Chapter Four – Facility Requirements

4 | Section 1 – Introduction

The identified facilities will meet the needs of the 20-year demand forecast, FAA and MnDOT design standards, and the Airport's goals and objectives.

This chapter will identify the facilities necessary to meet the 20-year forecast of aviation demand at Elbow Lake Municipal Airport. It will also identify facilities needed to meet airspace and airfield design standards recommended by the FAA and MnDOT and address the goals and objectives of the Elbow Lake Airport Board and City of Elbow Lake.

For the purposes of this analysis, facility needs are discussed based upon their role in airfield or terminal area functions. Airfield components include, but are not limited to, runways, taxiways, NAVAIDs, aprons, and airfield marking, signage, and lighting. Terminal components include, but are not limited to, storage hangars, the A/D building, airport access, automobile parking, fencing and security, and support facilities. Deficiencies in the design or function of these components may affect airport safety, security, efficiency, or capacity.

The planning period of this study covers years 2016 through 2036. The long-term Ultimate analysis and recommendations are included to provide general guidelines for adequate future development. Whether the recommendations for the Ultimate development will actually be implemented will depend on the actual future demand and the willingness and available resources of the local, state, and federal decision-makers to meet that demand. This report will consider an Ultimate design that will address the most demanding contingencies that may present themselves during the planning period.

As conditions change within the Elbow Lake community, the Airport itself, and in federal, state, and local general aviation trends, the existing facilities and operations at Y63 should be continuously monitored and evaluated against the recommendations of this Master Plan in the near- and long-term. Consistent monitoring of buildings, lighting, NAVAIDs, paving, obstructions, and documentation of actual aviation activity at the Airport will assist with this evaluation in the future.

This chapter will provide:

- A review of the criteria used to develop Y63's facility requirement recommendations for the planning period;
- Identification of existing non-standard FAA design conditions;
- A review of the airspace and airfield capacity of the airport; and
- Recommendations for specific airfield or terminal improvements and/or facilities.

Potential options and preliminary costs of providing the identified facilities will be provided in Chapter 5, *Identification and Evaluation of Alternatives.*

4 | Section 2 – Criteria for Determination of Facility Requirement Recommendations

Any growth or change in use requires a corresponding development and implementation program review.

Any growth in local aviation-related activities or change in existing or anticipated use of an airport facility requires a corresponding program of development and implementation to assure the airport remains able to accommodate its demand.

The developed schedule of recommendations for maintenance, new or expanded facilities at Elbow Lake is based upon the following considerations:

- Standards described in FAA Advisory Circular 150/5300-13A, *Airport Design*;
- The recommendations of the 2012 Minnesota State Airport System Plan (SASP);
- Fundamental Airfield Development Criteria;
- Inventory of the existing facilities, found in Chapter 2;
- Forecast of aviation demand, found in Chapter 3;
- The recommended Critical Design Aircraft, found in Chapter 3; and
- The goals and objectives of the Airport Board and City of Elbow Lake.

The facility requirements were developed with acknowledgement of the following criteria:

- The Airport is currently designed to accommodate aircraft in Approach Category A/B and Airplane Design Group I, and is able to serve small (12,500 pounds or less) aircraft only.
- According to Airport staff and the managing Airport Board, the current critical aircraft operating on Runway 14/32 are those such as the Piper PA series and Cessna 100 series, which are ARC A-I (Small). The most demanding aircraft using Runway 11/29 is the DeHavilland DHC-2 Beaver.
- The current fleet using Runway 14/32 are a mix of single-engine and multi-engine aircraft such as Pipers, Cessnas (100 series and 337), Cherokees, and Super Cubs. These procedures plus numerous helicopter operations account for 6,000 operations a year.

- The forecast critical aircraft will be "small" (12,500 pounds or less) aircraft in the A-I, B-I, and B-II classifications. Designing for the recommended critical aircraft, the Beechcraft King Air 90, ARC category B-II, requires only minimal additional facilities or changes from the existing condition. So as not to impede future use, all major facilities such as runways and taxiways should be designed for B-II aircraft, including all B-II movement areas on aprons.
- The dimensional standards and design criteria for all recommended improvements shall be as detailed in AC 150/5300-13A and the requirements of the Minnesota Department of Transportation. Design standards for facilities development in the initial and ultimate terms should follow B-II standards with a non-precision approach.

Y63 is classified as an Intermediate Airport in the Minnesota SASP. Table 4-1 illustrates the minimum objectives for an Intermediate Airport and any recommended improvements for Y63. These recommendations will be discussed further in upcoming sections of this chapter.

Y63 is classified as an Intermediate Airport in the Minnesota SASP.

Facility	Y63	Minimum System Objectives	Recommendation
Runway Length (SF)	3,400	2,400	No Change
Runway Width (SF)	60	75	Widen
Parallel Taxiway/ Turnaround	Turnaround	Full Parallel if more than 20,000 Ops/Year	No Change
Runway/Taxiway Lighting	MIRLs	MIRLs or LIRLs	No Change
Weather Reporting	AWOS	As needed	No Change
Fuel	100LL	24/7 100LL Desirable	No Change
Transient Aircraft Apron (SY)	1,860	Unhangared Based Aircraft plus Peak Hour Itinerant Operations	Construct
Based Aircraft Apron	-		
Based Tie Downs	-		
Primary Runway Approach Type	Visual/Basic NPI	Enhanced Non-Precision with Vertical	Upgrade*
Wind Cone	Yes	Wind Cone, Rotating Beacon, PAPI, REIL	No Change
Rotating Beacon	Yes		No Change
PAPIs/VASIs	PAPIs		No Change
REILs	Yes		No Change
Approach Lighting	None		No Change
Commercial Terminal	No	GA/Admin Building	No Change
GA/Administration	Yes		No Change
Restroom	Yes		No Change
T-Hangar (Units)	16	100% of Jets and Turbos, 95% of Single- and Multi-Engine	No Change
Conventional Hangar (Units)	4		No Change
Automobile Parking	6	1 Stall per based aircraft plus 25%	Construct
Perimeter Fencing	None	Full perimeter desirable	Install

Table 4-1: MN SASP Minimum System Objectives Comparison; Source: SASP, 2012
**Note that Runway 14/32 now has RNAV approaches at both ends.*

Guidelines for fundamental airfield development are included in FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS). Fundamental development is the basic configuration recommended for an airport in the national system and is affected by the type of activity the airport serves. It includes, but is not limited to, land acquisition, aircraft movement areas, landing and NAVAIDs, and aircraft parking areas.

Many of the development items recommended by Order 5090.3C are already in place in Elbow Lake. As Y63 continues to grow, it is valuable to consider the expansion or addition of fundamental development to support future demand. Development determined to be necessary based upon the analysis in this chapter will adhere to these standards and to criteria included in the appropriate Advisory Circulars and Orders.

According to FAA AC 150/5300-13A, *Airport Design*, airports, runways, and taxiways must be designed and constructed for the most demanding airplane (Critical Design Aircraft) currently using or projected to use the facility on a regular basis. Airport design criteria is based on the Airport Reference Code (ARC) designation, which provides minimum safety standards in accordance with the performance characteristics of the family or aircraft represented by the airport's critical or design aircraft. This aircraft, classified by approach speed, wingspan, and tail height, is within a design category of aircraft that conducts at least 500 annual itinerant operations (as a total of landings and takeoffs) in one year. The types of approach aids, lighting, and navigational equipment required at an airport are determined primarily by the level of annual activity, weather, terrain, and the role of the airport in the national system of airports.

MnDOT and FAA personnel have recommended that Elbow Lake be designated as B-II at a minimum.

In this case, Y63 is not projected to see the required 500 annual itinerant operations for aircraft in the B-II category, though many of the aircraft using the airport meet that criteria. However, FAA personnel have recommended that Elbow Lake be designated as B-II at a minimum, in order to ensure the continued viability of the airport over time and to accommodate the critical medivac service aircraft that use Y63.

As discussed in previous chapters, Y63's current ARC is A/B-I (Small), with the great majority of its airport users flying aircraft with approach speeds of less than 91 knots, tail heights of less than 20 feet, and wingspans of less than 49 feet. The Critical Design Aircraft for Runway 14/32 has been identified in Chapter 3 as ARC B-II (Small), represented by the Beechcraft King Air 90. The Critical Design Aircraft for Runway 11/29 is recommended to remain an ARC A-I (Small), represented by the DeHavilland DHC-2 Beaver.

Accordingly, all subsequently recommended airfield components designed to support Runway 14/32 as well as its terminal facilities for this planning period will be designed to accommodate the following aircraft:

- Approach Category B aircraft: Approach speeds of 91 knots or more but less than 120 knots
- Design Group II aircraft: Tail heights of 20 feet or more but less than 30 feet; Wingspans of 49 feet or more but less than 79 feet

It is recommended that Y63 be designated an ARC B-II airport throughout the planning period.

As discussed in Chapter 3, *Aviation Demand Forecast*, aviation activity and operations are expected to steadily grow during the 20-year planning period. A significant portion of these increasing operations counts can be attributed to the addition of the FBO and its growing customer base. Other factors contributing to the development at Y63 are the development of the seaplane base, the Lakes Area Pilot's Association (LAPA), and other on-field businesses. Ongoing efforts by the City to improve airport infrastructure has enhanced the attractiveness and usefulness of the airport to both based and itinerant users. In order to accommodate forecasted growth, airside and landside improvements are necessary.

The goals and objectives of the Airport Board play a significant role in determining the future facility needs and development opportunities for Y63. As outlined in the first chapter, the Board has several distinct focus areas as part of this planning effort grouped in the following categories:

- Airfield and Airspace – Use forecasts to review taxiways and runways for future development, evaluate land use as needed in safety zones, and evaluate NAVAIDs for compliance with FAA requirements.
- General Aviation Facilities – Review capacity and layout of current A/D building and hangars against forecasts and Airport Board and City's goals.
- Support Facilities – Evaluate equipment and equipment storage needs and review suitability of fuel facility.
- Access, Circulation and Parking – Analyze need for improvements to airport wayfinding, security fencing, security lighting, and visitor/employee parking.
- Other Needs – Creating/updating of FAA required documents such as the Airport Layout Plan, Seaplane Base Layout Plan, Wildlife Hazard Management Plan, Solid Waste Management Plan, Obstacle Action Plan, Airport Capital Improvement Plan, and Exhibit "A" Document. Review electrical service and submit safety-critical Airport Geographical Information.

4 | Section 3 – FAA Design Standards and Non-Standard Conditions

AC 150/5300-13A, *Airport Design*, provides design standards for airport geometrical layout, runway and taxiway/taxilane design and associated elements. This guidance references many other AC documents for specific applications and is complemented by 14 CFR Part 77. A key objective of any airport planning project should be to identify any non-standard conditions that exist at the facility and offer recommendations on actions to achieve full compliance with FAA and MnDOT standards.

FAA does not currently have a record of non-standard conditions for Elbow Lake. Table 4-2 notes the non-standard conditions found at Y63.

Non-Standard Condition	Existing Condition	FAA or MnDOT Standard	Remarks
Fence at Apron	Incomplete Protection of Apron	Exclude visitors other than pilots and passengers	Fencing recommendations included in Master Plan
Taxilane Centerline to Fixed or Movable Object Clearance	Does not meet dimensional standards between existing T-hangars and in front of Private Hangars	Taxiway Separation Standard is 39.5 feet	Existing Condition Analysis by Bollig Inc
Part 77 Surfaces to Runway 11	Obstructions Present	No Obstructions	Analysis completed by Woolpert (4/6/2017)
Part 77 Surfaces to Runway 29	Obstructions Present	No Obstructions	Analysis completed by Woolpert (4/6/2017)
Approach Surface to Runway 14	Obstructions Present	No Obstructions	Analysis completed by Woolpert (9/11/2017)
Departure Surface for Runway 14	Obstructions Present	No Obstructions	Analysis completed by Woolpert (9/11/2017)
Approach Surface to Runway 32	Obstructions Present	No Obstructions	Analysis completed by Woolpert (9/11/2017)
Departure Surface for Runway 32	Obstructions Present	No Obstructions	Analysis completed by Woolpert (9/11/2017)

Table 4-2: Non-Standard Conditions

4 | Section 4 – Airfield and Airspace Capacity

The number of runways, runway and taxiway configuration, and the mix of aircraft using the airport all factor into the airport's ability to accommodate activity.

The ability of an airport to accommodate aviation activity is a function of the number of runways, runway and taxiway configuration, and the mix of aircraft using the airport. The capacity of any runway is finite in relation to the number of hourly and annual operations it can accommodate. Capacity is expressed in two terms: annual service volume (ASV) and hourly capacities under Visual Flight Rules (VFR) and Instrument Flight Rules (IFR).

These variables are used to provide a quantitative breakdown of the airport's annual service volume and hourly capabilities. The procedures used for this analysis are detailed in FAA AC 150/5060-5, *Airport Capacity and Delay* and FAA Airport Design Program, Version 4.2D.

4.4.1 Runway and Airspace Capacity

There are currently no problems with runway or airspace capacity at either Runway 14/32 or 11/29 based on the current number of operations, with no reports of conflicts for aircraft landing/takeoffs. Activity naturally increases during warmer weather and decreases in the winter, particularly at Runway 11/29 which is frozen in the coldest part of the year.

According to the aviation demand forecast presented in Chapter 3, growth at Y63 is expected to continue at a slow but steady pace, reaching a threshold of 34 based aircraft and 7,500 total operations by 2036. At this rate, runway and airspace capacity will not be a problem for many years.

No additional runway or airspace capacity improvements are required for the planning period.

4.4.2 Obstructions

4.4.2.1 Part 77 Surfaces

Part 77 imaginary surfaces are geometric shapes in relation to each runway, with the size and dimension based on that runway's operations.

14 Code of Federal Regulations (CFR) Part 77 defines and establishes the standards for determining obstruction to an airport's imaginary surfaces. These surfaces are geometric shapes in relation to each runway, the size and dimension of which are based on the category of each runway for existing and planned airport operations. An obstruction is defined as "Any object of natural growth, terrain, permanent or temporary construction equipment, or permanent or temporary manmade structure that penetrates an imaginary surface." An object which penetrates these surfaces is deemed an obstruction to navigable airspace and must be removed. A detailed description of each of the five imaginary surfaces is included in Chapter 2, Section 2.4.3.3 *FAR Part 77 Imaginary Surfaces.*

Runway 14/32 is currently 3,400 feet long and 60 feet wide. Each is considered a *Utility Runway* with *Non-Precision Instrument approaches* and visibility minimums of not lower than one mile.

Runway 11/29 is 4,125 feet long and 130 feet wide. Each is considered a *Utility Runway* suitable for *Visual approaches* only.

Primary Surfaces: A rectangular surface longitudinally centered about a runway.

- As a paved Non-Precision Utility runway, Runway 14/32's Primary Surface is 500 feet wide and extends 200 feet beyond each end of the runway, yielding a surface 500 feet wide and 3,800 feet long.
- As a Visual Runway, Runway 11/29's Primary Surface is 250 feet wide and extends 200 feet beyond each end of the runway, yielding a surface 250 feet wide and 4,525 feet long.

Approach Surfaces: A surface longitudinally centered on the extended runway centerline, extending outward and upward from the primary surface at each end of the runway, at a designated slope and distance.

- As a paved Non-Precision Utility runway, Runway 14/32's Approach Surfaces expands uniformly to a width of 2,000 feet at a distance of 5,000 feet, at a 20:1 slope.
- As a Visual Utility Runway, Runway 11/29's Approach Surfaces expands uniformly to a width of 1,250 feet at a distance of 5,000 feet, at a 20:1 slope.

Horizontal Surfaces: A horizontal surface surrounding a runway at a height of 150 feet above the designated airport elevation, the perimeter of which is constructed by swinging arcs of specified radii from the center of each end of the Primary surface and connecting the arcs by lines tangent to those arcs.

- As a paved Non-Precision Utility runway, Runway 14/32's Horizontal Surface has arc radii of 5,000 feet, at an elevation of 1,356 feet.
- As a Visual Utility Runway, Runway 11/29's Horizontal Surface also has arc radii of 5,000 feet, at an elevation of 1,356 feet.

Conical Surfaces: A surface that extends upwards and outwards from the outer limits of the Horizontal Surface, for a horizontal distance of 4,000 feet at a slope of 20:1.

Transitional Surfaces: A surface that extends upwards and outwards, at right angles to the runway centerline, from the sides of the Primary Surface and the Approach Surfaces. It slopes at 7:1 until it intersects with the Horizontal or Conical Surfaces.

The city of Elbow Lake has adopted a zoning ordinance (Chapter 152) for airports, which specifically includes provisions for airspace obstructions. These zones mirror the Part 77 zones, with a few differences. *As was noted in Section 2.3.4 of Chapter 2, the zoning ordinance must be updated to reflect the current conditions of the airport and by approved by MnDOT as part of the Master Planning process. Changes to the Ultimate Airspace Obstruction Zoning standards will be determined as part of the runway length and approach procedures alternatives analysis in Chapter 5.*

Noted differences in the ordinance include:

- Primary Zone: City ordinance limits the length of the primary surface to 100 feet beyond each end, rather than 200 feet.
- Approach Zone: City ordinance sets the approach zone as Approach Surfaces expands uniformly to a width of 2,500 feet at a distance of 10,000 feet, at a 40:1 slope, rather than 2,000 feet at a distance of 5,000, at a 20:1 slope.
- Horizontal Zone: City ordinance sets the height of the zone at 100 feet above the established airport elevation, rather than 150 feet. The ordinance sets the arc radii at 6,000 feet rather than 5,000 feet.
- Conical Zone: City ordinance is the same as FAR Part 77 standards.
- Transitional Zone: City ordinance is the same as FAR Part 77 standards.

The recommended Ultimate Airspace Zoning standards will be determined as part of the runway length alternatives analysis in Chapter 5.

4.4.2.2 Existing Obstructions

According to Assurance #20 in the *Airport Sponsor Assurances* document dated March 2014, an Airport must "take appropriate action to assure that such terminal airspace as is required to protect instrument and visual operations to the airport… will be adequately cleared and protected by… mitigating existing airport hazards and by preventing the establishment or creation of future airport hazards."

An obstruction survey was completed in 2016 as part of the Master Plan effort to determine if there are obstructions to the Part 77 surfaces up to 100 feet above airport elevation. The obstruction analysis has determined that there are obstructions to the existing Part 77 Approach Surfaces to Sealanes 11 and 29. These trees can be trimmed or removed completely to restore the integrity of the Part 77 surfaces.

Any obstacles detected within airport property lines will be addressed in the Obstacle Action Plan as part of this Master Plan. Obstacles off-airport property, depending on severity, can be mitigated more flexibly, sometimes with removal, marking and lighting, or inclusion in the published arrival and departure procedures.

It is recommended that all existing obstructions to the Part 77 Approach Surfaces of all runways be cleared where practicable, and for those that cannot, be mitigated by obstruction lighting. If the Ultimate length for Runway 14/32 is pursued, Part 77 Approach Surfaces must be reevaluated.

The first priority for obstruction mitigation in the Part 77 surfaces will be acquisition of sufficient property interest in affected lands and removal of obstructions. However, the cost of acquisition of such property interests (i.e. eminent domain proceedings, etc.) may exceed the cost of installing obstruction lighting. If such an instance occurs, the Board may coordinate this alternative with the FAA.

