3. Facility Requirements

3.1. Introduction

Facilities at an airport are planned and developed to serve specific aircraft operations forecast over the 20-year planning horizon. These aircraft are defined by the approach (landing) speed, wingspan, and weight through the use of AAC and ADG, as discussed in Section 2.8, and taxiway design group (TDG), as defined in *FAA AC 150/5300-13B: Airport Design*. For runways, the visibility minimums of instrument approaches are also considered, resulting in the runway design code (RDC). The following sections use the FAA design criteria with data from the inventory, including interviews with airport staff, air traffic control, and tenants, and forecast chapters to identify facility improvements at VRB to be assessed further in the alternatives analysis.

In addition, VRB has a Title 14 CFR Part 139 Airport Operating Certificate. Part 139 certification includes annual inspections of the airfield and airport facilities and required documentation by the FAA. Any Part 139 requirements for applicable portions of the airport will be considered in this facility requirements analysis.

The facility requirements analysis begins with the runways because they are the most demanding and critical infrastructure on the airport, followed by airside and landside facilities that facilitate the movement and support services for aircraft.

3.2. Planning Activity Levels

While the aviation forecast summarized in Table 2.3 uses time periods, the level of activity within each period can also be considered as a planning activity level (PAL). This means that whether the activity projected by 2028 occurs in three, five, or eight years, the important element is to have a plan to meet that activity level. Therefore, the 2023 forecast should be considered the short-term PAL, the 2033 forecast the intermediate PAL, and the 2043 the long-term PAL. This results in the projected based aircraft and operations, as shown in **Table 3.1.** Because the commercial passenger service operator has been at VRB for less than one year at the time of this analysis, and while the enplanement levels are in the table below for reference, it recommended that passenger enplanement levels be used rather than PAL for the passenger facility.

TABLE 3.1: SUMMARY OF AVIATION ACTIVITY FORECASTS BY PAL

	Forecast		
	Short-Term PAL	Intermediate-Term PAL	Long-Term PAL
Based Aircraft			
Single-Engine	167	183	227
Multi-Engine (piston & turboprop)	42	45	53
Jet	23	31	42
Rotorcraft	5	7	12
Total	**237**	**266**	**334**
Annual Operations			
Total	**218,300**	**267,900**	**307,900**
Passenger Enplanements			
Total	38,400	43,400	55,500

Source: ESA, 2023.

3.3. Runway Orientation

Aircraft land and take off into the wind to have the highest airspeed for the lowest ground speed. Thus, wind influences the runway orientation and the number of runways needed to meet the FAA standard of 95% wind coverage. This means that 95% of the time, the crosswind does not exceed the demonstrated crosswind component (design capability) for the aircraft.

Ideally, a runway should be aligned with the prevailing wind. Prevailing winds blow predominantly from one general direction. Wind conditions affect all airplanes in varying degrees, with small aircraft more sensitive to crosswinds.

Previously shown in Table 1.7 are the crosswind components for the ARCs of the aircraft using VRB in varying weather conditions. The primary runway orientation provides the most wind coverage. However, for the ARC A/B-I and A/B-II (10.5 and 13 knots) using VRB, the primary runway, 12R/30L, does not provide 95% wind coverage. Therefore, a crosswind runway is justified at VRB to serve at least these aircraft. Runway 4/22 is the crosswind runway and, combined with the primary runway, provides at least 95% wind coverage for all aircraft operating at VRB.

3.4. Runway Designation

Runways are numbered by their magnetic heading rounded to the nearest 10 degrees. When there are parallel runways, the designation of left (L) or right (R) is added. Magnetic variation, also referred to as declination, is the difference between true north and magnetic north. This variation shifts a little each year, with the west variation continuing to increase to the west. At VRB, the magnetic variation is 7°15’ west.

The true heading of Runway 12R/30L is 110° 36’ 7.26”. Adding the magnetic variation and rounding to the nearest degree results in a magnetic heading of 118° and 298°. Rounded to the nearest 10 degrees results in Runway 12R/30L. With a shift of 0°4.8’ per year, no redesignation of this runway is needed in the planning period.

The true heading of Runway 12L/30R is 110° 51’ 20.03”. Adding the magnetic variation and rounding to the nearest degree results in a magnetic heading of 118° and 298°. Rounded to the nearest 10 degrees results in Runway 12L/30R. With a shift of 0°4.8’ per year, no redesignation of this runway is needed in the planning period.

The true bearing of Runway 4/22 is N 36° 10’ 45.77” E. Adding the magnetic variation and rounding to the nearest degree results in a magnetic heading of the crosswind runway is 43° and 223°. This runway is designated as 4/22. With a shift of 0°4.8’ per year, a redesignation of the runway will be needed in about 20 years.

