mn DEPARTMENT OF TRANSPORTATION

Airport Metrics White Paper

2020 State Aviation System Plan (SASP) Phase I

April 10, 2019

Contents

Airport Metrics

This white paper outlines the airport metrics that will be included in the 2020 SASP. The airport metrics include both measures and indicators.

Airport Measures

The 2020 SASP will include the following airport measures for each classification of airport. The airport measures replace the previous Minimum System Objectives in the 2012 SASP.

The measures include various facilities, services, and administrative items which are a required, recommended, or that should be provided on an as needed basis. Stakeholder feedback during Phase I of the 2020 SASP indicated that better clarification and definition of which facilities were required versus recommended was needed.

In this white paper, *required*, *recommended* and *as needed* are utilized to describe various facilities, services and administrative items for each classification. The definitions of these terms are as follows:

- *Required* indicates that MnDOT expects that item to be at each airport of that classification. Required items are those that are required by Minnesota rule or statute or other FAA requirement or guidance for that airport size or expected critical aircraft.
- *Recommended* items are those that MnDOT determined are *typically* expected and add value to airports in that classification; individual airports should evaluate the item and determine if it is needed at the local level.
- *As needed* indicates that MnDOT determined that the facility, service or administrative item *may sometimes* be needed in certain circumstances or add value for airports in a certain classification, but the need should be determined at the local level.

It is important to note that the airport facility requirements analysis does not replace the need for airport and individual project planning efforts or project justification. Because the requirements and recommendations are provided at a system-level, in some cases, the local need may exceed the recommendation or requirements in the system plan. In addition, some SASP requirements may not be feasible at each airport.

Facilities

Primary Runway Width

An airport's primary runway width is determined by the operational requirements of the airport's critical aircraft. A critical aircraft is one that requires the greatest runway width for safety operations and has, or is forecasted to have, over 500 annual takeoffs or landings (operations).

Key Commercial Service – A runway width of 100 feet is required for Key Commercial Service Airports. This width corresponds to Runway Design Codes (RDC) C-II and B-II with a ½ mile approach, the required approach for this classification. It also corresponds to FAA design standards for approaches with visibility minimums of less than ¾ mile. A runway width of 150 is recommended as it corresponds to an RDC of C-III which accommodates the larger regional jets that can be expected to serve the commercial service airports in MN in the future such as the Embraer 175.

Key General Aviation – A runway width of 100 feet is required for Key GA Airports. This width corresponds to FAA design standards for RDCs of C-II and B-II with approach visibility minimums lower than ¾ mile. This allows for airports to accommodate an instrument approach with ½ mile visibility minimums, which is recommended for this classification.

Intermediate Large – A runway width of 60 feet is required for Intermediate Large Airports. This width corresponds to the minimum width of a hard surface runway in Minnesota Administrative Rules. A 75-foot wide runway is strongly recommended as it corresponds to an RDC B-II runway with 1-mile visibility minimums, common RDC and approaches for an Intermediate Large Airport.

Intermediate Small – A runway width of 60 feet is required for Intermediate Small Airports. This width corresponds to the minimum width of a hard surface runway in Minnesota Administrative Rules. A 75-foot wide runway is strongly recommended as corresponds to an RDC B-II runway with 1-mile visibility minimums, common RDC and approaches for an Intermediate Small Airport.

Landing Strip Turf – A minimum runway width of 75 feet is required for turf landing strips. This width corresponds to the minimum width of turf runway in Minnesota Administrative Rules.

Landing Strip Seaplane Base – Runway width is not applicable to seaplane bases. However, sufficient space for safe operation should be provided.

Runway Lighting

Runway lighting helps pilots identify the edges of the runway while landing and taking off at night or during periods of low visibility. Depending on the type of aircraft using an airport at night and the existing runway approaches (e.g., precision, non-precision, visual), varying intensities of lights are required.

High intensity runway lights (HIRLs) provide the best view of a runway at night or during inclement weather. Medium intensity runway lights (MIRLs) provide less visibility than HIRLs, but provide sufficient visibility for aircraft with higher approach speeds. . Low intensity runway lights (LIRLs) provide the minimum amount of visibility for an airport open at night.

Key Commercial Service – High intensity runway lights (HIRLs) are required on primary runways at Key Commercial Service Airports. HIRLs provide the best view of a runway at night or during inclement weather and are required for night time precision approaches with ½ mile visibility and RVR based minimums.

Key GA – Medium Intensity Runway Lights (MIRLs) are required at Key GA Airports and HIRLs are recommended. Medium intensity runway lights (MIRLs) provide less visibility than HIRLs, but provide sufficient visibility for aircraft with higher approach speeds. MIRLs are required for night time approaches with visibility minimums of less than or equal to ¾ mile.

Intermediate Large – MIRLs are required at Intermediate Large Airports as they provide sufficient visibility for aircraft with higher approach speeds and allow for varying intensities. The higher intensity setting aids safety during IFR or low visibility conditions.

Intermediate Small - MIRLs are required at Intermediate Large Airports as they provide sufficient visibility for aircraft with higher approach speeds and allow for varying intensities. The higher intensity setting aids safety during IFR or low visibility conditions.

Landing Strip Turf – Low intensity runway lights (LIRL) are recommended for turf landing strips and edge markers are required for turf runways without lighting. LIRL provide the minimum lighting required for an airport to be open at night. Edge markers are required in Minnesota Administrative Rules for unlit turf runways.

Landing Strip Seaplane Base – Runway lighting is not applicable to seaplane bases.

