coupled with the nationwide shift to PBN, MnDOT Aeronautics may consider decommissioning equipment to “right-size” the state NAVAIDs system and optimally allocate state resources across the entire air transportation system.

There are many factors that should be considered when making decisions about maintaining versus decommissioning equipment, such as remaining lifespan, availability of parts, and level of service provided to various user groups. While the MnSASP did develop service coverage thresholds, this analysis applied assumptions based on equipment type and class. Individual pieces of equipment may under- or over-perform these assumed thresholds depending on condition, age, placement relative to terrain/obstacles, and other variables. When a NAVAID fails in the future, equipment-specific factors should be considered to better gauge the long-term value to the air traveling public versus the cost to repair/maintain. The NAVAID’s role at local and/or regional scales is also an important decision-making factor in a resource-constrained environment.

Should MnDOT Aeronautics decide to decommission a state-managed NAVAID, the state is required to follow FAA Order JO 7400.2, *Procedures for Handling Airspace Matters* (see Section 6. Discontinuance of Military and Non-federal NAVAIDs). This process determines if one of the following criteria applies:

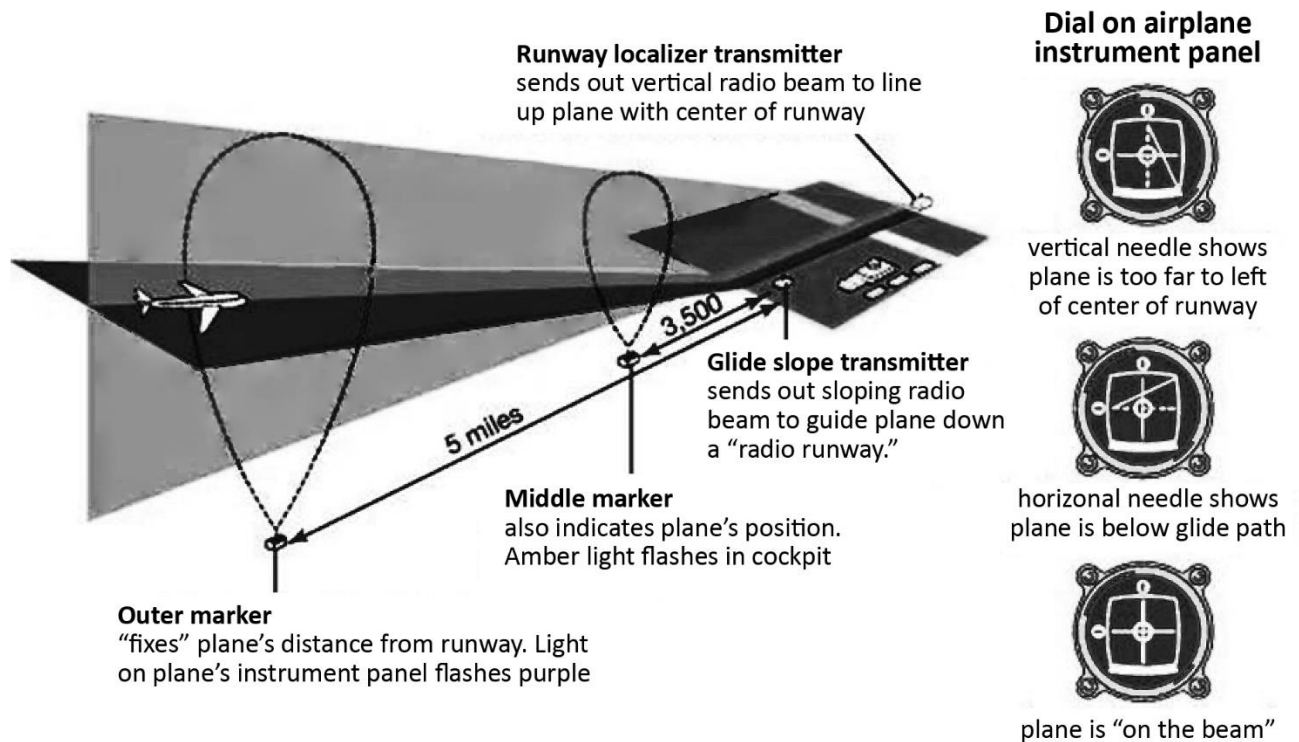
- The NAVAID forms part of the Federal airway/route system
- An airspace designation is predicated upon the NAVAID
- The NAVAID is used for a published civil instrument procedure

If the above criteria are determined to not apply, the FAA air traffic office will notify user groups of the discontinuation without initiating the nonrulemaking process. If one or more criteria do apply, the nonrulemaking process will be initiated and the FAA will consider the feasibility of an FAA takeover. If the NAVAID is ultimately discontinued, the FAA will ensure the airspace designated or IAP predicated on the NAVAID is revoked, modified, or canceled. Additional discontinuation processes are also required for NAVAIDs included in ICAO Air Navigation Plans.