Furthermore, if the runway is lengthened in the future, a new GPS approach should be considered. Longer runways provide service to larger aircraft, such as business and charter craft, and with those larger craft comes a greater expectation for reliability when landing or taking off in poor weather conditions. This often means lower visibility minimums, to 3/4 of a mile or less. The opportunity for the implementation of a lower minimum may be constrained by existing construction on the airport, such as buildings, that can restrict the possible primary surface width or transitional surfaces.

TERPS criteria specify the minimum elevation for obstacle clearance to provide a reasonable level of vertical protection for aircraft from obstructions.

4.4.2.3 Approach and Departure Surfaces

Approach and Departure Surfaces identified within Table 3-2 of AC 5300/150-13A, *Airport Design* are imaginary surfaces that specify the maximum elevation allowed for obstacles off the ends of runways to ensure the safe transition of aircraft to and from the airport under instrument meteorological conditions. These imaginary surfaces directly correlate to FAA Order 8260.3B, the *United States Standard for Terminal Instrument Procedures, "TERPS".* TERPS regulates the method for the creation and publishing of instrument procedures at an airport. The approach and departure surface criteria utilized for the Elbow Lake Airport Master Plan utilizes a draft updated version of *Table 3-2 (dated 12/15/2014).*

Table 3-2. Approach/departure standards table

Runway Type		DIMENSIONAL STANDARDS* Feet (Meters)					Slope/ OCS
		A	B	C	D	E	
1	Approach end of runways expected to serve small airplanes with approach speeds less than 50 knots. (Visual runways only, day/night)	0 (0)	120 (37)	300 (91)	500 (152)	2,500 (762)	15:1
2	Approach end of runways expected to serve small airplanes with approach speeds of 50 knots or more. Circling approaches not allowed. (Visual runways only, day/night)	0 (0)	250 (76)	700 (213)	2,250 (686)	2,750 (838)	20:1
3	Approach end of runways expected to accommodate instrument approaches having visibility greater than or equal to 3/4 statute mile, or expected to serve large airplanes (day or night). Includes circling approaches. [1]	200 (61)	400 (122)	3,800 (1158)	10,000 [2] (3048)	0 (0)	20:1
4	Approach end of runways expected to accommodate instrument approaches having visibility minimums < 3/4 statute mile (1.2 km).	200 (61)	800 (244)	3,800 (1158)	10,000 [2] (3048)	0 (0)	34:1
5[3,5,6,7]	Approach end of runways expected to accommodate approaches with vertical guidance (Glide Path Qualification Surface [GQS]).	0 (0)	Runway width + 200 (61)	1520 (463)	10,000 [2] (3048)	0 (0)	30:1
6	Departure runway ends for all instrument operations.	0 [4] (0)	See Figure 3-4.				40:1

* The letters are keyed to those shown in Figure 3-2.

Figure 4-3: Draft Table 3-2, Approach/Departure Standards
Source: Draft AC 150/5300-13A

- As a runway expected to support instrument approaches having visibility greater than one statute mile, Runway 14/32's Approach TERPS Surface has an inner edge which is 400 feet wide, expanding uniformly to a width of 3,800 feet at a distance of 10,000 feet and a slope of 20:1. The inner edge is offset from the runway end by 200 feet (Line 3 of table above).
- Runway 14/32's Departure TERPS surface (Line 6 of table above) has an inner edge which begins at the runway threshold and is 1,000 feet wide, expanding uniformly to a width of 6,466 feet at a distance of 10,200 feet and a slope of 40:1. This lower-sloped surface is the mostly likely to be the first to become obstructed by trees, roads, or other construction (Line 6 of table above).
- TERPS surfaces analysis is not applicable for Sealane 11/29 because it is a Visual Utility runway and is therefore not reviewed.

Obstacles discovered on airport property will be addressed in the Obstacle Action Plan, provided later in this Master Plan. Obstacles found off-airport may be dealt with in a number of ways, including removal, marking, notation in the published instrument flight procedures, or a combination of these.

If the Ultimate length for Runway 14/32 is pursued, TERPS Approach and Departure Surfaces must be reevaluated based on the desired approach minimums. These options will be reviewed in Chapter 5, Alternatives Analysis.

4.4.2.4 Future Obstructions

The Airport should continue to monitor all runway Part 77 and TERPS surfaces for upcoming or future obstructions on a regular basis. Trees may be cut extra low to allow for multiple years of growth. Local construction can be monitored for impediments or obstructions in Airport-critical safety areas. Most importantly, any safety areas not in Airport control should be purchased by fee simple or controlled with easements to ensure the protection of life and property in and around the Airport.

4 | Section 5 – Airside Facility Requirements

The airport facility requirements are based upon AC 150/5300-13A as it relates to the current and future design aircraft. As discussed previously, the Design Aircraft determines the Airport Reference Code from which the airside geometrics are evaluated.

4.5.1 Runway Analysis

This section evaluates the Runway Design Code (RDC), runway length, width, orientation/designation, wind coverage, safety areas, and object free areas based on the existing and future aircraft expected to use Y63. The recommendations are based on FAA Advisory Circulars and specific manufacturers' aircraft performance data. Discussion of the runway lighting system is in Section 4.5.6 of this chapter.

4.5.1.1 Runway Design Code

The assigned Runway Design Code determines the requirements which must be met for many of the dimensional criteria of a runway. The following analysis is based on the recommended RDC of B-II (Small)-1 Mile for Runway 14/32 and A/B-I (Small)-VIS for Runway 11/29 for the Ultimate Conditions.

4.5.1.2 Runway 14/32 Length and Width

The determination of runway length required for an airport is based on standards presented in AC 150/5300-13A, Chapter 3 and AC 150/5325-4B, *Runway Length Requirements for Airport Design*. The recommended length for a primary runway at an airport is determined by the family of airplanes having similar performance characteristics requiring the greatest runway length.

Additional factors considered include Critical Aircraft approach speed, Maximum Certificated Take-Off Weight (MTOW), useful load and length of haul, the airport's field elevation above sea level, the mean daily maximum temperature at the airfield, wind velocity and direction, and typical runway surface conditions, such as wet and slippery.

The process of establishing recommended runway length begins by identifying the MTOW of the Critical Aircraft (Beechcraft King Air E90). This aircraft has a MTOW of 10,100, falling below the 12,500-pound threshold seen in Table 1-1 of AC 150/5325-4B. Its approach speed is 121 knots and it carries less than 10 passengers.

In addition, the airports are categorized in two family groupings, "95% of fleet" or "100% of fleet." The "100% of fleet" airport category is intended to serve communities located on the fringe of a metropolitan area or a relatively large population remote from a metropolitan area. The "95% of fleet" airport category is intended to serve low-activity locations, small population communities, and remote recreational areas. Y63 will fall into the 95% category.

Using Figure 2-1 of this AC, with a mean daily maximum temperature of the hottest month of the year (81°F) and the airport's elevation above sea level (1206'), and a 95% of fleet category, the recommended runway length would be 3,350 feet. *Runway extensions generally require at least 500 operations per year of aircraft falling into the aircraft category requiring a longer runway for approval from FAA for funding.*

Figure 2-2 of the AC references "Small Airplanes Having 10 or More Passenger Seats," listing the Raytheon E90 King Air as a Representative Airplane. Prior to March 26, 2007, Beechcraft Corporation was owned by Raytheon Company. The AC was published July 1, 2005. *If these aircraft are indeed one and the same, an argument could be made that Figure 2-2 is an appropriate way to assess runway Ultimate length requirements. In this case, the required runway length should be approximately 4,250 feet.*

Figure 2-2. Small Airplanes Having 10 or More Passenger Seats
(Excludes Pilot and Co-pilot)

Representative Airplanes	Runway Length Curves
Raytheon B80 Queen Air **Raytheon** E90 King Air **Raytheon** B99 Airliner **Raytheon** A100 King Air (Raytheon formerly Beech Aircraft) **Britten-Norman** Mark III-I Trilander **Mitsubishi** MU-2L **Swearigen** Merlin III-A **Swearigen** Merlin IV-A **Swearigen** Metro II	**Example:** Temperature (mean day max hot month) 90° F (32° C) Airport Elevation (msl) 1,000 feet (328 m) Recommended Runway Length 4,400 feet (1,341 m) **Note:** For airport elevations above 3,000 feet (915 m), use the 100 percent of fleet grouping in figure 2-1.

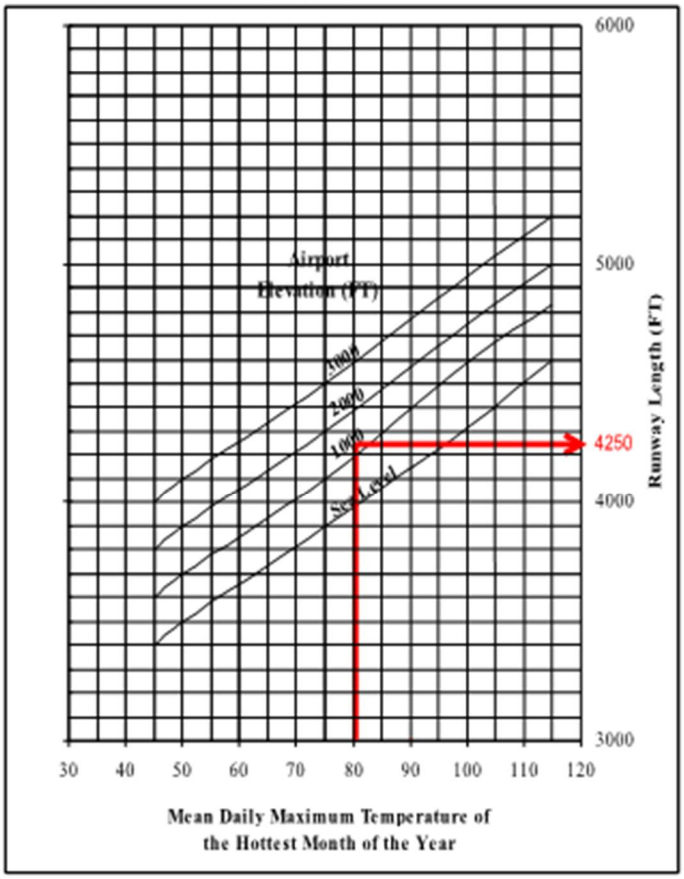


Figure 4-4: Runway Length for Y63's Critical Aircraft; Source: AC 150/5325-4B

It should be noted that Elbow Lake's zoning ordinance was not updated when the existing, paved runway was built. The ordinance must be updated to include this existing condition as part of the Master Plan process. If the Ultimate runway length is eventually pursued, the ordinance must be modified at that time to accommodate the extended runway length.

Elbow Lake's zoning ordinance was not updated when the existing, paved runway was built.

Elbow Lake's current Runway 14/32 length is 3,400 feet, and it meets the current requirements of AC 150/5325-4B for 95% of fleet. However, the Sponsor has expressed a desire to lengthen the runway to 4,000 feet in order to accommodate future military drone operations, having already made contacts within the military drone community. In addition, Y63 wishes to be able to accommodate business planes and Medivac aircraft which often require a longer runway. It is recommended that this extension be shown on the Airport Layout Plan (ALP) to help the Airport Board and community be aware of the impacts of the extension and prepare accordingly to protect the land use and zoning around the airport should the Ultimate runway length of 4,000 feet be pursued.

Runway width requirements are a function of the Approach Category of the Critical Aircraft and the type of instrument approach at the airport. The existing runway is 60 feet wide. According to AC 150/5300-13A, Table A7-2 *Runway Design Standards Matrix, A/B-I (Small),* this is the appropriate width for aircraft in the A/B-I categories. The required runway width for aircraft in A/B-II (Small) categories, shown in Table A-7-3 *Runway Design Standards Matrix, A/B-II Small Aircraft* with a non-precision instrument approach and greater than ¾-mile visibility minimums is 75 feet.

The current Minnesota SASP also recommends a width of 75 feet as a Minimum System Objective. *To bring the runway in compliance to B-II requirements and the Minnesota SASP, Runway 14/32 should be widened to 75 feet for a future Ultimate runway width.*

Please note that prior to any runway widening or lengthening projects, an environmental assessment must be completed to ensure that the proposed development does not threaten historical, biological, water, or other environmental resources.

4.5.1.3 Runway 11/29 Width and Length

Runway 11/29 is constrained in its length and width by the limiting factor of Flekkefjord Lake's physical dimensions. At an established length of 4,125 feet and width of 130 feet, these dimensions necessarily limit the size and type of aircraft that can operate on the lake.

An increase in the width or length of Runway 11/29 is not recommended at this time.

4.5.1.4 Runway Magnetic Declination and Designation

Since magnetic north is utilized for runway identifier designations, it is prudent to evaluate this designation periodically to ensure that it is still accurate. Since magnetic forces change and shift over time, a magnetic declination must be applied to a compass to determine a true north heading.

According to the National Geophysical Data Center, which was consulted on March 10, 2017, the magnetic declination at the airport reference point is 2° 24' East, and is drifting approximately 0° 5' West per year.

The magnetic bearing for a runway is the true bearing corrected for magnetic declination at a particular point in time. If the declination is easterly, it is subtracted from the bearing.

Current Runway Designation	Azimuths	Magnetic Declination	Magnetic Bearing	Verified Runway Designation
11	108° 51' 59.35365"	(-) 2° 24' E	106° 27' 59.35365"	11
29	288° 52' 39.12173"	(-) 2° 24' E	286° 28' 39.12173"	29
14	140° 29' 49.18637"	(-) 2° 24' E	138° 05' 49.18637"	14
32	320° 30' 11.21771"	(-) 2° 24' E	318° 06' 11.21771"	32

Table 4-5: Runway Designation Analysis

With a westerly drift of only 0° 5' per year, it will be many years before runway designations would require revision.

4.5.1.5 Pavement Strength and Condition

Runway 14/32 is constructed of asphalt and is currently reported at a strength of 12,500 pounds for Single Wheel Gear (SWG) equipped aircraft. The critical design aircraft for Y63, the Beechcraft King Air E90, is a SWG aircraft and has a MTOW of 10,100 pounds.

Runway 14/32 is constructed of asphalt and is currently reported at a strength of 12,500 pounds for SWG aircraft.

The Existing and Ultimate conditions are anticipated to serve small aircraft (12,500 pounds or less). The pavement strength of Runway 14/32 meets the requirements of the existing and recommended Critical Aircraft (Beechcraft King Air E90), therefore no additional strengthening is recommended.

As documented in Chapter 2, the condition of runways, taxiways, and aprons are in Very Good to Excellent condition (See Figure 2-36) per the 2014 Pavement Condition Index (PCI) inspection and report.

No surface treatment of the runway is recommended other than routine maintenance, such as joint and crack sealing and patching, which should be performed on a regularly-scheduled basis to extend the life of the pavement. Recommended routine maintenance will also include a mill and overlay at a later date.

Runway 14/32 was constructed in 2006 and has a PCI of 74 (Very Good). Airport Improvement Project (AIP) funding for runway rehabilitation is projected in 2028.

The current PCN number for the runway is 44/F/C/Y/T, calculated using the FAA's current COMFAA 3.0 software with the theoretical analysis method in August 2017.

Runway 11/29, being a sealane, was not evaluated.

Understanding PCN Numbers

Aircraft operators utilize the published PCN number to help determine if an airfield pavement strength is able to accommodate their aircraft.

What does the PCN Number mean?

##/A/B/C/D

- ##: Load bearing capacity of the pavement based on a standard single wheel gear load at a tire pressure of 181 psi
- A: Type of pavement
- B: Subgrade (soil) strength (Ultra Low, Low, Medium or High)
- C: Maximum tire pressure (Low, Medium or High)
- D: Indicates whether load bearing capacity was calculated using physical testing or theoretical analysis

Additional information can be found in AC 150/5335-5C.

4.5.1.6 Runway Wind Coverage

Primary Runway 14/32 meets the 95% coverage threshold with over 97% for IFR, VFR, and All Weather at 13 knots, and over 99% at 16 knots.

Runway orientation is primarily determined by topography and the direction of prevailing winds. Per AC 150/5300-13A when the current runway system provides less than 95% wind coverage for any aircraft using the airport on a regular basis, a crosswind runway should be considered. For a RDC of B-II, which is the recommended RDC for Runway 14/32, the maximum crosswind component should not exceed 13 knots.

As detailed in Section 2.4.2.3 *Wind Analysis*, Table 2-21, primary Runway 14/32 meets the 95% coverage threshold with over 97% for IFR, VFR, and All Weather at 13 knots, and over 99% at 16 knots.

The orientation for Runway 14/32 exceeds the recommended 95% wind coverage, so no reconfiguration or additional crosswind runways are recommended.

Runway 11/29, the seaplane runway, does not meet the 95% threshold for IFR, VFR, or All Weather, with a coverage of only 86% or less at 10.5 knots and 92% or less at 13 knots. Only at a 16-knot cross wind does the coverage exceed the 95% threshold.

The orientation for Runway 11/29 does NOT meet the recommended 95% wind coverage threshold. However, since this runway is not considered a primary runway and is constrained in location and orientation by available water surfaces, no reconfiguration or additional crosswind runways are recommended.

4.5.1.7 Instrument Approach Procedures

Runway 14/32 has a non-precision instrument landing procedure, having only directional guidance to the runway using an RNAV/GPS system. Precision approach procedures provide both vertical and horizontal guidance to a runway, using NAVAIDs such as an Instrument Landing System (ILS).

Runway 14/32 also has Localizer Performance with Vertical Guidance (LPV) approaches for each end. The LPV approach utilizes the WAAS system and very precise GPS capabilities to attain an aircraft's position with great accuracy. It is considered a non-precision approach, but provides both horizontal and vertical guidance to as low as a 200-foot decision altitude, making it possible for aircraft to land in very low visibility. An LPV approach is similar to an instrument landing system (ILS) but more accurate, using satellites to pinpoint location, rather than locally-mounted ground equipment. Most LPV approaches require only non-precision design standards at an airport.

As previously discussed, Runway 14/32 has an RNAV/GPS landing procedure, while Runway 11/29 is Visual approach only. Instrument approaches to 14 and 32 require a minimum of one-mile visibility and cloud ceiling minimums of 250 feet.

Runway 14/32 is has an RNAV/GPS landing procedure, while Runway 11/29 is Visual approach only.

The MnDOT SASP recommends that Intermediate airports, like Y63, have a non-precision approach with vertical guidance on at least one runway end, such as an LPV approach. *It is recommended that the airport's LPV approach procedures be maintained for both ends of Runway 14/32 with a Decision Altitude of 250' in the planning period.*

Runway 11/29 is a visual runway with no published instrument approach procedures, which will accommodate small A/B-I (Small) aircraft. Operators of such aircraft are more likely to fly during VFR conditions. *No instrument approaches are recommended for Runway 11/29.*

4.5.1.8 Runway Safety Areas

A Runway Safety Area (RSA) is defined as a surface surrounding the runway which is suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from the runway. AC 150/5300-13A designates a minimum Runway Safety Areas based on the Runway Design Code (RDC) of the runway. A runway with an RDC of B-II-1 Mile, such as is suggested for Runway 14/32, is required to have an RSA of 300 feet beyond the departure end, 300 feet prior to the threshold, and 75 feet on either side of the runway centerline. This is larger than the RSA for the existing RDC of A/B-I (Small) 1-mile. Please see Table 4-10 below for a summary of the dimensional standards for each RSA. *It is recommended that the RSA for Runway 14/32 be maintained throughout the planning period. The recommended Ultimate Runway Safety Area standard will be determined as part of the runway length alternatives analysis in Chapter 5.*

At this time, there is no FAA requirement for RSAs at sealanes such as Runway 11/29.