Primary Runway Approaches

Runway approach procedures are designed to guide the transition from the en route phase of a flight to the approach and landing phase. An instrument approach makes an airport useable under a wider variety of weather conditions than an airport without one. Instrument approach procedures improve access to airports during inclement weather and periods of low visibility.

Key Commercial Service – Key Commercial Service Airports are required to have a precision approach with minimums of ½ mile to at least one primary runway end. A precision approach guides a pilot vertically and horizontally to a runway end. Minnesota Administrative Rules require Key airports to protect airspace for precision instrument approach surfaces. Visibility minimums of ½ mile help support reliable air service and community access and can be achieved through either a full Instrument Landing System (ILS) or through an LPV (localizer performance with vertical guidance) approach which uses GPS guidance along with an approach lighting system.

Key GA – Key GA Airports are required to have a precision approach with minimums of ¾ mile to at least one primary runway end and a ½ mile is recommended. A precision approach guides a pilot vertically and horizontally to a runway end. Minnesota Administrative Rules require Key airports to protect airspace for precision instrument approach surfaces. The ¾ mile minimums support reliable general aviation access to a community and can be achieved through either a full Instrument Landing System (ILS) or through an LPV approach.

Intermediate Large – Intermediate Airports have less activity during inclement weather so the requirement is less precise than Key Airports. Intermediate Large Airports are required to have a non-

precision instrument approach with 1-mile visibility or lower to at least one runway end. Non-precision approaches can be provided using ground based (VOR, NDB, etc.) navigation or GPS (including LPV approaches). Approaches with vertical guidance, such as LPV approaches, are recommended as they improve the accessibility to airports and provide more precise guidance.

Intermediate Small – It is recommended that Intermediate Small Airports have a non-precision instrument approach with 1-mile visibility or lower to at least one runway end. Non-precision approaches can be provided using ground based (VOR, NDB, etc.) navigation or GPS (including LPV approaches). Approaches with vertical guidance, such as LPV approaches, are recommended as they improve the accessibility to airports and provide more precise guidance.

Landing Strip Turf – Visual approaches are required for Landing Strip Turf Airports as they are sufficient for most aircraft users using these airports.

Landing Strip Seaplane Base –   Visual approaches are required for Landing Strip Seaplane Base Airports.

Parallel Taxiway

Parallel taxiways serve two primary purposes. First, they provide added safety by minimizing potential conflicts between taxiing aircraft and arriving or departing aircraft. Second, parallel taxiways increase runway capacity, particularly at busier airports because a landing or departing aircraft must wait to use the runway while it's occupied by taxiing aircraft. Parallel taxiways are required infrastructure for certain instrument approach procedures.

Partial parallel taxiways provide access to and from the runway at multiple points but do not extend the entire length of the runway. A partial parallel taxiway allows aircraft to turn around and hold while other aircraft utilize the runway and allows two aircraft to pass each other in between the runway and building area. A partial parallel taxiway does not need to extend a significant portion of a runway to be considered a partial parallel. A runway with a single connector on one end and a small 'tea-cup handle' style partial parallel taxiway/turnaround on the other end would fulfill the intent of a partial parallel in this case.

Key Commercial Service – A parallel taxiway is required for Key Commercial Service Airports. It is required that Key Commercial Service Airports have an instrument approach procedure with ½ mile visibility minimums. A parallel taxiway is required in order to achieve a precision approach with less than 1-mile visibility.

Key GA – A parallel taxiway is required for Key GA Airports. It is required that Key Commercial Service Airports have an instrument approach procedure with at least ¾ mile visibility minimums. A parallel taxiway is required in order to achieve a precision approach with less than 1-mile visibility.

Intermediate Large – A parallel taxiway is required for Intermediate Large Airports if an airport has approach minimums of less than 1-mile. A partial parallel taxiway is required if visibility minimums are 1-mile or greater. A full-length parallel taxiway increases safety, especially for airports with aircraft operating in instrument conditions.

Intermediate Small – A partial parallel taxiway is required for Intermediate Small Airports, and a parallel taxiway is recommended. A full-length taxiway increases safety, especially for airports with aircraft operating in instrument conditions and airports with higher traffic levels overall or concentrated high activity during a certain time period. A partial parallel taxiway would allow aircraft to turn around and hold while other aircraft utilize the runway and for two aircraft to pass each other in between the runway and building area.

Landing Strip Turf – Taxiway connectors are required for Turf Landing Strip Airports and a partial parallel taxiway is recommended. Connectors are required to reach the runway and a partial parallel taxiway allows aircraft to turn around and hold while other aircraft utilize the runway and for two aircraft to pass each other in between the runway and building area.

Landing Strip Seaplane Base – A parallel taxiway is not applicable for Landing Strip Seaplane Bases.

Taxiway Width:

The parallel taxiway width at an airport is dependent on the critical aircraft for the taxiway system.

Key Commercial Service – A minimum taxiway width of 35 feet is required, and 50 feet is recommended for Key Commercial Service Airports. A width of 35 feet corresponds to a TDG 2 (i.e. CRJ 200) and a width of 50 feet corresponds to a TDG 3 aircraft (i.e. Embraer 175, an aircraft likely to service EAS communities in MN).

Key GA – A minimum taxiway width of 35 feet is required for Key GA Airports in order to accommodate TDG 2 aircraft. TDG 2 aircraft likely to use a Key GA Airport include the Gulfstream III/IV/V, Global Express, Citation V, and King Air 350.

