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 Mercer County Regional Airport (HZE).

As the chapter analyzes various components of the runway and taxiways at HZE, 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 Data
- Runways
- Taxiways
- Alternatives
- Preferred Alternative

Critical Design Aircraft

As discussed in the previous chapter, the current and future critical design aircraft is a B-II aircraft which has an aircraft approach category (AAC) B, airplane design group (ADG) II, and a taxiway design group (TDG) 2A.

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 HZE are summarized in the following sections.

Table 2-1 –Airfield Design Aircraft Summary

Design Characteristics	Existing	Future
Aircraft Make/Model	Various	Various
Airplane Approach Category	B	B
Airplane Design Group	II	II
Taxiway Design Group	2	2
Wingspan	Up to 79’	Up to 79’
Length	Up to 65’	Up to 65’
Height	Up to 25’	Up to 25’
Main Gear Width	Up to 20’	Up to 20’
Approach Speed	Up to 121 knots	Up to 121 knots
Maximum Takeoff Weight	12,500 pounds	12,500 pounds

Source: KLJ Analysis

Meteorological Data

The runway discussion must start with meteorological information. For safety and to maximize performance capabilities, aircraft need to takeoff and land into the wind. In addition, aircraft must often operate in poor weather conditions to deliver passengers and cargo. For these reasons, weather needs to be addressed early in the discussions.

Weather Reporting

There are two types of weather reporting systems that are certificated for use on an airport which are the ASOS and AWOS. 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. The AWOS is a second-tier system which is maintained locally or by states and contains varying sets of instrumentation packages to provide local weather observations. Hazen has an AWOS-IIIPT weather observation system located on the airfield. For wind analysis at HZE, the AWOS on the field was used to provide wind coverage and meteorological analysis.

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 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 metrological data was reviewed from HZE AWOS available from the National Climatic Data Center (NCDC). Periodic “special” weather observations within each hour were removed. This method provides and 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.

In addition to wind, temperature affects runway length required. From weather reports over the last years (1991-2020) the average maximum temperature at HZE in the hottest month has been 84 degrees Fahrenheit (July).

WIND COVERAGE

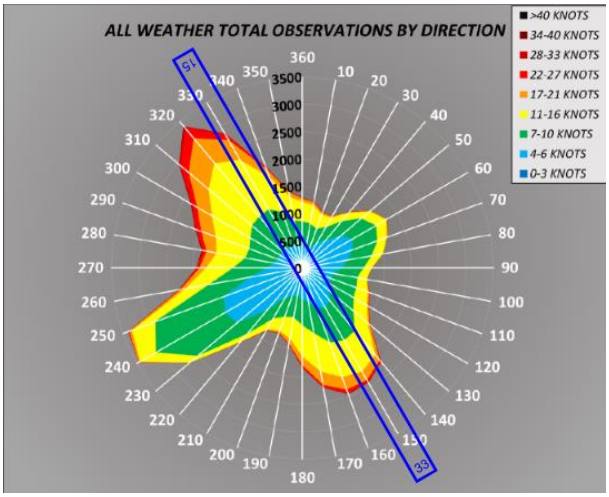
Wind coverage is important to airfield configuration and utilization. Aircraft ideally takeoff and land into a headwind aligned with the runway orientation. Aircraft are designed and pilots are trained to land aircraft in limited crosswind conditions. Small, light aircraft are most affected by crosswinds. To mitigate the effect of crosswinds, FAA recommends runways be aligned so that excessive crosswind conditions are encountered at most 5 percent of the time. This is known as a “95 percent wind coverage”



Small Aircraft Crosswind Landing Diagram (faasafety.gov)

standard. When this level of coverage is not provided, the FAA recommends development of a secondary (crosswind) runway.

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 direction of flight.



Source: KHZE AWOS (2012 -2021, hourly) National Climatic Data Center, 83,657 total observations

Even when the 95 percent wind coverage standard is achieved for the design airplane or airplane design group, cases arise where certain airplanes with lower crosswind capabilities are unable to utilize the primary runway. The maximum crosswind component for different aircraft sizes and speeds are shown in **Table 2-2 - FAA Wind Coverage Standards**.

Table 2-1 – FAA Wind Coverage Standards

AAC-ADG	Maximum Crosswind Component
A-I & B-I	10.5 knots
A-II & B-II	13.0 knots
A-III, B-III & C/D I-III	16.0 knots

Source: FAA AC 150/5300-13B – Airport Design

Prevailing winds, as reported by the HZE AWOS are from the southwest and is generally aligned with the current runway configuration. The HZE data is shown in **Table 2-3** for Runway 15-33.

Table 2-2 – AWOS All-Weather Wind Analysis

Runway	AAC-ADG	Crosswind Component (Wind Speed)		
		10.5 knots	13.0 knots	16.0 knots
15-33	A/B-II	93.50%	97.60%	99.17%

Source: KHZE AWOS (2012 -2021, hourly), National Climatic Data Center, 83,657 total observations

For all-weather conditions, the A/B-II design aircraft crosswind component (13 knots) is accommodated with Runway 15-33 according to the HZE AWOS. However, A/B-I design aircraft crosswind component (10.5 knots) is not accommodated.

Wind coverage during IMC is evaluated to determine the ideal alignment for instrument approach to an airport's runway. As shown in **Table 2-4**, the wind data was applied to the runway alignment at HZE to evaluate the IMC wind coverage. The 95 percent wind coverage requirement is met for the design aircraft (B-II) with a maximum crosswind component of 13.0 knots. The 95 percent wind coverage requirement is not met for A/B-I aircraft.

Table 2-4 – IMC Wind Analysis

Runway	AAC-ADG	Crosswind Component (Wind Speed)		
		10.5 knots	13.0 knots	16.0 knots
15-33	A/B-II	91.19%	96.67%	98.97%

Source: HZE AWOS (2012-2021; hourly), National Climatic Data Center, 5,233 total observations

Based on the wind analysis, the current runway configuration meets 95 percent wind coverage for the critical design aircraft family of B-II (or 13 knot crosswind component) at HZE in both all weather conditions and IMC. Runway 15-33 does not meet the required 95 percent crosswind coverage for A/B-I aircraft (10.5 knot crosswind component). **It is recommended that a crosswind runway be evaluated to increase airport usability for A/B-I design aircraft.** The crosswind runway alternatives should include considerations of surrounding obstructions such as residences and terrain, as well as optimal orientation to provide increased wind coverage for smaller aircraft to increase the overall usability of the airport.