3.5. Airfield Capacity

Airfield capacity is the maximum number of aircraft operations that an airport can support with reasonable levels of delay. VRB’s airfield capacity calculations were prepared in accordance with *FAA AC 150/5060-5, Change 2: Airport Capacity and Delay*. Methodologies from this AC were used to calculate the annual service volume (ASV) of the airfield. These calculations consider the airfield geometry, operational, and meteorological characteristics at VRB.

Mix Index

The percentage of large aircraft — those with a maximum takeoff weight of 12,500 pounds or more — operating at an airport influences its capacity. Large aircraft require more separation from smaller aircraft due to wake turbulence. This reduces the capacity of an airport. The mix index for ASV is C+3D. A and B aircraft are less than 12,500 pounds and do not impact the mix index. C aircraft are12,500 pounds up to 300,000 pounds. D aircraft are more than 300,000 pounds. There are no D aircraft operating at VRB. All the aircraft operating at VRB other than A and B (single-engine and multi-engine piston aircraft) are C aircraft. C aircraft are 18.8% of the VRB operations in the base year of 2022. This rises to 23% in 20 years. As the mix index increases, the ASV will decline due to a higher proportion of larger aircraft operations.

Airfield Configuration

At VRB, the preferred operational configuration is to use the parallel runways 12L/30R and 12R/30L because this provides the highest capacity. Runway 12L/30R is limited to small aircraft only. This configuration is used, unless the wind direction and speed requires the use of the crosswind runway. Typically, when the crosswind runway is in use, almost all the aircraft operations are on Runway 4/22, unless an aircraft requires a longer runway length that is only available on the primary runway. For purposes of calculating the ASV, it was assumed that VRB will operate on the parallel runways or the crosswind runway. Using the wind coverage data, there is an average of 5% of the time that the 10.5-knot and 13-knot crosswind component is exceeded on the parallel runways. Therefore, it was assumed that about 5% of the time, operations at VRB are on Runway 4/22.

Weather Conditions

Using the wind data, the IFR observations are about 10% of the all-weather observations. Therefore, about 10% of the time, it was assumed that VRB is in IFR conditions. While VRB has an ATCT, it is a nonradar tower for IFR flights because the tower needs to call approach control to obtain a clearance. Also, VRB does not have an instrument landing system, so the ASV calculations were based on nonradar IFR operations. Poor visibility and ceiling conditions of less than 500 feet and visibility less than one mile are limited at VRB, so they were not addressed separately in the ASV calculations but included as part of the percentage of IFR conditions.

Touch-and-Go, Percentage of Arrivals, and Exit Taxiways

Depending on the airfield configuration, other factors in the tables in *FAA AC 150/5060-5* take into consideration the percentage of touch-and-go operations, the percentage of arrivals, and the location of exit taxiways. When all the operations are on Runway 4/22, the percentage of touch-and-go operations was assumed to be 21 to 30%, with VRB's mix index between 0 and 40. The arrivals and departures are assumed to be 50% each. A percentage other than 50% is common at commercial service airports with arrival and departure peak hours. When Runways 4/22 and 12R/30L (IFR) are operating as a single runway, they each have two exit taxiways within the desirable distance.

Annual Service Volume

The baseline annual operations, peak month, and average day in peak month are also used in the ASV calculations. The resulting base year ASV is 203,300 annual operations. **Appendix F** contains the calculations. VRB's base year operations are 65.8% of the ASV. The FAA recommends planning for additional capacity when an airport is operating at approximately 60% of its ASV and implementing capacity enhancements when it is at 80% of its ASV. Also, per Table G-1 in *FAA Order 5100.38D, Change 1: Airport Improvement Program Handbook*, a secondary runway that is not a crosswind runway is eligible for federal funding, when the primary runway or primary runway and secondary runway is operating at 60% of its capacity. Therefore, the parallel runway 12L/30R at VRB should be considered a secondary runway and eligible for federal funding.

Historical operations were almost as high as the ASV in 2019 at 201,644. By the end of the planning period in 2043, the forecast operations at VRB are 307,900 and will exceed the ASV by 104,600 operations. This will result in increasing delays. If delay increases at VRB, because many of the operations are training operations, some may shift to using other local airports to avoid the delay. Opportunities to increase the efficiency of the airfield should be considered.

Taxiway Considerations

Each of the runways at VRB is served by a full-length parallel taxiway on one side of the runway. When there is development on both sides of the runway, a full-length parallel taxiway on each side would reduce runway crossings, thereby enhancing airport safety, and increase the available runway capacity. The alternatives analysis should consider the development of additional full-length parallel taxiways. Also, opportunities to develop bypass taxiways near the ends of runways should be considered, so if an aircraft is holding for a flight plan clearance, others can still depart, improving the utilization of the runway. The location and alignment of connector taxiways should be considered. Also, the location and use of engine run-up pads near runway ends should be reviewed to make sure they are supporting efficient airfield operations and maximizing the developable areas on the airport.