Intermediate Large – A minimum taxiway width of 25 feet is required and 35 feet is recommended for Intermediate Large Airports. A minimum width of 25 feet is required to serve TDG 1A and 1B aircraft (ie. King Air 90, Queen Air, many smaller jets and most common single engine piston aircraft). A width of 35 feet allows TDG 2 aircraft to utilize the taxiway. These aircraft include King Air 200 and 250 and several common jets.

Intermediate Small – A minimum taxiway width of 25 feet is required for Intermediate Small Airports. A minimum width of 25 feet is required to serve TDG 1A and 1B aircraft (ie. King Air 90, Queen Air, many smaller jets and most common single engine piston aircraft

Landing Strip Turf – A minimum taxiway width of 25 feet is required for Turf Landing Strip Airports. A minimum width of 25 feet is required to serve TDG 1A and 1B aircraft that are likely to use these airports including common single engine and smaller twin engine aircraft.

Landing Strip Seaplane Base – A minimum taxiway width of 25 feet is required for Landing Strip Seaplane Bases. A minimum width of 25 feet is required to serve TDG 1A and 1B aircraft that are likely

to use these airports including Cessna Caravan Amphibian, Cessna Skywagon Amphibian and other common single engine and smaller twin engine floatplane aircraft.

Navigation Systems

Navigation systems aid pilots landing or departing from an airport. These facilities range from sophisticated instrument landing systems (ILS) which can guide an aircraft to the runway on autopilot, to simple fixtures, like wind cones, which aid a pilot in determining wind direction and speed at the airport. Like the runway approaches described in the previous section airport measures for navigation systems are tailored to the users of each classification of airport. The following NAVIADs may be required or recommended for each classification:

Approach Lighting – A medium intensity approach lighting system with runway alignment indicator lights (MALSR) is a series of flashing lights which help guide a pilot to a runway end. Other approach lighting systems meeting the objectives are: omni-directional approach lighting (ODALs), medium intensity approach lighting system with sequenced flashers (MALSF), and high intensity approach lighting system with sequenced flashers for ILS category 1, 2, and 3 approaches (ALSF-I, ALSF-II, ALSF-III). Each lighting system serves a similar purpose but has a different configuration.

Vertical Glide Slope Indicator (VGSI) - Precision Approach Path Indicators (PAPIs) and Vertical Approach Slope Indicators (VASIs) are a series light boxes adjacent to the runway which when viewed from an approaching aircraft indicate when the airplane is on the proper glide path. The lights will appear as different colors depending if the airplane is too low, too high, or right on the approach path. While both PAPIs and VASIs adequately meet this metric, MnDOT prefers that all new VGSI systems utilize PAPIs.

Runway End Identifier Lights (REIL) - REILS are flashing lights at the end of the runway used to identify the end of a runway from the air.

Rotating Beacon - Rotating beacons flash various colors of light to help pilots locate an airport from the air.

Wind Cone - A wind cone is an orange fabric cone which rotates on a pole depicting the present wind direction. The wind cone allows pilots to visually see the direction of the wind near the runway from the air.

> **Key Commercial Service** – An approach lighting system and REILs, VGSI, beacon, and a wind cone are required for Key Commercial Service Airports. Approach lights are required as they are needed to achieve the visibility minimum measure. REILs are required as they improve a pilot's ability to identify the runway environment; they are included in MALSR approach lighting systems. VGSI (PAPI or VASI) provide visual approach path guidance to the runway threshold. Beacons visually aid pilots in locating an airport from a distance. Wind cones are required per MN statute and they help pilots determine wind direction and velocity to aid in identifying the preferred runway for landing or takeoff.

> **Key GA** – An approach lighting system and REILs, VGSI, beacon, and a wind cone are required for Key GA Airports. Approach lights are required as they are needed to achieve the visibility minimum measure. REILs are required as they improve a pilot's ability to identify the runway environment; they are included in MALSR approach lighting systems. VGSI (PAPI or VASI) provide visual approach path

guidance to the runway threshold. Beacons visually aid pilots in locating an airport from a distance. Wind cones are required per MN statute and they help pilots determine wind direction and velocity to aid in identifying the preferred runway for landing or takeoff.

Intermediate Large – Intermediate Large Airports are required to have a VGSI, wind cone, and a rotating beacon. VGSI (PAPI and VASI) provide visual approach path guidance to the runway threshold. Beacons visually aid pilots in locating an airport from a distance. Wind cones are required per MN statute and they help pilots determine wind direction and velocity to aid in identifying the preferred runway for landing or takeoff. REILs are recommended as they improve a pilot's ability to identify the runway environment.

Intermediate Small – Intermediate Small Airports are required to have a beacon and wind cone. Beacons visually aid pilots in locating an airport from a distance. Wind cones are required per MN statute and they help pilots determine wind direction and velocity to aid in identifying the preferred runway for landing or takeoff. VGSI are recommended as they provide visual approach path guidance to the runway threshold.

Landing Strip Turf – A wind cone is required for turf landing strips. If the landing strip is lighted, a rotating beacon is also required. Beacons visually aid pilots in locating an airport from a distance. Wind cones are required per MN statute and they help pilots determine wind direction and velocity to aid in identifying the preferred runway for landing or takeoff. VGSI should be provided as-needed as they provide visual approach path guidance to the runway threshold.

Landing Strip Seaplane Base – A wind cone is required for a seaplane base. Wind cones are required per MN statute and they help pilots determine wind direction and velocity to aid in identifying the preferred runway for landing or takeoff.