Based on true hourly weather data summarized in **Table 2-5**, the airport has visual meteorological conditions 93.24 percent of the time. With an instrument approach of 400 feet ceiling and 1-mile visibility, the airport is used an additional 4.78% (17.4 days) leaving only 7.2 days unusable.

Table 2-5 – Meteorological Analysis

Weather Condition	Percentage			Days Per Year	Hours Per Year
VMC	93.24%			340.3	8,168
Usable IMC 400 foot Ceiling - 1 mile visibility	4.78%			17.4	419
Existing Usability	**98.02%**			**357.8**	**8,587**
Additional Capture with IMC Improvements	**Rwy 15**	**Wind Calm**	**Rwy 33**		
300 foot Ceiling - ¾ mile Visibility No Approach Lighting Required	0.41%	0.11%	0.49%	3.7	88.3
250 foot Ceiling - ½ mile Visibility MALSR Lighting Required[1]	0.02%	0.02%	0.04%	0.2	5.2
Below Weather Minimums	0.91%			3.3	79.5
Total	**100.00%**			**365.0**	**8,760**

*Source: HZE AWOS (2012-2021; hourly), National Climatic Data Center, 77,043 total observations. Note: *Based on Runway 15 & 33 current IFR minimums are 400-foot cloud ceiling and 1-mile visibility for RNAV GPS approach.*

If the instrument approach was changed to a ceiling as low as 300 feet and a ¾ mile visibility for both runway ends, this would increase the usable IMC by 1.01% for an additional 3.7 days or 21.1 days total per year. If the instrument approach were improved further to 250 feet and a ½ mile visibility with the addition of Medium Intensity Approach Lighting with Runway Alignment Indicator (MALSR) approach lighting on the Runway 33 end it would increase the usable IMC by an additional 0.06% for an additional 0.2 days or a total of 21.3 days per year. As a result, the recommendation is to improve the instrument approach capabilities to 300 feet and ¾ mile visibility but to not pursue approach lighting.

[1] MALSR on Runway 33 end – Days and Hours based on Calm and Runway 33 wind conditions. Runway 15 wind conditions are below weather minimums and are included in the remaining calculations.

Figure 2-1 – Airfield Facilities Map



Runways

There is currently one paved runway at HZE, Runway 15-33. The details of the runway are as follows.

RUNWAY 15-33

Runway 15-33 runs Southeast to Northwest and is the primary asphalt runway that is 4,999 feet long by 75 feet wide with a weight bearing capacity to accommodate up to single wheel 17,000 pounds. There is a non-precision approach with one mile visibility and two-light Precision Approach Path Indicator (PAPI) for both runway ends. The runway has medium intensity runway lights (MIRL) and on the Runway 33 End there are Runway End Identifier Lights (REILs).

Table 2-6 – Runway Facility Summary

Component	Runway 15-33
Runway Length (feet)	4,999
Runway Width (feet)	75
Runway Surface Material	Asphalt
Runway Surface Treatment	None
Single Wheel Pavement Strength	17.0
Runway Design Code	A/B-II

Source: KLJ Analysis

RUNWAY DESIGN CODES

The Runway Design Code (RDC) provides the design standards for a specific runway based on design aircraft and instrument approach minimums. Further information about Runway Design Codes can be found in **Appendix B: General Aviation Airports 101**.

Runway 15-33: The existing RDC is B-II-5000 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 are derived based on a taxiway separation distance.

Runway 15-33: The runway does not have a parallel taxiway and therefore does not have either approach reference codes or departure reference codes.

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 2024 magnetic declination at HZE is 6° 10’ east, changing 0° 5’ west per year as the location of the magnetic north pole moves over time. Any change to runway designation will be made at the discretion of the FAA as it requires the update of aeronautical publications, procedures, and signage.

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 Runway 15-33 meet existing airport design standards. Improvements will need to be made to meet future standards. The basic safety standards dimensional requirements for the runway are summarized in **Table 2-7**.

Table 2-7 – Runway Safety Design Standards

Standard	Runway 15-33
Runway Safety Area (RSA)	5,599 x 150’
Runway Object Free Area (ROFA)	5,599 x 500’
Runway Obstacle Free Zone (ROFZ)	5,399’ x 400’

Source: KLJ Analysis

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.

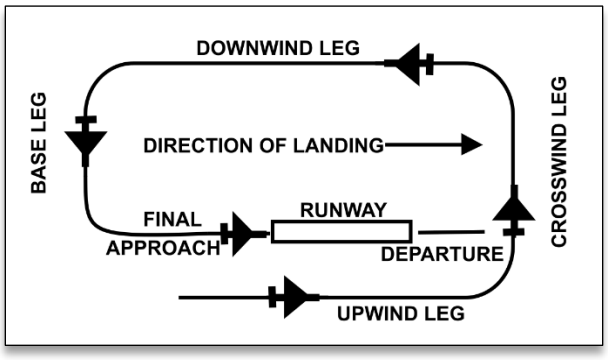
Airport owners should, at a minimum, maintain the RPZ clear of all facilities supporting incompatible activities, such as residential structures. It is desirable to clear all above-ground objects from the RPZ. Protection of the RPZ is achieved through airport control over RPZs including fee title ownership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

The land uses in the existing RPZs appear to be acceptable now. Further review is required if new land uses, runway end locations or a change in the size of the RPZ is proposed and a land use requiring FAA coordination is in the RPZ.

Runway 15-33 has RPZs sitting 200 feet from the runway threshold, 500 feet-wide for the inner width, 700 feet-wide for the outer width, and are 1,000 feet long. Currently, HZE controls the land needed in fee or easement for the RPZs. The airport should continue acquiring land to control all future and ultimate RPZs in fee simple or land use easement.

APPROACH/DEPARTURE PROCEDURES

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



Standard VFR Airport Traffic Pattern (Source: FAA)

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 degrees downwind. Arrivals typically enter a traffic pattern 45 degrees to a downwind leg for landing. All traffic at HZE follow a standard left traffic pattern.

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. Both runway ends are available for instrument departures. There are penetrations to the existing Runway 15 and 33 instrument departure surfaces that are noted in FAA publications (see below figure).

