
CHAPTER 2: RUNWAYS & TAXIWAYS

Introduction

This Chapter of the Airport Master Plan is focused on the Runway and Taxiway system at the airport which is commonly referred to as the airfield where aircraft takeoff, land and maneuver on the ground. Please note that **Chapter 3: Terminal Area and Support Facilities** will look at the apron, hangars and other facilities supporting the airport. These two chapters will address existing and future facility needs at Madison Municipal Airport (MDS).

As the chapter analyzes various components of the runway and taxiways at MDS, it will review current conditions and any deficiencies that do not meet FAA design standards. It will consider the future critical design aircraft and provide facility requirements to accommodate these aircraft through the planning period. The chapter will further present the alternatives that were considered to meet future needs and the preferred airfield alternative that was chosen. Included in this chapter will be the following elements:

- [Critical Design Aircraft](#)
- [Meteorological Information](#)
- [Runways](#)
- [Taxiways](#)
- [Airfield Data Summary](#)
- [Alternatives](#)
- Preferred Alternative

Critical Design Aircraft

The critical design aircraft types must be identified to determine the appropriate airport design standards to incorporate into airport planning. The existing and future critical design aircraft characteristics at Madison Municipal Airport (MDS) are summarized in the following sections.

Operational Breakdown

The forecasted annual operations at MDS were broken down by aircraft design characteristics. The critical design aircraft is expected to remain the same through the planning period, **B-II, TDG 1-B aircraft greater than 12,500 pounds**. Future development at MDS will be based on accommodating aircraft with these design characteristics.

Table 2-1 – Overall Design Aircraft Operations

AAC		ADG		TDG		MTOW	
A	31,073	I	31,145	1-A	31,228	< 12,500 lbs	31,294
B	1,060	II	995	1-B	816		
C	5	III	0	2-A	93	≥ 12,500 lbs	846
D		IV	0	2-B	0		

Source: KLJ Analysis. AAC = Aircraft Approach Category, ADG = Airplane Design Group, TDG = Taxiway Design Group. Large Aircraft: >12,500 lbs. Maximum Takeoff Operating Weight (MTOW), Small Aircraft: ≤ 12,500 lbs. MTOW. Green highlight depicts substantial use of the design aircraft category.

Table 2-2 – Existing/Future Airfield Design Aircraft Summary

Design Characteristics	Runway 15-33	Runway 3-21
Airplane Approach Category	B	A
Airplane Design Group	II	I
Taxiway Design Group	1B	1A
Wingspan	49' - <79'	<49'
Tail Height	20' - <30'	<20'
Cockpit to Main Gear	<40'	<20'
Main Gear Width	<15'	<15'
Approach Speed	91 - <121 knots	<91 knots
Maximum Takeoff Weight	12,500 pounds or greater	Less than 12,500 pounds

Source: KLJ Analysis

Meteorological Factors

Meteorological conditions that affect the facility requirements of an airport include but are not limited to wind direction, wind speed, cloud ceiling, visibility, and temperature. Hourly meteorological data was reviewed data from the MDS Automated Weather Observation System (AWOS) facility available from the National Climatic Data Center (NCDC). Periodic “special” weather observations within each hour were removed. This method provides considers the true average weather trends at an airport without skewing conditions toward IFR where multiple observations may be taken each hour due to changing conditions.

Wind coverage and weather conditions are evaluated based on the two different flight rules, VFR and IFR. Visual Meteorological Conditions (VMC) are encountered when the visibility is 3 nautical miles or greater, and the cloud ceiling height is 1,000 feet or greater. Conditions less than these weather minimums are considered Instrument Meteorological Conditions (IMC) requiring all flights to be operated under IFR.

METEOROLOGICAL FACILITIES

Metrological facilities provide users with up-to-date weather information at the airport to aid in pilot decision making for safe flight operations.

Wind Indicator(s)

Wind direction indicators provide an immediate visual indication of the wind direction and velocity. A segmented circle provides a visual indication of the wind direction and velocity together with runway alignment and/or traffic pattern information.

There is a lighted wind cone and segmented circle located at MDS and visible to both runways.

Airport Beacon

The airport beacon serves as the airport identification light so approaching pilots can identify the airport location from sunset to sunrise. The airport beacon's location at MDS adequately serves the airport without known obstructions to its line of sight. The minimum light beam angle is 2 degrees.

Weather Reporting

There are two types of weather reporting systems on an airport. The Automated Surface Observing System (ASOS) program was a joint effort between the Federal Aviation Administration and the National Weather Service (NWS) to deploy a network of high-grade weather monitoring stations across the United States. ASOS serves as a primary climatological observing network in the United States and have equipment that provides weather observations every minute. A second-tier Automated Weather Observation System (AWOS) has varying sets of equipment packages to provide local weather observations.

There is an AWOS-3 located at MDS. This equipment is capable of observing wind speed, direction, gust, variable wind direction, temperature, dew point, altimeter setting, density altitude, visibility, precipitation, cloud height and sky condition.

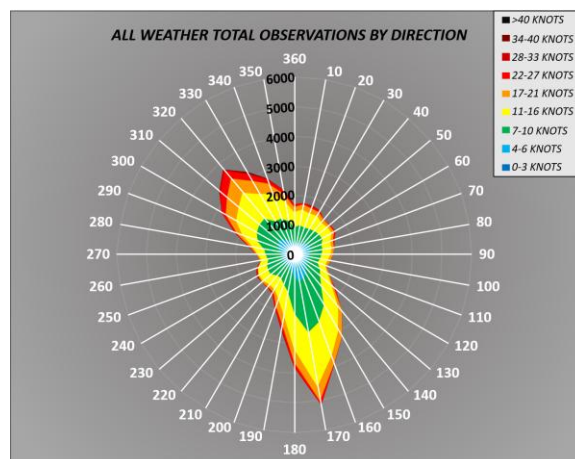
Temperature

Average high temperature data for the hottest month was reviewed from climate data available from the NCDC for MDS. Using locally available data, the average high temperature in the hottest month from 1991-2020 was 83.3 degrees Fahrenheit. Temperature affects recommended runway lengths.

WIND ANALYSIS

Local weather conditions are a significant factor in the design and development of airport facilities since they affect aircraft performance. Temperature affects runway length, wind direction and speed affect runway orientation, and visibility and cloud ceiling conditions determine the need for runway navigational aids and lighting

Prevailing winds are from the southeast and are generally aligned with the airport's runway configuration. Crosswind or tailwind conditions can be hazardous to aircraft operations if they exceed the



operational capabilities of the airplane or flight crew. The smallest aircraft are typically the most affected operationally by crosswinds.



A runway’s wind coverage is determined by an aircraft’s ability to operate with a “direct” crosswind, which is defined as 90 degrees to the direction of travel. For planning purposes, FAA has defined the maximum direct crosswind for small aircraft as 12 miles per hour (10.5 knots). For increasingly larger aircraft, a 15-mile per hour (13 knot) direct crosswind is used up through 23-mile per hour (20 knots) for the largest aircraft. Aircraft can operate safely in progressively higher wind speeds as the crosswind angle

decreases and the wind direction aligns more closely with the opposing the direction of flight. In addition, some aircraft are designed to safely operate with higher crosswind components. Ideally, an aircraft will take off and land directly into the wind or with a light crosswind. The FAA recommends that primary runways accommodate at least 95 percent of local wind conditions; when this level of coverage is not provided, the FAA recommends development of a secondary (crosswind) runway.