3.6. Runway Requirements

There are multiple factors that are considered for a runway, ranging from the physical length and width of the runway to the required runway safety areas. Each of the factors to be considered for a runway are described in this section and will be applied to each of the runways at VRB.

Runway Length and Width

The required runway length is based on the requirements of aircraft operations. Multiple variables are considered when a pilot identifies if a runway has a suitable length for landing or departing. These variables include runway elevation, slope, condition (wet or dry), wind speed and direction, aircraft weight, and outside temperature.

The FAA provides runway length requirements in *FAA AC 150/5325-4B: Runway Length Requirements for Airport Design*, but recommends the use of aircraft manufacturer operating manuals, especially for larger aircraft. General runway length guidance from aircraft manufacturers is published for a standard day (15°C/59°F, pressure 29.92 inches) at sea level with no wind. The aircraft operating manual provides the data to adjust for varying conditions. Ideally, runways are planned to allow unconstrained operations by critical aircraft. However, physical constraints on or around the airport may limit the length available, in which case pilots must reduce the aircraft takeoff or landing weights to allow for operations on the available runway length.

The FAA specifies the required runway width and the runway shoulder width, based on the ARC of the critical aircraft. The FAA also specifies the allowable grade and grade changes along the length of the runway, based on the ARC of the critical aircraft. These standards also require a clear line of sight along the length of the runway.

Runway Safety Area

The FAA defines the runway safety area (RSA) as "a defined area surrounding the runway consisting of a prepared surface suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from the runway."[21] The RSA also provides greater accessibility for ARFF equipment if an aircraft leaves the runway pavement. As a prepared surface, there are specific grading requirements associated with the RSA based on the ARC of the critical aircraft. The only items allowed within the RSA are navigational aids fixed by function, such as runway lights. Any objects within the RSA must be frangible, such that they break away if struck by an aircraft.

Runway Object Free Area

The FAA defines the runway object free area (ROFA) as "a clear area limited to equipment necessary for air and ground navigation, and provides wingtip protection in the event of an aircraft excursion from the runway."[22] Similar to a RSA, any equipment within the ROFA must be frangible. The ROFA does not have grading requirements, but the terrain cannot be higher than the nearest point of the RSA for half the wingspan of the most demanding aircraft of the RDC.

[21] *FAA AC 150/5300-13B: Airport Design*, dated March 31, 2022.
[22] *FAA AC 150/5300-13B: Airport Design*, dated March 31, 2022.

Runway Obstacle Free Zone

The FAA definition of the runway obstacle free zone (ROFZ) is "a defined volume of airspace centered on the runway centerline, whose base elevation is that of the highest runway elevation at that particular location".[23] The ROFZ extends 200 feet beyond each end of the runway. The width of the ROFZ varies, based on the size of the aircraft using the runway. For runways with approach lighting systems, there is an OFZ that extends beyond the runway to protect the approach lighting system. While the ROFZ overlaps the RSA and ROFA, the RSA and ROFA are surfaces on the ground, whereas the ROFZ applies to the airspace above the ground.

Runway Protection Zone

The runway protection zone (RPZ) is a trapezoidal shape beyond the end of each runway to protect people and property on the ground. The RPZ starts 200 feet from the runway threshold. The size of the RPZ is determined by the critical aircraft and visibility minimums associated with each runway end. The FAA recommends that an airport have property interest within the limits of RPZs. The preferred property interest is fee simple, but if the land cannot be acquired, an avigation easement to control object height and land use within an RPZ is acceptable. The goal is for the RPZ to be clear of any incompatible land use or activities and remain that way.

Runway Visibility Zone and Line of Sight

For airports without an ATCT or with a part-time ATCT, such as VRB, the FAA requires an area between intersecting runways, the runway visibility zone (RVZ), to be clear to avoid blocking the view of pilots to an intersecting runway. The FAA specifies the size of the RVZ based on the location of the intersection from the end of the runway. The FAA also has recommended standards for runways that converge but do not intersect, e.g., the extended runway centerlines intersect but the runway pavement does not.

Also, the FAA requires a clear line of sight along the length of the runway. For runways with a full-length parallel taxiway, such as at VRB, any point 5 feet above the runway centerline needs to be visible to any other point 5 feet above runway centerline, for a distance of half the length of the runway.

Declared Distances

When an object is off the end of a runway within the RSA or ROFA or penetrates the approach or departure path and cannot be removed, the FAA provides an alternate means to meet the design standards. These standards are known as declared distances. With declared distances, each takeoff and landing operation on the runway is considered separately, and the portion of the runway available for that operation is identified. With declared distances for some operations, the available runway length is less than the physical length of the runway pavement to provide the standard RSA or ROFA beyond the declared runway end or a clear approach or departure surface.

The takeoff and landing operations under declared distances are divided into four operations: landing distance available (LDA), accelerate-stop distance available (ASDA), takeoff run available (TORA), and takeoff distance available (TODA).

[23] *FAA AC 150/5300-13B: Airport Design*, dated March 31, 2022.