4.5.1.9 Runway Object Free Area

The Runway Object Free Area (ROFA) is a two-dimensional surface centered on the runway centerline. It is provided to enhance the safety of aircraft operations by having the area free of objects except for those that need to be located within the ROFA for air navigation or aircraft ground maneuvering purposes and to taxi and hold aircraft in the ROFA. The ROFA clearing standard requires clearing the OFA of above ground objects protruding above the RSA edge elevation.

A runway such as Runway 14/32 with a recommended RDC of B-II-1 Mile is required to have a ROFA of 300 feet beyond the departure end, 300 feet prior to the threshold, and 250 feet on either side of the runway centerline. There are currently no objects in this area other than fixed-by-function runway and taxiway lighting. The ROFA for Runway 14/32 as an A/B-I (Small) 1-mile runway currently meets ROFA standards. Please see Table 4-10 below for a summary of the dimensional standards for each ROFA. *It is recommended that the ROFA for Runway 14/32 be maintained throughout the planning period. The recommended Ultimate Runway Object Free Area standard will be determined as part of the runway length alternatives analysis in Chapter 5.*

At this time, there is no FAA requirement for ROFAs at sealanes such as Runway 11/29.

4.5.1.10 Runway Obstacle Free Zone

Figure 4-6 illustrates a runway's Runway Obstacle Free Zone (ROFZ), which is a volume of airspace centered above the runway centerline and is required to be clear of all objects, except for frangible NAVAIDs. These NAVAIDs need to be located in the OFZ due to their function in order to provide clearance protection for aircraft landing or takeoff from the runway, and for missed approaches, where applicable.

The ROFZ is subdivided as follows:

- *Runway OFZ:* The airspace above the runway surface centered on the runway centerline. The elevation of the OFZ at any point is the same as the elevation of the nearest point on the runway centerline. The OFZ extends 200 feet beyond each runway end; however, the width may vary depending on the runway classification.
- *Inner-Approach OFZ:* The volume of airspace centered on the approach area, with a slope of 50:1, and applies only to runways with an approach lighting system (ALS). *Consequently, this does not apply to Y63.*
- *Inner-Transitional OFZ:* The volume of airspace along the sides of the runway OFZ and the inner-approach OFZ, and applies only to runways with approach visibility minimums lower than three-quarter statute mile. *Consequently, this does not apply to Y63.*

The ROFZ for Runway 14/32 as an A/B-I (Small) 1-mile runway currently meets ROFZ standards. Please see Table 4-10 below for a summary of the dimensional standards for each ROFZ.

The ROFZ at Runway 14/32 currently meets this standard. It is recommended that the ROFZ for the runways be maintained throughout the planning period. The recommended Ultimate Runway Object Free Zone standard will be determined as part of the runway length alternatives analysis in Chapter 5.

At this time, there is no FAA requirement for ROFZ s at sealanes such as Runway 11/29.

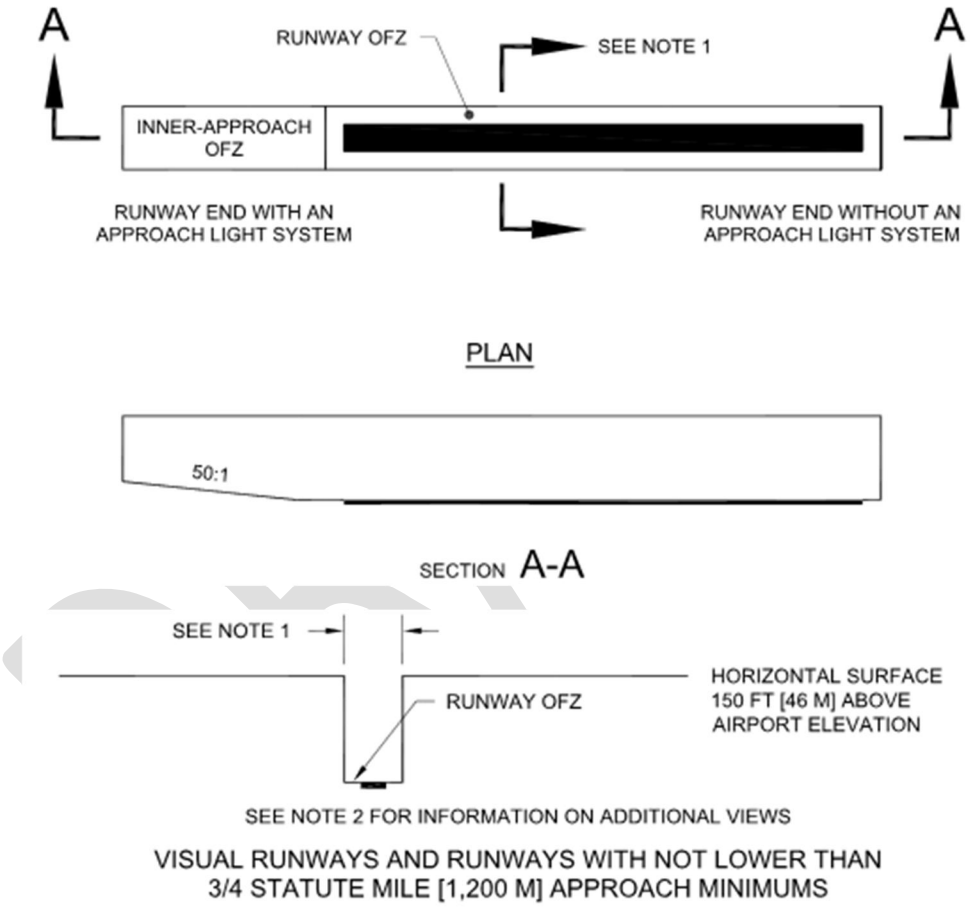


Figure 4-6: Obstacle Free Zone; Source: AC 150/5300-13A

4.5.1.11 Runway Protection Zones

Runway Protection Zones (RPZs) are airfield design elements intended to protect airspace, prevent incompatible land uses, and protect people and property on the ground within the vicinity of a runway end. RPZs are trapezoid-shaped areas that are located on both the arrival and departure ends of a runway, within the innermost portion of the FAR Part 77 approach surface. The dimensions of the RPZs are determined by the type of aircraft expected to use a runway and its approach visibility minimums.

Airports are required by the FAA to control, to the greatest extent possible, the land within an RPZ to prevent the creation of hazards to landing and departing aircraft.

The RPZs for Runway 14/32 as an A/B-I (Small) 1-mile runway currently meets RPZ standards. Please see Table 4-10 below for a summary of the dimensional standards for each RPZ. The dimensions for the Existing and Ultimate condition RPZs are equal.

Airports are required by the FAA to control, to the greatest extent possible, the land within an RPZ to prevent the creation of hazards to landing and departing aircraft. According to AC 150/5300-13A, *control* is exercised through the acquisition of property interest as well as the clearing and maintenance of incompatible objects and activities in those areas. The preferred method of control is through fee simple interest, giving the airport owner the greatest influence over construction and activity in the area.

The RPZs of Runway 14/32 are already owned by the City of Elbow Lake or are controlled by easement. These interests are summarized in the Exhibit A document which will be a part of the Airport Layout Plan set. There is no requirement for RPZs for sealanes such as Runway 11/29.

The FAA's Memorandum, *Interim Guidance on Land Uses within a Runway Protection Zone*, issued September 27, 2012, clarifies issues raised in AC 150/5300-13A regarding new guidance on RPZs. This Memorandum discusses restricted land uses with respect to existing conditions versus proposed or modified conditions. See Table 4-7 below.

Restricted Land Uses	Additional Details/Examples
Buildings and Structures	Including but not limited to: residences, schools, churches, hospitals or other medical care facilities, commercial/industrial buildings
Recreational Land Use	Including but not limited to: golf courses, sports fields, amusement parks, or other places of public assembly
Transportation Facilities	Including, but not limited to: rail facilities (light or heavy, passenger or freight), public roads/highways, vehicular parking facilities
Fuel Storage Facilities	Above and below ground
Hazardous Material Storage	Above and below ground
Wastewater Treatment Facilities	N/A
Above-Ground Utility Infrastructure	Electrical substations, including any type of solar panel installations

Table 4-7: RPZ Land Uses Requiring Coordination with FAA
Source: FAA Interim guidance on Land Uses within a Runway Protection Zone

Figures 4-8 and 4-9 depict the current RPZs for Runway 14/32. The RPZs for this runway are clear of incompatible uses in accordance with the Memorandum.

Where practicable, it is recommended that the City of Elbow Lake acquire fee simple interest in the portions of the RPZs that they do not currently control to prevent incompatible land uses. The recommended Ultimate Runway Protection Zone standard will be determined as part of the runway length alternatives analysis in Chapter 5. Should the city desire to extend Runway 14/32 to the proposed Ultimate length, it will be necessary for the City to coordinate compatible land uses at that time including possible relocation or other mitigation measures to these existing conditions.

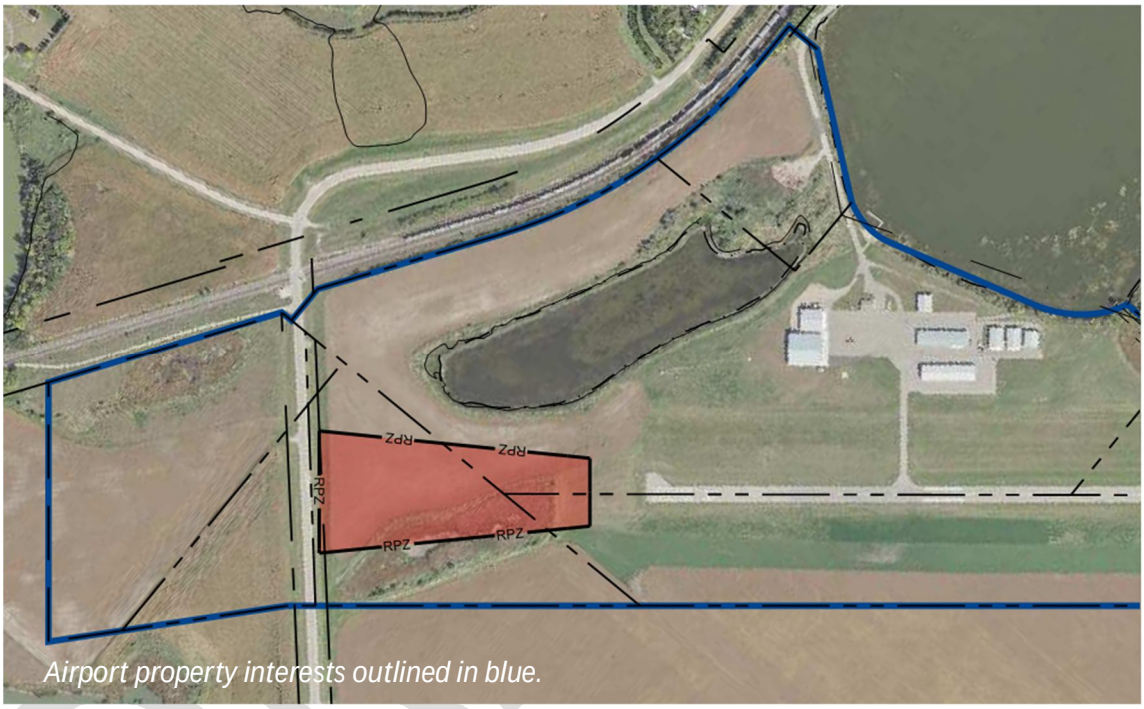


Figure 4-8: Runway 14 Existing Runway Protection Zone

Figure 4-9: Runway 32 Existing Runway Protection Zone

	Runway 11/29	Existing Runway 14/32	Ultimate Runway 14/32
Runway Design Code (RDC)		A/B-I(S)-1 Mile	B-II(S)-1 Mile
RUNWAY DESIGN			
Runway Width		60	75
Shoulder Width		10	10
Blast Pad Width		80	95
Blast Pad Length		60	150
Crosswind Component		10.5 knots	13 knots
RUNWAY PROTECTION			
Runway Safety Area (RSA)			
Length Beyond Departure End		240	300
Length Prior to Threshold		240	300
Width		120	150
Runway Object Free Area (ROFA)			
Length Beyond Departure End		240	300
Length Prior to Threshold		240	300
Width		250	500
Runway Obstacle Free Zone (ROFZ)			
Length Beyond Departure End		200	200
Length Prior to Threshold		200	200
Width		250	250
Approach Runway Protection Zone (RPZ)			
Length		1000	1000
Inner Width		250	250
Outer Width		450	450
Acres		8.035	8.035
Departure Runway Protection Zone (RPZ)			
Length		1000	1000
Inner Width		250	250
Outer Width		450	450
Acres		8.035	8.035
MnDOT Clear Zones			
Length	1200	1000	1000
Inner Width	250	500	500
Outer Width	490	800	800
Splay	10:1	20:3	20:3
Slope	20:1	20:1	20:1
RUNWAY SEPARATION			
Runway Centerline to:			
Holding Position		125	125
Parallel Taxiway/lane Centerline		150	240
Aircraft Parking Area		125	250

Table 4-10: Runway Design Standards Summary; Sources: AC 150/5300-13A, Appendix 7, and MnDOT Policy Statement No. 1, Clear Zone Requirements

4.5.1.12 Minnesota Safety Zones

The Minnesota State Statutes require airports to have Safety Zones in place to restrict land uses in critical operations areas, to protect the operational safety of aircraft and pilots during approach and departure and to protect life and property in those areas, as well as state and local investment.

The Minnesota State Statutes also require airports to have specific Safety Zones in place to restrict land uses in critical operations areas, to protect the operational safety of aircraft and pilots during approach and departure and to protect life and property in those areas.

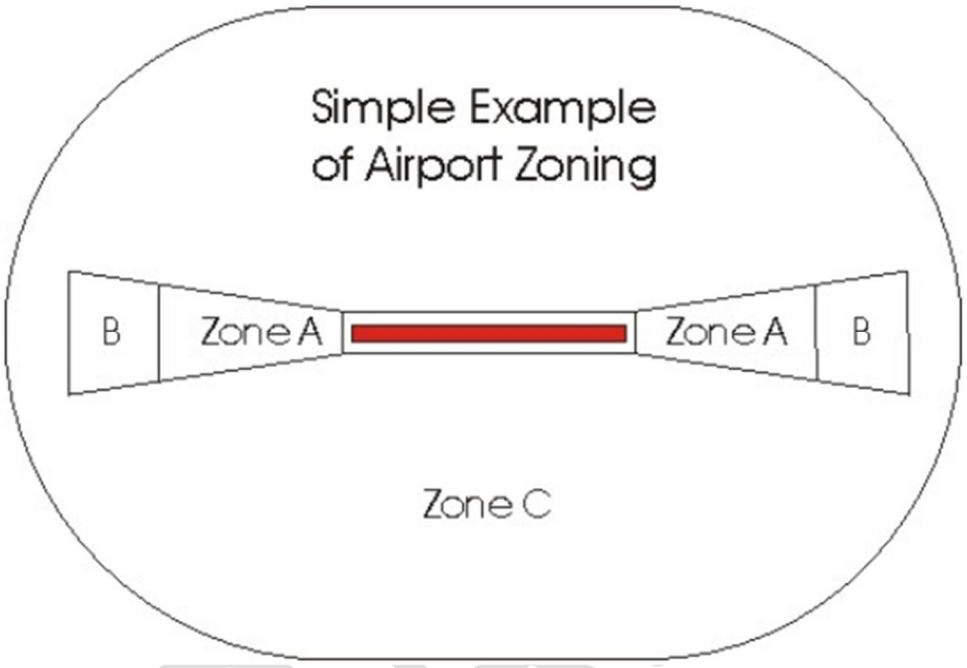


Figure 4-11: Simple Example of Airport Zoning
Source: MnDOT Aeronautics and Aviation

These zones are referred to as Safety Zones A, B, and C. According to Minnesota Administrative Rules 8800.1200, *Airport Zoning Standards*, the delineation of these zones begins with the Primary Surface.

The Primary Surface is defined as "An imaginary surface longitudinally centered on a runway and extending 200 feet beyond each end of a runway with a specially prepared hard surface or coinciding with each end of other runways. The width of the primary surface is 120 feet for visual runways at special purpose airports, 250 feet for visual utility runways, or 500 feet for nonprecision instrument runways and for visual runways other than utility, or 1,000 feet for precision instrument runways and for nonprecision instrument runways having visibility minimums as low as three-fourths of a statute mile."

Safety Zone A extends outward from the primary surface a distance equal to two-thirds the runway length or planned runway length. Safety Zone B extends outward from Safety Zone A a distance equal to one-third the runway length or the planned runway length.

Safety Zone C is "All that land which is enclosed within the perimeter of an imaginary horizontal plane 150 feet above an established airport elevation, the perimeter of which is constructed by swinging arcs of a specified radii from the center of each end of the primary surface of each runway and connecting the adjacent arcs by lines tangent to those arcs. The radius of each arc is:

- 5,000 feet for all runways designated as utility or visual; and
- 10,000 feet for all other runways."

The Safety Zones A, B, and C described in Administrative Rules 8800.1200 are summarized in Table 4-12 below.

Runway Length	Length Zone A	Inner Width Zone A	Outer Width Zone A	Length Zone B	Inner Width Zone B	Outer Width Zone B
Runway 11/29 Primary Surface: 250 wide x 4,525 long						
Runway 11/29 Zones A and B:						
11 – 4,125	2,750	250	800	1,375	800	1,075
29 – 4,125	2,750	250	800	1,375	800	1,075
Runway 11/29 Zone C: 5,000 arcs from center of designated primary surface end						
Existing Runway 14/32 Primary Surface: 500 wide x 3,800 long						
Existing Runway 14/32 Zones A and B:						
14 – 4,000	2,667	500	1,300	1,333	1,300	1,700
32 – 4,000	2,667	500	1,300	1,333	1,300	1,700
Existing Runway 14/32 Zone C: 5,000 arcs from center of designated primary surface end						
Zone C Height Restriction: No object shall exceed 1356 MSL (Airport elevation 1206 + 150)						

Table 4-12: MN Safety Zones A, B, and C at Y63;
Note: All measurements are in feet.

Each Safety Zone has its own set of restrictions on land use.