HAZEN, ND
MERCER COUNTY RGNL (HZE)
TAKEOFF MINIMUMS AND (OBSTACLE) DEPARTURE PROCEDURES
AMDT 1 20APR23 (23110) (FAA)
TAKEOFF MINIMUMS:
Rwy 15, 300-1⅛ or std. w/min. climb of 296' per NM to 2100 or 1000-3 for climb in visual conditions.
Rwy 33, std. w/min. climb of 215' per NM to 2700 or 1000-3 for climb in visual conditions.
VCOA:

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 2-8**:

Table 2-8 – Approach/Departure Surface Requirements

Runway End(s)	Par. 3.6 Surface	Description	Slope
Existing/Future/Ultimate			
15, 33	5	Approach end of runways providing ILS or localizer type directional aid with glidepath (LPV, LNAV/VNAV) ≥ ¾ mile visibility	20:1
Future/Ultimate			
Crosswind Runway	2	Approach end of runways serving small airplanes with approach speeds of 50 knots or more	20:1

Source: FAA AC 150/5300-13B, KLJ Analysis. Note: Most critical row(s) shown. Only changes from existing shown in future.

RUNWAY LENGTH

Runway 15-33 at HZE has a length of 4,999 feet. 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 this method including FAA runway length charts and aircraft performance data is in **Appendix D: Runway Length Evaluation**.

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 HZE are identified in **Table 2-9**.

Table 2-9 – FAA AC 150/5345-4B Runway Length Requirements (≤ 12,500 lbs.)

Airport and Runway Data	
Airport Elevation	1814 feet
Mean Daily Maximum Temperature of Hottest Month	84.0°F
Aircraft Classification	**Recommended Runway Length**
Small Airplanes 12,500 Pounds or less	
10 or more passenger seats	4,410 feet
Less than 10 passenger seats at 100 percent of fleet	4,280 feet
Less than 10 passenger seats at 95 percent of fleet	3,700 feet
Other Notable Aircraft	
Air Tractor 502	3,330 feet
Air Tractor 802	**5,300** feet
Beech King Air 200	3,905 dry/4,491 wet
Pilatus PC-12	3,619 dry/4,162 wet
Cessna 560 XL	4,838 dry/**5,564** wet
Phenom 300	4,427 dry/**5,091** wet

Source: FAA AC 150/5325-4B, KLJ Analysis
Note: Runway length requirements estimated based on charts for airport planning purposes only.

For general aviation aircraft that operate at HZE, the FAA runway length requirements of 95 percent of fleet would apply at HZE due to it being located in a lower population community which is a length of 3,700 feet. Specific aircraft were also analyzed which operate at HZE. Most notable are the requirements of the Air Tractor 802 and the Cessna 560 XL and Phenom 300 in wet conditions. The

length requirements are respectively 5,300, 5,564 and 5,019 feet. The existing runway length of Runway 15-33 is determined to be sufficient through the planning period and no extension is needed.

Crosswind Runway

As discussed above, Runway 15-33 does not provide the necessary crosswind coverage to accommodate smaller A/B-I aircraft. **To increase crosswind coverage for smaller aircraft, the addition of a crosswind runway is recommended.**

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.

Because of the restricted land to the west of the current runway, the length for the turf crosswind was determined based on available land of the evaluated alignment. The final runway length will be determined as the airport layout plan is put together in more detail. Details on specific needed runway lengths can be found in **Appendix D – Runway Length Analysis**.

Taxiways

SYSTEM DESIGN

FAA has placed a renewed emphasis on taxiway design in their updated airport design standards. Fundamental elements help develop and 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.
- 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.

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. 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/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 taxiway system at Hazen is made up of two taxiways.

- **North Taxiway:** This taxiway is paved, 35 feet wide and connects the north terminal apron to Runway 15.
- **Central Taxiway:** This taxiway is paved, 35 feet wide and connects the south terminal apron to the midpoint of Runway 15-33.

As part of the feedback received from various airport users, there were safety concerns regarding the lack of radio communications by pilots back taxiing on the runway during busy times. **As defined in the 2008 Airport Layout Plan, the airport should continue to plan for the addition of a parallel taxiway meeting design requirements of a TDG-2A to increase safety at HZE.**

Runway and Taxiway Conditions

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 HZE the current surface treatment is asphalt with a single wheel weight bearing capacity of 17.0 according to the airport master record (5010). In 2020, all airside pavements underwent a full mill and overlay as part of the 2020 Capital Improvement plan.

According to the North Dakota Aeronautics Commission Pavement Management System, all airside pavements at HZE are listed at 100 PCI. As such, no recommendations for pavement maintenance are recommended during this planning study.

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.

Identification Lighting

HZE has a clear and green rotating beacon, which is a two-sided light that assists pilots in the visual identification of a civilian airport. The clear and green beacon indicates a lighted land airport. The airport beacon is located on the northeast edge of the north apron and operates sunset to sunrise.

Pavement Edge Lighting

Pavement edge lighting fixtures are installed off the edges of runway and taxiway pavements to help pilots identify the edges and ends of pavement and facilitate safe operations in darkness and/or low visibility environments. Runway edge lights are white (bi-directional), except for the final 3,000 feet of the runway where the lights change color to yellow to warn pilots approaching the end of the runway for instrument runways. The runway end threshold lights (bi-directional) are green when viewing down the runway at the start of takeoff roll and red when approaching the end of the runway. Taxiway edge lights are blue and omni-directional.

The airport has Medium Intensity Runway Lighting (MIRL) for Runway 15-33. The taxilanes connecting to the north and south apron areas are marked with reflectors. It is recommended to maintain good

condition of the MIRL on all paved runways. **If when a parallel taxiway is constructed, it is recommended the airport install a Medium Intensity Taxiway Lighting (MITL) system.**

Airfield lighting systems allow for pilots to control the complexity and intensity of lights. The lights for the Runways including the PAPIs are all controlled with the pilot-controlled lighting system activated through the Common Traffic Advisory Frequency (CTAF).

Visual Approach Lighting

Visual approach lighting (or visual approach aids) 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.

The PAPI has red and white lights that are used by the pilot to indicate whether they are too high, too low, or on the appropriate glidepath. PAPIs 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.

Hazen has two box PAPIs on both ends of Runway 15-33. The PAPIs are set at a 3.00-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. HZE currently has the runway 33 end with REILs installed. These REILs should be maintained through the long-term.