Table 2-3 – FAA Wind Coverage Standards

AAC-ADG	Maximum Crosswind Component
A-I & B-I	10.5 knots
A-II & B-II	13.0 knots

Source: FAA AC 150/5300-13B, Change 1

For all-weather conditions, the A/B-II design aircraft crosswind component (13 knots) is accommodated with Runway 15-33 according to the MDS AWOS. However, the A/B-I design aircraft crosswind component (10.5 knots) is not accommodated. The current runway combined runway configuration achieves sufficient coverage for smaller aircraft. **Table 2-4** provides the calculated all-weather wind coverage for the airport.

Table 2-4 – All-Weather Wind Coverage

Runway	Crosswind Component (Wind Speed)		
	10.5 knots	13.0 knots	16.0 knots
Runway 15-33	89.29%	95.08%	-
Runway 03-21	78.49%	-	-
Combined*	96.95%	95.08%	-

Source: KMDS AWOS (2015-2024, hourly) National Climatic Data Center, 79,028 observations

*Combined assumes up to maximum design aircraft crosswind component for each runway

Wind coverage during VMC is evaluated to determine the ideal alignment for runways used during visual operations, such as VFR flight training. This is important as majority of the traffic at MDS is flight training. As shown in **Table 2-5**, VMC wind coverage is not achieved by either runway for A/B-I aircraft (10.5 knots), however the combination of both runways provides adequate coverage. Runway 15-33 provides the recommended 95 percent coverage for A/B-II aircraft during VMC conditions.

Table 2-5 – VMC Wind Coverage

Runway	Crosswind Component (Wind Speed)		
	10.5 knots	13.0 knots	16.0 knots
Runway 15-33	90.17%	95.70%	-
Runway 03-21	79.06%	-	-
Combined*	97.22%	95.70%	-

Source: KMDS AWOS (2015-2024, HOURLY) FROM NATIONAL CLIMATIC DATA CENTER, 71,633 TOTAL OBSERVATIONS, VFR = VISIBILITY GREATER THAN 3 MILES AND CEILING GREATER THAN 1,000 FEET. *Combined assumes up to maximum design aircraft crosswind component for each runway.

Wind coverage during IMC is evaluated to determine the ideal alignment for instrument approach to an airport's runway. As shown in **Table 2-6**, during IMC conditions, the current Runway 15-33 does not provide adequate wind coverage.

Table 2-6 – IMC Wind Coverage

Runway	Crosswind Component (Wind Speed)		
	10.5 knots	13.0 knots	16.0 knots
Runway 15-33	81.38%	89.54%	-
Runway 15 End	48.07%	50.91%	-
Runway 33 End	45.92%	48.87%	-
Combined*	81.38%	89.54%	-

Source: KMDS AWOS (2015-2024, HOURLY) FROM NATIONAL CLIMATIC DATA CENTER, 7,972 TOTAL OBSERVATIONS, IFR = VISIBILITY LOWER THAN 3 MILES OR CEILING LOWER THAN 1,000 FEET. *Combined assumes up to maximum design aircraft crosswind component for each runway

Based on true hourly weather data summarized in **Table 2-7**, the airport experiences IMC weather conditions 5.01 percent of the time. When considering the current instrument approach weather minimums of 300-foot cloud ceiling and 1-mile flight visibility for Runway 33 and 500-foot cloud ceiling and 1-mile flight visibility for Runway 15, the airport has weather conditions below this criterion 13.3 days per year where the airport is not usable.

Table 2-7 – Meteorological Analysis

Weather Condition	Percentage	Days per Year	Hours per Year
VMC	89.99%	328.4	7,883
Usable IMC	6.37	23.3	558
Usability	96.36%	351.7	8441
Below Weather Minimums*	3.64%	13.3	319
Total	100.00%	365.0	8,760

Source: KMDS AWOS (2015-2024, HOURLY) FROM NATIONAL CLIMATIC DATA CENTER, 71,633 TOTAL OBSERVATIONS

*Current IFR minimums are 300-foot cloud ceiling and 1 mile flight visibility for Runway 33 approach and 500-foot cloud ceiling and 1 mile flight visibility for Runway 15 approach.

Instrument Approach Conditions

Instrument approach procedures to a runway end are used by landing aircraft to navigate to the airport during instrument conditions when the cloud ceiling is less than 1,000 feet and/or visibility is less than 3 miles. Establishing approaches with the lowest possible weather minimums allow the airport to

maximize its operational utility. Each approach type requires differing infrastructure and navigational aids. Types of approach procedures include non-precision approach (NPA), approach with vertical guidance (APV) and precision instrument approach (PA). See **Appendix B – General Aviation Airports – 101** for details on the requirements of different levels of instrument approach procedures. **Table 2-8** is a list of the major approach categories and associated capabilities.

Table 2-8 – Instrument Approach Procedure Visibility Minimums

Typical Categories of Approaches					
Approach	Category	Vertical Guidance	Lowest Ceiling	Lowest Visibility	Ground Based Aids
Visual			1,000'	3 miles	
RNAV LNAV	NPA	No	250'	¾ mile	MIRL, VGSI*
RNAV LNAV/VNAV	APV	Yes	250'	¾ mile	MIRL, VGSI*
RNAV LPV**	APV	Yes	250'	¾ mile	MIRL, VGSI*
VOR	NPA	No	250'	¾ mile	VOR, MIRL, VGSI*

Source: KLI Analysis; * Recommended; ** Often the best RNAV minimums but requires aircraft equipped with WAAS receiver

GPS IAPs (see **Table 2-9**) are available for Runways 15 and 33 with satellite-based NAVAIDS. Instrument approach weather minimums are a result of the approach type, airport infrastructure, and any prevailing airspace obstructions.

Table 2-9 – Instrument Approach Procedures

Approach Procedure	Approach Type	Lowest Cloud Ceiling Minimum (HAT)	Lowest Visibility Minimum (n.m.)
RNAV (GPS) RWY 15	Non-Precision Approach	LNAV MDA: 402 feet Circling: 462 feet	1 mile
RNAV (GPS) RWY 33	Non-Precision Approach with Vertical Guidance	LPV: 250 feet LNAV/VNAV: 300 feet LNAV MDA: 407 feet Circling: 462 feet	1 mile

Source: Airnav

Note: HAT = Height Above Touchdown, n.m. = nautical miles (reported), VG = Vertical Guidance, NVG = Non-Vertical Guidance, ILS = Instrument Landing System, LPV = Localizer Performance with Vertical Guidance, LNAV = Lateral Navigation, VNAV = Vertical Navigation, VOR = Very High Frequency Omni-Directional Range, DME = Distance Measuring Equipment

The airport should continue to maintain their instrument approach procedures. No additional improvements are recommended at this time.

CROSSWIND RUNWAY

For the crosswind runway, a minimum of 500 operations must also be shown by aircraft needing the crosswind runway to support FAA funding. This is demonstrated at MDS by evaluating the fleet mix and wind coverage.

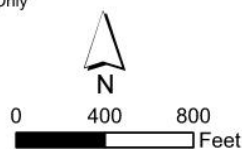
There is a wind coverage deficiency of 7.05 percent without a crosswind runway. This means 7.06 percent of the time, A/B-I design aircraft requires a crosswind runway for the airport to achieve a minimum of 95 percent total wind coverage. **A/B-I aircraft operations needing a crosswind runway at MDS exceed 500 annual operations and will continue to throughout the planning period.**

Table 2-10 – Crosswind Runway Operations

Calculations for 10.5 Knot Wind Coverage	2025 Ops	2030 Ops	2035 Ops	2040 Ops	2045 Ops
All A/B-I Operations	23,124	24,911	26,836	28,910	31,145
Primary Runway Coverage (90.17%)	20,851	22,462	24,198	26,068	28,083
Combined Wind Coverage (97.22%)	22,481	24,219	26,090	28,107	30,279
Unmet A/B-I Coverage (= Combined - Primary)	1,630	1,756	1,892	2,038	2,196
Crosswind Justified with 500+ A/B-I Operations (Yes/No)	Yes	Yes	Yes	Yes	Yes

Source: KLJ Analysis

Figure 2-1 – Airfield Facilities Map



Madison Municipal Airport
Airfield Map

Runways & Landing Areas

Runways

MDS has two (2) runways. Runway 15-33 is the airport's primary runway and serves the majority of the airport's traffic. Runway 3-21 serves as the crosswind runway.