In Zone A, no:

- Buildings or temporary structures
- Exposed transmission lines
- Assembled groups of people
- Other similar uses
- Uses that cause interference with radio or electronic facilities on the airport
- Uses causing interference with radio or electronic communications between the airport and aircraft
- Lighting that makes it difficult for pilots to distinguish between airport lights and other lights
- Lighting that results in glare in pilot's eyes
- Lighting that impairs visibility in the airport vicinity

In Zone B, no:

- Building site less than three acres
- Assembled groups of people more than 15 per acre
- Churches, hospitals, schools, theaters, stadiums, hotels and motels, trailer courts, or campgrounds
- Other places of assembly
- Uses that cause interference with radio or electronic facilities on the airport
- Uses causing interference with radio or electronic communications between the airport and aircraft
- Lighting that makes it difficult for pilots to distinguish between airport lights and other lights
- Lighting that results in glare in pilot's eyes
- Lighting that impairs visibility in the airport vicinity

In Zone C, no:

- Uses that cause interference with radio or electronic facilities on the airport
- Uses causing interference with radio or electronic communications between the airport and aircraft
- Lighting that makes it difficult for pilots to distinguish between airport lights and other lights
- Lighting that results in glare in pilot's eyes
- Lighting that impairs visibility in the airport vicinity

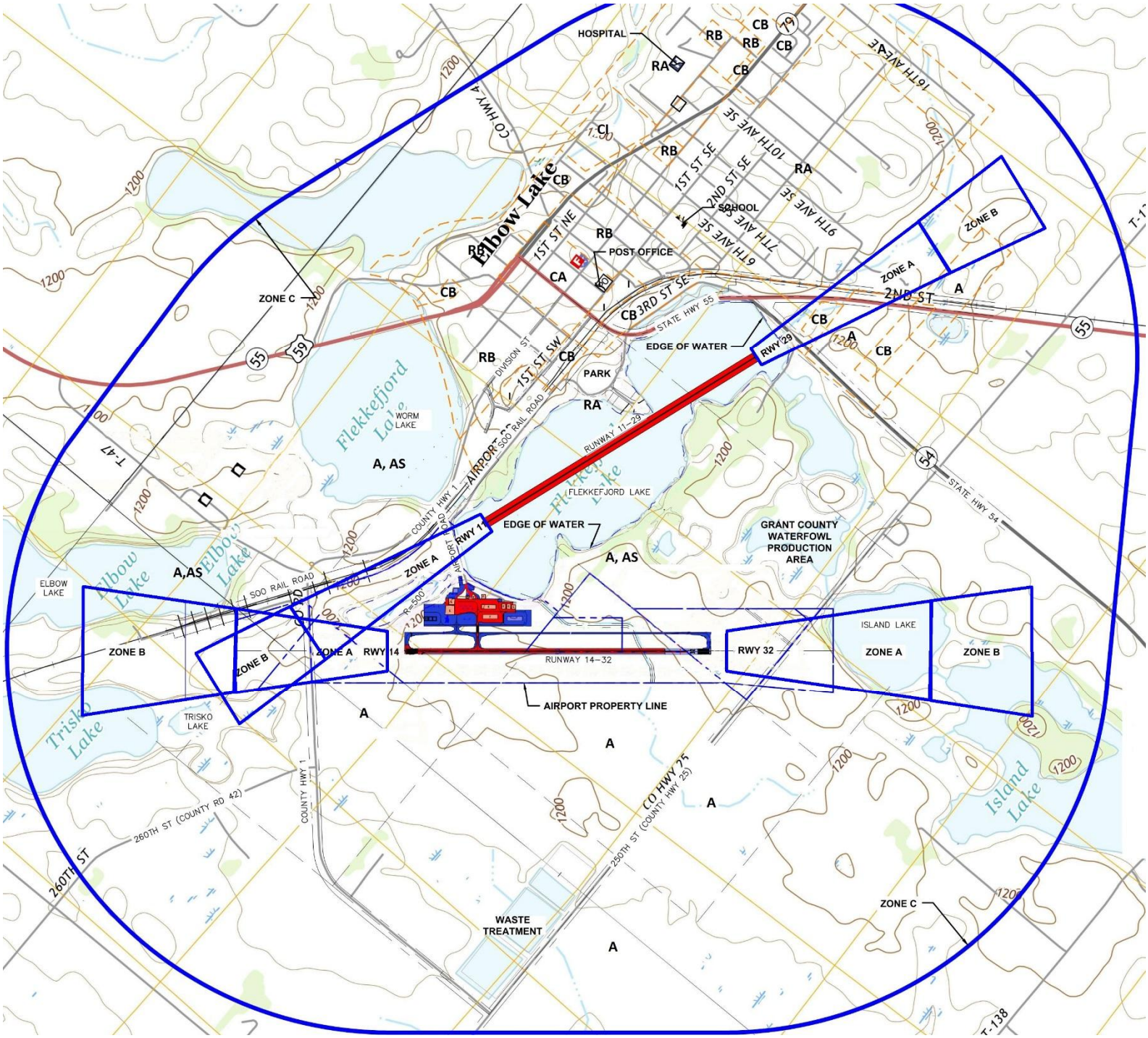


Figure 4-13: Safety Zones A, B, and C at Y63

Reference Key - City of Elbow Lake Zoning Use Districts:			
Outside Shoreland Management Area		**Within Shoreland Management Area**	
Agricultural	A	Agricultural	AS
Residence A	RA	Residence A	RAS
Commercial A	CA	Residence B	RBS
Commercial B	CB		
Industrial	I		
Commercial-Industrial	CI		

4.5.1.13 Elbow Lake Airport Ordinance, Chapter 152

Elbow Lake has adopted a zoning ordinance for airports, which specifically includes provisions for land use safety zoning.

The city of Elbow Lake has adopted a zoning ordinance for airports, which specifically includes provisions for land use safety zoning. These zones mirror the Minnesota State Statutes' 8800.2400 *Airport Zoning Standards*, with a few differences. *As was noted in Section 2.3.4 of Chapter 2, the zoning ordinance must be updated to reflect the current and future conditions of the airport and be approved by MnDOT as part of the Master Planning process. Changes to the Ultimate Land Use Safety Zoning dimensions will be determined as part of the runway length and approach procedures alternatives analysis in Chapter 5.*

Noted differences in the ordinance are shown in Table 4-14 below.

MN Statute 8800.2400, Airport Zoning Standards	Elbow Lake Airport Ordinance, Chapter 152
Safety Zone A: "In the approach zones of a runway, Safety Zone A extends outward from the end of the primary surface a distance equal to two-thirds the runway length or planned runway length."	Safety Zone A: "All that land in the approach zones of a runway which is located within a horizontal distance of 3,000 feet from each end of the primary zone."
Safety Zone B: "In the approach zones of a runway, Safety Zone B extends outward from Safety Zone A a distance equal to one-third the runway length or the planned runway length."	Safety Zone B: "All the land in the approach zone of a runway which is located within a horizontal distance of 4,500 feet from each end of the primary zone and is not included in Zone A."
Safety Zone C: "All that land which is enclosed within the perimeter of the horizontal zone defined in subpart 3, Item B and which is not included in Zone A or Zone B."	Safety Zone C: "All the land which is enclosed within the perimeter of the horizontal zone and which is not included in Zone A or Zone B." It is assumed that the "horizontal zone" referenced in this description is the zone described in the Airspace Obstruction Zoning section of the chapter, described in Section 4.4.2.1 of this document.

Table 4-14: Safety Zone Dimension Comparison

Like the Minnesota State Statutes land use zoning regulations described above, there are restrictions on land uses within each one of the Safety Zones. In Zone A, there shall be no "…buildings or temporary structures, except as necessary and incidental to airport operations, and shall be restricted to those uses which will not create, attract, or bring together an assembly of person thereon. Permitted uses may include agriculture, light outdoor recreation (non-spectator), cemeteries and auto parking."

In Zone B, agricultural, residential, commercial or industrial uses are allowed but with restrictions on density and public or private assembly. Churches, hospitals, schools, theaters, stadiums, hotels and motels, trailer courts, camp grounds, and other places of public or semi-public assembly are prohibited.

In Zone C, only height restrictions are in place to limit land use.

The recommended Ultimate Safety Zoning dimensions will be determined as part of the runway length alternatives analysis in Chapter 5.

4.5.2 Taxiway and Taxilane Analysis

AC 150/5300-13A provides design standards for taxiway and taxilane development. A taxiway is defined as a path established for the taxiing of aircraft from one part of the airfield to another. A taxilane is the portion of the aircraft parking area designated for the access between taxiways and aircraft parking positions. According to the AC, the basic taxiway system design principles include:

- Whenever possible, taxiways should be designed such that the nose gear steering angle is no more than 50 degrees.
- Turns should be 90 degrees whenever possible. For intersections, the preferred standard angles are 30, 45, 60, 90, 120, 135, and 150 degrees.
- Taxiways systems should employ the three-node concept, in which a pilot should have no more than three turn choices at an intersection.
- Minimize runway crossings, and limit the runway crossing to the outer thirds of the runway.
- Avoid wide expanses of pavement. Wide pavements require placement of signs and edge lighting or markers far from the pilot's eye and reduces the conspicuity of visual cues.
- Taxiways should not provide direct access from an apron to a runway in order to reduce opportunity for human error.

An efficient runway/taxiway system will increase an airport's ability to handle arriving and departing aircraft, as well as expedite ground movements between the runway and terminal areas.

Additions or enhancements to the taxiway system are typically completed to increase airport capacity, for operational efficiency, and to enhance safety. An efficient runway/taxiway system will increase an airport's ability to handle arriving and departing aircraft, as well as expedite ground movements between the runway and terminal areas. Figure 4-15 depicts the existing taxiway and taxilane layout. Taxiway lighting is discussed in Section 4.5.6 of this chapter.

Figure 4-15: Terminal Area

4.5.2.1 Taxiways

Taxiway width is determined in accordance with the stated Taxiway Design Group (TDG) standards provided in AC 150/5300-13A. Elbow Lake's recommended Critical Design Aircraft, the Beechcraft King Air E90, has a main gear width (MGW) of 13 feet and a cockpit-to-main gear dimension of 13 feet. According to Figure 1-1 of the AC, this aircraft then has a TDG of 1A, and any taxiways that will serve this aircraft must meet the minimum requirements for this design group.

AC 150/5300-13A requires that taxiways designed for Taxiway Design Group (TDG) 1A be 25 feet wide minimum. The existing taxiway meets this design standard. *It is recommended that the taxiway (or any future taxiways) should be maintained at its current width throughout the planning period using routine maintenance practices.*

AC 150/5300-13A also recommends that direct access to the runway from a parking apron be eliminated if possible to avoid runway incursions. Taxiway A leads directly from the main apron onto the runway and does not meet the FAA's basic taxiway design principles. *During the next taxiway rehabilitation project, it is recommended that Taxiway A be realigned to prevent direct access to the runway from the apron and to increase pilot situational awareness.*

Like a runway, taxiways and taxilanes also have designated object free areas. The Taxiway Object Free Area (TOFA) clearing standards prohibit service vehicle roads, parked airplanes, and above ground objects, except for objects required to be located in the TOFA for air navigation or aircraft ground maneuvering purposes. The TOFA is centered on the taxiway, and for ARC B-II aircraft, it must be 131 feet wide. The existing TOFA at Y63 meets this standard. *It is recommended that the TOFA be maintained throughout the planning period using routine maintenance practices.*

FAA criteria does not currently support the provision of a full-length parallel taxiway unless 30,000 or more operations occur at an airport. Forecasted operations at Y63 will not approach this number in the planning period. However, it is prudent to plan for this facility in the future, and it should be included in the Ultimate Airport design to ensure that future hangars or aprons are not planned for this area.

An interim solution would be to provide a partial parallel taxiway, which could result in an improvement in safety by eliminating direct access from the apron to the runway.

It is recommended that the construction of a partial parallel taxiway be planned as an interim solution, with a full-length parallel taxiway as the goal for the Ultimate condition.

Taxiway Design Standards	Existing ADG I (feet)	Recommended ADG II (feet)	TDG-1A (feet)
TAXIWAY PROTECTION			
Taxiway Safety Area	49	79	N/A
Taxiway Object Free Area	89	131	N/A
Taxilane Object Free Area	79	115	N/A
TAXIWAY SEPARATION			
Taxiway Centerline to:			
Parallel Taxiway/Taxilane Centerline	70	105	N/A
Fixed or Movable Object	44.5	65.5	N/A
Taxilane Centerline to:			
Parallel Taxilane Centerline	64	97	N/A
Fixed or Movable Object	39.5	57.5	N/A
WINGTIP CLEARANCE			
Taxiway Wingtip Clearance	20	26	N/A
Taxilane Wingtip Clearance	15	18	N/A
STANDARDS BASED ON TDG			
Taxiway Width	N/A	N/A	25
Taxiway Edge Safety Margin	N/A	N/A	5
Taxiway Shoulder Width	N/A	N/A	10

Table 4-16: Taxiway/Taxilane Design Standards; Source: AC 150/5300-13A

There is minimal taxiway lighting present at this time. *To ensure safety for operations at night or low visibility, it is recommended that the interim and Ultimate taxiways be equipped with Medium Intensity Taxiway Lighting (MITL) along their entire lengths.*

4.5.2.2 Taxilanes

Taxilanes have slightly less expansive Object Free Area standards than taxiways. For Group II aircraft, such as the recommended Critical Design Aircraft, Taxilane Object Free Area (TLOFA) width is a minimum of 115 feet. Table 4-16 illustrates the minimum standards for taxiways and taxilanes.

Y63 currently has three taxilanes within the terminal area, each with their own functional TOFA, constrained by the presence of existing buildings, tiedown positions, or other objects along the length of each. As described in the previous table, the TLOFA for ADG I is 79 feet, and for ADG II it is 115 feet.

The Taxilane Centerline to Fixed or Movable Object dimensional standard for ADG I is 39.5 feet. The current Taxilane B does not meet this requirement between the two existing T-hangars and in front of the three private hangars.

In some locations on the apron, due to the placement of existing buildings, it is not possible to accommodate ADG II or even ADG I requirements. Table 4-17 identifies which taxilanes meet the TLOFA requirements. None of the three taxilanes comply with ADG II standards over their entire lengths. *Taxilane object free areas will be further discussed in the Alternatives chapter for consideration of segregated areas for ADG I and ADG II aircraft.*

Taxilane	Existing Centerline to Fixed Object (feet)	Existing TLOFA Width (feet)	Meets ADG I Standard	Meets ADG II Standard
TLA	36.5	73	NO	NO
TLB	38	76	NO	NO
TLC	41	N/A	YES	NO

Table 4-17: Existing Taxilane Object Free Area vs. Minimum Standards
Source: AC 150/5300-13A

It is recommended that the taxilanes be reconfigured and upgraded where practicable to meet current taxilane width and TLOFA standards during the next rehabilitation project for each area. For taxilanes which cannot be improved as required due to existing building siting, a Modification to Standards should be pursued. Still other taxilane areas may need to be marked as non-movement areas.

According to the 2014 Pavement Condition Report, Taxilanes A and B are in Very Good Condition with PCIs of 75. Taxilane C is in Excellent condition with a PCI of 97.

4.5.2.3 Taxiway Pavement Strength and Condition

As noted previously, the recommended Critical Design Aircraft is part of the B-II ADG, and has a maximum take-off weight of 12,500 pounds. Taxiway A is constructed of asphalt and is currently reported at a strength of 12,500 pounds Single Wheel Gear (SWG).

The taxiway was built in 2006, when the paved Runway 14/32 was constructed. According to the Pavement Condition Report, the taxiway is in Very Good Condition with a PCI of 76.

The current PCN number for the taxiway is 44/F/C/Y/T, calculated using the FAA's current COMFAA 3.0 software with the theoretical analysis method in August 2017.

Routine maintenance, such as joint and crack sealing or slurry sealing, should be performed on a scheduled basis to extend the life of the pavement.

At the time of construction of a parallel taxiway, Taxiway A should be reconfigured to prevent direct access to Runway 14/32 from the apron.

4.5.2.4 Seaplane Base Taxi Channel and Turning Basins

As defined in AC 150/5395-1A, *Seaplane Bases,* a Taxi Channel is a water channel used for the movement of seaplanes between shoreline facilities and the sea lane. The minimum width of taxi channels serving small seaplanes should be 125 feet, with a minimum clearance of 50 feet between the side of the channel and the nearest object. The channel on Flekkefjord Lake, though unmarked, easily accommodates these dimensional standards between the west end of the sea lane and the seaplane dock and ramp. Due to the narrowness of the center of the lake, aircraft on the eastern end of the sealane must turn around and taxi back down the sealane in order to reach the dock and ramp.

A Turning Basin is a water area used for the taxiing and turning maneuvers of seaplanes along shoreline facilities and at the ends of a narrow sealane. It offers seaplane pilots and extra wide water taxi maneuvering area to enter or exit an anchorage area and facilities located on the shoreline, such as ramps, piers, docks, and hoisting equipment. For restricted sealanes less than 200 feet wide, both ends of the sealane shall have turning basins with a minimum radius of 200 feet. The open area at each end of Runway 11/29 meets this requirement.

There is no lighting or signage associated with the taxi channel or turning basins.

4.5.2.5 Taxiway Designation

In AC 150/5340-18F, *Standards for Airport Sign Systems*, the FAA has recommended a new format for taxiway designation. The new format provides a simple and logical methodology that can help improve situational awareness on an airfield.

The AC offers common sense guidance for taxiway naming conventions. Y63's simple taxiway means that no naming changes are suggested at this time. However, if a partial or full parallel taxiway is added at Y63, the following recommendations will apply:

- Keep it simple and logical.
- Use letters of the alphabet for taxiways starting at one end of the airport and continuing to the opposite end.
- Do not use letters "I" or "O" as they could be mistaken for runway numbers.
- Do not use letter "X" as it could be misconstrued as indicating a closed taxiway.
- Designate all separate, distinct taxiway segments.
- Do not change designation if there is no significant change in direction of the taxiing route. However, when the overall system design indicates a need, such a change can be made and appropriately signed at intersections.
- Do not designate taxiways by reference to a direction of travel or to a physical object, such as "inner," "outer," "parallel," or "bridges."

It is recommended that any new taxiways built at Y63 conform with the FAA's current naming convention and that sign panels reflecting that naming convention be installed per FAA standards during the next major runway or taxiway project. Proposed taxiway naming will be explored in Chapter 5.

4.5.3 Seaplane Base Dock and Ramp

4.5.3.1 Seaplane Base Dock

Elbow Lake's modular polyethylene floating dock, manufactured by Shoremaster and installed in 2004, is in fair condition. It includes a slip-resistant surface and an ultraviolet inhibitor to slow down degradation from sun exposure. Airport staff remove the dock from the lake in the winter to extend its useful life. The dock's 8-year warranty expired in 2012 and is showing signs of wear and fading.

Elbow Lake's Zoning Ordinance, Chapter 151: *Shoreland Management*, does not address docks and ramps such as is found at the seaplane base, nor does the City have other regulations regarding those facilities.

The Minnesota Department of Natural Resources (DNR) has recommendations and requirements related to the installation of boat ramps and docks on public waters. These documents are included in the appendix of this Master Plan.

According to the fact sheet Docks and Access in Public Waters, no permit is needed to install, construct, or reconstruct a dock on shoreline property if it meets the following criteria:

- It is not more than eight feet wide.
- The dock is no longer than needed to achieve its intended use, including reaching navigable water depth.
- The structure is not a hazard to navigation, health, or safety.
- The structure will allow free flow of water beneath it.
- The structure is not used or intended as a marina.
- The structure is consistent with the guidelines of the local unit of government.
- Docks placed on rock-filled cribs are located only on waters where the bed is predominantly bedrock.

A general permit was issued in 2008 to allow a modest platform at the lake end of the dock, as long as it meets certain restrictions as outlined in the fact sheet.

It is recommended that the dock be replaced in the near future and that it comply with all applicable DNR regulations. At the time of replacement, design and selection of the dock and dock capacity for seaplane tie-off positions should be evaluated based on current and expected seaplane traffic demand, assembly and component longevity, and safety features.

4.5.3.2 Seaplane Base Ramp

The seaplane base ramp is concrete and not removable. In the winter, it is often damaged by ice and requires extensive effort to repair and set back in place. In addition, the concrete can be damaging to the floats of seaplanes. The ramp is a high priority replacement item for Y63.