C.3. Instrument Landing System Location Details

The Hub also depicts all equipment associated with ILS in Minnesota. ILS are ground-based NAVAIDS composed of a LOC to provide azimuth guidance and a glideslope (GS) to define the correct vertical descent profile. These two radio beams work together to provide precise vertical and horizontal guidance during landing and are a key element of having a precision runway approach.⁷ A depiction of an ILS is provided in Figure C.2.

Figure C.2. Depiction of an ILS Functionality

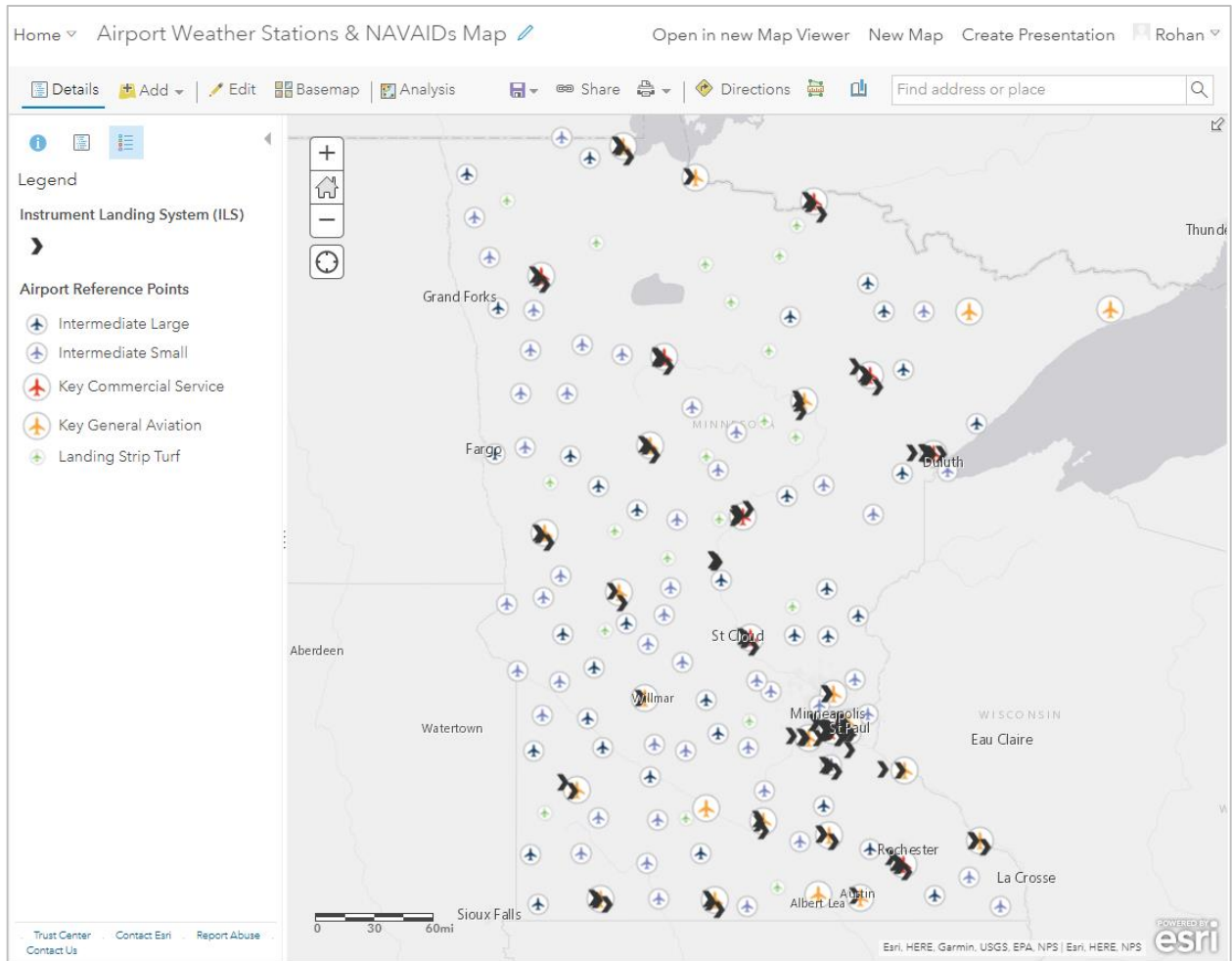


Source: Encyclopedia Britannica, 2009

Airports with an ILS are depicted on a spatial layer in the Hub, as shown in Figure C.3.

⁷ Additional components of having a precision approach including proper runway lighting and marketing and an approach lighting system (ALS). Runway visual range (RVR) and marker beacons or LPDME may also be required. The components of an ILS depend, in part, on how precision the approach is (i.e., approaches with lower weather minimums/visibility). For additional information about components of an ILS, visit the FAA's Ground-based Navigation – ILS website.