Weather Reporting

Weather reporting facilities broadcast weather information over a radio frequency for pilots to use when operating on, and in the vicinity of, an airport. The two types of weather reporting facilities include Automated Weather Observing Systems (AWOS) and Automated Surface Observing Systems (ASOS).   While both systems meet the SASP guidance for weather reporting, the term AWOS is used below for simplicity.

Key Commercial Service – Key Commercial Service Airports are required to have an AWOS. On-site weather reporting increases safety for pilots and reliability for aircraft operations. When an AWOS, or elements of what it reports such as altimeter, are not available, instrument approach procedures may be impacted. In addition, Part 121 and Part 135 operators must obtain weather information from an AWOS information to depart or arrive. Terminal weather observation and reporting facilities must be available for an airport to serve as an alternate airport.

Key GA – Key GA Airports are required to have an AWOS or ASOS. On-site weather reporting increases safety for pilots and reliability for aircraft operations. When an AWOS, or elements of what it reports such as altimeter, are not available, instrument approach procedures may be impacted. In addition, Part

135 operators must obtain AWOS information to depart or arrive. Terminal weather observation and reporting facilities must be available for an airport to serve as an alternate airport.

Intermediate Large – Intermediate Large Airports are recommended to have an AWOS. When an AWOS, or elements of what it reports such as altimeter, are not available, instrument approach procedures may be impacted. Terminal weather observation and reporting facilities must be available for an airport to serve as an alternate airport. The availability of an on-site weather facility increases reliability and safety for aircraft operations.

Intermediate Small – Intermediate Large Airports are recommended to have an AWOS. When an AWOS, or elements of what it reports such as altimeter, are not available, instrument approach procedures may be impacted. Terminal weather observation and reporting facilities must be available for an airport to serve as an alternate airport. The availability of an on-site weather facility increases reliability and safety for aircraft operations.

Landing Strip Turf – Landing Strip Turf Airports should have and AWOS as-needed. The availability of an on-site weather facility increases reliability and safety for aircraft operations.

Landing Strip Seaplane Base – Landing Strip Seaplane Bases should have and AWOS as-needed. The availability of an on-site weather facility increases reliability and safety for aircraft operations.

Aircraft Parking:

Aircraft parking spaces allow for both based and transient aircraft to be parked for long-term and short-term use.

Key Commercial Service – Tiedowns for at least three more aircraft than normally utilize the airport are required. This is required per Minnesota Administrative Rules.

Key GA – Tiedowns for at least three more aircraft than normally utilize the airport are required. This is required per Minnesota Administrative Rules.

Intermediate Large – Tiedowns for at least three more aircraft than normally utilize the airport are required. This is required per Minnesota Administrative Rules.

Intermediate Small – Tiedowns for at least three more aircraft than normally utilize the airport are required. This is required per Minnesota Administrative Rules.

Landing Strip Turf – Tiedowns for at least three more aircraft than normally utilize the airport are required. This is required per Minnesota Administrative Rules.

Landing Strip Seaplane Base – An adequate number of tiedowns and/or docking locations is required for seaplane bases. The number that is deemed adequate will be determined at the local airport sponsor level.

GA Terminal/Admin Building

GA Terminal, administrative, and arrival/departure (A/D) buildings provide space and shelter for pilots, passengers, and travelers. Many of these buildings provide space for flight planning, meetings, and other activities.

Key Commercial Service – Key Commercial Service Airports are required to have a GA terminal with a phone and restroom. GA terminal buildings provide shelter for pilots and passengers, and space for flight planning, business meetings, etc. A phone and restroom are required in Minnesota Administrative Rules.

Key GA – Key GA Airports are required to have a GA terminal with a phone and restroom. GA terminal buildings provide shelter for pilots and passengers and space for flight planning, business meetings, etc. A phone and restroom are required in Minnesota Administrative Rules.

Intermediate Large – Intermediate Large Airports are required to have a GA terminal with a phone and restroom. GA terminal buildings provide shelter for pilots and passengers, and maybe provide space for flight planning, business meetings, etc. A phone and restroom are also required in Minnesota Administrative Rules.

Intermediate Small – Intermediate Small Airports are required to have a GA terminal with a phone and restroom. GA terminal buildings provide shelter for pilots and passengers, and may provide space for flight planning, business meetings, etc. A phone and restroom are required in Minnesota Administrative Rules.

Landing Strip Turf – GA terminals are recommended at Landing Strip Turf Airports. GA terminal buildings provide shelter for pilots and passengers, and may provide space for flight planning, business meetings, etc. A phone and restroom are required in Minnesota Administrative Rules. These can be provided outside of a terminal building, if none is available.

Landing Strip Seaplane Base – A phone and restroom are required in Minnesota Administrative Rules. These can be provided for outside of a terminal building, if none is available.

Automobile Parking

Dedicated automobile parking is commonly available near terminal buildings at airports. In addition, automobile parking may be needed at airport businesses and within hangar areas. Dedicated automobile parking aids in ensuring that automobile traffic and aircraft traffic are not mixed which may create a safety risk.

Key Commercial Service – Adequate parking is required at Key Commercial Service Airports. Automobile parking at these airports serves both general aviation and commercial passenger needs. The level of parking spaces that is adequate for each Key Commercial Service Airport will differ and should be determined at the local level.

Key GA – Adequate parking is required at Key GA Airports. The level of parking spaces that is adequate for each airport will differ and should be determined at the local level.

Intermediate Large – Adequate parking is required at Intermediate Large Airports. The level of parking spaces that is adequate for each airport will differ and should be determined at the local level.