Runway 15-33: This general aviation runway is 5,000 feet long and 75 feet wide. This runway is currently designed to accommodate non-precision instrument approaches and aircraft weights greater than 12,500 pounds. The runway's pavement is in good condition. The last major reconstruction/rehabilitation took place in 2019. This runway is equipped with Medium Intensity Runway Lighting (MIRL) and has non-precision pavement markings.

Runway 3-21: This turf crosswind runway is 2,380 feet long and 200 feet wide. The runway is designed to accommodate visual approaches and aircraft weighing less than 12,500 pounds and is in good condition. The runway is equipped with cones and reflectors.

Table 2-11 – Runway Facility Summary

Component	Runway 15/33	Runway 03/21
Runway Length (feet)	5,000	2,380
Runway Width (feet)	75	200
Runway Surface Material	Concrete-Asphalt	Turf
Runway Surface Treatment	None	-
Pavement Strength	56,000 (SW) / 69,000 (DW)	-
Runway Design Code	B-II	A/B-I Exclusively Small
Approach Reference Code	B-II-4000	-
Departure Reference Code	B-II	-
Runway Safety Area	5,600' X 150'	2,860' X 120'
Object Free Area	5,600' X 500'	2,860' X 250'
Obstacle Free Zone	5,400' X 400'	2,780' X 250'
Runway Protection Zone	700' X 1,000' X 500'	450' X 1,000' X 250''

Source: AC 5300-13B Change 1

RUNWAY DESIGN CODES

The design aircraft and instrument approach minimums drive the RDC designation for each runway. More information on Runway Design Codes and Design Standards can be found in **Appendix B: General Aviation Airports 101**.

Runway 15-33: The existing RDC is B-II-5000 (Not lower than 1 mile) for both runway ends. No recommended change is needed to accommodate larger aircraft during this planning study.

Runway 3-21: The existing RDC is B-I (Small)-VIS for both runway ends. No recommended change is needed to accommodate larger aircraft during this planning study.

RUNWAY REFERENCE CODES

Runway Reference Codes (RRCs) indicate current operational capabilities where no special operations procedures are necessary, and without consideration of the actual runway length. The existing operational capabilities of the runway is identified based on a taxiway separation distance. At MDS, the current runway to parallel taxiway separation distance is 240 feet for Runway 15-33. There is no parallel taxiway for Runway 3-21.

Runway 15-33: Existing Approach Reference Codes (APRCs) for both Runway 15 and 33 are B-II-4000. The existing Departure Reference Codes (DPRCs) are B-II for both runway ends. Future APRCs and DPRCs are expected to remain the same.

Runway 3-21: This runway does not have a parallel taxiway and as such does not have an APRC or DPRC. There are no plans to add a parallel taxiway at this time.

DESIGN STANDARDS

Basic Safety Standards

One primary purpose of this master plan is to review and achieve compliance with all FAA safety and design standards. The design standards vary based on the RDC and RRC as established by the design aircraft. Some of the safety standards include:

- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)

Other basic design standards include runway width, runway surface gradient, runway shoulder width, blast pad, and required separation distances to markings, objects, and other infrastructure for safety. Critical areas associated with navigational aids as well as airspace requirements are described further in this chapter.

The existing RSA, ROFA and ROFZ standards for all runways meet existing airport design standards. Improvements will need to be made to meet future standards. It should be noted that the ROFA for Runway 15-33 does extend to the edge of the apron. The basic safety standards dimensional requirements for all runways are summarized in **Table 2-16**.

Runway Protection Zone

The Runway Protection Zone (RPZ) is a trapezoidal land use area at ground level prior to the landing threshold or beyond the runway end. The RPZ's function is to enhance the protection of people and property on the ground. The RPZ size varies based on the runway's RDC. The RPZ is further broken down to Approach RPZ and Departure RPZ.

Airport owners should, at a minimum, maintain the RPZ clear of all facilities supporting incompatible activities, such as residential structures. It is desirable to clear all above-ground objects from the RPZ. Protection of the RPZ is achieved through airport control over RPZs including fee title ownership or clear zone easement.

The existing RPZs for Runway 15-33 currently have roads going through them. The Runway 33 RPZ has approximately 480 linear feet of County Highway 36 transversing through it. Runway 15 has approximately 400 linear feet of 456th Avenue which is a city street within the RPZ. Roads are considered to be an incompatible land use. The alternatives will evaluate removing any incompatible land uses from the RPZs for all runways at MDS.

Runway Line of Sight

Runway Line of Sight (LOS) standards ensure clear visibility between aircraft while on the runway. For airports with intersecting runways, the Runway Visibility Zone (RVZ) is an area formed by connecting points on the intersecting runways. This ensures pilots can maintain visual separation from aircraft operating on an intersecting runway. It is important to maintain a clear RVZ especially at airports with crops planted on and around the airfield.

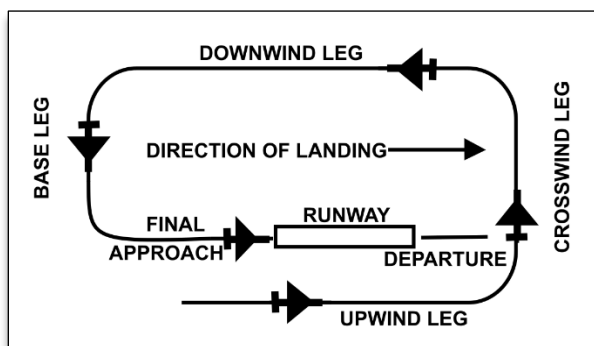
At MDS, the RVZ was evaluated at ground level in addition to crops being present at 3 feet and 5 feet. **The ground obstructs the LOS on the north side of Runway 33 and east of Runway 3-21. In addition, crop height of 5 feet would obstruct the LOS on the north side of Runway 15-33 and west of Runway 3-21. The airport should ensure LOS is maintained by taking opportunities to regrade and restricting the height of crops. Alternatives presented later in the study will be evaluated to ensure runway LOS is maintained.**

APPROACH/DEPARTURE PROCEDURES

Aircraft operate under either Visual Flight Rules (VFR) or Instrument Flight Rules (IFR) depending on weather conditions and/or operational standards.

Visual Approach/Departure Procedures

Under VFR, pilots are advised to utilize a standard rectangular traffic pattern around the runway to approach or depart an airport. Standard traffic pattern legs include upwind, crosswind, downwind, base, and final. Departures are typically straight-out from a departing runway, a 90-degree crosswind, or 180 degree downwind. Arrivals typically enter a traffic pattern 45 degrees to a downwind leg for landing. All traffic at MDS follow a standard left traffic pattern.



Standard VFR Airport Traffic Pattern (Source: FAA)

IFR/Obstacle Departure Procedures

Special procedures are published at airports to provide aircraft with adequate obstacle clearance. Examples include increased aircraft climb rates or recommended turns. There are penetrations to the existing Runway 15 and 33 instrument departure surfaces that are noted in FAA publications (see below figure). Runway 3-21 does not accommodate instrument departure procedures at this time.