Figure C.3. ILS Equipment at Minnesota Airports (Example Screenshot)



Sources: MnDOT Aeronautics, 2021; Kimley-Horn, 2021; FAA, 2021

Additional attributes provided by this spatial layer include:

- Type (i.e., LOC versus GS, with the LOC indicated solely as “ILS” in the attribute table)
- Latitude
- Longitude
- Magnetic variation
- Elevation (feet)
- Facility name
- City
- State
- Owner
- Operator
- Ownership type (i.e., city, state, federal, military)
- Facility Identifier (ID)

C.4. Automated Weather Station Visual Assessment

Having accurate and up-to-date weather is a critical factor of safe flying. Temperature, wind, and moisture work together to create the meteorological conditions that determine ceiling and visibility, create turbulence, and affect aircraft performance. These factors work in combination to influence the pilot and aircraft based on skill, available equipment, and performance characteristics.⁸ Approximately 100 Minnesota airports host an on-site weather station (AWOS/ASOS) to provide accurate weather data to the pilots who rely on their facilities.⁹ These AWOS/ASOS may also provide data to pilots operating at nearby airports if on-site equipment is unavailable.

The accuracy of the data reported by an AWOS/ASOS is, in part, affected by its placement at the airport. Natural or manmade obstacles and proximity to the runway threshold and centerline can impact equipment’s ability to accurately report temperature, wind, and moisture—which, under the right conditions—can have serious consequences for pilots and their passengers. FAA Order JO 6560.20C, *Siting Criteria for Automated Weather Observing Systems*, details the siting criteria for weather reporting systems at airports. To ensure the observations are representative of the meteorological conditions affecting an airport, AWOS/ASOS should comply with the following criteria:

- The preferred siting of the cloud height, visibility, and wind sensors is:
 - Adjacent to the runway 1,000 feet to 3,000 feet from the primary runway threshold
 - Between 500 and 1,000 feet from the primary runway centerline.
- The wind sensor requires a 500-foot clear area where all obstructions must be at least 15 feet lower than the height of the sensor.

The MnSASP team conducted a desktop review of all existing weather stations (AWOS/ASOS) to determine compliance with the FAA’s siting criteria. A visual assessment using Google Earth was completed to identify any potential incompatibilities in terms of obstructions and placement in relationship to the primary runway. A summary of the methodology used in this analysis and the key findings are provided in the following subsections.

C.4.1. METHODOLOGY

As the first step in the AWOS/ASOS visual assessment, MnDOT Aeronautics provided a list of Minnesota airports with an on-site weather reporting station. These data did not indicate the precise location of the equipment at the airport, but instead provided the latitude and longitude of the Airport Reference Point (ARP).¹⁰ Several additional databases were then reviewed to obtain exact location details and equipment type by airport (as available).

⁸ Parson, Susan (March/April 2015). “I’ve Got Weather! (...Now What Do I Do with It?). FAA Safety Briefing.” Available online at https://www.faa.gov/news/safety_briefing/2015/media/MarApr2015.pdf (accessed March 2022).

⁹ This includes 99 airports within the Minnesota state aviation system and four airports not included in the state system. Non-state system airports with on-site weather reporting include Ray S Miller AAF (RYM), Scotts (Crane Lake) Seaplane Base, (CDD), Field of Dreams (04W), and Silver Bay Municipal Airport (BFW). Silver Bay Municipal Airport had been in the state aviation system until its closure in 2019.

¹⁰ The ARP is the approximate geometric center of all usable runways at an airport.

Supplemental data sources are summarized in **Table C.4**. These sources were also used to confirm the list of weather reporting stations in the analysis was comprehensive.

Table C.4. Data Sources Reviewed During AWOS/ASOS Visual Assessment

Name	URL	Data Obtained
FAA Surface Weather Observation Stations ASOS/AWOS	https://www.faa.gov/air_traffic/weather/asos/?state=MN	AWOS/ASOS location and type details
FAA ADIP	https://adip.faa.gov/agis/public/#/public	AWOS/ASOS location details
FAA Validated UDDF Files	https://nfdc.faa.gov/nfdcApps/services/publicData/uddfList.jsp	AWOS/ASOS location details
Iowa State University – IOWA Environmental Mesonet	https://mesonet.agron.iastate.edu/request/download.phtml?network=MN_A_SOS	AWOS/ASOS location details include latitude and longitude and elevation

Source: Kimley-Horn, 2022

Once all other potential databases had been reviewed to obtain as many additional details as possible, the project team used Google Earth as follows:

- When precision position information was known, the point was plotted to determine if the type of system anticipated could be visually confirmed.
- When precision position information was unknown, the ARP was plotted, and the airport was scanned to attempt to locate and identify the type of system anticipated at the airport.

Where a positive identification was made, the latitude/longitude was documented in MnDOT Aeronautics' AWOS/ASOS inventory sheet provided as **Table C.5**. Airports that were identified to have a weather reporting system but equipment could not be located were similarly noted. All identified weather reporting stations were then evaluated to determine if they were sited in accordance with the FAA's criteria relative to the airport's primary runway.