Approach Lighting System



Typical Approach Lighting System (FAA)

An approach lighting system provides extended runway centerline alignment information near the runway's end for pilots to transition from instrument flight to visual flight for landing in low visibility conditions. There are several types of systems with varying configurations. The type of ALS to consider at HZE is the **Medium-intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR):** This is the system that would be needed to reduce visibility down to ½ mile by providing an extended centerline 2,400 feet from the Runway 33 threshold. This full ALS consists of seven rows of lights, five flashing lights and a row of steady burning green lights prior to runway threshold. Consideration of the MALSR is related to instrument meteorological conditions noted previously in this chapter.

Pavement Markings

Pavement markings provide visual guidance to aircraft to critical areas on the runway and taxiway surface. 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*. Runway markings vary in complexity depending on the type of approach served. Runway markings vary in complexity depending on the type of approach. Runway 15-33 is marked with non-precision runway markings which include a landing designator, centerline, threshold markings, and aiming point.

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.

Hazen has all the required lighted mandatory signs for the runways and directional signs for all the taxiways.

Airfield Summary

This section identifies safety, capacity and development needs for the Mercer County Regional Airport based on forecasted activity levels. These recommendations provide the basis for formulating development alternatives to adequate address recommended improvements. The following summarizes the facility recommendations:

Airside Facilities

- Continue to maintain runway and taxiway design standards in accordance with FAA AC 150/5300-13B Change 1
- Plan for the addition of a taxiway parallel to Runway 15-33
- Plan for the addition of a turf crosswind runway to increase wind coverage for A/B-I 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.

The planning study identified the need for an additional runway to satisfy crosswind coverage for A/B-I aircraft. After gathering feedback from various airport users and members of the Planning Advisory Committee, many of them expressed a preference for a turf runway option at HZE. It was determined that the addition of a turf runway would provide the best solution to satisfy the crosswind requirements.

The alternatives listed below consider current property, wind coverage, geographical features, Runway Protection Zones (RPZs), Part 77 surfaces, runway length, and effect on future development.

INITIAL TURF RUNWAY ALTERNATIVES

Parallel Runway within Runway 15-33 RSA: Proposed addition of a 2,800-foot turf runway parallel to runway 15-33 located inside the existing Runway Safety Area (RSA). See **Figure 2-2 Parallel Runway Alternatives.**

Advantages:

- No issues with RPZs or Part 77 surfaces
- No additional property needed
- No need to relocate any runway lighting or change any runway markings
- No impact to future terminal area development

Disadvantages:

- Considered the same surface as Runway 15-33, therefore no simultaneous use
- Does not increase crosswind coverage

Parallel Runway with 300-foot Centerline Separation from Runway 15-33: 1,800-foot turf runway parallel to Runway 15-33.

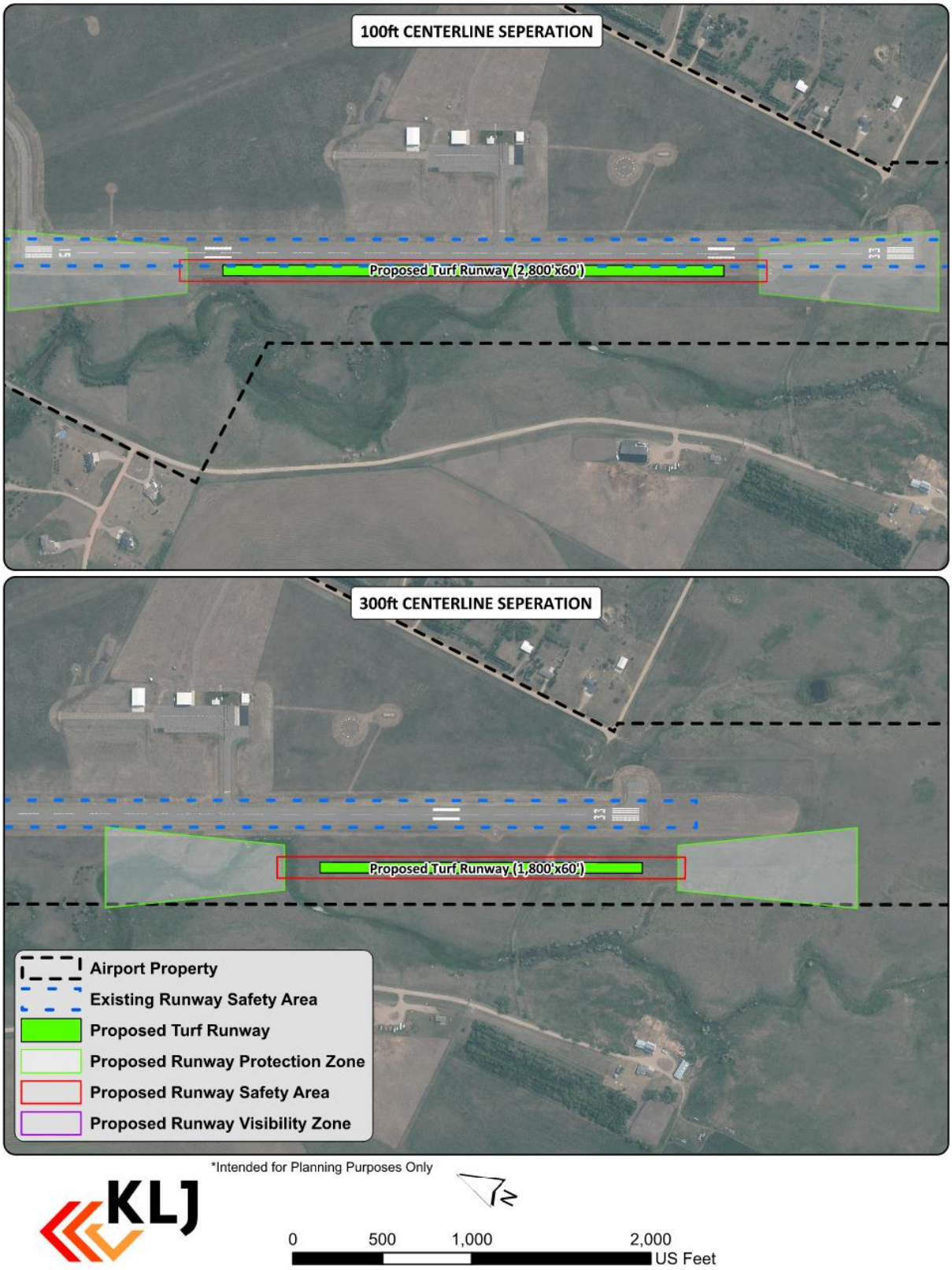
Advantages:

- Provides turf runway option to users
- No impact to future terminal area development
- Minimal land acquisition required for RPZs

Disadvantages:

- Does not increase crosswind coverage
- Current airport fencing would need to be moved at least 135 feet to the west

Figure 2-2 - Parallel Turf Runway Alternatives



Initial Runway 3-21 Option

A new 2,000-foot turf runway northwest of central terminal area. See **Figure 2-3 Initial Runway 3-21.**

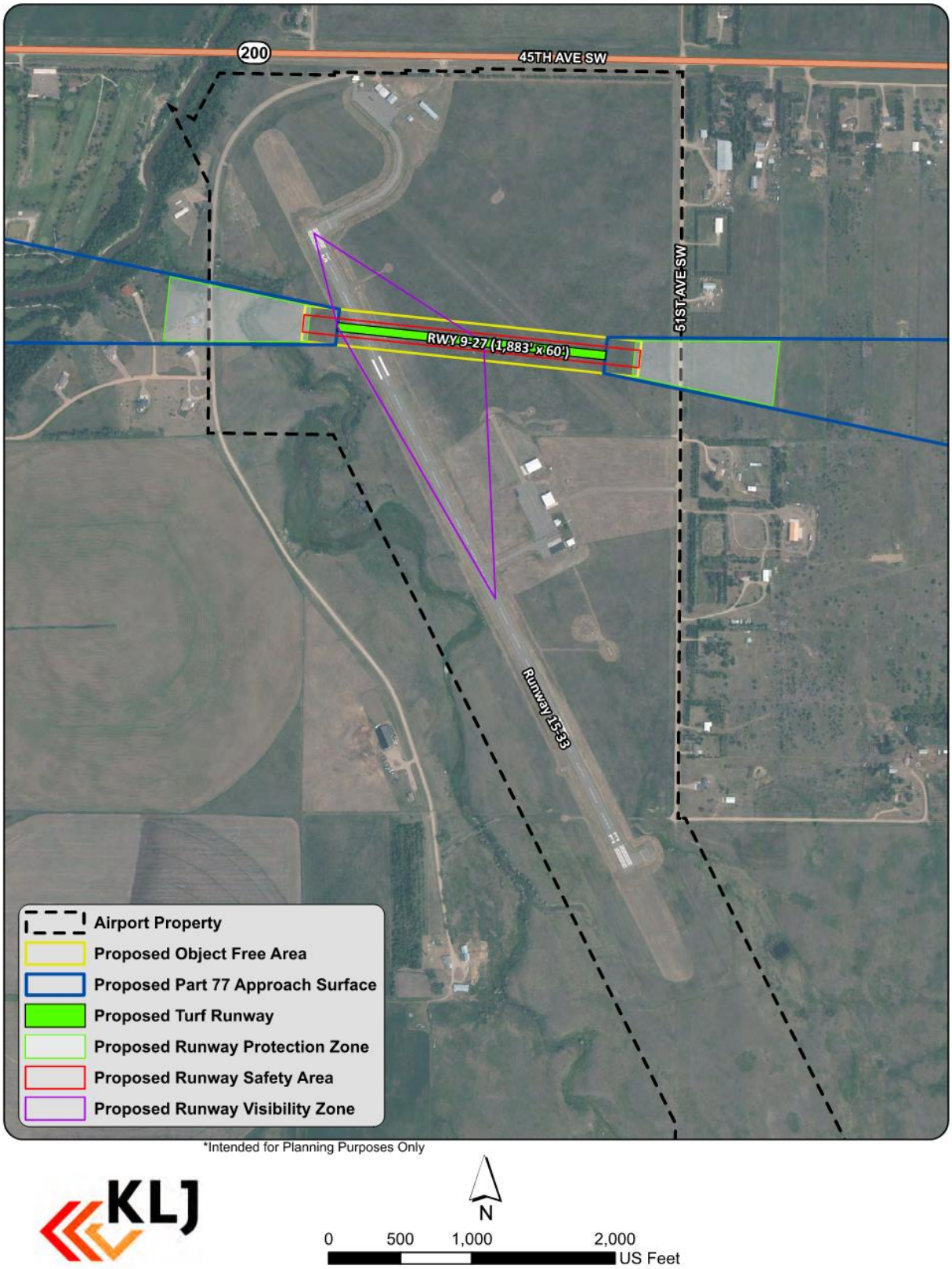
Advantages:

- 97.22% crosswind coverage

Disadvantages:

- Runway Visibility Zone (RVZ) requirements impact possible future terminal area development
- Incompatible uses within RPZs on both ends (land control and relocate part of property fence)

Figure 2-3 - Initial Runway 3-21



Initial Runway 9-27 Option

A new 2,000-foot turf runway located between the terminal areas. See **Figure 2-4 Initial Runway 9-27.**