MADISON, SD

MADISON MUNI (MDS)

TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES

ORIG 30JUN11 (11181) (FAA)

TAKEOFF MINIMUMS:

Rwys 3, 21, NA - environmental.

TAKEOFF OBSTACLE NOTES:

Rwy 15, trees beginning 764' from DER, 284' left of centerline, up to 76' AGL/1766' MSL.

Plant and fence beginning 65' from DER, 384' right of centerline, up to 24' AGL/1733' MSL.

Rwy 33, road 82' from DER, 399' left of centerline, 23' AGL/1723' MSL.

Road and trees beginning 131' from DER, 9' right of centerline, up to 100' AGL/1859' MSL.

RUNWAY APPROACH/DEPARTURE SURFACES

FAA identifies sloping approach surfaces that must be cleared at an absolute minimum for safety for landing aircraft. These surfaces are identified in paragraph 3.6 of FAA AC 150/5300-13B Change 1.

The departure surface applies to runways with instrument departures available. It begins at the end of the takeoff distance available and extends upward and outward at a 40:1 slope. No new penetrations are allowed unless an FAA study has been completed and a determination of no hazard has been issued.

The applicable approach/departure surface standards are identified in **Table 2-12**:

Table 2-12 – Approach/Departure Surface Requirements

Runway End(s)	Par. 3.6 Surface	Description	Slope
Existing, Future and Ultimate			
15, 33	4	Approach end of runways that support IFR circling procedures and procedures only providing lateral guidance (VOR, NDB, LNAV, LP, TACAN, VORTAC, ASR, and LOC).	20:1
3, 21	2	Approach end of runways serving small airplanes with approach speeds of 50 knots or more	20:1
15, 33	7	Runways providing instrument departure operations	40:1

Source: FAA AC 150/5300-13B Change 1, KLJ Analysis

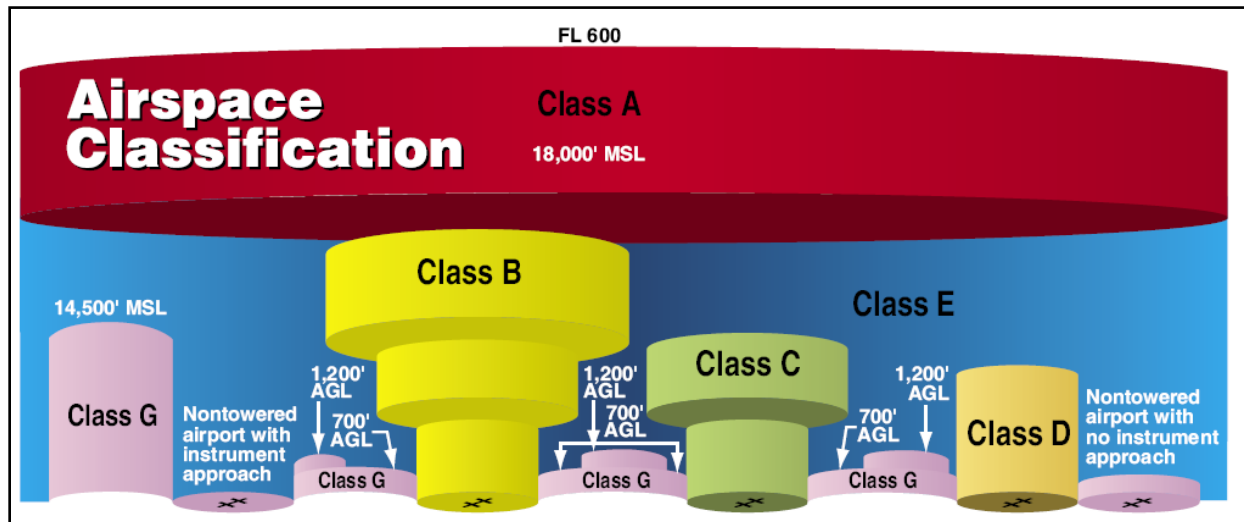
Note: Most critical row(s) shown. Only changes from existing shown in future.

Based on data from the aeronautical survey, there are trees located in the Runway 15 and 33 end departure surfaces that are penetrations and create obstacles. The FAA expects a plan to clear or mitigate these obstacles. Part of this planning study will include identifying what controls the airport has in place to clear these obstacles. Appendix X: Obstacle Action Plan will cover in depth the obstacles and how they will be addressed. Airspace & Area Navigation Systems

The National Airspace System (NAS) consists of various classifications of airspace regulated by the FAA. Airspace classification ensures the safe separation of VFR and IFR aircraft. Airspace is separated into controlled, uncontrolled, special use, or other airspace. Controlled airspace is classified as A, B, C, D, or E. Uncontrolled airspace is classified as G. These classes specify appropriate minimum cloud clearances, visibility requirements, and other operating requirements for aircraft. The major difference between controlled and uncontrolled airspace is that the FAA does not exercise air traffic control over aircraft operating within uncontrolled airspace. Airspace is segregated into controlled, uncontrolled, special use or other airspace. Each airspace class has different operating rules.

MDS is located in uncontrolled Class G Airspace. Controlled Class E Airspace begins at 700 feet above the surface. Flights departing the airport under instrument flight rules (IFR) must receive an IFR clearance from Minneapolis Center before reaching an altitude of 2,418 feet above mean sea level.

Figure 2-2 – FAA Airspace Classifications



Source: [Federal Aviation Administration \(FAA\) Pilot's Handbook of Aeronautical Knowledge \(2007\)](#)

Automatic Dependent Surveillance-Broadcast (ADS-B)

ADS-B is a satellite-based surveillance technology in which aircraft transmit GPS position information to other aircraft and to ATC facilities. ADS-B will supplement primary ground-based radar. FAA has required all aircraft operating within airspace requiring a transponder to have ADS-B transmitting equipment installed. Various ground stations are located nationwide to provide ADS-B coverage. ADS-B coverage begins at 500 feet above ground level (AGL) at Madison.

Communications & ATC

The ability for pilots to communicate with other pilots and air traffic control (ATC) is critical for the safety and efficiency of the overall air transportation system. MDS will continue to be an uncontrolled airport however there is a combined Common Traffic Advisory Frequency (CTAF)/UNICOM frequency, 122.8 MHz that can be used for pilots to announce their positions while operating on or around the airfield and request airport advisory information and services. For airports with higher aircraft operations, providing separate a separate UNICOM and CTAF frequency can reduce radio congestion and increase safety.

Airspace Protection

Airspace is an important resource around airports that is essential for safe flight operations. The airspace is protected through several layers of protection which include property ownership, aviation easements and land use/height restriction zoning.

LAND ACQUISITION

Land acquisition allows the airport to protect airspace and land use areas from possible intrusions. FAA encourages the airport sponsor to own the following land for the existing and planned airport facility:

- Airport Infrastructure
- Runway and Taxiway Object Free Areas
- Runway Protection Zones
- Building Restriction Line

- Navigational Aid Critical Areas
- Airspace Protection

AVIGATION EASEMENTS

Avigation easements can control height and/or land use. They have often been used to control the area inside the Runway Protection Zone however the FAA has more recently recommended full acquisition of these properties. The easements can still be a very useful tool to protect the airport depending on the circumstances of particular properties and the type of protection that is needed.