Elbow Lake's Zoning Ordinance, Chapter 151: *Shoreland Management*, does not address docks and ramps such as is found at the seaplane base, nor does the City have other regulations regarding those facilities.

According to the fact sheet *Water Access: Installing a Boat Ramp*, a public waters permit is not required from DNR Waters for construction a boat ramp suitable for a sea plane base that meets certain criteria:

- The site can support a ramp without pilings, dredging, or other special site preparations.
- The ramp will be constructed of gravel, natural rock, steel matting, or other durable inorganic material not exceeding 7" in thickness.

- The ramp is less than 36' wide and less than 30' waterward of the shoreline, or into the water a depth of four feet, whichever is less.
- No more than 200 cubic yards of excavation is allowed, and placement of no more than 80 cubic yards of crushed rock, gravel, clean sand, or small stone is allowed to provide a stable base or maintain use of the ramp.
- The site is not a federally-designated wild and scenic river.

Emily Siira, Area Hydrologist, in a discussion on October 6, 2017, noted that in the case of the ramp at the seaplane base, which is used primarily for seaplanes with floats, it is acceptable to provide a wooden ramp which will not damage the floats sliding over the ramp in lieu of rock, gravel, concrete, or steel.

It is recommended that the existing ramp, which is built of concrete and damages aircraft floats, be removed and a new wood ramp be built in its place to conform with the recommendations found in AC 150/5395-1A Seaplane Bases*, Chapter 4* Shoreline Facilities*, but shall conform to DNR requirements in all other noted construction criteria. The ramp should be removed at the end of the flying season each year to reduce damage from ice heave over the winter and spring.*

4.5.4 General Aviation Aircraft Parking Requirements

General aviation aircraft parking requirements vary widely depending on the number of transient aircraft using the Airport and the based aircraft that might be temporarily tied down at any given time rather than being put in a hangar. The existing tie-down spaces on Y63's apron are sized for Group I aircraft with circulation for only Group I aircraft.

The existing tie-down spaces on Y63's apron are sized for Group I aircraft with circulation for only Group I aircraft.

The apron area is approximately 9,900 square yards with eight aircraft tiedown positions for transient aircraft. Minnesota's Administrative Rules 8800 require a minimum of three tiedown positions for an airport to be licensed, while the Minnesota SASP recommends that Intermediate airports have at least enough tiedowns to accommodate all unhangared based aircraft plus peak hour transient aircraft. There are currently no unhangared based aircraft at Y63, and peak hour transient activity has not been determined, because operations activity has not been actively tracked at Y63.

Joe LaRue, Airport Manager, reported in May 2017 that the current apron is often overcrowded on good-weather days or when agricultural spraying season is in full swing. He reports that when aircraft are tied down in the locations nearest the FBO or Public Storage hangars, circulation in and out of those buildings is extremely difficult. When the tie-downs facing north are being used (nose into prevailing wind), access to the A/D building and fueling station is sometimes blocked.

The over-crowding of the apron is chaotic and unsafe for circulating or parked aircraft and pedestrians. As few as 2-4 planes in tie down locations can impinge on needed taxilane circulation width.

In addition, agricultural spray planes with their wingspans of 50'+ (ADG II), take up much more space on the apron than typical GA planes. He noted that on one occasion, he counted 7 spray planes on the apron at once. The over-crowding of the apron is chaotic and unsafe for circulating or parked aircraft and pedestrians. As few as 2-4 planes in certain tie down locations can impinge on needed taxilane circulation width, demonstrating that the TLOFAs are not in compliance.

Removing or relocating a few of these tiedown locations may improve this circulation in the short term. In the future, a complete redesign of the apron/tiedown layout may be necessary, which could include relocation of tiedown locations, reconfiguring existing tiedowns, relocation of taxilanes or the use of non-movement areas, resulting in conforming TLOFAs and separation from fixed or movable objects such as buildings or fueling areas. These options will be explored in Chapter 5, Alternatives Analysis.

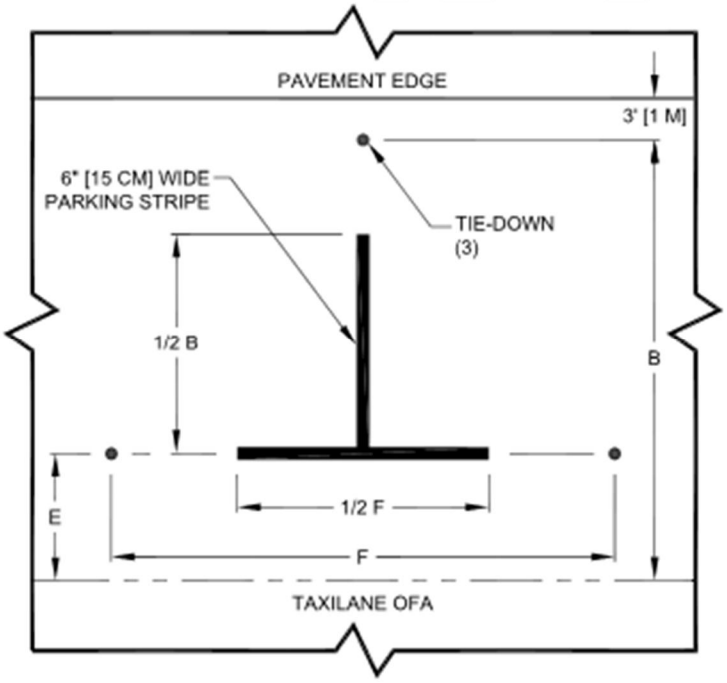


Figure 4-18: Tiedown Design Standards; Source: AC 150/5300-13A, Fig. A5-1
Note: Dimension "B" – Overall length of the Design Aircraft;
Dimension "F" – Wingspan of the Design Aircraft

While it is possible for larger aircraft to use smaller tie down sites by occupying more than one at a time, it may be beneficial to provide tie down sites sized suitably for these aircraft, leaving the smaller sites available and increasing tie down capacity. The expected fleet mix at Y63 does not indicate that a large number of these larger sites would be needed within the planning period.

Aircraft Dimensions	Existing Tiedown Dimensions	Group II Critical Aircraft Dimensions
Wingspan	23	46
Length	20	40

Table 4-19: Existing Tiedown Dimensions vs. Recommended ADG II Dimensions
Source: AC 150/5300-13A

4.5.4.1 Transient Aircraft Apron Requirements

Transient aircraft parking requirements typically comprise the largest demand for apron space requirements. Transient aircraft are defined as those aircraft not based at the facility.

Approximately one-third of all operations at Y63 are transient operations.

Approximately one-third of all operations at Y63 are transient operations. As documented in Figure 3-25 of the preceding Chapter 3, *Aviation Demand Forecasts*, transient, or itinerant, annual operations are expected to reach 2,125 by 2021, 2,250 by 2026, and 2,750 by 2036.

Apron parking planning space allocations for the footprint of typical transient aircraft at Y63 are estimated at 250 square yards (SY) for single engine piston and small multi-engine piston aircraft, 500 SY for large multi-engine piston and turbo-prop aircraft, 900 SY for jet aircraft, and 250 SY for other aircraft, such as rotorcraft. These allocations do not include circulation space.

According to Mr. LaRue, it is common to see 4-8 GA or agricultural aircraft at any given time during a busy day with good weather or during the spraying season. Aircraft circulation is further complicated when helicopters land on the apron or when medivac aircraft are present.

4.5.4.2 Based Aircraft Apron Requirements

Based aircraft, as opposed to transient aircraft, are permanently stored at the airport. For those owners not requiring hangar storage, adequate space for parking and storage of these aircraft on the apron should be provided. At this time, there is no demand for based aircraft parking on the apron. The square yardage per based aircraft used for this analysis is the same as transient aircraft and does not include Group II circulation requirements.

4.5.4.3 Helicopter Parking Requirements

The airport receives frequent helicopter operations related to the specialized repair services offered at the FBO. Emergency helicopter service usually flies directly to the Hospital helipad rather than landing at the airport.

There are no designated helicopter parking areas on the apron. The helipad at Y63 is undersized for the rotorcraft that are using the airport more frequently, and it is remote from the FBO and A/D buildings. Due to the limited apron area and tie-down spaces currently available, a dedicated space for helicopter landing and parking would increase apron and taxilane accessibility and efficiency.

Locating the helicopter spaces on north side of the FBO and MASH hangar can improve safety by separating helicopter circulation from GA circulation. The MASH hangar was designed to accommodate the installation of a second hangar door in the future, facing this proposed helicopter landing and apron space.

It is recommended that a dedicated concrete helicopter landing pad and two helicopter parking spaces be provided in the next apron construction project. The helipad and parking spaces should be located away from the main parking apron, due to undesirable buffeting of lighter GA planes from the downwash of landing helicopters.

4.5.4.4 Seaplane Parking Requirements

The seaplane base is expected to see more traffic due to its recent listing with the FAA, leading to the flying public's increased awareness of its availability.

The seaplane base is expected to see more traffic due to its recent listing with the FAA, leading to the flying public's increased awareness of its availability. Due to the seaplane dock and ramp's relatively remote location away from and below the main apron, seaplane parking there is difficult.

It is recommended that a dedicated seaplane parking apron, with a minimum of two tiedown spaces, be provided in close proximity to the dock and ramp for exclusive use by seaplanes.

4.5.4.5 Total General Aviation Apron Parking Area Space Requirements

The preceding discussions have identified the total demand for apron parking area space for the planning period. Table 4-21 presents the apron parking area requirements for the planning period, taking into consideration the expected demand for both based and transient tie down spaces. The analysis indicates that the existing general aviation apron parking area space does not meet current TOFA design standards and is not adequate for demand throughout the planning period.

The current apron can be used for both transient and based-aircraft tie-down needs, but only partially meets the requirements for Taxilane Centerline Fixed or Moveable Object clearance for ADG I, which is a dimension of 39.5 feet. As discussed at the beginning of this section, it only takes a few aircraft in tiedown positions to make the apron difficult to traverse. ADG II aircraft have an even greater dimension requirement, at 57.5 feet. The taxilanes on the apron are not sized to meet ADG II needs, nor are the existing tie-down spacing dimensions. At this time, the apron circulation and tie-downs can only minimally meet ADG I requirements. This clearly demonstrates the deficiency of the current apron to accommodate the Critical aircraft and the future parking demand.

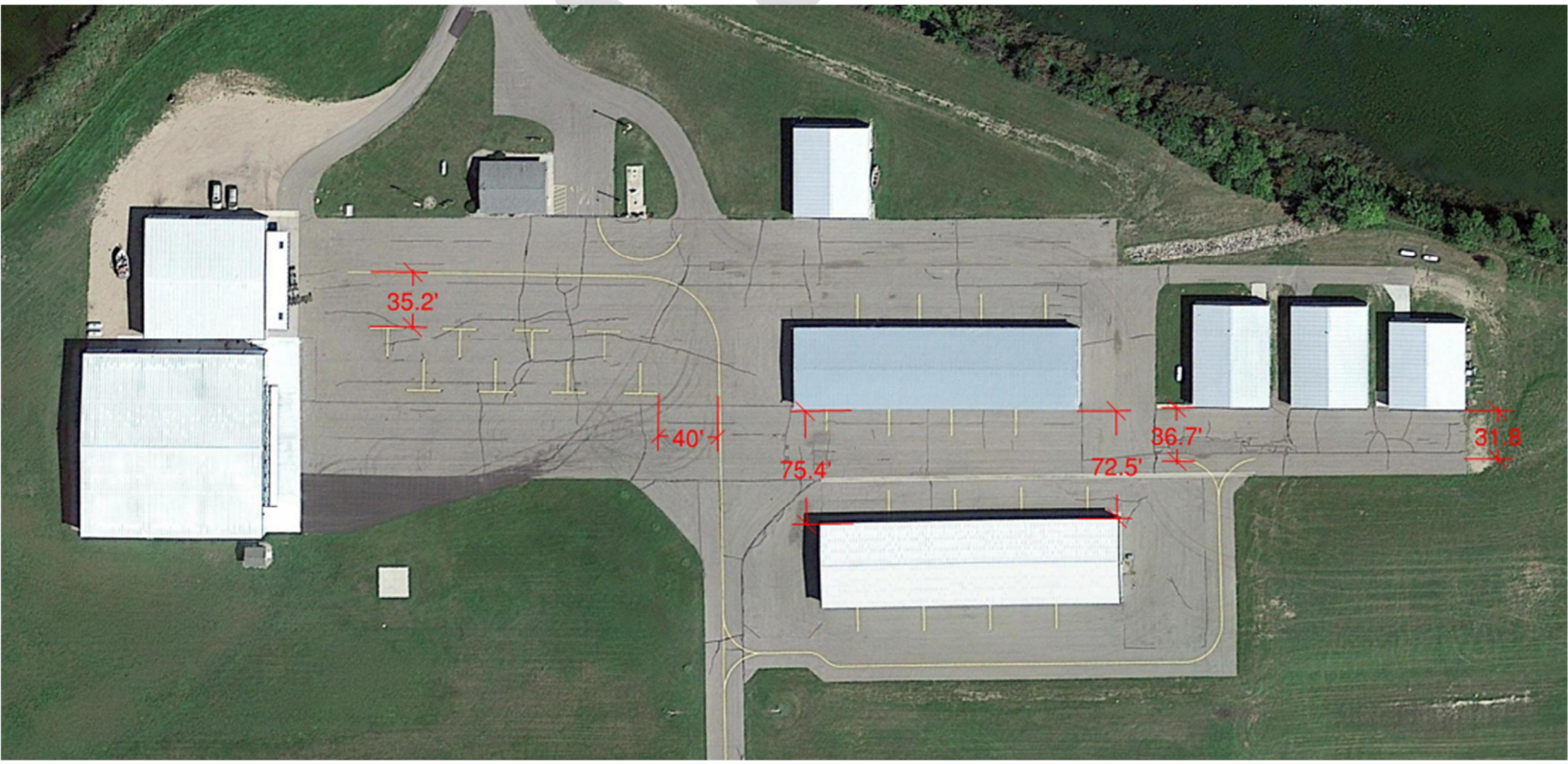


Figure 4-20: Existing Taxilane Centerline to Fixed or Movable Object and Taxilane Object Free Area Dimensions

As illustrated in the table below, the number of tiedown spaces needed to meet forecasted demand is greatly underserved by the available apron space on which to park aircraft.

Total Needed Tiedown Spaces vs. Existing Space Available by Year	Base Year 2016	Phase I 2021	Phase II 2026	Phase III 2036
A/B-I Spaces	8	8	6	6
B-II Spaces	0	0	6	10
Rotorcraft Spaces	0	0	2	2
Seaplane Spaces	0	0	2	2
Tie Down Requirement (SY)	250	250	250	250
Total Required Area for Tie Down Spaces (SY)	2,000	2,000	4,000	5,000
Existing Apron Parking Area (SY)	1,200	1,200	1,200	1,200
Parking Area Deficiency (SY)	-800	-800	-2,800	-3,800

Table 4-21: General Aviation Apron Parking Area Requirements

4.5.4.6 Apron Pavement

The existing apron pavement is in Very Good condition with a PCI rating of 83. *It is recommended that the pavement be maintained throughout the planning period using routine maintenance practices.*

The current PCN number for the apron is 44/F/C/Y/T, calculated using the FAA's current COMFAA 3.0 software with the theoretical analysis method in August 2017.

4.5.5 Instrument Approach Procedures

Y63 currently has two published instrument approaches as listed in the table below.

Approach	MSL (mean sea level)	AGL	Visibility
RNAV (GPS) RWY 14	1201	795'	1 mile
RNAV (GPS) RWY 32	1201	795'	1 mile

Table 4-22: Published Instrument Approach Procedures

If the runway is lengthened to an Ultimate length of 4,000 feet, enhanced approach procedures to serve a larger category of aircraft should be evaluated.

The approach procedures in place at Y63 are adequate and appropriate for a runway serving A/B-I (Small) and B-II (Small) aircraft. If the runway is lengthened to an Ultimate length of 4,000 feet, enhanced approach procedures to serve a larger category of aircraft should be evaluated.

It is recommended that the existing procedures be maintained the planning period, but that no further approaches be developed during the planning period.

4.5.6 NAVAIDs

Navigational Aids (NAVAIDs) are a system of electronic and visual aids that assist pilots with navigating their aircraft in a safe and orderly manner during take-off, approach, and landings. The Minnesota SASP's Minimum Objectives for Intermediate Airports (See Table 4-1) are all met by the existing NAVAIDs at Elbow Lake.

Federal Aviation Regulations Part 91.175 indicates that an aircraft attempting to land under IFR conditions on a published instrument approach procedure may not descend below the established Decision Altitude (DA) or Minimum Descent Altitude (MDA) unless at least one of the following are distinctly visible to the pilot:

- The runway threshold
- Threshold markings or lights
- Runway End Indicator Lights (REILs)
- Approach Slope Indicator Lights, such as VASI or PAPIs
- The runway lights
- Touchdown zone lights or markings, or
- Approach lighting (MALSF, MALSR, ODALs).

Note that many of the NAVAIDs described below are recommended to be switched to LED source lighting at some time in the future. It is not permissible, per Section 1.4 of AC 150/5340-30H, Airport Visual Aids, *to "mix and match" light sources within a single system, due to the differences in perceived brightness or color from LED to incandescent light sources. If, for instance, a runway is lengthened, it is not permissible to leave the existing incandescent sources in place and add LED fixtures along the new portion of the work. Instead, the whole runway edge lighting system must be of only one source – either incandescent or LED. Similarly, LED lighting sources cannot be used to replace individual fixtures in a system on a maintenance basis. Light sources changes must be comprehensive within any giving NAVAID system to maintain a uniform appearance.*

The following are recommendations related to NAVAIDs at Y63.