Pavement Strength and Condition

The required pavement strength is dictated by the weight and frequency of the critical aircraft operating on the runway. The strength of the runways required at VRB will vary with the critical aircraft for each runway. For runways used by jet aircraft, the pavement may be grooved, which is a benefit in wet conditions. An aircraft classification number (ACN) and pavement classification number (PCN), recently updated to aircraft classification rating (ACR) and pavement classification rating (PCR), is an international method for identify pavement strength. If the ACR is less than the PCR, an aircraft can use the pavement. Some airports still publish pavement ratings by MTOW and gear configuration.

Instrument Approaches, Navigational Aids, and Lighting Systems

Instrument Approaches

To enhance the utility of a runway in poor weather conditions, an instrument approach procedure may be developed and published for the runway. An instrument approach is a set of maneuvers for an aircraft operating under instrument flight rules to transition to the start of the approach and to a landing. Runways without an instrument approach are considered visual runways, because the pilot lands using only visual references.

Navigational Aids

There are two categories of navaids: those that serve a specific runway and those that serve the overall airport. Runway navaids include items such as precision approach path indicators (PAPIs), runway end identifier lights (REILs), approach lights, and instrument landing systems. Airport navaids are items such as primary wind cones and airport beacons. While not a navaid, an automated weather systems is an airport system that supports instrument approaches by providing real-time weather conditions. **Table 3.2** summarized the navaids at VRB.

TABLE 3.2: SUMMARY OF NAVAIDS AT VRB

Item Description	Owner	LED/Incandescent
Airport Navaids		
Airport Beacon	Airport	Incandescent
Segmented Circle (Lighted)	Airport	Incandescent
Primary Wind Cone	Airport	Incandescent
Runway Navaids		
Runway 12R/30L PAPIs	12R: FAA; 30L: FAA	12R: LED; 30L: LED
Runway 12R/30L REILs	12R: Airport; 30L: FAA	12R: LED; 30L: LED
Runway 4/22 PAPIs	4: FAA; 22: Airport	4: LED; 22: Incandescent
Runway 4/22 REILs	4: Airport; 22: Airport	4: Incandescent; 22: Incandescent
Runway 12L/30R PAPIs	12L: Airport; 30R: Airport	12L: Incandescent; 30R: Incandescent

Lighting

Edge lighting of various intensities is used to mark the edges of runways and taxiways at night and in poor visibility. Medium intensity is the most common type of lighting. PAPIs, REILs, and approach lights provide visual guidance to landing pilots. Approach lighting systems start at the landing threshold and extend into the approach 1,400 to 2,400 feet. The FAA has six approved types of approach lighting systems for runways with precision and nonprecision approaches, with the applicable type of system varying with the type of instrument approach. In addition to enhancing, identifying, and aligning with the runway, if a pilot on an instrument approach can identify the approach lighting system, they are allowed to descend below the minimum descent altitude or decision height to 100 feet above the threshold elevation. To go lower to land, the pilot must see other items in the runway environment. There are no approach lighting systems at VRB.

Approach and Departure Surfaces

In addition to establishing standards for the area around the runway, the FAA has established standards for the approach and departure surfaces off the ends of the runway. There are two documents used to define the approach and departure surfaces:

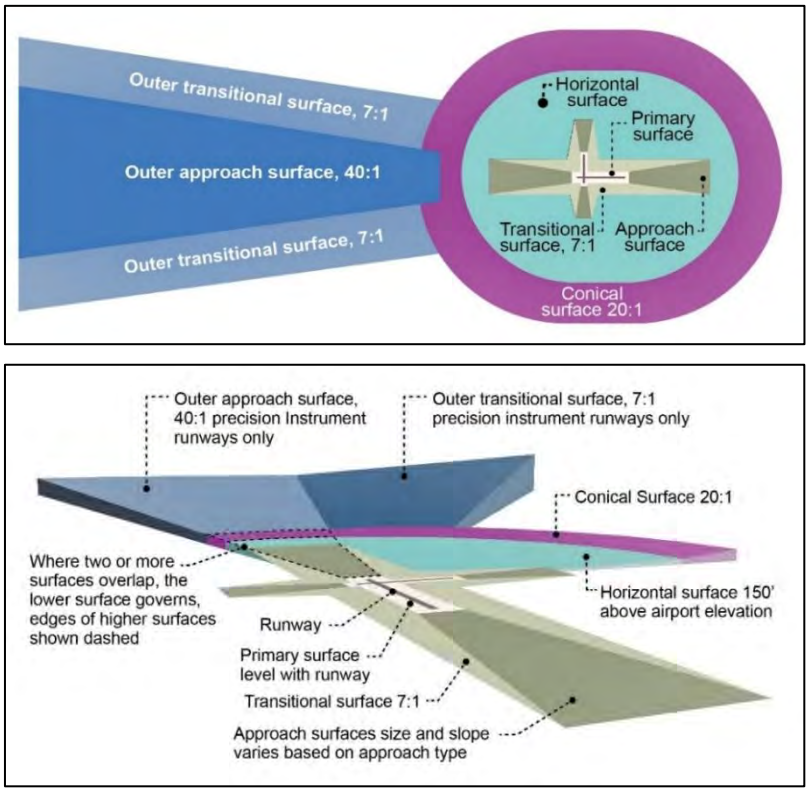
- *Title 14 CFR Part 77* (otherwise known as Federal Aviation Regulations [FAR] Part 77)*: Safe, Efficient Use and Preservation of Navigable Airspace,* establishes the notice requirements for certain proposed construction or alteration of structures, defines the standards for obstructions to air navigation, and details the process for studying potential obstructions to air navigation to determine the effect on the safe and efficient use of navigable airspace.
- *FAA AC 150/5300-13B* provides dimensional standards for threshold siting surfaces and instrument departure surfaces.