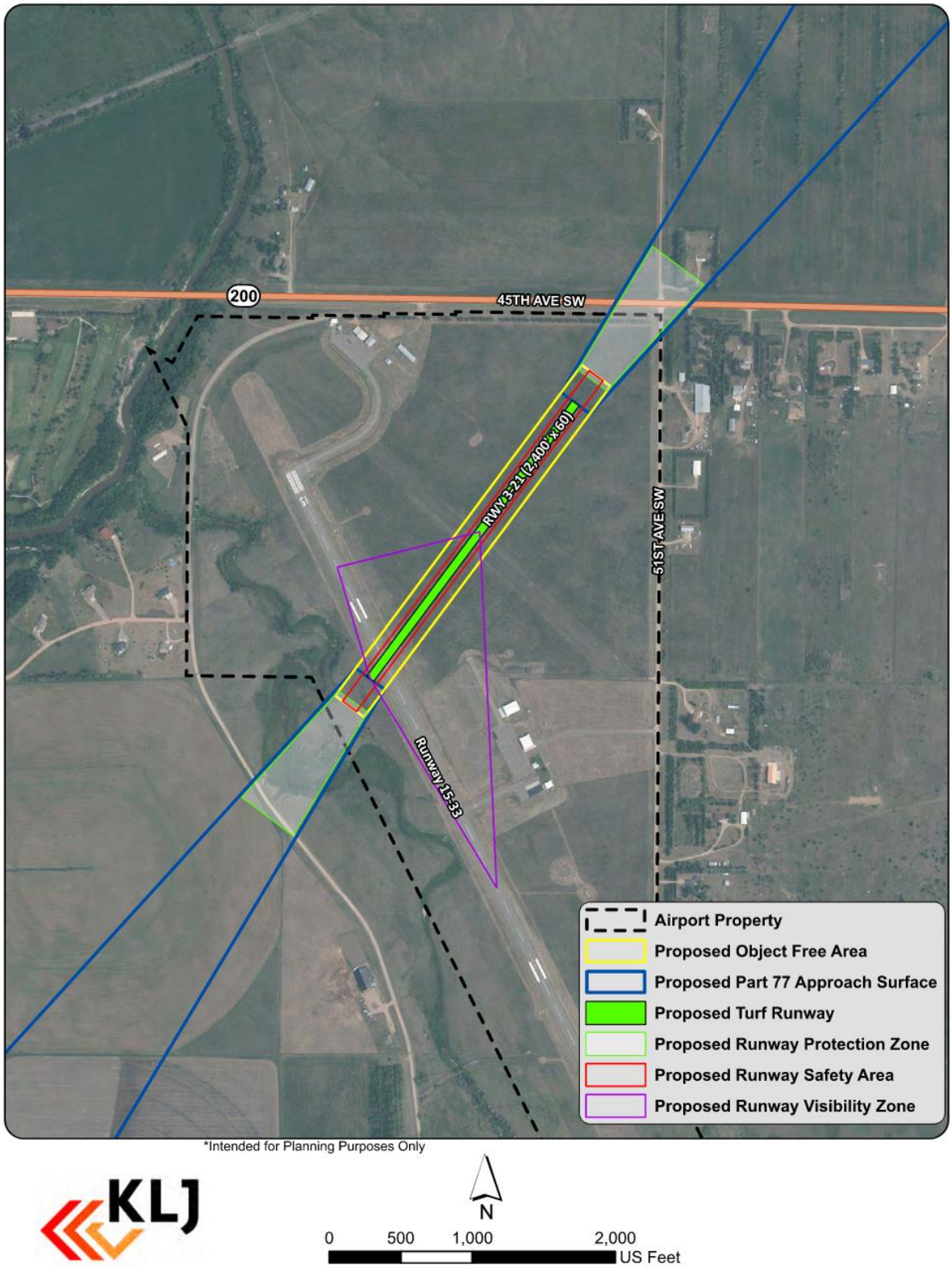
Advantages:

- 98.85% crosswind coverage
- RVZ does not interfere with future terminal area development

Disadvantages:

- Incompatible uses within RPZs on both ends (land control and relocate part of property fence)

Figure 2-4 - Initial Runway 9-27



Initial Runway 13-31 Option

A new 2,300-foot turf runway between terminal areas. See **Figure 2-5 Initial Runway 13-31.**

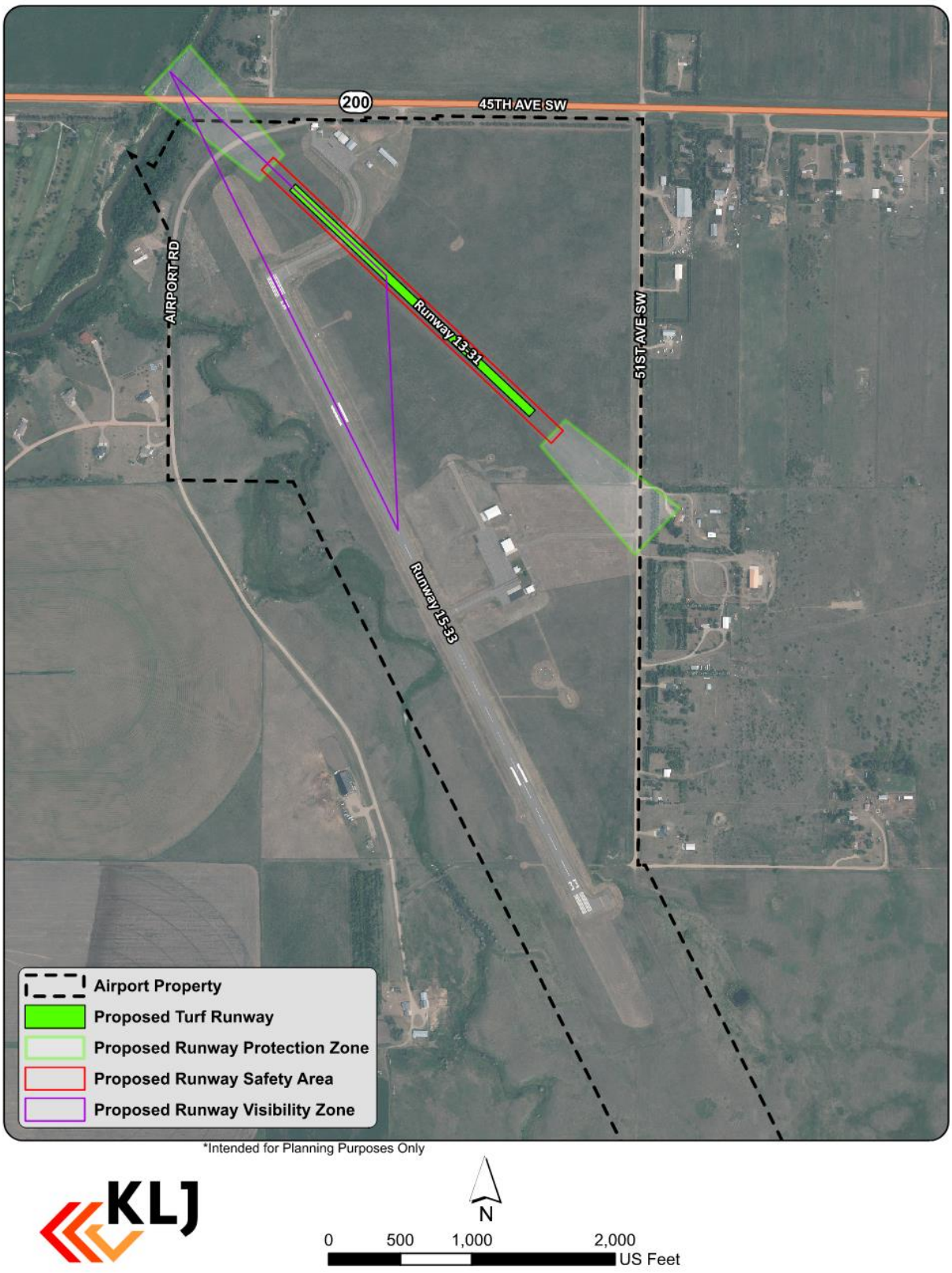
Advantages:

- 96.79% crosswind coverage
- No impact to future terminal area development

Disadvantages:

- Crosses airport access road and north taxiway
- Incompatible uses within RPZs (land control)

Figure 2-5 - Initial Runway 13-31



REVISED TURF RUNWAY ALTERNATIVES

Each alternative was presented to the Planning Advisory Committee (PAC) and other airport users. Feedback was gathered and the PAC and airport users determined to further explore the Runway 3-21 option and Runway 9-27 option. These two alternatives were revised with consideration to the following items;

- Current runway lights and PAPI location
- Fill material needed on the west side of the current runway
- RPZ placement and Part 77 surfaces
- Ensuring aircraft on the west end of the turf runway will be positioned outside the Runway 15-33 RSA before taking off.
- Possible runway length

Revised Runway 3-21 Option

Please reference **Figure 2-6**.

This option would extend the previous 2,000-foot option by 400 feet to offer a new 2,400-foot turf runway that would sit northeast of the central terminal area. The RVZ could limit future central terminal area development for this area which must remain free of structures and aircraft parking.

Revised Runway 9-27 Option

Please reference **Figure 2-7**.

This option was shortened to 1,883 feet from the previous 2,000-foot runway option. The length was adjusted for the west end to minimize the amount of fill material. This option could limit development within the east RPZ and would also require easement control be established very soon.

Table 2-10 – Turf Runway Options Summary Table

	3-21	9-27
Length	2,400’	1,833’
Wind Coverage	97.22%	98.85%
Terminal Area Impact	Minimal	Minimal
RPZ Items	Mosset Way, 45th Ave & 51st Ave	Mosset Way & 51st Ave Must limit development within RPZ
Easement Required	11.0 acres	9.0 acres (portion currently developable)
Unclassified Excavation	20,600 cubic yards	12,200 cubic yards
Topsoil (obtained on-site)	5,500 cubic yards	4,400 cubic yards
Estimated Cost	$940,000	$620,000