4.5.6.1 Airport Beacon

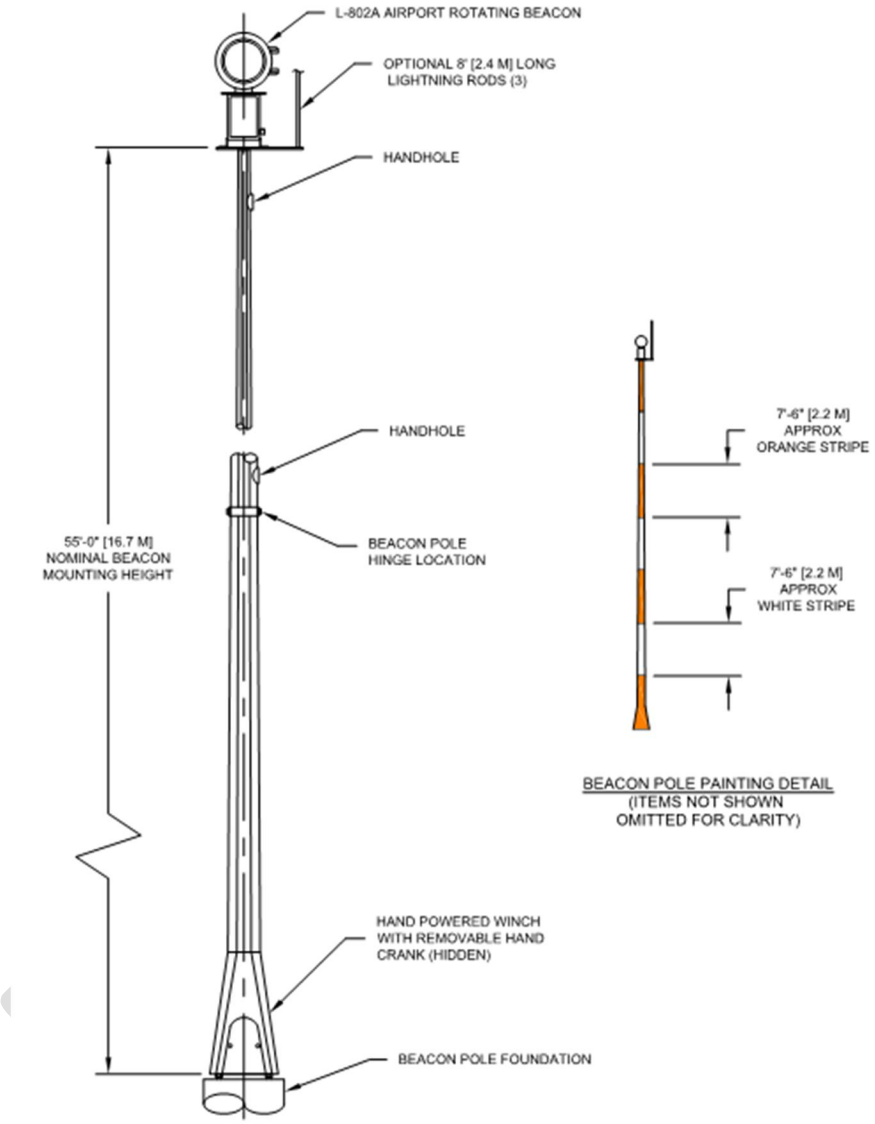


Figure 4-23: Beacon tip-down pole; Source: AC 150/5340-30H, Fig. 73

The airport's rotating beacon is located on a tower adjacent to the fueling station. The sponsor has noted that the beacon may not be up to FAA or MnDOT standards.

It is known that the pole does not meet the 55' height criteria, nor is it painted appropriately. The appropriateness of its location should also be evaluated. A tip-down pole with lightning protection is recommended for ease of maintenance of the beacon lighting and mechanisms.

It is recommended that the beacon be evaluated for compliance with AC 150/5345-12F, Specification for Airport and Heliport Beacons, *and then be brought up to these standards as needed.*

4.5.6.2 Wind cone

The airport's lighted primary wind cone is in good condition and is visible from both approaches to Runway 14/32. In addition to the primary wind cone, the seaplane base has an unlighted wind cone. The obstruction analysis, as part of this Master Plan, indicates that the wind cones do not penetrate any FAR Part 77 surfaces and do not require obstruction lighting. *It is recommended that the wind cones be maintained during the planning period using routine maintenance practices.*

4.5.6.3 Segmented Circle

The airport does not currently have a segmented circle. The addition of a segmented circle is not recommended.

4.5.6.4 Precision Approach Path Indicators (PAPIs)

The PAPIs on Runways 14 and 32 were installed in 2006 and are currently in good condition. A 5010 Inspection revealed that the frangible portions of the PAPIs of Runway 14 exceeded a height of three inches above grade (maximum allowable height). This remediation has since been completed.

The first PAPI fixture on either side of the runway is approximately 55 feet from the edge of the runway paving, and individual lights in each set of PAPI are spaced 20 feet apart. These dimensions fall within the acceptable range set forth by AC 150/5340-30H. The four-box PAPIs are appropriate for future jet operations.

It is recommended that Y63's PAPI system be maintained throughout the planning period using routine maintenance practices. When funding allows, it is recommended that the fixtures be converted to High Intensity LED light sources. At the reconfiguration of runway length or width, PAPI locations will need to be re-evaluated.

4.5.6.5 Runway End Identifier Lights (REILs) and Threshold Lights

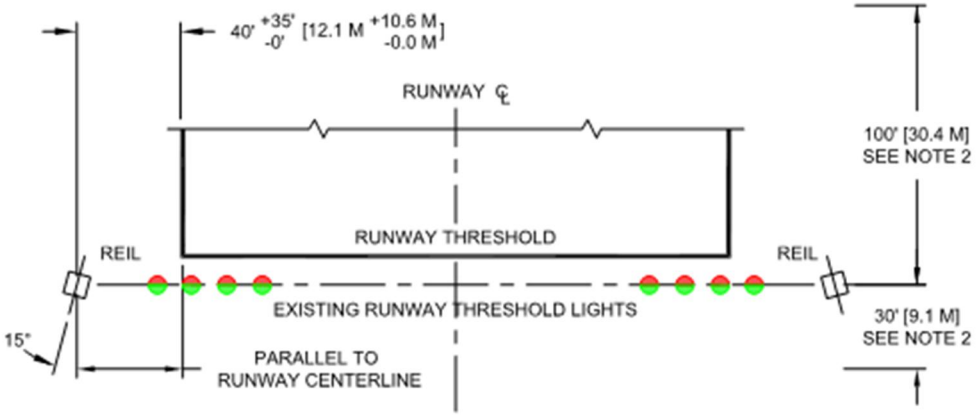


Figure 4-24: REILs; Source: AC 150/5340-30H, Fig. 78

The unidirectional REILs, which are synchronized flashing lights located at each end of each runway threshold and facing the direction of approach, were installed in 2006 and are currently in good condition. They are located 30 feet downwind of the threshold lighting at each approach and 40 feet from the edge of runway pavement, equally about the runway centerline, within the guidelines of AC 150/5340-30H.

It is recommended that Y63's REILs be maintained throughout the planning period using routine maintenance practices. When funding allows, it is recommended that the fixtures be converted to LED light sources. At the reconfiguration of runway length or width, REIL locations will need to be re-evaluated.

The red/green runway threshold lights at each approach were installed in 2006 and are currently in good condition. The groups of four, as required for non-precision instrument runways, are located in a range between 8.5 and 9 feet from the end of the pavement and are spaced at 10-foot centers, within the guidelines of AC 150/5340-30H.

It is recommended that Y63's threshold lighting be maintained throughout the planning period using routine maintenance practices. When funding allows, it is recommended that the fixtures be converted to LED light sources. At the reconfiguration of runway length or width, threshold lighting locations will need to be re-evaluated.

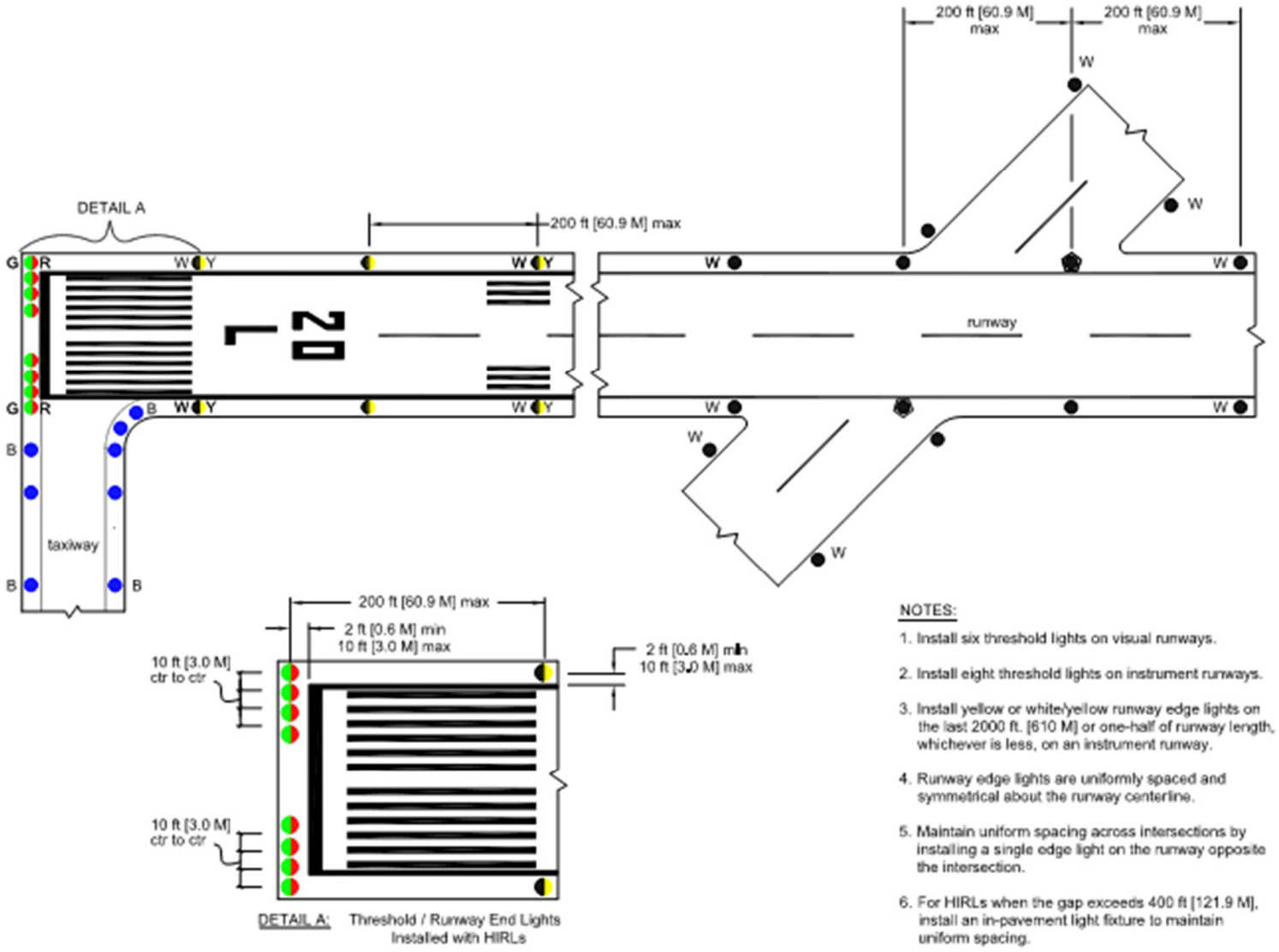


Figure 4-25: Runway and Threshold lighting configuration (NPI approach for MIRL); Source: AC 150/5340-30H, Fig. 3

4.5.6.6 Runway Edge Lighting

Runway 14/32 is equipped with incandescent white/yellow Medium Intensity Runway Lights (MIRLs). This system was installed in 2006 and is in good condition. The lights are parallel with the runway centerline and positioned 10 feet from the paved edge of the runway, which is the approved distance for protection from jet blast in AC 150/5340-30H. They are spaced approximately 190 feet apart along the runway's length, less than the 200-foot maximum spacing. *It is recommended that the MIRLs be maintained throughout the planning period using routine maintenance practices. When funding allows, it is recommended that the fixtures be converted to LED light sources. At the reconfiguration of runway length or width, runway edge lighting locations will need to be re-evaluated.*

There is currently no lighting associated with Sealane 11/29. Night time operations by seaplane pilots should be considered only in an emergency due to the difficulty of seeing objects in the water, judging surface conditions, and avoiding large waves or swells.

4.5.6.7 Taxiway Edge Lighting

AC 150/5340-30G, *Design and Installation Details for Airport Visual Aids*, recommends Medium Intensity Taxiway Lights (MITL) at all taxiways for airports where a runway lighting system is installed. MITL improve the visibility of the taxiway during night and low-visibility weather conditions. The Minnesota SASP also recommends MITLs for Intermediate airports.

The blue MITL, provided only at the junction of the taxiway to Runway 14/32, were installed in 2006 and are in good condition. The required distance from the edge of the taxiway paving to the lights should be no more than 10 feet. Four of the six fixtures comply with this, but the two eastern-most lights are 16 feet way from the taxiway pavement edge. It is possible this was done in response to the turf runway which still exists and crosses the taxiway at this location.

Where the taxiway joins the apron, blue reflectors are provided in lieu of lighting. Reflectors are acceptable per paragraph 2.1.4.c of AC 150/5340-30H.

The AC's Table 2-1 shall be referenced for spacing on straight sections of the taxiway, while Figure 17 is used to describe the requirements for curved taxiway sections.

It is recommended that the MITLs be maintained throughout the planning period using routine maintenance practices. When funding allows, it is recommended that the fixtures be converted to LED light sources. When a taxiway reconfiguration project is initiated, MITL lighting should be re-evaluated and a full taxiway lighting system planned.

Figure 4-26: Runway Signage

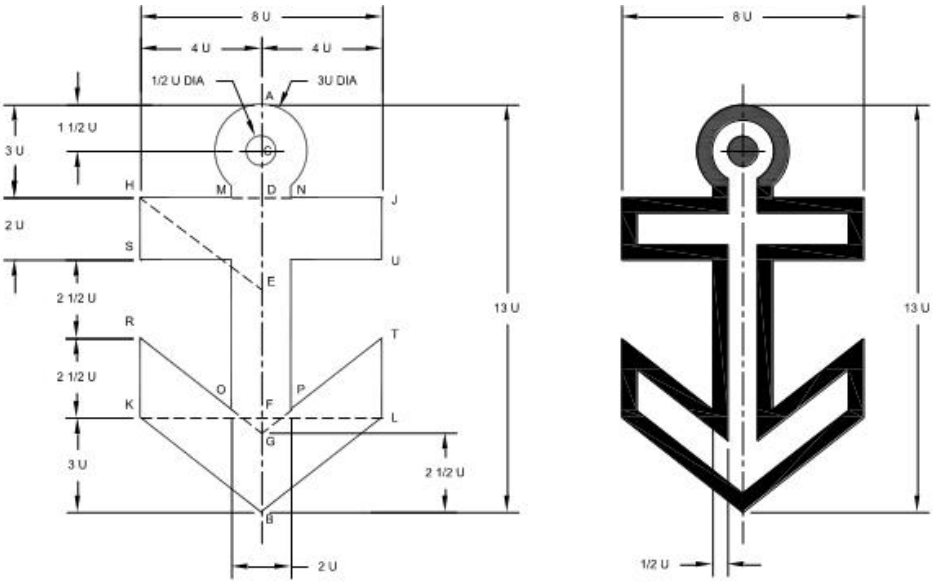
4.5.6.8 Airfield Signage

Elbow Lake is equipped with standard airfield signage, providing guidance information used to identify locations on the airport and airfield. FAA-required signage including location, direction, destination, and information signs meet the standards given in AC 150/5340-1J, *Standards for Airport Sign Systems*.

The airfield signage, such as taxiway and runway signs, were installed in 2006 and are in good condition. *It is recommended that the airfield signs be maintained throughout the planning period using routine maintenance practices. When runways or taxiways are reconfigured in the future, signage should be evaluated and revised/relocated as necessary to correspond to new designations and the fixtures be modified to employ LED light sources.*

AC 150/5395-1A, *Seaplane Bases*, includes guidance on marking and identifying seaplane bases. The anchor symbol, below, is the standard air marker, but numerals and or other symbols may be used for such identification. These symbols are often painted on roofs or other flat surfaces that are easily visible from the air. When such a marker is provided, the color of the symbol shall be Aviation Yellow, No. 13538. If a border is used to make the symbol easier to see against its background, the color shall be Aviation Black, lusterless, No. 37038. The recommended minimum overall dimensions shall be 13 feet in length by 8 feet in width.

It is recommended that a seaplane base identification marker be provided according to FAA standards when funding allows.



Note: Outside dimensions of markers are identical. Black border of marker "B" is 0.5 unit wide. One unit is 1/13 of the overall length.

Figure 4-27: Seaplane Base Air Marker Proportions
Source: AC 150/5395-1A, Seaplane Bases

4.5.6.9 Pavement Markings

Runway 14/32 is marked with Non-Precision Runway Markings which include centerline, aiming point, threshold, and runway designator markings. Taxiway A and Taxilanes A, B, and C are marked with yellow centerlines. The FAA's AC 150/5340-1K, *Standards for Airport Markings*, recommends that all airports have surface painted holding position markings where a taxiway meets a runway.

It is recommended that the pavement markings be maintained on a regular schedule to keep them in good condition. Holding positions should be added during the next scheduled painting to reflect the new FAA standard.

4.5.6.10 Weather Equipment

The Automatic Weather Observation System (AWOS), owned by MnDOT, was installed in 2007 and relocated to its current location in 2015.

According to FAA Order 6560.20b, *Siting Criteria for Automated Weather Observing Systems*, for airports with only visual and/or non-precision instrument runways, the minimum distance for the AWOS from the primary runway centerline is 500 feet. The current location is approximately 450 feet from the centerline. According to the Order, "Since desired locations are not always available due to excessive physical or economic reasons, compromises may have to be considered and less than desired locations may have to be selected. If this occurs, it must be understood that the alternative location must still allow the system to provide accurate information."

FAA recommends a 500' radius around the AWOS location, called the "Critical Area," in which no development occurs in order to protect the functionality of the sensors. This constrains the available building area on the site.

In addition, flexibility in the exact location of the AWOS equipment is determined by the owner if the equipment, which in this case is MnDOT. Any future development within a 500' radius of the AWOS should be coordinated with MnDOT.

It is recommended that the AWOS be maintained throughout the planning period using routine maintenance practices. If future development of taxiways, apron, or buildings is planned within a 500-foot radius of the AWOS, coordination with MnDOT is recommended.

4 | Section 6 – Landside Facility Requirements

Landside facilities include the A/D building, hangars, automobile parking, and fencing. The landside facility requirements were developed from a review of the Inventory and Forecast chapters of this study, consistent with FAA and industry guidelines.

4.6.1 Arrival/Departure Building and Airport Board Offices

The A/D building, constructed in 1999, contains restrooms, a meeting space, pilot's lounge with kitchen, and an office. While it is adequate in size and amenities for a local GA airport, it is in need of rehabilitation. *It is recommended that the buildings' roof, gutters and downspouts, siding, soffit and fascia be replaced. Carpet replacement is recommended, as well as the water heater and furnace, which are nearing the end of their useful lives, and which can be upgraded with more energy efficient units to improve functional reliability and reduce utility costs. It is recommended that the remainder of the building be maintained throughout the planning period using routine maintenance practices.*

4.6.2 Hangar Facilities

Hangar space requirements include demand generated by based aircraft, normal fixed base operations, and corporate aircraft use. Due to the severe weather often experienced in Minnesota, it is assumed that most based aircraft owners prefer to hangar their aircraft, and all based aircraft at Elbow Lake are hangared. Y63 currently has two 8-unit T-hangars, four private hangars, and one public multi-aircraft storage hangar, for a total of 47,870 SF of hangar space. Following discussion with airport staff, there are currently two people on a waiting list for T-hangar spaces. Reviewing the forecast found in Chapter 3, the demand for based aircraft hangar space is expected to grow in the planning period, and the provision of leasable hangar units will be a high priority.

Total hangar requirements are highlighted in Table 4-28. The planning model used for this analysis indicates the airport does not have adequate T-Hangar and conventional hangar space for the planning period.

Total Needed Hangar Spaces vs. Existing Space Available by Year	Base Year 2016	Phase I 2021	Phase II 2026	Phase III 2036
Total Based Aircraft Demand Forecast	23	25	27	31
T-Hangar Demand	18	19	20	21
Existing T-Hangar units	16	16	16	16
T-Hangar Deficiency (-)	-2	-3	-4	-5
Conventional/Private Hangar Demand	4	4	5	6
Existing Conventional/Private Units	4	4	4	4
Conventional Hangar Deficiency (-)	0	0	-1	-2
MASH Hangar demand	4	5	6	7
Existing Mash Hangar space	8	8	8	8
MASH Hangar Capacity (+)	+4	+3	+2	+1

Table 4-28: Hangar Requirement Summary

In order to accommodate the increase in based aircraft desiring T-hangar space, an additional 8-unit T-hangar should be built to meet current and future demand. This hangar should be sized to accommodate Group II aircraft.