Intermediate Small – Adequate parking is required at Intermediate Small Airports. The level of parking spaces that is adequate for each airport will differ and should be determined at the local level.

Landing Strip Turf – Adequate parking is required at Landing Strip Turf Airports. The level of parking spaces that is adequate for each airport will differ and should be determined at the local level.

Landing Strip Seaplane Base – Adequate parking is required at Landing Strip Seaplane Bases. The level of parking spaces that is adequate for each seaplane base will differ and should be determined at the local level.

Fencing

Fencing at airports adds security and can help prevent hazardous wildlife, such as deer, from entering the airport environment.

Key Commercial Service – Full perimeter fencing is required at Key Commercial Service Airports. Part 139 airports are required to provide effective safeguards against inadvertent entry into the movement area by unauthorized persons or vehicles. Fencing 10-12 feet with 3 strands of barbed wire is recommended in FAA Cert Alert 04-16 to prevent wildlife from entering the airport operations area.

Key GA – Controlled vehicle access is required and full perimeter fencing should be provided as-needed for security and wildlife control at Key GA Airports. Controlled access improves safety by limiting unauthorized individuals from accessing the airfield. Perimeter fencing improves security as well as reduces wildlife hazards when wildlife fencing is used. The need for wildlife fencing should be determined at the local level based on wildlife activities and attractants on and near the airport.

Intermediate Large – Controlled vehicle access is required and full perimeter fencing should be provided as-needed for security and wildlife control at Intermediate Large Airports. Controlled access improves safety by limiting unauthorized individuals from accessing the airfield. Perimeter fencing improves security as well as reduces wildlife hazards when wildlife fencing is used. The need for wildlife fencing should be determined at the local level based on wildlife activities and attractants on and near the airport.

Intermediate Small – Controlled vehicle access and full perimeter fencing should be provided as-needed for security and wildlife control at Intermediate Small Airports. Controlled access improves safety by limiting unauthorized individuals from accessing the airfield. Perimeter fencing improves security as well as reduces wildlife hazards when wildlife fencing is used. The need for wildlife fencing should be determined at the local level based on wildlife activities and attractants on and near the airport.

Landing Strip Turf – Controlled vehicle access and full perimeter fencing should be provided as-needed for security and wildlife control at Landing Strip Turf Airports. Controlled access improves safety by limiting unauthorized individuals from accessing the airfield. Perimeter fencing improves security as well as reduces wildlife hazards when wildlife fencing is used. The need for wildlife fencing should be determined at the local level based on wildlife activities and attractants on and near the airport.

Landing Strip Seaplane Base – Controlled vehicle access should be provided as-needed for security at Landing Strip Seaplane Bases. Controlled access improves safety by limiting unauthorized individuals from accessing the seaplane base.

Airport Surfaces

Obstructions in protected airport surfaces are flight hazards and must be accounted for by the pilot during the two most critical phases of flight – take-off and landing. Obstructions may pose a safety risk and raise the minimums of instrument approach procedures, when lower minimums are more desirable. This affects the amount of time an airport is accessible during inclement weather. Several airspace surfaces are defined in Minnesota Administrative Rules.

Key Commercial Service – Airport surfaces are required to be clear of obstructions at Key Commercial Service Airports. Clear approach and primary surfaces, as defined in Minnesota Administrative Rules, are required for a Public Airport License. Other defined surfaces should be clear to provide a safe operating environment. Clear surfaces include those that have a waiver for any existing obstructions (primary and approach surface) or surfaces with an obstruction that has been studied through an airspace case and determined to not be a hazard (for example, a transitional obstruction).

Key GA – Airport surfaces are required to be clear of obstructions at Key GA Airports. Clear approach and primary surfaces, as defined in Minnesota Administrative Rules, are required for a Public Airport License. Other defined surfaces should be clear to provide a safe operating environment. Clear surfaces include those that have a waiver for any existing obstructions (primary and approach surface) or surfaces with an obstruction that has been studied through an airspace case and determined to not be a hazard (for example, a transitional obstruction).

Intermediate Large – Airport surfaces are required to be clear of obstructions at Intermediate Large Airports. Clear approach and primary surfaces, as defined in Minnesota Administrative Rules, are required for a Public Airport License. Other defined surfaces should be clear to provide a safe operating environment. Clear surfaces include those that have a waiver for any existing obstructions (primary and approach surface) or surfaces with an obstruction that has been studied through an airspace case and determined to not be a hazard (for example, a transitional obstruction).

Intermediate Small – Airport surfaces are required to be clear of obstructions at Intermediate Small Airports. Clear approach and primary surfaces, as defined in Minnesota Administrative Rules, are required for a Public Airport License. Other defined surfaces should be clear to provide a safe operating environment. Clear surfaces include those that have a waiver for any existing obstructions (primary and

approach surface) or surfaces with an obstruction that has been studied through an airspace case and determined to not be a hazard (for example, a transitional obstruction).

Landing Strip Turf – Airport surfaces are required to be clear of obstructions at Landing Strip airports. Clear approach and primary surfaces, as defined in Minnesota Administrative Rules, are required for a Public Airport License. Other defined surfaces should be clear to provide a safe operating environment. Clear surfaces include those that have a waiver for any existing obstructions (primary and approach surface) or surfaces with an obstruction that has been studied through an airspace case and determined to not be a hazard (for example, a transitional obstruction).