C.4.2. KEY FINDINGS

The full results of AWOS/ASOS visual assessment are presented in **Table C.5**, with the key findings summarized as follows:

- One-hundred and three ASOS/AWOS were positively identified in Minnesota
- Five systems reported by MnDOT Aeronautics could not be cross-referenced in the supplemental data sources nor visually confirmed in Google Earth¹¹
- Possible siting issues were identified at 66 locations

¹¹ Airports that MnDOT Aeronautics reported as having an on-site weather reporting station that could not be cross-referenced in external data source nor visually confirmed include Bemidji Regional Airport (BJI), Bigfork Municipal Airport (FOZ), Scotts (Crane Lake) (CDD), Fosston Municipal Airport (FSE), and Walker Municipal Airport (Y49). MnDOT Aeronautics also reported stations at three locations that could not be identified as airports in any federal database (9MN, FGN, GNA).

It is important to recognize that the visual assessment could only measure the proximity of objects relative to one another. Equipment's distance from the runway threshold and centerline could be evaluated; however, the height of objects cannot be determined using Google Earth. The siting criteria states that the wind sensor requires a 500-foot clear area *where all obstructions must be at least 15 feet lower than the height of the sensor*. Therefore, additional investigation is warranted in cases where objects are located within a 500-foot radius of the wind sensor to determine if a height obstacle is present. Furthermore, this visual assessment is only intended to provide a high-level overview of potential siting issues. Additional on-site evaluations are warranted to confirm findings prior to applying to funding or other policy-related decisions.

C.4.3. AWOS/ASOS VISUAL ASSESSMENT RESULTS BY AIRPORT

Table C.5 provides the findings of the AWOS/ASOS siting assessment by airport. The results of this analysis are also depicted in the Hub in the Minnesota NAVAIDs spatial layer.

Table C.5. AWOS/ASOS Siting Assessment Findings by Airport

Associated City	Airport Name	FAA ID	State Classification	Located on Airport	Latitude	Longitude	Equipment Type	Primary RWY	Remarks	Siting Comments
Aitkin	Aitkin Municipal Airport	AIT	Intermediate Large	Yes	46°32'54.03"N	93°40'31.71"W	AWOS III	16/34	None	Objects w/in 500'
Albert Lea	Albert Lea Municipal Airport	AEL	Key General Aviation	Yes	43°40'56.22"N	93°22'19.75"W	AWOS III	17/35	None	Objects w/in 500'
Alexandria	Alexandria Municipal Airport (Chandler Field)	AXN	Key General Aviation	Yes	45°52'4.93"N	95°23'38.29"W	ASOS	13/31	Found in ADIP/UDDF	No issues identified
Appleton	Appleton Municipal Airport	AQP	Intermediate Small	Yes	45°13'29.61"N	96° 0'14.92"W	AWOS III	13/31	None	Objects w/in 500'
Austin	Austin Municipal Airport	AUM	Key General Aviation	Yes	43°40'7.71"N	92°55'55.47"W	AWOS III	17/35	None	5000' from RWY 35 that has ILS
Baudette	Baudette International Airport	BDE	Key General Aviation	Yes	48°43'33.79"N	94°36'43.72"W	ASOS	12/30	Found in ADIP/UDDF	3250' from RWY 12, Objects w/in 500'