It is also recommended that the oldest T-hangar be demolished and a new 8-unit T-hangar built in its place once T-hangar demand is satisfied as a long-term planning objective.

The T-hangars can be constructed through a MnDOT hangar loan, be City-owned, and be a source of revenue for the Airport.

It is also recommended that conventional hangars be built as demand warrants.

The private hangars at Y63 are built on land that remains in the ownership of the City, with the aircraft owner leasing the land on which to construct the hangar. This arrangement should be continued with any new private hangars that are built at the airport.

Note that the demand for MASH hangar space varies by season. During the winter months, several agricultural spray planes and float planes are stored there, while there are fewer in the summer. The “demand” shown in the chart above is an average for the year.

4 | Section 7 – Support Facilities

Support facilities play a vital role in the operation of the Airport. The sizing, location, and phasing of these facilities must provide flexibility to accommodate the dynamically growing aviation environment at Y63. Support facilities that will be discussed in this section include the following:

The sizing, location, and phasing of the support facilities must provide flexibility to accommodate the dynamically growing aviation environment at Y63.

- Fuel Storage and Dispensing
- Aircraft Maintenance
- Maintenance and Snow Removal Equipment and Storage
- Ground Support Equipment and Storage
- Airport Security, Wildlife Hazards and Perimeter Fencing
- Airport Access, Parking, and Wayfinding
- Utilities

4.7.1 Fuel Storage and Dispensing

The Airport maintains one underground 10,000-gallon storage tank for 100LL fuel, installed in 1993 adjacent to the A/D building. 100LL fuel, or AvGas, contains lead, a toxic substance than can be inhaled or absorbed in the blood stream. This gas is the only remaining lead-containing transportation fuel in the United States. According to the FAA's website regarding Aviation Gasoline (faa.gov/about/initiatives/avgas/), more than 167,000 piston-engine aircraft still use AvGas to power their aircraft, whose emissions have become the largest contributor to the low levels of lead emissions produced in the US. The FAA and the Environmental Protection Agency (EPA), along with industry partners, are working to remove lead from AvGas. The goal is to phase out lead in aviation fuels completely, but to smoothly transition from leaded to lead-free AvGas. Until the time that the transition is complete, a tank for AvGas will be needed at Y63. *It is recommended that Y63 monitor the FAA and EPA's progress for updated regulations and replacements for AvGas, and comply with new regulations as they are enacted.*

Other aircraft use Jet A fuel, such as King Airs and Air Tractors, but at this time there is not enough demand to justify adding a jet fuel tank to their existing fueling system. *It is recommended that space be reserved on the ALP for a Jet A fuel tank and fueling system. The City should continue to monitor and evaluate the need for a Jet A fuel tank in the future and install it when it is warranted by demand.*

The 100LL tank is now 24 years old and nearing the end of its useful life. While the tank maintains sufficient capacity to meet current demand, its location in relation to adjacent taxiways means that a fueling airplane in conjunction with a few aircraft parked at the nearby tie down locations creates a bottleneck in circulation on the apron. In addition, other parts of the fueling system are in fair to poor condition and have required constant maintenance. Float planes which require fuel are filled at the Seaplane Base dock with the airport's fuel truck.

It is recommended that a new above-ground fuel facility with secondary containment for one 8,000-gallon 100LL tank and one future 8,000-gallon jet fuel tank be constructed to current environmental standards and that it be located so that circulation and future facility development is not negatively impacted. It is also recommended that a dedicated parking area for the Airport's fuel truck be constructed near the seaplane base.

4.7.2 Aircraft Maintenance

The expected life of any part of a building enclosure can vary considerably depending on the component's use, abuse, weather exposure, and mechanical properties.

Since the FBO was built over ten years ago, regular maintenance of the building has kept it in good condition. A pre-engineered steel building such as this can be expected to have a reasonable life span of 40-60 years, but individual components within the building may have much shorter life expectancies. Depending on the component's use, abuse, weather exposure, and mechanical properties, the expected life of any part of a building enclosure can vary considerably.

While a metal roof, such as that installed on the FBO, can conceivably last up to 60 years, finishes are likely to wear and fade much sooner than that. It is prudent to plan for the painting or replacement of metal roofing and exterior siding when fading or environmental damage becomes apparent. Windows in the FBO are fixed and out of range of equipment and people, so their life expectancy should be long as well. Personnel doors and overhead doors are frequently opened and closed, are exposed to harsh weather, are subject to abuse from equipment and vehicles, and are relatively complex, which leads to a shorter life expectancy. Painting of these doors can extend their service life, as long as they are mechanically sound.

Electrical and HVAC systems are often revised or upgraded when new or more efficient technologies become available. The lifespan of these components vary widely.

It is recommended that the FBO building be inspected by airport staff at least once per year, focusing on the physical condition of building components, doors, windows, overhead and hangar doors, lighting, plumbing, and mechanical systems. Special attention should be paid to functionality of components and the integrity of seals and caulking to guard against leaks. Upcoming maintenance expenses for the FBO are likely to include refinishing of the roof, replacement/ refinishing of exterior siding, and painting of the exterior steel doors.

4.7.3 Maintenance and Snow Removal (SRE) Equipment and Storage

In 2004, the City of Elbow Lake purchased the Airport's snow removal equipment. It is for Airport use exclusively, but is stored in an off-site city shed. It would be beneficial and more efficient to have the Airport's equipment on site during the snowy season. In addition, the Airport's gang mower is currently being stored in a T-hangar. If the mower could be stored elsewhere, that space could be rented, adding to the monthly revenue of the Airport.

It is recommended that new grounds keeping equipment, such as a gang mower, loader, and snow removal equipment be purchased near the end of the equipment's useful life.

It is recommended that a 60' x 60' combination Maintenance and Snow Removal Equipment building be constructed to house all the Airport's grounds-keeping equipment. Any equipment paid for by FAA must be stored and used on Airport property and may not be used for any other purpose. It should be carefully located so that any future facility development, safety zones, approach or departure surfaces, or Part 77 surfaces are not negatively impacted.

4.7.4 Ground Support Equipment (GSE) Storage

Ground Support Equipment, such as carts, tugs, auxiliary power units, and mobile stairways are currently stored in the various locations, such as the FBO, MASH hangar, and T-hangars, where they are typically used. Airport staff find this arrangement convenient and see no need to change it.

4.7.5 Airport Security, Perimeter Fencing and Wildlife Hazards

At this time, there is minimal security fencing at Y63, either at the apron or around the perimeter of the airport. The existing fencing includes a short length of chain link fencing between the apron and the more "public" parking area. The fence does not keep automobiles from driving directly on to the apron.

Because Elbow Lake is not a commercial service airport, it is not required to meet the provisions of 49 CFR Part 1542 Airport Security through the development and implementation of a TSA-approved Airport Security Program.

A 5010 letter from Christopher Meyer, a representative of MnDOT, dated July 12, 2016, identifies safety discrepancies at Y63 to be remedied. This includes the completion of a fence to separate the public access route from the aircraft apron. Minnesota public airport licensing rules require that fencing or barriers be constructed to prevent persons not engaged in flight activities from having access to a position of danger with relation to aircraft near building areas and on the flight line or other aircraft movement areas. It was requested that Y63 add additional fencing to prevent unauthorized persons from accessing the apron.

The Minnesota SASP for Intermediate airports, such as Elbow Lake, also recommends full perimeter fencing for security.

It is recommended that the existing apron fencing, which is in good condition, be maintained throughout the planning period using routine maintenance practices. It is also recommended that additional fencing with access gates be provided to comply with MnDOT Office of Aeronautics and Aviation's request. This may include a computerized security access system. As development occurs in the apron area, opportunities should be evaluated for the installation of closed circuit television cameras and computerized controlled access points to protect the safety and security of the traveling public.

Because Elbow Lake is not a commercial service airport, it is not required to meet the provisions of 49 CFR Part 1542, to develop and implement a TSA-approved Airport Security Program.

The Minnesota SASP for Intermediate airports, such as Elbow Lake, recommends full perimeter fencing for security.

In addition, the circulation areas around the Airport buildings lack adequate security lighting. Improved lighting would discourage break-ins of Airport buildings and would improve the overall appearance of safety and security at the airport.

It is recommended that full-cutoff LED wallpack lighting be provided on buildings that are currently underlit on Airport property. Lighting locations must be carefully considered to promote safety and security for people and property on the Airport while avoiding negative impacts such as glare for aircraft operating at night.

The WHSV report and WHMP, found in the appendix, make recommendations for fence construction and maintenance.

The Wildlife Hazard Site Visit (WHSV) Report and Wildlife Hazard Master Plan (WHMP), prepared as part of this effort in 2016, recommends a perimeter fence as an effective deterrent for wildlife to prevent deer or other mammals from entering the operating area which may result in aircraft strikes. The WHSV report and WHMP, which can be found in the appendix of this document, make recommendations for fence construction and maintenance.

Please see the complete Wildlife Hazard Management Plan in the appendix for a complete list of recommendations regarding items such as monitoring, habitat modifications, exclusion measures, wildlife harassment, and depredation.

The FAA's guidance on perimeter wildlife fencing recommends at least an 8-foot chain link fence topped with three strands of barbed wire on outriggers to deter deer. In addition, at least four feet of chain link skirt, buried, attached to the fence base, and sloped away from the outside of the fence at a 45° angle, is recommended to prevent burrowing animals from breeching the bottom of the fence. This guidance can be found in FAA's *CertAlert 04-16*. Fence installation may be eligible for AIP funding if the fence is at least ten feet in height, with three strands of barbed wire at the top and a minimum 3' buried skirt. Note that when installation of chain link fencing is not feasible due to cost or environmental impacts, other types of fencing may be considered.

Also recommended in the WHSV is the removal of the Municipal Brush Dump site, which is an attractant for rodents and the birds of prey which hunt them.

It is recommended that an airport perimeter fence be provided and maintained per the recommendation of the WHSV Report and Wildlife Hazard Master Plan (WHMP). The design and construction of this fencing will need to meet FAA standards to qualify for FAA funding. It is further recommended that the Municipal Brush Dump site be closed and the remaining debris removed and/or buried to discourage wildlife.

Please see the Wildlife Hazard Management Plan, included in the Appendix, for further recommendations regarding control of wildlife hazards.

4.7.6 Airport Access, Parking, and Wayfinding

4.7.6.1 Airport Access

Regional access is from Highway 55, which travels north-south through Elbow Lake. This access serves as the only entrance point to the airport, via Central Avenue/Park Avenue, which becomes Airport Road, running along the north side of Flekkefjord Lake. It is a long and winding road, which can be problematic during heavy snowfall or increased traffic. While there is no requirement for an additional access to the airport, a secondary access point is recommended for emergency situations if the main access road becomes impassable.

Airport Road also provides access to the City brush dump, which is currently directly adjacent to the airport. Once the brush dump, which is a wildlife attractant, is moved away from the airport, there are no other facilities accessed by Airport Road. It could be said that the Airport's "driveway" begins at their property line.

Discussion of this idea with the Airport Board revealed that a secondary access to the airport does exist, as a construction access road built by contractors during the runway paving project. While this road is not paved and is not known to the general public as an access point, it could be used in case of an emergency when the primary access road is unavailable. *Given these influences, it is recommended that this secondary access route be maintained and its location shared with all Airport Board members, Airport/FBO staff, and local emergency personnel for emergency use only.*

Airport Road was first paved in 2006 and is maintained by City staff. *It is recommended that maintenance for this road be completed by the City, including crack sealing and repairs on a biannual basis. A pavement overlay project is recommended for completion in 2026.*

4.7.6.2 Automobile Parking

Existing public automobile parking for Y63 consists of 6 bituminous-paved spaces near the A/D building and 10 gravel-paved spaces near the FBO. These spaces are for the airport and FBO staff, visitors to the airport, and the airport courtesy car. Based on discussions with airport staff, on a general, day-to-day basis, the existing parking is adequate for parking demand.

The Minnesota SASP Minimum Objectives, noted at the beginning of this chapter, recommend that the number of parking spaces provided at Elbow Lake be one space per based aircraft + 25%. Please see Table 4-29 below.

The Minnesota SASP Minimum Objectives recommend that the number of parking spaces provided at Elbow Lake be one space per based aircraft + 25%.

Total Needed Auto Parking Spaces vs. Existing Space Available by Year	Base Year 2016	Phase I 2021	Phase II 2026	Phase III 2036
1 per based aircraft	25	27	30	34
+25% of based aircraft	6	7	8	9
Total recommended parking spaces	31	34	38	43
Existing parking spaces	16	16	16	16
Automobile Parking Deficiency (-)	-15	-18	-22	-27

Table 4-29: GA Terminal and Hangar Automobile Parking Requirements

It is recommended that additional parking areas be developed to meet the expected demands and the requirements of the Minnesota SASP as paving projects are completed throughout the planning period. This includes an automobile parking area at the seaplane base, near the dock. The number of recommended parking spaces will be studied in Chapter 5.

It is further recommended that the gravel parking area north of the FBO be paved to reduce the amount of gravel being drawn across the apron itself by vehicles on the airport property. This lot should also be marked to promote orderly parking and efficient circulation, thereby increasing the available number of automobile parking spaces.

4.7.6.3 Wayfinding

There is little to no wayfinding signage associated with the airport. The only signage for the airport's singular access on Highway 55 is a sign at the junction of Central Avenue/Park Avenue/Airport Road and the highway, and is one sided, facing north, toward town. A new airport visitor approaching from the south would not know they have driven past the access road. In addition, the long and winding access road has no "reinforcing" signage along the path to reassure that the new visitor is indeed driving the right way along the turning, wooded road.

It is recommended that a wayfinding study and improvement project be completed in the near future.

4.7.7 Utilities

The utilities at Y63 include electric power and communications. Natural gas is not available at the site, requiring on-site storage tanks for propane. Water is provided with an on-site well. Sewer service is not available, so septic tanks are used. While all tanks are pumped at this time, the tanks for the FBO and Public Storage hangar are set up for a possible future drain field.

While the well adequately serves the domestic water needs, lack of an appropriate volume of water means that fire sprinkling of future buildings is very difficult and expensive. This issue will create challenges meeting fire protection needs and a road block for constructing buildings and any hangars larger than 12,000 square feet.

It is recommended that a water service evaluation study be completed to ensure that when new facilities are proposed, adequate services are available.

The old, single-phase electrical service is unreliable, leading to occasional power outages which might last for hours, leaving the runway lighting and NAVAIDs non-functional during that period. The airport does not have a dedicated backup generator to ensure that critical safety equipment and lighting is operable during a power outage.

The Sponsor desires to bring 3-phase electrical power to the airport, replacing the single-phase power supply currently in place, installed by the City in the 1970's. The airport manager reports that Y63 experiences power "blinks" approximately once a month, usually during storms. At this time, when power is disrupted for a longer period, the City of Elbow Lake brings its portable generator to the site.

The ADO may find a secondary power supply allowable if the primary power supply is extremely unreliable due to:

- An extensive documented history of cable cuts
- Extraordinary meteorological conditions
- An extensive documented record of commercial utility interruptions

The secondary power supply must be in the form of an electrical service provided by a power company. Generators are not considered secondary electrical power supplies.

Table C-3 of the AIP Handbook lists portable emergency generators as an example of a prohibited project/cost for equipment. Table M-1, "Other Equipment Project Requirements," states that Emergency Generators can be justified if necessary to support lighting on Cat II/III runways and taxiways if the airport is designated as a continuous power airport eligible for fixed generators. Y63 is not designated as such. According to Simon Schmitz, Program Manager, the FAA would need special justification to fund a backup generator for a Non-Primary Airport in Minnesota. Based on Y63's operations and runway category, it is unlikely to meet the requirements for special justification.

It recommended that an electrical power evaluation be completed to identify the feasibility of bringing more reliable three-phase power to the site vs. providing a backup generator for emergency use. These studies are to be used to identify capacity and service deficiencies.

The existing airfield electrical vault was relocated in 2015 and is in good condition. *It is recommended that the vault be maintained throughout the planning period using routine maintenance practices.*

4.7.8 Solid Waste

As a City of Elbow Lake facility, the Airport is responsible to comply with Minnesota Statute Section 115A.02.

As a City of Elbow Lake facility, the Airport is responsible to comply with Minnesota Statute Section 115A.02. This Chapter's goal is to "protect the State's land, air, water, and other natural resources and the public health by improving waste management in the state…" by:

- Reducing the amount and toxicity of waste generated
- Separating and recovering materials and energy from waste
- Reducing the indiscriminate dependence on land waste disposal
- Coordinating solid waste management among political subdivisions (state, county, and city)
- The orderly and deliberate development and financial security of waste facilities, including disposal facilities.

These goals will be achieved through the following methods, in order of preference: waste reduction and reuse, recycling, composting, resource recovery through composting or incineration, and land disposal with or without the creation and retrieval of methane gas.

At this time, Y63 does not have a sustainability plan. Such a plan can help bring the airport into compliance with the statute and yields long-term benefits such as reduced energy consumption, reduced noise impacts, reduced hazardous and solid waste generation, reduced greenhouse gas emissions, improved water quality, improved community relations and cost savings.

The airport's waste generation is small and their recycling and waste disposal processes are simple.

As noted in Section 2.4.7.6 *Solid Waste and Recycling*, the airport's waste generation is small and their recycling and waste disposal processes are simple. Airport staff and all tenants have access to solid waste and recycling opportunities. Solid waste is removed weekly in a dumpster, while recycling for metal and cardboard is provided separately. Hazardous waste, such as waste oil and filters are stored at the FBO and collected quarterly by a local company that uses a waste oil burner for heat. Tires are collected by Dresser Tires. Flammable waste in waste traps is pumped out on an as needed basis by Ness Sanitation.

4.7.8.1 Waste Reduction and Reuse

Minnesota's Waste Management Hierarchy, outlined in the statute, gives preference to waste reduction and reuse. Reducing waste generation, such as by packaging reduction, office paper reduction, composting, and material reuse, reduces the volume of waste requiring land disposal.

Ideas that would benefit waste reductions efforts might be:

- Promoting the use of reusable beverage containers, mugs, and bottles. Provide reusable glass or plastic drinking glasses or coffee mugs for use in the pilot's lounge kitchenette rather than providing disposable cups.
- Provide reusable mugs for Airport and FBO staff.
- Utilize the Grant County Coordinator office to identify potential reuse or proper disposal of site materials and equipment. Options should be explored to reduce solid waste generation through logistical changes, purchasing policies, or recycling efforts for any unique waste materials generated routinely or as part of special construction projects.
- Develop a delivery system for notifications to airport users that employs electronic media, mail, or website notifications rather than paper. Make it easy to submit required forms online on the Airport's website.

Any waste reduction and reuse programs should be evaluated annually with the Grant County Coordinator, who is responsible for solid waste and recycling, to determine if the efforts are adequate, if there have been changes to relevant regulations, and whether changes are needed.

4.7.8.2 Waste Education

Waste Education helps the public to understand why waste reduction and recycling is important and how to accomplish it. The County Coordinator's website (http://www.co.grant.mn.us/474/Coordinator) has several resources available to inform the public about the County's waste reduction and recycling programs.