Landing Strip Seaplane Base – Airport surfaces are required to be clear of obstructions at Landing Strip Seaplane Bases if the sea lane is marked. Clear approach and primary surfaces, as defined in Minnesota Administrative Rules, are required for a Public Airport License. Other defined surfaces should be clear to provide a safe operating environment. Clear surfaces include those that have a waiver for any existing obstructions (primary and approach surface) or surfaces with an obstruction that has been studied through an airspace case and determined to not be a hazard (for example, a transitional obstruction).

Services

Fuel

Aviation fuel available at an airport varies depending on the type of user. Self-service as well as full-service fuel services may be available.

Key Commercial Service – Both 100LL and Jet A fuel is recommended at Key Commercial Service Airports. These airports are frequently used as alternates and should have fuel available. Aircraft who typically utilize this classification of airport include aircraft utilizing each fuel type.

Key GA – Both 100LL and Jet A fuel is recommended at Key GA Airports. These airports are frequently used as alternates and should have fuel available. Aircraft who typically utilize this classification of airport include aircraft utilizing each fuel type.

Intermediate Large – 100LL fuel is recommended and Jet A fuel should be available as-needed at Intermediate Large Airports. These airports are frequently used as alternates and should have fuel available. Aircraft who typically utilize this classification commonly include those using 100LL; however, aircraft using Jet A may also regularly utilize the airport. Some airports may experience enough demand to sell both types while others may only have demand for 100LL.

Intermediate Small – 100LL fuel is recommended and Jet A fuel should be available as-needed at Intermediate Small Airports. These airports are frequently used as alternates and should have fuel available. Aircraft who typically utilize this classification commonly include those using 100LL; however, aircraft using Jet A may also regularly utilize the airport. Some airports may experience enough demand to sell both types while others may only have demand for 100LL.

Landing Strip Turf – 100LL fuel should be available as-needed at Landing Strip Turf Airports. Some airports may experience enough demand for fuel sales while others may not sell enough for fuel sales to be financially viable for the airport.

Landing Strip Seaplane Base – 100LL fuel should be available as-needed at Landing Strip Turf Airports. Some airports may experience enough demand for fuel sales while others may not sell enough for fuel sales to be financially viable for the airport.

Courtesy Car/Rental Car

Ground transportation provides access to the community from an airport. Common types of ground transportation used by commercial air travelers is a rental car. General aviation users depend on rental cars as well as courtesy cars, cars available short-term at no cost or low-cost, to airport users. Often, courtesy cars may provide valuable transportation for travelers to reach their final destination from airports where a car rental business is not financially viable. Courtesy cars available at airports should be in a safe operating condition and properly registered.

Key Commercial Service – Courtesy cars and rental cars are recommended at Key Commercial Service Airports. On-site rental cars are valuable to both commercial as well as general aviation airport users. Courtesy cars are often made available to airport users at no cost or low cost, offer short-term use and add value for general aviation users.

Key GA – Courtesy cars and rental cars are recommended at Key GA Airports. On-site rental cars are valuable to both commercial as well as general aviation airport users. Courtesy cars are often made available to airport users at no cost or low cost, offer short-term use and add value for general aviation users.

Intermediate Large – Courtesy cars are recommended at Intermediate Large Airports. Courtesy cars are often made available to airport users at no cost or low cost, offer short-term use and add value for general aviation users.

Intermediate Small – Courtesy cars are recommended at Intermediate Small Airports. Courtesy cars are often made available to airport users at no cost or low cost, offer short-term use and add value for general aviation users.

Landing Strip Turf – Courtesy cars should be available as-needed at Landing Strip turf airports. Courtesy cars are often made available to airport users at no cost or low cost, offer short-term use and add value for general aviation users.

Landing Strip Seaplane Base – Courtesy cars should be available as-needed at Landing Strip Seaplane Bases. Courtesy cars are often made available to airport users at no cost or low cost, offer short-term use and add value for general aviation users.

Transient Aircraft Storage

Transient airport users sometimes require or prefer to store their aircraft in a hangar in order to avoid inclement weather and/or be in a climate controlled space.

Key Commercial Service – Heated transient storage is recommended for Key Commercial Service Airports. Heated transient storage allows for aircraft to be stored in climate controlled space which is preferred by many users in the winter months and also provides for a method of deicing an aircraft.

Key GA – Heated transient storage is recommended for Key GA Airports. Heated transient storage allows for aircraft to be stored in climate controlled space which is preferred by many users in the winter months and also provides for a method of deicing an aircraft.

Intermediate Large – Transient storage should be provided for as-needed at Intermediate Large Airports.

Intermediate Small – Transient storage should be provided for as-needed at Intermediate Small Airports.

Landing Strip Turf – Transient storage should be provided as-needed at Landing Strip Turf Airports.

Landing Strip Seaplane Base – Transient storage should be provided as-needed at Landing Strip Seaplane Bases.

ADMINISTRATIVE

Airport Layout Plan

An Airport Layout Plan (ALP) is a graphical representation of the existing and planned facilities and design standards at an airport. An Airport Master Plan serves as the long-term comprehensive plan for an airport.

Key Commercial Service – An ALP and Master Plan is required to be updated or revisited at least every ten (10) years at Key Commercial Service Airports. Some airports may require updates more frequently, depending on local needs.

Key GA – An ALP and Master Plan is required to be updated or revisited every ten (10) years at Key GA Airports. Some airports may require updates more frequently, depending on local needs.