Source: KLJ Analysis

Figure 2-6 – Revised Runway 3-21 Option

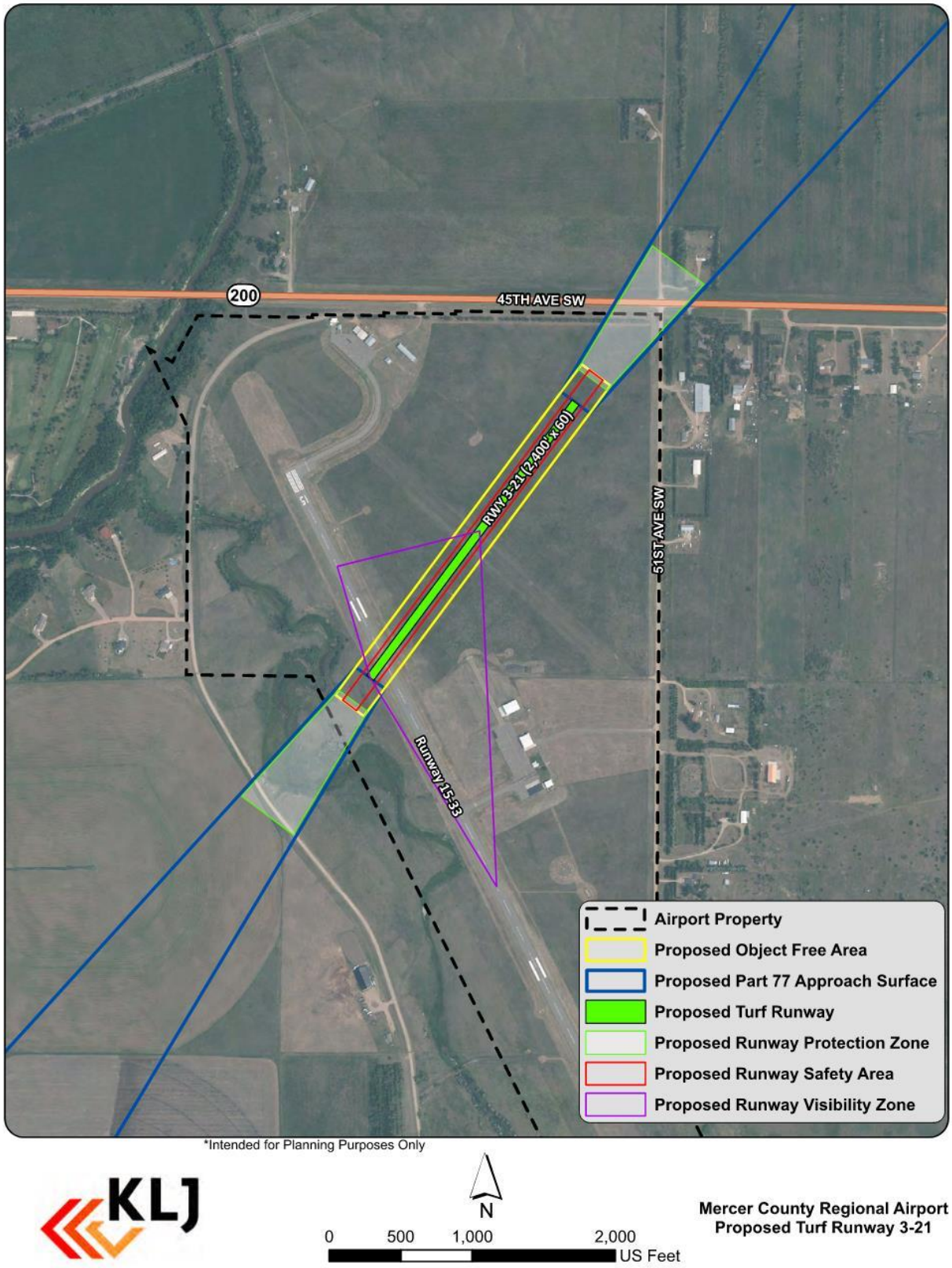
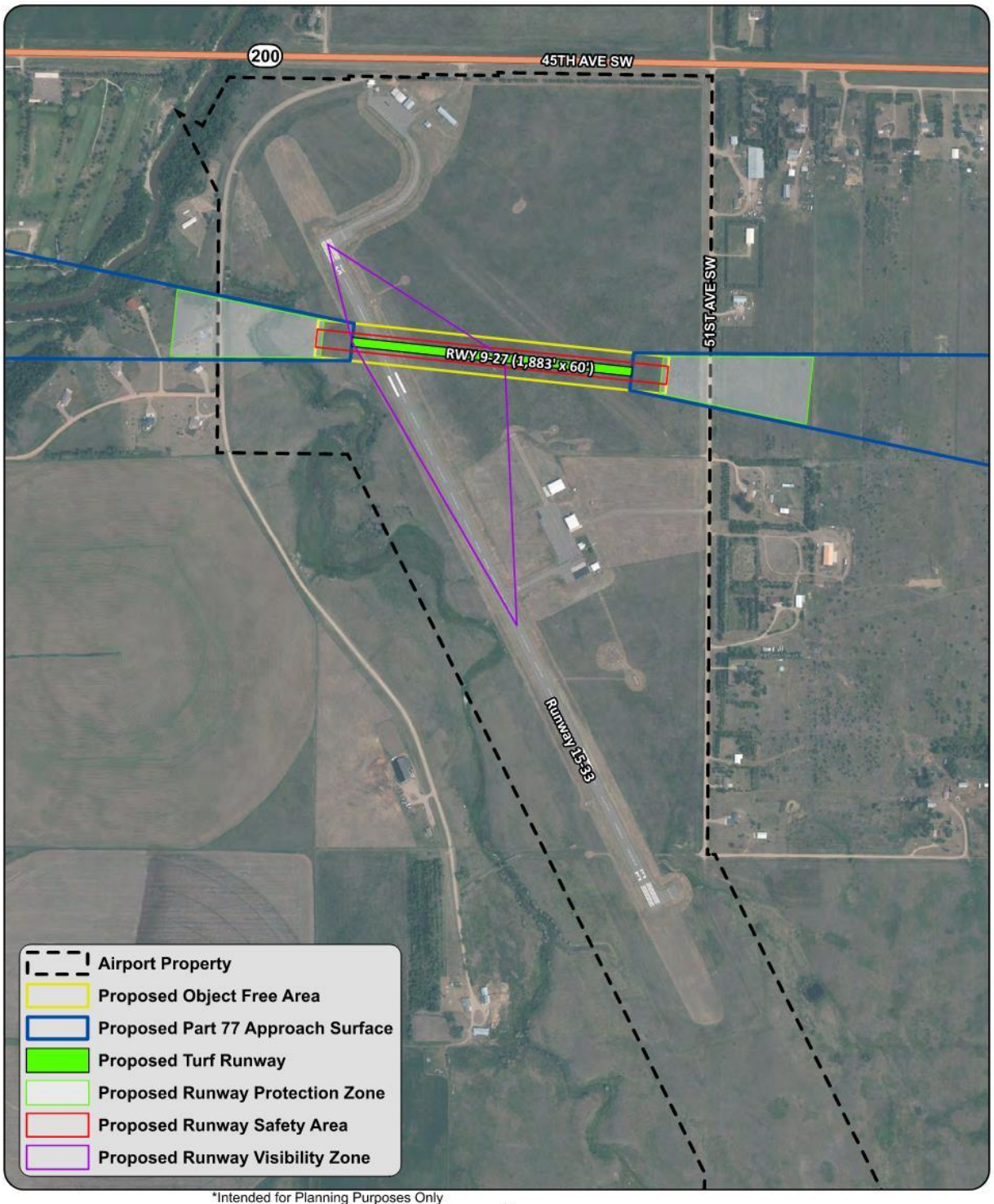


Figure 2-7 – Revised Runway 9-27 Option



FAA EVALUATION OF RUNWAY 4-22

While developing the Airport Layout Plan (ALP), the actual alignment of the proposed turf crosswind runway was determined to be 4-22 rather than 3-21. After the Runway 4-22 alternative was reviewed by the FAA, they had concerns of the 22 End RPZ being close to a residence. They also asked about the possibility of moving the Runway 4 End to the east of the current paved runway. KLJ evaluated three alternatives and those were presented to the Mercer County Airport Board.

Option 1: 22 RPZ at Road Intersection and 4 End West of Paved Runway

This option allows for 2,500 feet of runway length with the 4 End to the west of the current paved runway and the outer edge of the 22 End RPZ at the roadway intersection. A displaced threshold will be placed on the 22 End at 285 feet. Please reference **Figure 2-8**. This may require an RPZ Analysis when the runway is designed.

Option 2: 22 RPZ at Road Intersection and 4 End East of Paved Runway

This option presented leaves the 22 End RPZ outer edge at the intersection while bringing the Runway 4 End to the east of the paved runway. This brings the total runway length to 1,900 feet with a displaced threshold of 285 feet on the 22 End.

Option 3: 22 RPZ within Current Property and 4 End East of Paved Runway

This option offers the least runway length amount of 1,900 feet with a displaced threshold of 600 feet on the 22 End. This is with the Runway 4 End to the east of the current paved runway and the Runway 22 End RPZ is within current airport property.

Preferred Alternative

After reviewing the options for turf runway alternatives at HZE, the Mercer County Airport Authority chose to select the revised runway 4-22 option with the 22 RPZ at the road intersection and the 4 End west of the paved runway as the preferred alternative. The reason for this selection was for the length of 2,215 feet without displaced thresholds. The Runway 4-22 alignment provides a combined 97.22% wind coverage including Runway 15-33 to meet the FAA minimum requirement of 95%. Please reference **Figure 2-8**.

Figure 2-8 – 22 RPZ at Road Intersection and 4 End West of Paved Runway