Ideas to establish and meet waste education goals for the airport might be:

- Prominently display Grant County education resources to promote waste management and recycling activities in airport facilities. Areas of emphasis might be the management and disposal of environmentally dangerous or toxic substances such as antifreeze, tires, vehicle batteries, used oil and filters.
- Establish goals for airport waste abatement and create signs or notifications that identify the goals and how airport users can assist the airport in achieving those goals.

Any waste education programs should be evaluated annually with the Grant County Coordinator, who is responsible for solid waste and recycling, to determine if the efforts are adequate, if there have been changes to relevant regulations, and whether changes are needed.

4.7.8.3 Waste Recycling

The success of any waste management or recycling program rests firmly in the convenience and availability of disposal and recycling facilities for the general public to use. Waste education, described above, outlines the *value* of these efforts.

At this time, Y63 has provides recycling opportunities for cardboard, metal, batteries, tires, and flammable wastes such as oils and oil filters. When bituminous paving of aprons or taxiways are due to be replaced, it can be taken up and recycled as part of the new surface. Existing concrete can be crushed and reused as a substrate for new layers of concrete.

Ideas to establish and meet the convenience and availability goals for waste management facilities at the airport might be:

- Provide prominent and easy access to recycling facilities, especially in the areas where the materials are used. In the A/D building's pilot's lounge, provide recycling bins for metal, plastic, newspaper, glass, and magazines. Be sure that metal and cardboard recycling bins are easily found where they are most likely needed.
- Provide separate waste and recycling bins in areas where people gather or linger, such as outside the A/D building or near the fueling station.
- Provide a centralized storage area for the collection of materials such as fluorescent lamps, electronics, household hazardous waste, used oil and oil filters, tires, vehicle batteries, and household batteries. Provide information to alert airport users to this area, its purpose, and make it accessible to them.
- Arrange for regular removal of all recyclables on a scheduled basis by airport staff to the City's recycling center.

Any waste recycling programs should be evaluated annually with the Grant County Coordinator, who is responsible for solid waste and recycling, to determine if the efforts are adequate, if there have been changes to relevant regulations, and whether changes are needed.

4 | Section 8 – Airport Property, Acquisition, and Easements

Y63 currently encompasses over 217 acres. Of these areas, over 178 are owned in fee, and approximately 38.67 acres are held in avigation easements. For further information, see the property descriptions in the Appendix and the Exhibit A Property Map contained in the ALP (also included in the Appendix).

Adequate property should be acquired to provide for the construction of the Ultimate Runway 14/32. This area must include the limits of the Building Restriction Line (BRL) as well as the RSA, RPZ and Clear Zones.

The FAA requires that the airport have sufficient control of the runway approach, which is usually accomplished through purchase of the entire RPZ.

MnDOT's Policy Statement No. 1, *Clear Zone Requirements,* includes diagrams which illustrate the required clear area for airports depending on aircraft served, landing aids available, and approach minimums which are planned or established. These dimensions are described in Section 4.5.1.11 of this Chapter. The Policy also states: "The actual property interests to be acquired will be determined upon consideration of land lines, availability of the property, severance, and other factors affecting compatible land use of the area surrounding the airport…. Exceptions to this policy may be made in the case of routine maintenance projects, emergency, terrain limitations, unusual cost, or other consideration for the safety and convenience of the public as determined by the Commissioner of Transportation."

MnDOT's requirements for land use zoning requirements, applicable to all public use airports, are found in the MnDOT Aeronautical Rules, Chapter 8800.

Airport property, as described in a grant or the Exhibit A Property Map, is considered "dedicated" property for airport purposes only, and subject to FAA Airport Sponsor Grant Assurances. These Assurances require Sponsors to hold good title to the property, preserve all rights and powers, ensure compatible land uses of the property, and to keep an updated ALP showing airport boundaries, existing and proposed airport facilities, and the location of existing and proposed non-aeronautical use areas. Any non-aeronautical uses on the property are considered encumbrances. Some of these encumbrances are recorded and official; others may be "unrecorded," akin to a handshake between individuals for the use of the property, such as providing access to another person's property or for recreational use. Research of Airport property records revealed a number of both recorded and unrecorded encumbrances, which are others' rights to use airport property, which are described below.

Please note that a boundary survey was not performed as part of this research and is typically not eligible for federal funding. All parcel lines and airport boundaries shown in the Master Plan and ALP are taken from Grant County GIS information. They are not guaranteed to exact, but are shown for reference only.

It is recommended that the Airport conduct a boundary survey to determine actual property lines. If additional encumbrances are found, it is recommended the Airport prepare and file the necessary easement documents for the these and the other items listed below.

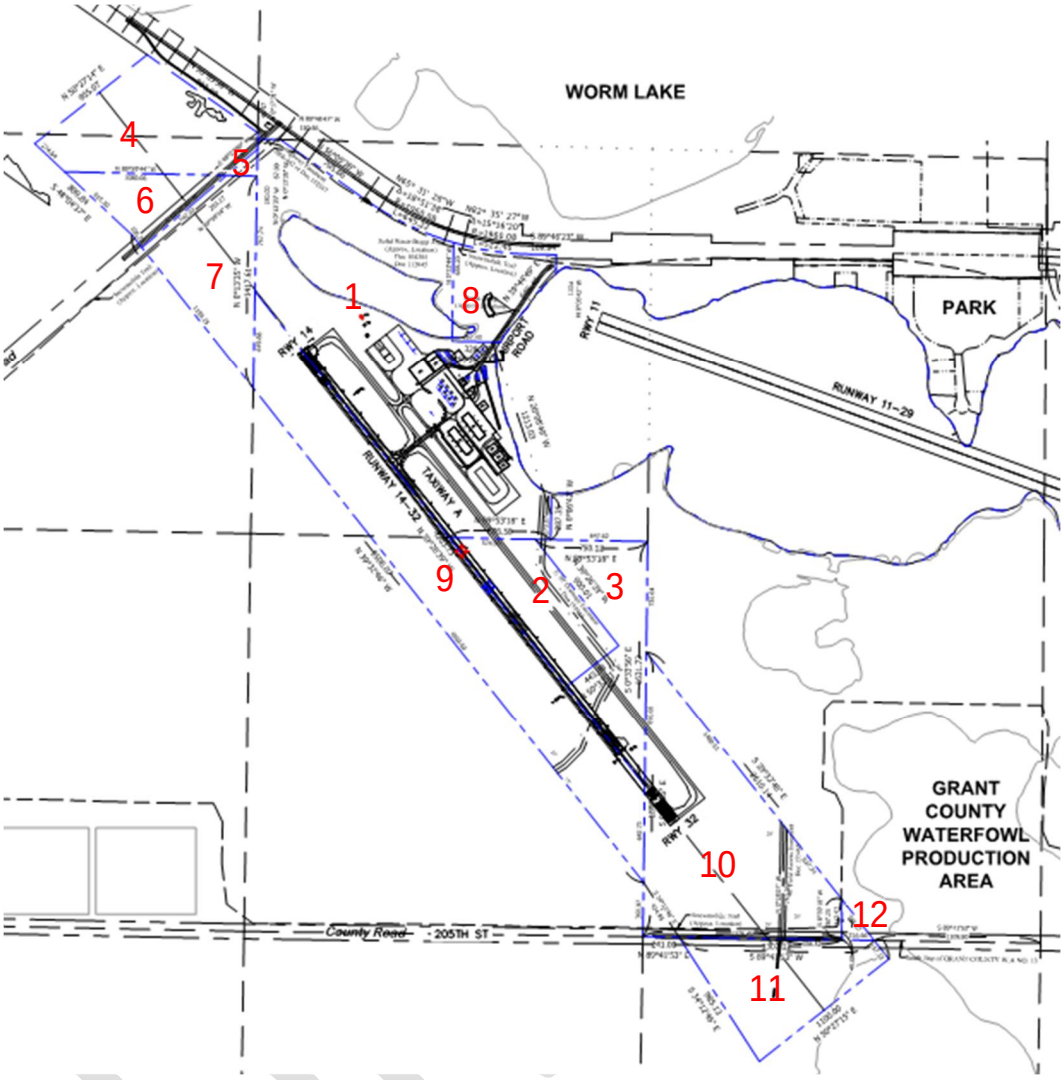


Figure 4-30: Airport Parcels

4.8.1 Recorded Encumbrances

Airport Parcel #1: Abandoned Solid Waste Dump. This disposal site for household and demolition materials was closed in 1973. The site is estimated to be approximately 3 acres in size and 3 feet deep. *Since the Solid Waste Dump is closed/abandoned, on airport property, and is a non-aeronautical use of airport land, it is recommended that Y63 secure a release of this easement.*

Airport Parcel #1: Abandoned Solid Waste Dump. This disposal site for household and demolition materials was closed in 1981. The site is estimated to be approximately 3 acres in size and 3 feet deep. *Since the Solid Waste Dump is closed/abandoned, on airport property, and is a non-aeronautical use of airport land, it is recommended that Y63 secure a release of this easement.*

Airport Parcel #1: ROW Easement for County Road 1. A Right of Way (ROW) easement for County Road 1, northwest of Parcel 1, was found in the property search, with Grant County as the Encumbrance Holder. County Road 1 crosses the northwest portion of the airport property. *As a road ROW is a non-aeronautical use of airport land, it is recommended that Y63 seek approval from FAA for a concurrent land use.* The roadway easement does not interfere with aeronautical use, and the land continues to serve its aeronautical purpose (aviation development) while also allowing the non-aeronautical use (ROW easement). In addition, this road benefits Y63 by providing access to the airport.

Airport Parcel #10: 40' Access Easement. A 40-foot wide farm field access easement to the owner of Government Lot 4 in the SW Quarter of the SE Quarter of Section 17, Township 129 North, Range 42 West. The access is granted as a perpetual easement for ingress and egress only to the property for agricultural purposes. The City has no obligation to the maintenance of this access easement. *As an access easement is a non-aeronautical use of airport land, it is recommended that Y63 seek approval from FAA for a concurrent land use.* The easement does not interfere with the aeronautical use, and the land continues to serve its aeronautical purpose (aviation development) while also allowing the non-aeronautical use (access easement). If in the future Runway 14/32 is extended to the southeast, this access easement will need to be moved outside of the Ultimate RPZ or eliminated.

Airport Parcel #1, 2, 3, and 9: 50' Drainage Easement. A 50-foot wide permanent easement for drainage, for the benefit of the owner of the SW Quarter of Section 17, Township 129 North, Range 42 West. The City is responsible to maintain the existing open drainage way and tile line along the easement to maintain free flow of water. Under no circumstances shall the City obstruct or impede the flow of surface water to its intended outlet. At this time, the open ditch drains in a culvert under the south end of Runway 32, then heads north and west to Flekkefjord Lake in a tile line. *As a drainage easement is a non-aeronautical use of airport land, it is recommended that Y63 seek approval from FAA for a concurrent land use.* The easement does not interfere with the aeronautical use, and the land continues to serve its aeronautical purpose (aviation development) while also allowing the non-aeronautical use (drainage easement). This easement would need to be reviewed with any expected future or Ultimate development for taxiways, aprons, or buildings.

4.8.2 Unrecorded Encumbrances

Airport Parcel #5: Assumed 120' ROW Easement for County Road 1. A Right of Way (ROW) easement for County Road 1, northwest of Parcel 5, was not found in the property search. County Road 1 appears to cross over the northwesterly line of the airport property a distance of approximately 60 feet. It is likely a ROW easement exists by prescription for this road. *As a road ROW is a non-aeronautical use of airport land, it is recommended that Y63 seek approval from FAA for a*

concurrent land use. The roadway easement does not interfere with aeronautical use, and the land continues to serve its aeronautical purpose (aviation development) while also allowing the non-aeronautical use (ROW easement). In addition, this road benefits Y63 by providing access to the airport.

Airport Parcel #7: Assumed 120' ROW Easement for County Road 1. A Right of Way (ROW) easement for County Road 1, northwest of Parcel 7, was not found in the property search. County Road 1 appears to cross over the northwesterly line of the airport property a distance of approximately 60 feet. It is likely a ROW easement exists by prescription for this road. *As a road ROW is a non-aeronautical use of airport land, it is recommended that Y63 seek approval from FAA for a concurrent land use.* The roadway easement does not interfere with aeronautical use, and the land continues to serve its aeronautical purpose (aviation development) while also allowing the non-aeronautical use (ROW easement). In addition, this road benefits Y63 by providing access to the airport.

Airport Parcel #8: City Brush Dump. The existing brush dump is currently located along the Airport's driveway. It has been identified in the Wildlife Hazard Site Visit report as a wildlife attractant. *It is recommended that the brush dump be removed and replaced on a new City site, remote from the airport, eliminating the attractant and the encumbrance.*

Airport Parcel #10: Assumed 100' ROW Easement for County Road 25. A Right of Way (ROW) easement for County Road 25, south of Parcel 10, was not found in the property search. County Road 25 appears to cross over the southerly line of the airport property a distance of approximately 50 feet. It is likely a ROW easement exists by prescription for this road. *As a road ROW is a non-aeronautical use of airport land, it is recommended that Y63 seek approval from FAA for a concurrent land use.* The roadway easement does not interfere with aeronautical use, and the land continues to serve its aeronautical purpose (aviation development) while also allowing the non-aeronautical use (ROW easement). In addition, this road benefits Y63 by providing access to the airport. If in the future Runway 14/32 is extended to the southeast, County Road 25 will need to be moved outside of the Ultimate RPZ.

Airport Parcels #1, 7, 8, and 10: Snowmobile Trail. Low Plains Drifter Snowmobile Trail, which follows in or near the ROW of County Roads 1 and 25 and the Soo Railroad. This trail is registered as Trail #94 on the MN Department of Natural Resources Interactive Snowmobile Trails web page. The contact for this trail is Drew Mossberg, (218) 770-1544. As a snowmobile trail is a non-aeronautical use of airport land, it is recommended that Y63 seek approval from FAA for a concurrent land use. As there are no above-ground features of the trail on airport property, the trail does not interfere with aeronautical use, and the land continues to serve its aeronautical purpose (aviation development) while also allowing the non-aeronautical use (snowmobile trail easement). If in the future Runway 14/32 is extended to the southeast, County Road 25 and the snowmobile trail will need to be moved outside of the Ultimate RPZ.

4.8.3 Concurrent Use Agreements

FAA approval is required to allow a non-aeronautical use of airport property. Some of the recommendations above suggest the Airport seek approval from FAA for a Concurrent Use. This designation can identify a compatible land use, meeting Grant Assurance #21, specifying that the land is to remain in use for its primary aeronautical purpose but also used for a revenue-producing non-aeronautical reason. For instance, land needed for approach surfaces might also be used for agricultural purposes that generate revenue for the airport. Any revenue received by the airport for a concurrent use should be based on fair market rent, per Grant Assurance #25.

A Concurrent Use Agreement means that a piece of airport property can be used for more than one purpose at a time, both aeronautical and non-aeronautical. Concurrent Use requires FAA approval, but the land is not required to be formally released – it still belongs to the airport.

Any release, modification, reformation or amendment of an airport agreement between the airport owner and the United States must be based on a request made in writing and signed by a duly authorized official of the public agency that owns the airport with full concurrence of the airport owner. Evidence of such authorization must accompany the request. The FAA is not required to grant a land release or approve concurrent use. As described in Chapter 22 of Order 5190.6B, *FAA Airport Compliance Manual*, for a concurrent use request to the FAA, the Airport Sponsor will need:

- A cover letter describing the purpose for which the land was originally purchased, that the proposed use will not interfere with the original use, and explain the benefits of the proposed concurrent use;
- Plat of the lease with a boundary description;
- Summary Appraisal that includes a statement of fair market rent;
- Draft copy of the lease agreement;
- Copy of letter approving the airspace study; and
- National Environmental Policy Act (NEPA) Clearance.

4 | Section 9 – Facility Requirements Summary

This chapter presents the necessary facility requirements for the continued development of Y63 predicated on the existing and forecasted aviation demand developed in Chapter 3, Standards presented in FAA Advisory Circular 150/5300-13A, *Airport Design*, Fundamental Airfield Development Criteria, determination of the existing and future design aircraft for Y63, and the goals and objectives of the Airport Board. These requirements are needed to satisfy the short- and long-range aviation needs of the Elbow Lake area. Recommendations contained herein are intended to optimize the operational efficiency, effectiveness, flexibility, and safety of Y63 throughout the planning period. Chapter 5, *Identification and Evaluation of Alternatives,* will discuss and illustrate the optimum size and timing of the facility development that is most appropriate to accommodate the facility requirements. Prior to construction, projects will require an environmental evaluation per the National Environmental Policy Act (NEPA) regulations. Initial phasing for each recommended project, including demand-based development, is presented in Table 4-31. Each item will be presented and discussed further in Chapter 5.

Phase	Project Description	Triggering Event
I	Obstruction Removal	MnDOT Requirement
I	Update Zoning	MnDOT Requirement
I	Security Fence at Entrance	MnDOT Requirement
I	Rehab A/D Building Roof/Siding	Regular Building Maintenance
I	Paving Parking Lot at FBO	Improve Surface of Adjacent Aprons
I	Remove Brush Dump Site	Reduction of Wildlife on Airport Grounds
I	Runway Crack-Slurry Seal	Regular Maintenance
I	Seaplane Base Ramp/Parking/Apron	Basic Facilities for Seaplane Base
I	Expand Apron toward Runway (SW) and Rehab Existing Apron as Needed	Improve Circulation and Parking on Apron
I	Site Security Lighting	Improve Security on Airport Grounds
I	Update Beacon	Non-Compliant Beacon
I	Relocate Helipad	Improve Safety of Traffic and Circulation
I	3-phase Electrical Service	Security/Consistency of Electrical Service to Critical Airport Infrastructure
I	Paint Compass Rose	Assistance to Pilots
I	Partial Parallel Taxiway	Recommended by Section 405 of AC 150/5300-13A
I	Grading/sitework for T-hangar and Apron	Prep for next year's Apron /T-hangar
I	Expand Apron behind MASH w/tiedowns (NW)	To meet growing demand
II	Maintenance Equip – Loader for Snow	Expected replacement
II	8-Unit T-Hangar	Meet demand for aircraft storage
II	Expand Apron SE	Around new T-Hangar
II	Maintenance Equip – Mower and Attachments	Expected Replacement
II	Wayfinding Signage/Vintage Aircraft	Marketing for Airport
II	Demo Old T-Hangar and Replace	Existing Building Replacement
II	Maintenance/SRE Building	Allow airport equipment to be kept on site
II	FBO Improvements (roofing, siding, door painting)	Required Maintenance
III	Acquisition of property/easements in RSA and RPZ of Ultimate Runway 14/32	In preparation for future ultimate runway length/width
III	Environmental Assessment for Runway Extension	In preparation for future ultimate runway length/width
III	Runway Rehab, Length/Width and new LED Runway Lighting	75' width required by SASP. Improvement for reliability, energy use, and reduced maintenance
III	Airport Road Improvement	Expected Maintenance
III	Updated Fuel System	Expected Maintenance
III	Airport Perimeter Wildlife Fencing	Wildlife Site Visit recommendation
III	Update Master Plan	Required by FAA
Beyond	Replace siding/roofing on 2006 T-hangar	Required Maintenance

Table 4-31: Project Priorities