Bemidji	Bemidji Regional Airport	BJI	Key Commercial Service	Unknown	Unknown	Unknown	AWOS III	13/31	Cannot locate	N/A
Benson	Benson Municipal Airport	BBB	Intermediate Large	Yes	45°19'51.51"N	95°38'48.96"W	AWOS III	14/32	None	No issues identified
Bigfork	Bigfork Municipal Airport	FOZ	Intermediate Large	Unknown	Unknown	Unknown	AWOS III P/T	15/33	Cannot locate	N/A
Brainerd	Brainerd-Crow Wing County Regional Airport	BRD	Key Commercial Service	Yes	46°24'7.06"N	94° 7'38.41"W	ASOS	05/23	Found in ADIP/UDDF	5500' from RWY 05 and 6000' from Rwy 16, Trees w/in 500' to the SE
Buffalo	Buffalo Municipal Airport	CFE	Intermediate Small	Yes	45° 9'36.27"N	93°50'45.61"W	AWOS III	18/36	Found in ADIP/UDDF	700' from RWY CL, buildings/trees w/in 500' all around
Cambridge	Cambridge Municipal Airport	CBG	Intermediate Large	Yes	45°33'45.81"N	93°15'51.71"W	AWOS III	16/34	None	3800' from RWY 34, buildings w/in 500' to the E/NE
Camp Ripley	Ray S Miller Army Airfield (AAF)	RYM	Not in the State System	Yes	46° 5'16.25"N	94°21'10.90"W	Unknown	13/31	None	No issues identified
Canby	Canby Municipal Airport (Myers Field)	CNB	Intermediate Large	Yes	44°43'46.80"N	96°15'44.19"W	AWOS III	12/30	None	3200' from RWY 12
Cloquet	Cloquet-Carlton County Airport	COQ	Intermediate Large	Yes	46°41'55.17"N	92°30'12.34"W	AWOS III	17/35	None	No issues identified
Cook	Cook Municipal Airport	CQM	Intermediate Large	Yes	47°49'11.83"N	92°40'54.01"W	AWOS III	13/31	None	4000' from RWY 13, Buildings and Trees w/in 500'
Crane Lake	Scotts (Crane Lake)	CDD	Not in the State System	No	Unknown	Unknown	AWOS III	07W/ 25W	Cannot locate. ARP in a lake	N/A
Crookston	Crookston Municipal Airport (Kirkwood Field)	CKN	Intermediate Large	Yes	47°50'25.51"N	96°37'12.46"W	AWOS III	13/31	None	Building w/in 500'
Detroit Lakes	Detroit Lakes Airport (Wething Field)	DTL	Intermediate Large	Yes	46°49'42.99"N	95°53'8.62"W	AWOS III P/T	14/32	Found in ADIP/UDDF	Building w/in 500', 3100' from RWY 31
Dodge Center	Dodge Center Municipal Airport	TOB	Intermediate Large	Yes	44° 1'13.01"N	92°49'46.31"W	AWOS III	16/34	None	No issues identified
Duluth	Duluth International Airport	DLH	Key Commercial Service	Yes	46°50'36.52"N	92°11'11.79"W	ASOS	09/27	None	No issues identified
Duluth	Duluth-Sky Harbor Airport & Seaplane Base	DYT	Intermediate Small	Yes	46°43'28.18"N	92° 2'40.12"W	AWOS III	14/32	Found in ADIP/UDDF	Buildings and Trees w/in 500'
Elbow Lake	Elbow Lake Municipal Airport	Y63	Intermediate Small	Yes	45°59'20.68"N	95°59'40.57"W	AWOS III	14/32	Found in ADIP/UDDF	Hanger w/in 500', 3300' from RWY 32
Ely	Ely Municipal Airport	ELO	Key General Aviation	Yes	47° 49' 43.31" N	091° 50' 13.56" W	AWOS III	12/30	None	5300' from RWY 30, Buildings and Trees w/in 500'
Eveleth	Eveleth-Virginia Municipal Airport	EVM	Intermediate Large	Yes	47°25'38.66"N	92°29'49.98"W	AWOS III	09/27	None	1400' from RWY centerline, Trees w/in 500' to east
Fairmont	Fairmont Municipal Airport	FRM	Key General Aviation	Yes	43°38'43.72"N	94°25'0.53"W	AWOS III P/T	13/31	Found in ADIP/UDDF	No issues identified
Faribault	Faribault Municipal Airport	FBL	Intermediate Large	Yes	44°19'47.36"N	93°18'42.74"W	AWOS III	12/30	None	No issues identified