The FAA also uses *FAA Order 8260.3E: United States Standard for Terminal Instrument Procedures (TERPS)* to design instrument approaches, which have obstacle clearance requirements. The TERPs surfaces near an airport are generally represented by the surfaces in FAA AC 150/5300-13B.

14 CFR Part 77 Surfaces

14 CFR Part 77 defines the standards used in determining obstructions and hazards to air navigation. Obstructions are objects that penetrate the imaginary airspace surfaces surrounding an airport and can be a hazard to air navigation, unless an airspace study shows otherwise. Imaginary surfaces include the primary, approach, transitional, horizontal, and conical surfaces, as shown on **Figure 3.1**.

FIGURE 3.1: TITLE 14 CFR PART 77 SURFACES



Primary Surface

The primary surface is an area around the runway that cannot exceed the runway elevation. The primary surface width is determined by the critical aircraft size and approach visibility minimums. If there are different visibility minimums to each runway end, the runway end with the largest primary surface requirement controls the primary surface width for the entire runway.

Horizontal Surface

The horizontal surface protects aircraft operations in the vicinity of the airport. The horizontal surface is 150 feet above the airport elevation, which is the highest elevation on a runway. The radius of the horizontal surface from the end of the primary surface off each runway end is 10,000 feet for runways, other than utility runways with nonprecision approaches, and 5,000 feet for utility visual runway ends. The horizontal surface arcs from the center of primary surface off each runway end and are connected by tangent lines to close the surface.

Transitional Surface

The transitional surface extends outward and upward, from the sides of the primary surface and the approach surfaces at a 7:1 slope up to the horizontal surface.

Conical Surface

The conical surface extends upward and outward from the edge of the horizontal surface for 4,000 feet at a 20:1 slope.

Approach Surface

The approaches at VRB under 14 CFR Part 77 are classified as nonprecision or visual. The 14 CFR Part 77 approach surface for nonprecision instrument runways with visibility minimums as low as 3/4 of a mile has an inner width equal to the primary surface of 1,000 feet and extends 10,000 feet, beginning 200 feet from the runway end, with an outer width of 4,000 feet at a slope of 34:1.

Nonprecision instrument runways with visibility minimums greater than 3/4 of a mile have an inner width of 500 feet. The approach surface extends 10,000 feet, beginning 200 feet from the runway end, with an outer width of 3,500 feet at a slope of 34:1.

For utility runways with visual approaches, the approach surfaces have an inner width of 250 feet. The approach surface extends 5,000 feet, beginning 200 feet from the runway end, with an outer width of 1,250 feet at a slope of 20:1.

If a precision approach is considered as a future improvement, it has an inner width of 1,000 feet. The approach surface extends 50,000 feet, beginning 200 feet from the runway end, with the first 10,000 feet at 50:1 and the remaining approach surface at 40:1. It has an outer width of 16,000 feet.

Threshold Siting Surface

With the implementation of GPS-based approaches (RNAV approaches), rather than revising 14 CFR Part 77, the FAA issued additional approach standards through its advisory circulars and orders. The threshold siting surfaces from *AC 150/5300-13B,* Tables 3-2 to 3-4[24], must be kept clear for the associated instrument approach.

For the approach end of runways expected to accommodate instrument approaches having visibility greater than or equal to 3/4 of a mile, the threshold siting surface is offset 200 feet from the landing threshold, has an inner width of 400 feet, an outer width of 3,400 feet, and a length of 10,000 feet. This surface has a slope of 20:1.

For visual approaches serving small aircraft with approach speeds of 50 knots of more, the surface starts at the runway end, has an inner width of 250 feet widening to 700 feet at 2,250 feet from the runway end and continuing at a width of 700 feet, for an additional 2,750 feet. It has a slope of 20:1.

To accommodate a runway end with an instrument approach with vertical guidance, a surface known as the visual guidance surface (VGS) starts at the runway threshold with an inner width of the runway width plus 200 feet, a length of 10,000 feet, and an outer width of 1,520 feet with a slope of 30:1.