Intermediate Large – An ALP and Master Plan is required to be updated or revisited at least every 15 years at Intermediate Large Airports. Some airports may require updates more frequently, depending on local needs. A Master Plan update can vary in scale and scope from a simple 5-15 page document to a full Master Plan.

Intermediate Small – An ALP and Master Plan is required to be updated or revisited at least every 15 years at Intermediate Small Airports. Some airports may require updates more frequently, depending

on local needs. A Master Plan update can vary in scale and scope from a simple 5-15 page document to a full Master Plan.

Landing Strip Turf – An ALP is required at Landing Strip Turf Airports. It should be updated as-needed.

Landing Strip Seaplane Base – An ALP is required at Landing Strip Seaplane Bases. It should be updated as-needed.

Airport Zoning

In order for an airport to receive funding for land acquisition, construction, improvement, or maintenance, or for air navigation facilities, the governmental unit (airport sponsor) must have or be in the process of establishing a zoning authority for that airport. The authority must also have made a good-faith showing that it is in the process of and will complete with due diligence, an airport zoning ordinance in accordance Minnesota Statutes.

In Minnesota, communities in the airport influence area enact zoning. A set of Procedural Steps is prescribed that meets the requirements set forth in Minnesota Statutes Chapter 360 sections 360.061 to 360.074.

Land use safety zones and other Airport Zoning Standards are established in the Minnesota Administrative Rules Chapter 8800.2400. Minimum Standard Zones are; Safety Zone A, Safety Zone B, and Safety Zone C. These zones are intended to restrict land uses that may be hazardous to the operational safety of aircraft using the airport, and to protect the safety and property of people on the ground in the area near the airport.

Key Commercial Service – Adequate airport zoning is required at Key Commercial Service Airports.

Key GA – Adequate airport zoning is required at Key GA Airports.

Intermediate Large – Adequate airport zoning is required at Intermediate Large Airports.

Intermediate Small – Adequate airport zoning is required at Intermediate Small Airports.

Landing Strip Turf – Adequate airport zoning is required at Landing Strip Turf Airports.

Landing Strip Seaplane Base – Adequate airport zoning is required as-needed at Landing Strip Seaplane Bases.

Minimum Standards

Minimum standards document the minimum requirements that must be met to provide aeronautical services at an airport. Minimum standards can help provide a safe operating environment, airport sponsors protect the public, airport facilities, users, and tenants.

Key Commercial Service – Minimum standards are recommended at Key Commercial Service Airports.

Key GA – Minimum standards are recommended at Key GA Airports.

Intermediate Large – Minimum standards are recommended at Intermediate Large Airports.

Intermediate Small – Minimum standards are recommended at Intermediate Small Airports.

Landing Strip Turf – Minimum standards are recommended at Landing Strip Turf Airports.

Landing Strip Seaplane Base – Minimum standards are recommended at Landing Strip Seaplane Bases.

Clear Zone Ownership

MnDOT Aeronautics Policy Statement No. 1, Clear Zone Requirements, states that State participation in acquisition, construction, maintenance, operation, and improvement of airports be limited to those at which adequate clear zones for the ultimate development have been acquired and maintained. The clear zones are a trapezoidal shape beyond the runway end that restrict land uses which may be hazardous to the operational safety of aircraft and protect life and property in runway approach areas. Exceptions to the clear zone policy may be made as determined by the Commissioner of Transportation.

Key Commercial Service – Clear Zones at Key Commercial Service Airports are required to be controlled in fee.

Key GA – Clear Zones at Key GA Airports are required to be controlled in fee.

Intermediate Large – Clear Zones at Intermediate Large Airports are required to be controlled in fee.

Intermediate Small – Clear Zones at Intermediate Small Airports are required to be controlled in fee.

Landing Strip Turf – Clear Zones at Landing Strip Turf Airports are required to be controlled in fee.

Landing Strip Seaplane Base – Clear Zones for marked sea lanes at Landing Strip Seaplane Bases are required to be controlled in fee.

Summary

The facilities, services, and administrative items included in the airport measures are summarized in Table 1.