Associated City	Airport Name	FAA ID	State Classification	Located on Airport	Latitude	Longitude	Equipment Type	Primary RWY	Remarks	Siting Comments
Fergus Falls	Fergus Falls Municipal Airport (Einar Mickelson Field)	FFM	Key General Aviation	Yes	46°17'11.58"N	96° 9'12.44"W	AWOS III	13/31	None	Buildings w/in 500'
Fosston	Fosston Municipal Airport	FSE	Intermediate Small	No	Unknown	Unknown	AWOS III	16/34	Cannot locate	N/A
Glencoe	Glencoe Municipal Airport (Vernon Perschau Field)	GYL	Intermediate Small	Yes	44°45'31.73"N	94° 5'25.86"W	AWOS III	13/31	None	1025' from RWY 13, Buildings w/in 500'
Glenwood	Glenwood Municipal Airport	GHW	Intermediate Large	Yes	45°38'44.32"N	95°19'7.55"W	AWOS III	15/33	None	No issues identified
Grand Marais	Grand Marais-Cook County Airport	CKC	Key General Aviation	Yes	47°50'11.92"N	90°23'11.16"W	AWOS III	10/28	Found in ADIP/UDDF	Trees w/in 500'
Grand Rapids	Grand Rapids-Itasca County Airport (Gordon Newstrom Field)	GPZ	Key General Aviation	Yes	47°12'10.55"N	93°30'25.35"W	AWOS III P/T	16/34	Found in ADIP/UDDF	Trees w/in 500' to the east
Granite Falls	Granite Falls Municipal Airport (Lenzen-Roe Memorial Field)	GDB	Intermediate Large	Yes	44°45'7.61"N	95°33'32.82"W	AWOS III	15/33	None	Buildings w/in 500'
Hallock	Hallock Municipal Airport	HCO	Intermediate Large	Yes	48°45'8.77"N	96°56'15.36"W	AWOS III	13/31	None	Buildings w/in 500'
Hibbing	Hibbing-Chisholm-Hibbing Municipal Airport	HIB	Key Commercial Service	Yes	47°22'49.45"N	92°49'56.88"W	ASOS	13/31	None	Trees w/in 500' to the west
Hick	Field of Dreams	04W	NA	Yes	46° 1'27.69"N	92°53'56.55"W	AWOS III	06/24	None	Objects w/in 500'
Hutchinson	Hutchinson Municipal Airport (Butler Field)	HCD	Intermediate Large	Yes	44°51'34.55"N	94°23'8.01"W	AWOS III	15/33	None	Yes
International Falls	Falls International Airport	INL	Key Commercial Service	Yes	48° 33' 34.19"N	093° 23' 44.16" W	ASOS	13/31	None	Trees w/in 500' to the west
Jackson	Jackson Municipal Airport	MJQ	Intermediate Small	Yes	43° 38' 59.99"N	094° 59' 11. 40" W	AWOS III	13/31	None	Crops w/in 500'
Litchfield	Litchfield Municipal Airport	LJF	Intermediate Large	Yes	45° 5'41.57"N	94°30'30.15"W	AWOS III	13/31	None	Buildings and Trees w/in 500'
Little Falls	Little Falls-Morrison County Airport	LXL	Intermediate Large	Yes	45°57'3.35"N	94°20'38.69"W	AWOS III	13/31	Found in ADIP/UDDF	Buildings and Trees w/in 500'
Long Prairie	Long Prairie Airport (Todd Field)	14Y	Intermediate Small	Yes	45°54'6.16"N	94°52'21.94"W	AWOS III	16/34	None	Objects w/in 500'
Longville	Longville Municipal Airport	XVG	Intermediate Small	Yes	46°59'38.38"N	94°12'21.48"W	AWOS III	13/31	Found in ADIP/UDDF	Trees w/in 500'
Luverne	Luverne Municipal Airport	LYV	Intermediate Large	Yes	43°37'17.97"N	96°12'50.21"W	AWOS III	18/36	None	1050' from RWY Centerline, Buildings and Trees w/in 500', 4000' from RWY 36
Madison	Madison-Lac Qui Parle Airport	DXX	Intermediate Small	Yes	44°59'1.90"N	96°10'44.16"W	AWOS III	14/32	None	Yes
Mahnomen	Mahnomen County Airport	3N8	Intermediate Small	Yes	47°15'35.45"N	95°55'58.03"W	AWOS III P/T	17/35	None	Objects w/in 500'
Mankato	Mankato Municipal Airport	MKT	Key General Aviation	Yes	44°13'6.38"N	93°55'4.20"W	AWOS III P/T	15/33	Found in ADIP/UDDF	5600' from RWY 15
Maple Lake	Maple Lake Municipal Airport & Seaplane Base	MGG	Intermediate Small	Yes	45°14'7.36"N	93°59'22.83"W	AWOS III	10/28	None	Trees w/in 500' to South
Marshall	Marshall-Southwest Minnesota Regional Airport-Marshall/Ryan Field	MML	Key General Aviation	Yes	44°27'1.16"N	95°49'17.08"W	AWOS III P/T	12/30	None	Yes
McGregor	McGregor-Isedor Iverson Airport	HZX	Intermediate Small	Yes	46°37'8.20"N	93°18'46.04"W	AWOS III	14/32	None	Buildings w/in 500'
Minneapolis	Minneapolis Anoka County/Blaine Airport (Janes Field)	ANE	Key General Aviation	Yes	45° 8'33.28"N	93°12'45.84"W	AWOS III	09/27	None	3100' from RWY 27, 3300' from RWY 18
Minneapolis	Minneapolis Flying Cloud Airport	FCM	Key General Aviation	Yes	44°49'55.73"N	93°28'13.82"W	ASOS	10R/28L	UDDF but not correct	1100' from RWY centerline