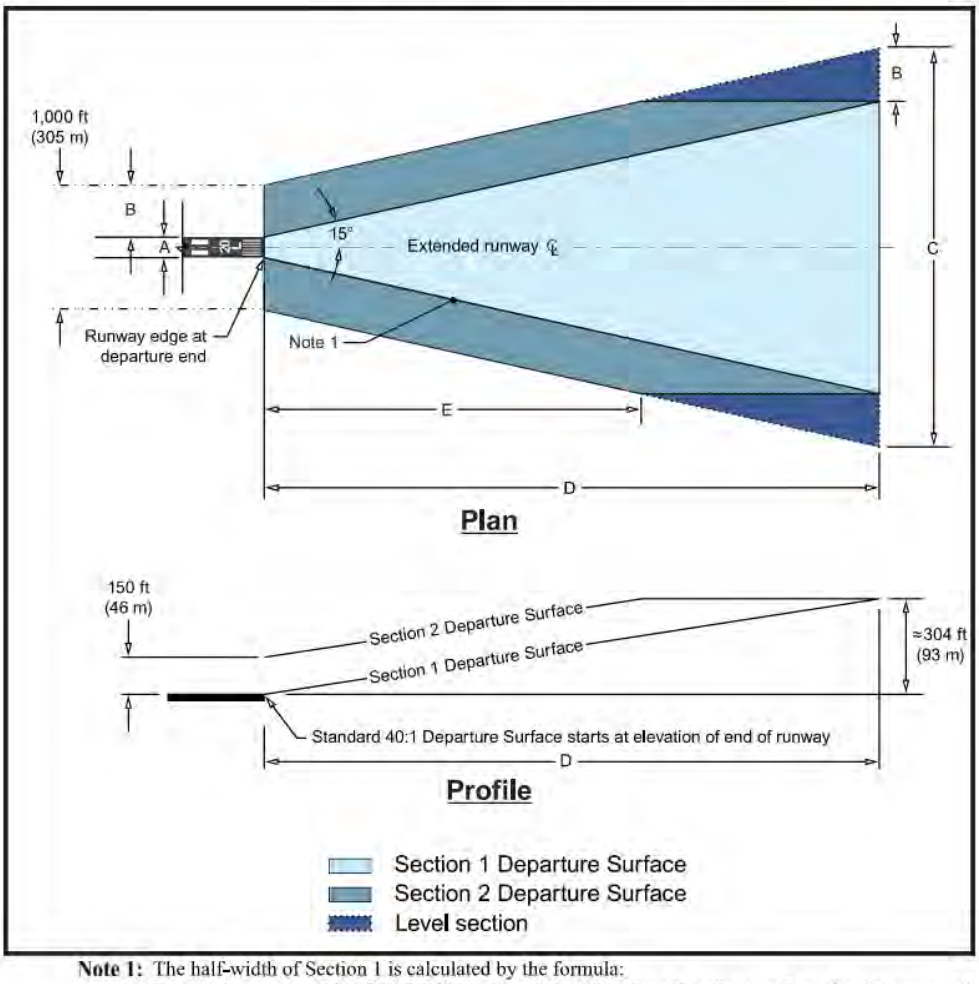
[24] FAA AC 150/5300-13B: Airport Design, dated March 31, 2022.

Departure Surfaces

On runways that support instrument departures, the FAA has designated an instrument departure surface. Per FAA AC 150/5300-13B, Table 3-5, the departure surface starts at the end of the departure threshold and is 12,152 feet long, with an outer width of 7,512 feet. The inner width is 1,000 feet. The center portion of the inner width of the departure surface, the width of the runway, starts at the runway end elevation and goes up to 150 feet above runway elevation at 500 feet from centerline. The entire approach surface goes up at a 40:1 slope along the extended runway centerline. While it is desirable to provide a clear departure surface, the FAA can design and publish instrument departure takeoff minimums, (obstacle) departure procedures, and takeoff obstacle notes to mitigate obstacles in departure surfaces. **Figure 3.2** depicts the departure surface. A clear departure surface is one of the considerations in establishing takeoff declared distances.