		Key Commercial Service	Key General Aviation	Intermediate Large	Intermediate Small	Landing Strip Turf	Landing Strip Seaplane Base
Facilities	Primary Runway Width	100 feet / 150 feet	100 feet	60 feet / 75 feet	60 feet / 75 feet	75 feet	Sufficient for safe operation
	Primary Runway Lighting	HIRL	MIRL / HIRL	MIRL	MIRL	LIRL / Edge Markers - If no LIRL	n/a
	Primary Runway Approaches	Precision Visibility ½ mile	Precision Visibility ≤3/4 mile / Precision Visibility ½ mile	Non-Precision Visibility ≤1 mile / Vertical Guidance	Non-Precision Visibility ≤1 mile and Vertical Guidance	Visual	Visual
	Parallel Taxiway	Full	Full	Full required - if vis < 1 mile Partial required - if vis ≥1 mile	Full / Partial	Connectors / Partial	n/a
	Taxiway Width	35 feet / 50 feet	35 feet	25 feet / 35 feet	25 feet	25 feet	25 feet
	Navigation Systems	Approach lights REIL VGSI Beacon Wind cone	Approach lights REIL VGSI Beacon Wind cone	REIL / VGSI Beacon Wind cone	VGSI / Beacon Wind cone	VGSI / Beacon (if lit) Wind cone	Wind cone
	Weather Reporting	AWOS	AWOS	AWOS	AWOS	AWOS	AWOS
	Aircraft Parking	Tiedowns for 3 more aircraft than regularly utilize the airport	Tiedowns for 3 more aircraft than regularly utilize the airport	Tiedowns for 3 more aircraft than regularly utilize the airport	Tiedowns for 3 more aircraft than regularly utilize the airport	Tiedowns for 3 more aircraft than regularly utilize the airport	Adequate tie-downs
	Terminal/GA/Admin Building	Terminal building with phone and restroom	Terminal building with phone and restroom	Terminal building with phone and restroom	Terminal building with phone and restroom	Terminal building / Phone and restroom	Phone and restroom
	Automobile Parking	Adequate parking	Adequate parking	Adequate parking	Adequate parking	Adequate parking	Adequate parking
	Fencing	Perimeter fencing	Controlled vehicle access / Perimeter fencing	Controlled vehicle access / Perimeter fencing	Controlled vehicle access and perimeter fencing	Controlled vehicle access and perimeter fencing	Controlled vehicle access
	Airport Surfaces	Clear of obstructions	Clear of obstructions	Clear of obstructions	Clear of obstructions	Clear of obstructions	Clear of obstructions - if marked
Services	Fuel	100LL Jet A	100LL Jet A	100LL / Jet A	100LL / Jet A	100LL	100LL
	Courtesy or Rental Car	Courtesy car Rental car	Courtesy car Rental car	Courtesy car	Courtesy car	Courtesy car	Courtesy car
	Transient Aircraft Storage	Heated storage	Heated storage	Storage	Storage	Storage	Storage
Administrative	Airport Layout Plan/ Master Plan	ALP and Master Plan (Update or revisit every 10 years)	ALP and Master Plan (Update or revisit every 10 years)	ALP and Master Plan (Update or revisit every 15 years)	ALP and Master Plan (Update or revisit every 15 years)	ALP (Update as needed)	ALP (Update as needed)
	Airport Zoning	Adequate zoning	Adequate zoning	Adequate zoning	Adequate zoning	Adequate zoning	Adequate zoning
	Clear Zone Ownership	Controlled in fee	Controlled in fee	Controlled in fee	Controlled in fee	Controlled in fee	Controlled in fee
	Minimum Standards	Minimum standards	Minimum standards	Minimum standards	Minimum standards	Minimum standards	Minimum standards

= Required   = Recommended   = As Needed

Table 1 – Airport Measures

Airport Indicators

The 2020 SASP will include the following airport indicators for each classification of airport. Airport indicators are a new component of the SASP and, similar to system indicators, can be driven by market demand, local community growth, or other difficult to influence factors. They aid in documenting trends and the health of the airport system. The indicators include metrics where MnDOT has little or no ability to influence the outcome but the expectations for transparency and information sharing still exist.

Based Aircraft

The total number of based aircraft at each airport will be measured to track trends in airport use. Based aircraft are those that are "operational and airworthy" and based at a particular airport the majority of the year. This definition is the same as the definition used by airports when reporting based aircraft to the FAA's National Based Aircraft Inventory Program (Airport Master Record, FAA Form 5010-1). The number of based aircraft and historic trends is one level of reporting airport usage. Based aircraft information can also help MnDOT develop system level activity forecasts.

Reported based aircraft will be separated by type including single-engine, multi-engine, jets and helicopters.

> **Key Commercial Service** – Number of based aircraft by type
>
> **Key GA** – Number of based aircraft by type
>
> **Intermediate Large** – Number of based aircraft by type
>
> **Intermediate Small** – Number of based aircraft by type
>
> **Landing Strip Turf** – Number of based aircraft by type
>
> **Landing Strip Seaplane Base** – Number of based aircraft by type

Airport Operations

The number of operations (takeoffs or landings) is another measure of activity and trends at an airport. The total operations at each system airport will be tracked as an indicator.

While airport operations are often difficult to estimate at non-towered airports, continued tracking of estimates may add value. MnDOT continues to work with stakeholders to evaluate and test methods of tracking operations at non-towered airports. As technology in this area improves, the accuracy of this measure will also improve.

> **Key Commercial Service** – Annual operations
>
> **Key GA** – Annual operations
>
> **Intermediate Large** – Annual operations

Intermediate Small – Annual operations

Landing Strip Turf – Annual operations

Landing Strip Seaplane Base – Annual operations

Available Services

Various types of services are available at system airports. Services may include: fixed based operators, various types of ground transportation, fuel, aircraft maintenance, and underwing camping. Available services will be identified for each system airport.

Key Commercial Service – Available services

Key GA – Available services

Intermediate Large – Available services

Intermediate Small – Available services

Landing Strip Turf – Available services

Landing Strip Seaplane Base – Available services

Certified Pilots within 30 miles of an Airport

The total number of certified pilots within a certain distance of an airport is one indicator of the potential demand for a local airport. Airports located in areas of higher numbers of pilots have a higher likelihood of being used by area residents. It is important to note that although this indicator is one way of measuring potential demand and trends for an airport amongst nearby residents, it does not reflect the need the airport may serve for transient (not local) recreational, business and other users.

The pilots in this indicator are those holding the following types of FAA certificates: sport pilot, private pilot, commercial pilot, air transport pilot, and rotorcraft only. Student pilots are excluded from this indicator.

Key Commercial Service – Certified pilots within 30 miles driving distance

Key GA – Certified pilots within 30 miles driving distance

Intermediate Large – Certified pilots within 30 miles driving distance

Intermediate Small – Certified pilots within 30 miles driving distance

Landing Strip Turf – Certified pilots within 30 miles driving distance

Landing Strip Seaplane Base – Certified pilots within 30 miles driving distance