Associated City	Airport Name	FAA ID	State Classification	Located on Airport	Latitude	Longitude	Equipment Type	Primary RWY	Remarks	Siting Comments
Minneapolis	Minneapolis Airlake Airport	LVN	Intermediate Large	Yes	44°37'30.78"N	93°13'38.20"W	AWOS III	12/30	Found in ADIP/UDDF	No issues identified
Minneapolis	Minneapolis Crystal Airport	MIC	Intermediate Small	Yes	45° 03' 43.91" N	093° 21' 03.96" W	ASOS	14/32	Found in ADIP/UDDF	No issues identified
Minneapolis	Minneapolis/St. Paul International Airport	MSP	Key Commercial Service	Yes	44°53' 07.43"N	093°13' 2.68"W	ASOS	12R/30L	None	No issues identified
Montevideo	Montevideo-Chippewa County Airport	MVE	Intermediate Large	Yes	44°58'2.88"N	95°42'41.76"W	AWOS III	14/32	None	No issues identified
Moorhead	Moorhead Municipal Airport	JKJ	Intermediate Large	Yes	46°50'17.08"N	96°39'48.90"W	AWOS III	12/30	None	No issues identified
Moose Lake	Moose Lake-Carlton County Airport	MZH	Intermediate Small	Yes	46°25'9.58"N	92°48'5.65"W	AWOS III	04/22	None	Buildings and Trees w/in 500'
Mora	Mora Municipal Airport	JMR	Intermediate Large	Yes	45°53'18.71"N	93°16'8.45"W	AWOS III	17/35	Found in ADIP/UDDF	Buildings and Trees w/in 500'
Morris	Morris Municipal Airport	MOX	Intermediate Large	Yes	45°34'3.77"N	95°57'57.43"W		14/32	Found in ADIP/UDDF	Buildings w/in 500'
New Ulm	New Ulm Municipal Airport	ULM	Key General Aviation	Yes	44°19'21.75"N	94°30'8.73"W	AWOS III	15/33	None	Buildings w/in 500'
Olivia	Olivia Regional Airport	OVL	Intermediate Small	Yes	44°46'45.05"N	95° 1'49.25"W	AWOS III	11/29	None	1 building w/in 500' to the southeast
Orr	Orr Regional Airport	ORB	Intermediate Large	Yes	48° 1'1.29"N	92°51'13.62"W	AWOS III	13/31	Found in ADIP/UDDF	Trees w/in 500'
Ortonville	Ortonville Municipal Airport (Martinson Field)	VVV	Intermediate Small	Yes	45°17'57.61"N	96°25'32.10"W	AWOS III	16/34	None	Prior to threshold, Building and Trees w/in 500'
Owatonna	Owatonna Degner Regional Airport	OWA	Key General Aviation	Yes	44° 7'8.71"N	93°15'24.80"W	AWOS III	12/30	None	No issues identified
Park Rapids	Park Rapids Municipal Airport	PKD	Key General Aviation	Yes	46°53'58.89"N	95° 4'0.57"W	ASOS	13/31	None	Buildings w/in 500'
Paynesville	Paynesville Municipal Airport	PEX	Intermediate Small	Yes	45°22'20.87"N	94°44'19.57"W	AWOS III P/T	11/29	None	Buildings w/in 500'
Pine River	Pine River Regional Airport	PWC	Intermediate Small	Yes	46°43'35.37"N	94°23'5.42"W	AWOS III	16/34	Found in ADIP/UDDF	Buildings w/in 500'
Pipestone	Pipestone Municipal Airport	PQN	Intermediate Large	Yes	43°59'7.44"N	96°17'51.59"W	AWOS III	18/36	None	Buildings w/in 500'
Preston	Preston Fillmore County Airport	FKA	Intermediate Large	Yes	43°40'37.11"N	92°10'27.38"W	AWOS III	11/29	None	Buildings w/in 500'
Princeton	Princeton Municipal Airport	PNM	Intermediate Large	Yes	45°33'51.38"N	93°36'29.00"W	AWOS III	15/33	None	No issues identified
Red Wing	Red Wing Regional Airport	RGK	Key General Aviation	Yes	44°35'33.32"N	92°29'3.82"W	AWOS III	09/27	None	1200' from RWY centerline
Redwood Falls	Redwood Falls Municipal Airport	RWF	Intermediate Large	Yes	44°32'53.74"N	95° 4'49.53"W	ASOS	12/30	None	No issues identified
Rochester	Rochester International Airport	RST	Key Commercial Service	Yes	92°29'31.43"W	43°54'14.50"N	ASOS	13/31	Found in ADIP/UDDF	No issues identified
Roseau	Roseau Municipal Airport (Rudy Billberg Field)	ROX	Intermediate Large	Yes	48°51'21.59"N	95°41'41.41"W	AWOS III	16/34	Found in ADIP/UDDF	No issues identified
Rush City	Rush City Municipal Airport	ROS	Intermediate Large	Yes	45°41'46.56"N	92°57'15.37"W	AWOS III	16/34	Found in ADIP/UDDF	Buildings and Trees w/in 500'
Sauk Centre	Sauk Centre Municipal Airport	D39	Intermediate Small	Yes	45°42'20.26"N	94°55'50.94"W	AWOS III	14/32	Found in ADIP/UDDF	Buildings and Trees w/in 500'
Silver Bay*	Silver Bay Municipal	BFW	Not in the system	Yes	47°15'07.55"N	091° 24' 35.28" W	AWOS III P/T	07/23	None	Within distances but prior to threshold. 3300' from RWY 07. Trees and buildings withing 500'