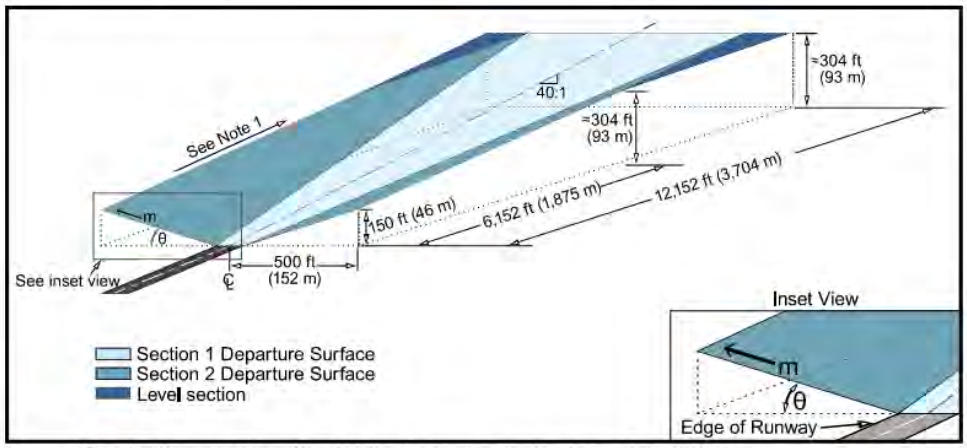
FIGURE 3.2: DEPARTURE SURFACE FROM FAA AC 150/5300-13B

Figure 3-9. Instrument Departure Surface



Note 1: The half-width of Section 1 is calculated by the formula:
Section $1_{\text{Half Width}}$ = (1/2 RWY Width) + (Tan 15° × X), where X = distance from the departure end of the runway.

Figure 3-11. Departure Surface – Perspective View (Without Clearway)



Note 1: The outer edge of the Section 2 Departure Surface has a slope of 40:1.
Note 2: The 304-foot (93 m) value represents the height above the DER.

3.7. Runway 12R/30L

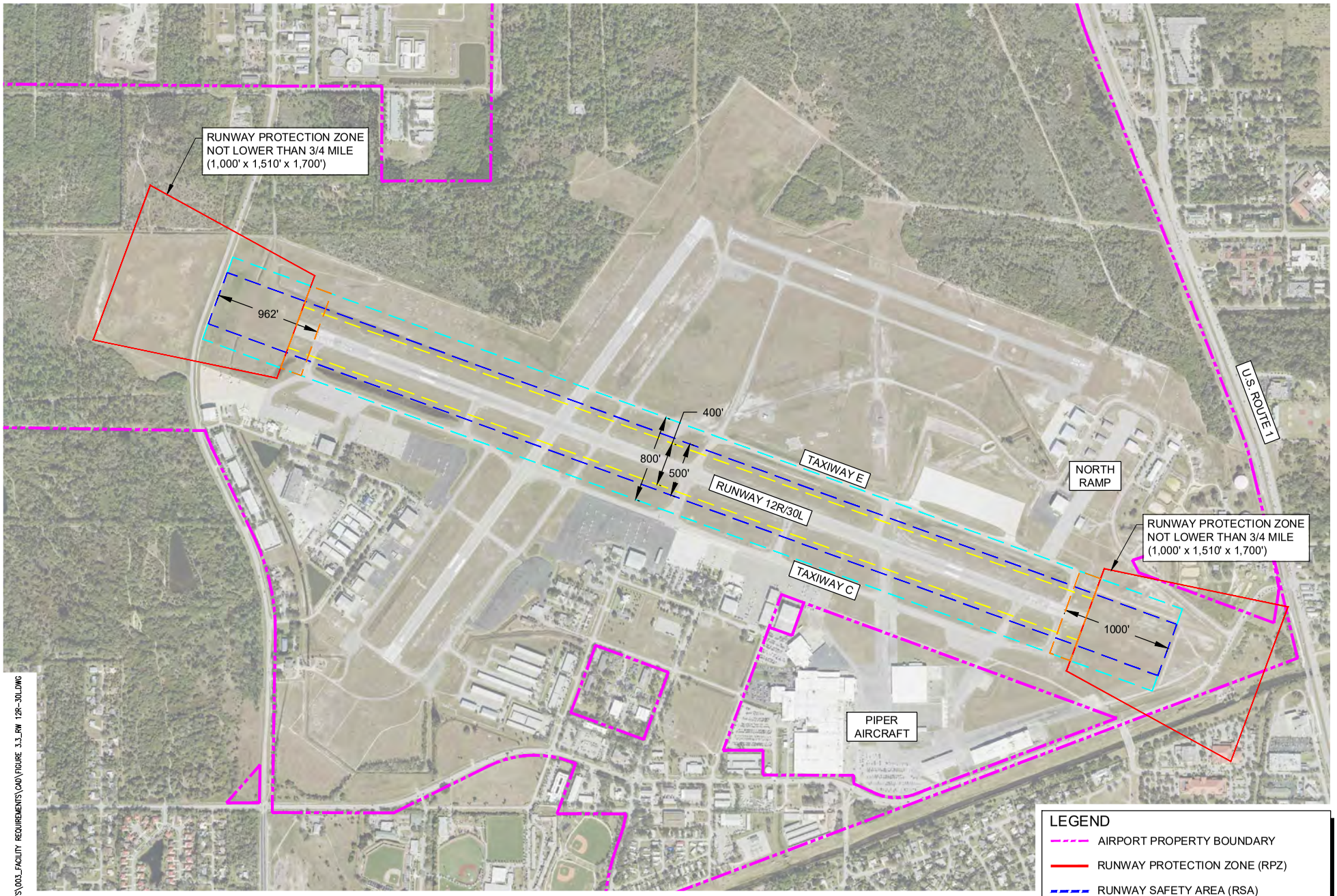
The runway standards described above will be applied to each runway at VRB. As previously identified in Table 2.26, which summarizes the approved forecast, the critical aircraft for Runway 12R/30L is the Airbus A220-300, ARC C-III, and the future critical aircraft is the Gulfstream 650, ARC D-III. The instrument approach visibility minimums are 3/4 of a mile, which converts to approximately 4,000 feet in runway visual range (RVR). If there is no change in future instrument approaches, this results in an existing and future RDC of C-III-4000 and D-III-4000, respectively, which are listed in **Table 3.3** and depicted on **Figure 3.3**.