LAND USE AND HEIGHT RESTRICTION ZONING

FAA recommends airport sponsors protect airport land use and airspace through local zoning. Owners of public airports are encouraged to enact airport overlay zoning to protect airspace and surrounding land use for public safety. The intent of zoning is to:

- Protect the airport from incompatible land uses that could interfere with the safety operation of the airport,
- Protect public safety by reducing the potential for fatalities, property damage or noise complaints within the vicinity of the airport, and
- Protect the public investment made by taxpayers in the airport and the economic benefits it provides to the region

Federal - Part 77 Civil Airport Imaginary Surfaces

[Title 14 CFR \(Code of Federal Regulations\) Part 77 Safe, Efficient Use, and Preservation of the Navigable Airspace](#) is used to determine whether man-made or natural objects penetrate “imaginary” three-dimensional airspace surfaces and are obstructions. See **Appendix B – General Aviation Airports 101** for a detailed explanation of Part 77 surfaces. **Table 2-13** depicts the existing approach airspace surfaces for MDS. The aeronautical survey identified penetrations to the Part 77 Approach Surface for both Runway 15 and 33 by trees. Any existing, future, or ultimate Part 77 obstructions located around MDS will be identified on the ALP and an obstacle action plan will be developed for further action.

Table 2-13 – Part 77 Approach Airspace Requirements

Runway End	Approach Standards	Part 77 Code	Inner Width*	Outer Width	Length	Slope
Existing						
15-33	Non-Precision Other-Than-Utility As low as 1 mile	C	1,000'	3,500'	10,000'	34:1
03-21	Visual Utility	A(V)	250'	1,250'	5,000'	20:1

Source: [Title 14 CFR Part 77](#), KLJ Analysis *Inner width is also the Primary Surface width driven by the most demanding approach to a runway. **Bold** indicates change from existing standard.

State Airspace Protections

The State relies upon the surfaces defined by the FAA in the Part 77 and RPZ areas. South Dakota statutes require Airport Sponsors to establish zoning for height and land use around airports, but the Airport Sponsor may not have the jurisdiction for the area surrounding the airport if it is outside the airport sponsors zoning jurisdiction.

Local Airspace Protections

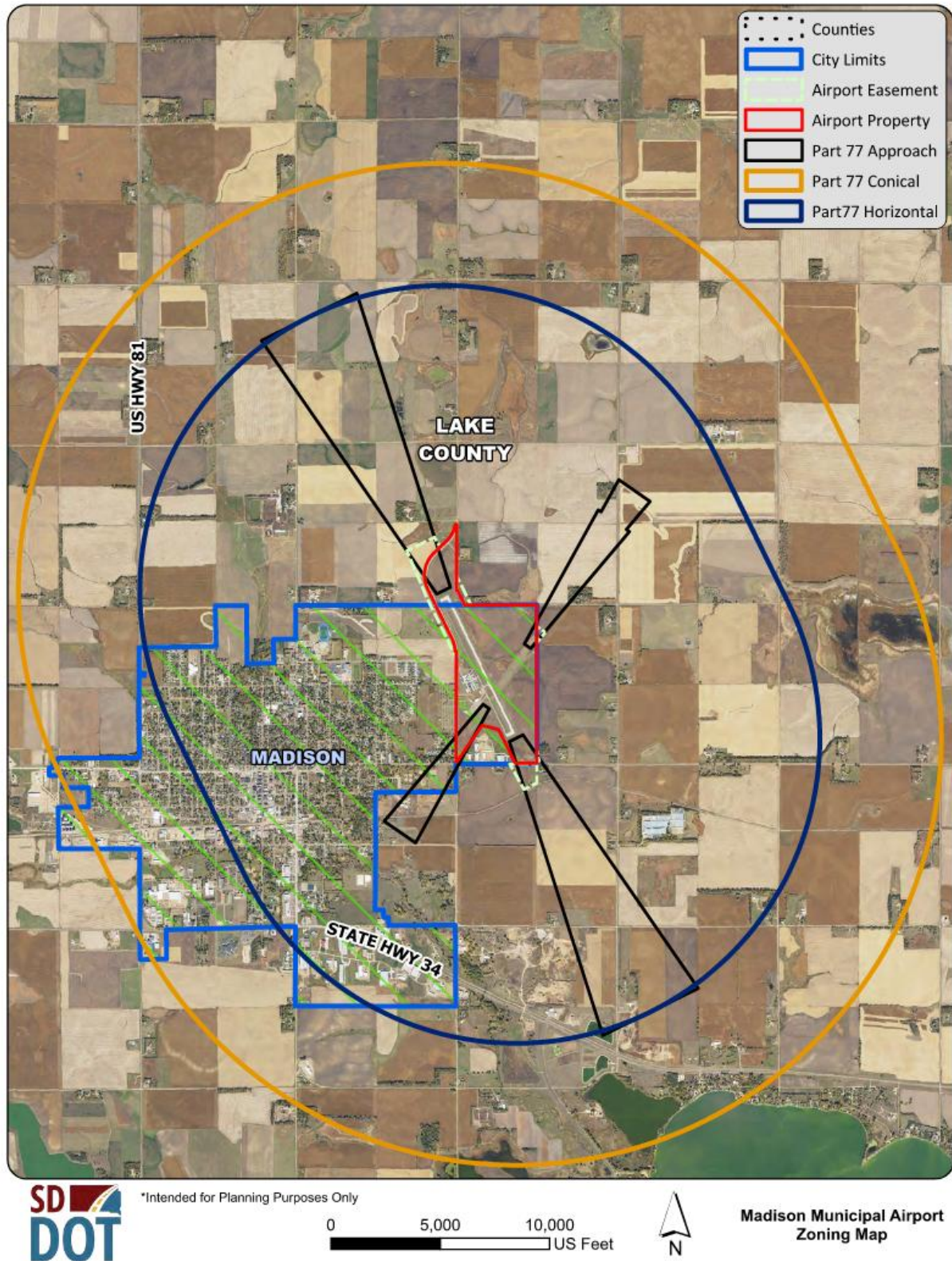
Local zoning regulations are implemented under the Madison, South Dakota Code of Ordinances, Appendix B, Section 17.121 Airport Safety Zone Overlay District.

“The purpose of the "AZ" Aviation Safety Zone Overlay District is to minimize potential risk for endangering the lives and property of users of the Madison Municipal Airport, and property or occupants of land in its vicinity. The City of Madison recognizes that to promote the health, safety, and general welfare of the community, certain uses and building heights are incompatible within specified proximities of Madison Municipal Airport.”

The ordinance designs each safety zone using FAA design surfaces. Safety Zone 1 is comprised of the Runway Protection Zone for each runway at MDS. The only permitted use inside this zone is aviation related structures and support facilities as long as there are no assemblages of people. Safety Zone 2 surrounds the runways and the inner approach and departure corridors. No critical community infrastructure facilities are allowed. Safety Zone 3 encompasses the areas where small aircraft turn inward toward the runway or outward from the runway on takeoff. More details can be found on the [City of Madison Zoning Ordinance](#) and in **Figure 2-3**.

Any recommended airspace protection measures including land acquisition, easements or zoning will be addressed in **Chapter 4 – Implementation & Compatibility** based on the Preferred Alternatives selected in Chapters 2 and 3.

Figure 2-3 Madison Municipal Airport Zoning Map (2024)



RUNWAY LENGTH & WIDTH

As of the date this Master Plan study was initiated, [FAA AC 150/5325-4B, Runway Length Requirements for Airport Design](#) was the current guidance for determining runway lengths at airports. A detailed analysis using these two methods including FAA runway length charts and aircraft performance data is in **Appendix D: Runway Length Evaluation**.