Associated City	Airport Name	FAA ID	State Classification	Located on Airport	Latitude	Longitude	Equipment Type	Primary RWY	Remarks	Siting Comments
Slayton	Slayton Municipal Airport	DVP	Intermediate Small	No	43°59'25.32"N	95°46'51.83"W	AWOS III	17/35	None	Buildings w/in 500'. Less than 400' from threshold.
South St. Paul	South St. Paul Municipal Airport (Fleming Field)	SGS	Intermediate Large	Yes	44°51'36.17"N	93° 1'55.25"W	AWOS III	16/34	None	Buildings w/in 500'
St. Cloud	Saint Cloud Regional Airport	STC	Key Commercial Service	Yes	45°32'39.00"N	94° 3'5.73"W	ASOS	13/31	None	Trees w/in 500'
St. James	Saint James Municipal Airport	JYG	Intermediate Large	Yes	43°59'8.10"N	94°33'10.82"W	AWOS III	15/33	None	Buildings w/in 500'
St. Paul	Saint Paul-Lake Elmo Airport	21D	Intermediate Small	Yes	45° 0'0.76"N	92°51'17.73"W	AWOS III	14/32	None	1250' from Primary, 624' from 04/22
St. Paul	Saint Paul Downtown Airport (Holman Field)	STP	Key General Aviation	Yes	44°55'56.46"N	93° 3'21.13"W	ASOS	14/32	None	No issues identified
Stanton	Stanton Airfield	SYN	NA	Yes	44°28'25.04"N	93° 0'52.04"W	AWOS III	Turf	None	Buildings w/in 500'
Staples	Staples Municipal Airport	SAZ	Intermediate Small	Yes	46°22'42.44"N	94°48'5.97"W	AWOS III	14/32	Found in ADIP/UDDF	Buildings w/in 500'
Thief River Falls	Thief River Falls Regional Airport	TVF	Key Commercial Service	Yes	48° 3'35.07"N	96°10'43.98"W	AWOS III P/T	13/31	Found in ADIP/UDDF	No issues identified
Tracy	Tracy Municipal Airport	TKC	Intermediate Small	Yes	44°14'58.27"N	95°36'42.84"W	AWOS III	11/29	None	Buildings and Trees w/in 500'
Two Harbors	Two Harbors-Richard B. Helgeson Airport	TWM	Intermediate Large	Yes	47° 3'6.90"N	91°44'43.69"W	AWOS III	06/24	None	Buildings and Trees w/in 500'
Wadena	Wadena Municipal Airport	ADC	Intermediate Large	Yes	46°27'0.84"N	95°12'48.69"W	AWOS III P/T	16/34	None	Building w/in 500'
Walker	Walker Municipal Airport	Y49	Intermediate Small	No	Unknown	Unknown	AWOS III P/T	15/33	Cannot locate	N/A
Warroad	Warroad International Airport (Swede Carlson Field)	RRT	Key General Aviation	Yes	48°55'54.51"N	95°20'25.87"W	AWOS III	13/31	None	Buildings w/in 500'
Waseca	Waseca Municipal Airport	ACQ	Intermediate Small	Yes	44° 4'12.75"N	93°33'12.40"W	AWOS III	15/33	Found in ADIP/UDDF	No issues identified
Waskish	Waskish Municipal Airport	VWU	Landing Strip Turf	Yes	48° 9'0.72"N	94°30'43.30"W	AWOS III	02/20	None	No issues identified
Wheaton	Wheaton Municipal Airport	ETH	Intermediate Small	Yes	45°46'58.14"N	96°32'45.90"W	AWOS III	16/34	None	No issues identified
Willmar	Willmar Municipal Airport	BDH	Key General Aviation	Yes	45° 6'40.05"N	95° 7'32.93"W	AWOS III	13/31	Found in ADIP/UDDF	3600' from RWY 13, Objects w/in 500', Can't validate obj lower than 15' (buildings)
Windom	Windom Municipal Airport	MWM	Intermediate Small	Yes	43°54'36.01"N	95° 6'26.12"W	AWOS III	17/35	Found in ADIP/UDDF	Buildings w/in 500'
Winona	Winona Municipal Airport (Max Conrad Field)	ONA	Key General Aviation	Yes	44° 4'34.43"N	91°42'20.64"W	AWOS III	12/30	None	No issues identified
Worthington	Worthington Municipal Airport	OTG	Key General Aviation	Yes	43°39'8.91"N	95°34'32.71"W	AWOS III P/T	11/29	Found in ADIP/UDDF	No issues identified
N/A	Unknown	9MN	Not in the system	No	Unknown	Unknown	Unknown	Unknown	Cannot identify airport	N/A
N/A	Unknown	FGN	Not in the system	No	Unknown	Unknown	Unknown	Unknown	Cannot identify airport	N/A
N/A	Unknown	GNA	Not in the system	No	Unknown	Unknown	Unknown	Unknown	Cannot identify airport	N/A

**Note: Silver Bay Municipal Airport closed in 2019 and is no longer part of the state airport system. Sources: MnDOT Aeronautics, 2021; Kimley-Horn, 2021; FAA ADIP, 2021; FAA Validated UDDF Files, 2021; Iowa State University – IOWA Environmental Mesonet, 2021; Google Earth, 2021; FAA JO 6560.20C, Siting Criteria for Automated Weather Observing Systems (effective 09/06/2017)*