Table 2-14 – Recommended Runway Length

Airport and Runway Data	
Airport Elevation	1718.4 feet
Mean Daily Maximum Temperature of Hottest Month	83.3°F
Runway Gradient	9 feet (+90 feet)
Aircraft Classification	Recommended Runway Length
Small Airplanes 12,500 Pounds or less	
10 or more passenger seats	4,400 feet
Less than 10 passenger seats at 95 percent of fleet	3,600 feet / 4,000' (Turf)
Large Aircraft more than 12,500 Pounds but less than 60,000 Pounds	
75 percent of fleet at 60 percent useful load	5,000 feet (Dry) / 5,500 (Wet)
Notable Aircraft	
Air Tractor AT 802	5,200 feet (MTOW- 16,000 lbs) / 5,000 feet (15,600 lbs)
Cessna 150	1,859 feet / 2,363 feet (Turf)
Cessna 152	1,812 feet / 2,304 feet (Turf)
Cessna 172	1,913 feet / 2,432 feet (Turf)
Cessna 177	1,893 feet/ 2,366 feet (Turf)
Cessna 180	1,625 feet/ 2,031 feet (Turf)
Cessna 182	1,827 feet / 2,283 feet (Turf)
Cirrus SR-22	2,580 feet / 3,096 (Turf)
Diamond DA-40	2,073 feet / 2,591 feet (Turf)
Piper 28 Cherokee	1,824 feet ¹

Source: [FAA AC 150/5325-4B](#), Small Aircraft Runway Length Analysis Tool (SARLAT), KLJ Analysis

¹Turf calculation not available

Note: Runway length requirements estimated based on charts for airport planning purposes only.

Small Airplanes Up to 12,500 Pounds

The FAA design approach to determine recommended runway length in small aircraft is identified in Chapter 2 of [FAA AC 150/5325-4B](#). The method requires several steps to be performed including identifying percentage of fleet and using airport data to calculate runway length based on curves. Calculations for MDS are identified in **Table 2-14**.

For small general aviation aircraft, the FAA runway length requirements of 95 percent of fleet would apply at MDS due its population and size. **The recommended runway length for small general aviation aircraft is 3,600.** The length of Runway 15-33 exceeds the recommended length.

Large Airplanes Up to 60,000 Pounds

The FAA design approach to determine recommended runway length in large aircraft greater than 12,500 pounds up to 60,000 pounds is identified in Chapter 3 of [FAA AC 150/5325-4B](#). The method requires several steps to be performed including identifying percentage of fleet, useful load factor and using airport data to calculate runway length based on curves. Runway 15-33 is designed to

accommodate aircraft weighing greater than 12,500 pounds. The recommended length for Runway 15-33 will utilize the curves found in Chapter 3 of [FAA AC 150/5325-4B](#).

It is important to note that aircraft weighing greater than 12,500 pounds operate at MDS. There are also several runway length adjustments for runway gradient and wet/slippery runways. The wet and slippery runway adjustment only applies to landing operations of turbojet aircraft. While operations of turbojet aircraft do occur at MDS, these operations do not meet the regular use threshold of 500 annual operations. As such, there will be no adjustment to the recommended length for Runway 15-33 during wet conditions. The recommended length to accommodate these aircraft is 5,000 feet.

Other Considerations

Additional length analysis was completed for aircraft regularly operating at MDS including the Air Tractor 802 and other aircraft commonly used by Riggin Flight Service using the Small Aircraft Runway Length Analysis Tool (SARLAT). The recommended lengths are noted above in **Table 2-14**.

Crosswind Runway

FAA recommends secondary “crosswind” runways have a length capable of accommodating the lower crosswind capable aircraft expected to use this runway. The length of a runway must now be justified to accommodate the aircraft that requires its use.

At MDS, Runway 3-21 is needed to provide adequate 95 percent wind coverage for ARC A/B-I and A/B-II aircraft types under a 10.5 and 13-knot crosswind component. FAA states the crosswind runway length shall be 100 percent of the recommended runway length for lower crosswind capable airplanes using the primary runway. Additionally, it is recommended that an additional 20 percent of length be added for turf runways. The recommended length from the AC 150/5325-4B for Runway 3-21 is 4,000 feet.

The aircraft utilized in this AC are dated and acknowledging the land constraints at MDS, the Small Aircraft Runway Length Analysis Tool (SARLAT) was used to determine recommended length for Runway 3-21. **Table 2-14** shows the recommended runway lengths for various aircraft that would typically utilize Runway 3-21. Several of the aircraft listed are currently owned and operated by Riggin Flight Service and are common flight training aircraft. Additionally, higher performance small aircraft that are occasionally used for flight training such as the Diamond DA-40 and Cirrus SR-22 were considered. MDS should try to accommodate these aircraft during crosswind conditions by planning for a future crosswind runway length of up to 3,100 feet. The alternatives section of this chapter will evaluate the feasibility of extending this runway due to land constraints.

RUNWAY WIDTH

Runway 15-33 is 75-feet wide and meets the standards for A/B-II aircraft. There is no change in width needed as the critical design aircraft is expected to remain the same throughout the planning period.

Runway 3-21 is designed for A/B-I Small aircraft. As such, the width required is 60 feet. Due to grading requirements for turf runways, the published runway width is often based on the required width of the Runway Safety Area (RSA). For Runway 3-21, the published width is 200 feet which exceeds the design standard of 120 feet.

PAVEMENT CONDITION/STRENGTH

Airfield pavements should be adequately maintained, rehabilitated and reconstructed to meet the operational needs of the airport. The published pavement strength is based on the construction

materials, thickness, aircraft weight, gear configuration and operational frequency for the pavement to perform over its useful life.

At MDS, the current surface treatment for Runway 15-33 is concrete with a PCN of 20/R/D/Y/T. In 2020, the runway pavement was rehabilitated. This included replacement of all joint sealant, saw and seal of cracks and spall repairs in select areas of the runway. The 2024 Pavement Condition Index (PCI) survey noted the runway PCI of 95, or good. The airport should continue periodic maintenance on airfield pavements.

RUNWAY DESIGNATION

Runway designation is determined by the magnetic bearing (azimuth) of the runway centerline which is relative to the location of the magnetic north pole. The runway designator number is the whole number nearest the one-tenth of the magnetic azimuth along the runway centerline.

The 2025 magnetic declination at MDS is 2° 49' east, changing 0° 4' west per year as the location of the magnetic north pole moves over time. **There are no recommended changes in runway designation at this time.** FAA will make a determination if runways are to be re-designated. Any change to runway designation will be made at the discretion of FAA as it requires the update of national aeronautical publications, procedures and signage. The official FAA published magnetic declination is 4° east from 2010. See **Table 2-15** for details.

Table 2-15 – Runway Designation Requirements

Runway Designation	Existing Magnetic Bearing (2025)	Future Magnetic Bearing (2045)	Recommended Future Designation
Runway 15-33	150.91°/330.91°	152.25°/332.25°	15-33
Runway 3-21	31.78/211.78	33.11°/213.11°	3-21

Source: National Oceanic and Atmospheric Association (NOAA), KLJ Analysis

VISUAL NAVIGATION AIDS

Visual aids are installed to provide airport usability during periods of darkness and/or low visibility. Pavement markings and lighting systems available at the airport are summarized in the following sections.

Runway Lighting

Runway edge lights are placed off the edge of the runway surface to help pilots define the edges and end of the runway during night and low visibility conditions.

Runway 15-33 is equipped with a Medium Intensity Runway Lighting (MIRL) system. The system was installed in 2004 and is nearing the end of its useful life. The MIRLs can be activated by pilots utilizing the Common Traffic Advisory Frequency (CTAF)

Runway 3-21 does not feature any lighting, however it is marked with white and black cones.

Visual Approach Slope Lighting

Visual approach slope lighting provide vertical descent guidance to pilots for a specific runway end. These approach aids enable the pilot to acquire and maintain the correct glide path for landing. Precision Approach Path Indicator Lights (PAPI) are the current FAA standard equipment installed for this purpose, however other types of equipment exist, including visual approach slope indicator lights (VASI).

Both PAPI and VASI function similarly. They both have red and white lights that are used by the pilot to indicate whether they are too high, too low, or on the appropriate glidepath. Precision approach path indicators project light along a standard glide path to a runway end, with red and white colored lights indicating the aircraft's vertical position (above, below, or on glide path) relative to the defined glide path. Visual approach slope indicators project a beam of light having a white segment in the upper part of the beam and red segment in the lower part of the beam.

Madison has four box PAPIs on both ends of Runway 15-33. The PAPIs are set at a 4.00 degree angle for each runway end. The airport should continue to maintain the PAPI lighting in good condition.

Runway End Identifier Lights (REIL)

REILs consist of high-intensity flashing white strobe lights located on the approach ends of runways to assist the pilot in early identification of the runway threshold. Both ends of Runway 15-33 have REILs installed which can be activated through the CTAF. These REILs should be maintained through the long-term.

Airfield Guidance Signs

Guidance signs provide location, direction, and guidance information to pilots on the ground to enhance awareness. Signs are placed around the airfield to identify runway and taxiway intersections, runway hold positions and other guidance. Mandatory signs are red and identify an intersection with a runway or critical safety zone. Other types of signs include location, direction, destination, and distance remaining signs.

MDS has mandatory, location, and directional signage on the airfield. All types of signage are lighted and marked in accordance with [FAA AC 150/5340-18F, Standards for Airport Sign Systems](#).

Pavement Markings

Pavement markings help airport users visually identify important features on the airfield. FAA has defined numerous different pavement markings to promote safety and situational awareness as defined by [FAA AC 150/5340-1, Standards for Airport Markings](#).

The minimum required runway markings for a standard runway are as follows:

- Visual (landing designator, centerline)
- Non-Precision (landing designator, centerline, threshold)
- Precision (landing designator, centerline, threshold, aiming point, touchdown zone, edge)

Runway 15-33 is marked with non-precision runway markings.

Taxiways

Taxiways provide for the safe and efficient movement of aircraft between the runway and other operational areas of the airport. The taxiway system should provide critical links to airside infrastructure, increase capacity and reduce the risk of an incursion with traffic on the runway. The taxiway system should meet the standards design requirements identified in FAA AC 150/5300-13B. Locations and identifiers are depicted in **Figure 2-1**.

The taxiway system at MDS consists of one full length parallel taxiway to Runway 15-33. Taxiway A is paved, 35 feet wide, designed for ADG-II and connects the apron to Runway 15-33. The taxiway was constructed in 2019 and is in good condition.

SYSTEM DESIGN

FAA has placed a renewed emphasis on taxiway design in their updated airport design standards. Fundamental elements help develop an efficient system to meet demands, reduce pilot confusion and enhance safety. Considerations include:

- Design taxiways to meet FAA design standards for existing and future users considering expandability of airport facilities.
- Design taxiway intersections so the cockpit is over the centerline with a sufficient taxiway edge safety margin.
- Simplify taxiway intersections to reduce pilot confusion using the three-node concept, where a pilot has no more than three choices at an intersection.
- Eliminate “hot spots” identified by the FAA Runway Safety Action Team where enhanced pilot awareness is encouraged.
- Minimize the number of runway crossings and avoid direct access from the apron to the runway.
- Eliminate aligned taxiways whose centerline coincides with a runway centerline.
- Other considerations include avoiding wide expanses of pavement and avoiding “high energy intersections” near the middle third of a runway.
- Design taxiways to ensure they cross runways perpendicularly at 90 degree angles plus or minus 15 degrees

Taxiway A currently provides direct access to Runway 15-33 from the central apron area. This should be reconfigured to require a turn from the apron onto the parallel taxiway. The angle at which Taxiway A crosses Runway 3-21 exceeds 15-degrees beyond perpendicular and future alignments will be evaluated to ensure the crossing angle meets standard.

Due to the high volume of flight training operations that occur at MDS, users have expressed a desire for designated areas for smaller piston engine aircraft to complete engine run ups prior to take off without blocking other taxiing aircraft. **Potential areas for engine run ups to be performed will be evaluated in the alternatives shown later in this chapter.**

HOT SPOT

A potential taxiway “hot spot” was identified for aircraft departing the south apron and turning right onto the parallel taxiway with insufficient visual cues prior to crossing Runway 3-21. The location of the sign indicating the runway crossing does not provide pilots enough time to stop prior to hold bar.

A change in taxiway geometry, additional markings or signage should be considered provide pilots more visual cues they are about to cross a runway.

DESIGN STANDARDS

FAA identifies the design requirements for taxiways. The design standards vary based on individual aircraft geometric and landing gear characteristics. The Taxiway Design Group (TDG) and Airplane Design Group (ADG) identified for the design aircraft using a particular taxiway. Some of the safety standards include:

- Taxiway Width
- Taxiway/Taxilane Safety Area (TSA)

- Taxiway Edge Safety Margin (TESM)
- Taxiway/Taxilane Object Free Area (TOFA)

Other design standards include taxiway shoulder width to prevent jet blast soil erosion or debris ingestion for jet engines, and required separation distances to other taxiways/taxilanes. More information can be found in **Appendix B: General Aviation Airports 101**.

The central apron area connects to Taxiway A and it should be noted that the TOFA extends onto the apron. The airport should ensure aircraft do not park within the TOFA.

Pavement Condition

According to the 2024 PCI study, Taxiway A is in good condition with a PCI of 94. Both Runway Turnarounds are also in good condition with PCI of 95.

Taxiway Lighting

Taxiway edge lighting delineates the taxiway and apron edges. Taxiway A, which runs parallel to Runway 15-33 is equipped with Medium Intensity Taxiway Lighting (MITL). **It is recommended the airport continue to maintain the MITL system on the airfield.**

Pavement Markings

Taxiway and taxilane markings are important for directional guidance for taxiing aircraft and ground vehicles. MDS's taxiway/taxilane markings are maintained by airport maintenance staff and are in good condition. They include taxiway/taxilane centerlines, runway hold-lines, and painted holding position signs (markings on pavement) on all runway hold lines and applicable taxiways/taxilanes. There are no long-term modification recommendations for taxiway/taxilane markings at MDS.

Holding Position

Holding position markings are a visual reference to prevent aircraft and vehicles from entering critical areas such as an active runway environment. The required holding position setbacks for Runway 15-33 at MDS include 200 feet from runway centerline. All runways meet FAA minimum design standard regarding holding position marking requirement.

Airside Data Summary

The following tables provide summary data of the facility requirements and recommendations associated with each of the runways at MDS through the planning period(s) identified in this study.

Table 2-16 – Runway 15-33 Design Standard Matrix

Design Standard	Actual Condition	Requirement or Recommendation	
		Existing	Future/Ultimate
Runway Identification	15/33	15/33	15/33
Aircraft Classification	Large Aircraft	Large Aircraft	Large Aircraft
Runway Design Code (RDC)	B-II-5000	B-II-5000	B-II-5000
Approach Reference Code (APRC)	B-II-4000 B-I(S)-2400	B-II-4000 B-I(S)-2400	B-II-4000 B-I(S)-2400
Departure Reference Code (DPRC)	B-II	B-II	B-II
Pavement Strength (Wheel Loading)	56,000 (SW) 69,000 (DW)	56,000 (SW) 69,000 (DW)	56,000 (SW) 69,000 (DW)
Effective Runway Gradient	0.180%	0.180%	0.180%
Runway Width	75'	75'	75'
Runway Length	5,000'	5,000'	5,000'

Line of Sight Requirements Met	RVZ Deficiency ¹		No		Yes
Runway Safety Area (RSA) Width	150' ²		150'		150'
RSA Length Prior to Threshold	300'		300'		300'
RSA Length Beyond Threshold	300'		300'		300'
Runway Lighting	MIRL		MIRL		MIRL
RPZ Start from Runway	Runway 15: 456 th Avenue Runway 33: County Highway 36		200'		200'
RPZ Length			1,000'		1,000'
RPZ Inner Width			500'		500'
RPZ Outer Width			700'		700'
Visibility Minimums	1 mile		1 mile		1 mile
Approach Type	NPI		NPI		NPI
14 CFR Part 77 Approach Slope	34:1		34:1		34:1
ROFA Width	500'		500'		500'
ROFA Length Prior to Threshold	300'		300'		300'
ROFA Length Beyond Threshold	300'		300'		300'
ROFZ Length Past Runway	200'		200'		200'
ROFZ Width	400'		400'		400'
Inner Approach OFZ	N/A		N/A		N/A
Inner Transitional OFZ	N/A		N/A		N/A
Precision OFZ Length	N/A		N/A		N/A
Precision OFZ Width	N/A		N/A		N/A
AC 150/5300-13B Approach Surface	Rwy 15: Surface 4	Rwy 31: Surface 5	Rwy 15: Surface 4	Rwy 31: Surface 5	Surface 5
Start from Runway End	200'	200'	200'	200'	200'
Length	10,000'	10,000'	10,000'	10,000'	10,000'
Inner Width	200'	200'	200'	200'	200'
Outer Width	400'	400'	400'	400'	400'
Slope	20:1	20:1	20:1	20:1	20:1
Departure Surface Slope	40:1	40:1	40:1	40:1	40:1
Departure Surface Dimensions	1,000' x 7,512' x 12,152'		1,000' x 7,512' x 12,152'		1,000' x 7,512' x 12,152'
Vertical Guidance (Surface 6) Slope	N/A	30:1	N/A	30:1	30:1
Vertical Guidance (Surface 6) Dimensions	300' x 1,520' x 10,200'		300' x 1,520' x 10,200'		300' x 1,520' x 10,200'
Visual and Instrument NAVAIDS	PAPI, REIL		PAPI, REIL		PAPI, REIL
Runway and Taxiway Separation	240'		240'		240'
Runway and Hold Line Separation	200'		200'		200'

Source: FAA AC 150/5300-13B, Change 1 & KLJ Analysis. Note: **RED** indicates a known deficiency to existing minimum design standards, **BLUE** indicates a change in design standard for future/ultimate condition

¹ Grading and possible crop height restrictions necessary to ensure Runway Visibility Zone remains unobstructed

² Grades within the Runway 15-33 Safety Area do not meet standard

Table 2-17 – Runway 3-21 Design Requirements Matrix

Design Standard	Existing Condition	Requirement or Recommendation	
		Existing	Future/Ulimate
Runway Identification	3/21	3/21	3/21
Aircraft Classification	Small (Less than 12,500 lbs)	Small (Less than 12,500 lbs)	Small (Less than 12,500 lbs)
Runway Design Code (RDC)	B-I(S)-VIS	B-I(S)-VIS	B-I(S)-VIS
Approach Reference Code (APRC)	N/A	N/A	N/A
Departure Reference Code (DPRC)	N/A	N/A	N/A
Pavement Strength (Wheel Loading)	N/A	N/A	N/A
Effective Runway Gradient	0.281%	0.281%	-
Runway Width	200	120'	120'
Runway Length	2,380'	2,380'	3,100'
Line of Sight Requirements Met	RVZ Deficiency ³	No	Yes
Runway Safety Area (RSA) Width	120' ⁴	120'	120'
RSA Length Prior to Threshold	240'	240'	240'
RSA Length Beyond Threshold	240'	240'	240'
Runway Lighting	Cones	Cones	Cones
RPZ Start from Runway	200'	200'	200'
RPZ Length	1,000'	1,000'	1,000'
RPZ Inner Width	250'	250'	250'
RPZ Outer Width	450'	450'	450'
Visibility Minimums	Visual	Visual	Visual
Approach Type	Visual	Visual	Visual
14 CFR Part 77 Approach Slope	20:1	20:1	20:1
ROFA Width	250'	250'	250'
ROFA Length Prior to Threshold	240'	240'	240'
ROFA Length Beyond Threshold	240'	240'	240'
ROFZ Length Past Runway	200'	200'	200'
ROFZ Width	250'	250'	250'
AC 150/5300-13B Approach Surface	Surface 2	Surface 2	Surface 2
Start from Runway End	0'	0'	0'
Length	5,000'	5,000'	5,000'
Inner Width	250'	250'	250'
Outer Width	700'	700'	700'
Slope	20:1	20:1	20:1
Departure Surface	N/A	N/A	N/A
Runway and Taxiway Separation	N/A	N/A	N/A
Runway and Hold Line Separation	N/A	N/A	N/A

Source: FAA AC 150/5300-13B, Change 1 & KLJ Analysis. Note: **RED** indicates a known deficiency to existing minimum design standards, **BLUE** indicates a change in design standard for future/ultimate condition

³ Grading and possible crop height restrictions necessary to ensure Runway Visibility Zone remains unobstructed

⁴ Grades within the Runway 3-21 Safety Area do not meet standard

DEFICIENCIES TO DESIGN STANDARDS

Known deficiencies to the existing runway design standards at MDS include:

- **Runway Protection Zone**
 - Deficiency: Runway 15-33 RPZ extends over roads on both ends
 - Action Plan: Ensure airport has control via fee simple ownership or easement of the RPZs
- **Runway Visibility Zone**
 - Deficiency: Ground and potential crops planted within the RVZ obstruct line of sight for aircraft on Runway 3-21 and 15-33
 - Action Plan: Relocating the Runway 3-21 threshold or grading the ground within the RVZ as well as restricting crop heights within the area to ensure unobstructed line of sight.
- **Runway Safety Area**
 - Deficiency: Nonstandard grades within the runway safety area.
 - Action Plan: Correct safety area grades during next runway project

Any existing deficiencies to airport design standards would need to be noted in the ALP and a Modification to Design Standards requested from FAA if they are to remain. **Table 2-16 and Table 2-17** depicts the existing airfield design standards, deficiencies and key facility needs. Airfield facility recommendations are listed below.

Airside Facility Recommendations

- Evaluate areas for aircraft to perform engine run-ups
- Evaluate options to Runway 3-21 length
- Evaluate taxiway geometry to ensure safe operations of taxiing aircraft

Alternatives

A wide range of alternatives are evaluated to determine the best solution for the airport to meet facility needs. In many cases the process is iterative to react to new information and input. Please refer to the alternative analysis process in Chapter 1 for details on the factors considered.

A range of alternatives were prepared for consideration and those initial alternatives were reviewed by the Planning Advisory Committee to create a narrower slate of alternatives for further review. In the end a preferred alternative was selected and portrayed at the end of this chapter.

ALTERNATIVES SECTION TO FOLLOW