TABLE 3.3: RUNWAY 12R/30L DESIGN STANDARDS

Item Description	Existing Runway 12R/30L	Future Runway 12R/30L
Runway Design Code (RDC)	C/D-III-4000	C/D-III-4000
Critical Aircraft	Airbus A220	Gulfstream 650
Runway Length	7,314’	7,314’
Runway Width	100’	150’
Runway Shoulder	15’	25’
Runway Blast Pads	200’ x 140’	200’ x 140’
Visibility	Not lower than ¾ mile	Not lower than ¾ mile or lower than ¾ mile
Runway Reference Code (ARC)	C/D-III less than 150,000 lbs. MTOW	C/D-III greater than 150,000 lbs. MTOW
FAR Part 77 Category	NP(D) – RW 12R NP(D) – RW 30L	NP(D) – RW 12R NP(D) – RW 30L
Runway Safety Area (length beyond runway end x width)	Standard: 1,000’ x 500’ 12R actual beyond: 962’ 30L actual beyond: 1,000’	1,000’ x 500’
Runway Safety Area (length before runway end x width)	600’ x 500’	600’ x 500’
Runway Object Free Area (length beyond runway end x width)	1,000’ x 800’	1,000’ x 800’
Runway Object Free Area (length before runway end x width)	600’ x 800’	600’ x 800’
Runway Obstacle Free Zone (length beyond runway x width)	200’ x 400’	200’ x 400’
Approach Runway Protection Zone (length x inner width x outer width)	1,700’ x 1,000’ x 1,510’	1,700’ x 1,000’ x 1,510’ or 2,500’ x 1,000’ x 1,750’
Departure Runway Protection Zone (length x inner width x outer width)	1,700’ x 500’ x 1,010’	1,700’ x 500’ x 1,010’
Runway Marking	Precision (12R)/Nonprecision (30L)	Precision (12R)/Nonprecision (30L)
Runway Lighting	Medium Intensity	Medium Intensity
Runway Centerline to Taxiway Centerline Separation	400–475’ (Existing) 400’ (Standard)	400–475’ (Existing) 400’ (Standard)

Sources: FAA AC 150/5300-13B, dated March 31, 2022; FAA Airport Data and Information Portal (ADIP), accessed March 31, 2023.

Notes: NP(D): nonprecision approach runway larger than utility with visibility minimums as low as ¾ mile.



LEGEND

- AIRPORT PROPERTY BOUNDARY
- RUNWAY PROTECTION ZONE (RPZ)
- RUNWAY SAFETY AREA (RSA)
- RUNWAY OBSTACLE FREE ZONE (ROFZ)
- PRECISION OBSTACLE FREE ZONE (POFZ)
- RUNWAY OBJECT FREE AREA (ROFA)

N

0 1,200

GRAPHIC SCALE IN FEET

Source: Airport Property Boundary, Vero Beach Department of Public Works Survey Division, September 2021; Aerial Photography, NV5 GeoSpatial, 2023.

AUG 12, 2024 11:57 AM ALEXA02176
I:\20JOBS\20A00690\01\ADMIN\14-REPORTS\003_FACILITY REQUIREMENTS\CAD\FIGURE 3.3_RW 12R-30L.DWG

VERO BEACH | HANSON

VERO BEACH REGIONAL AIRPORT
MASTER PLAN

RUNWAY 12R/30L
DESIGN STANDARDS

DRAWN BY: JA
CHECKED BY: SZ

FIGURE
3.3

Runway 12R/30L Length

Runway 12R/30L is the primary runway at VRB. It is also the Part 139 runway. The runway is 7,314 feet long by 100 feet wide. Runway 12R/30L has roads beyond both ends. To provide a clear RSA and ROFA, there are declared distances in use on Runway 12R/30L. The perimeter fence is 962 feet from the end of Runway 12R, with its location fixed relative to 43rd Avenue, and the perimeter road reduces the length of the RSA and ROFA beyond the physical end of Runway 12R. To provide a 1,000-foot-long RSA and ROFA beyond Runway 12R, the ASDA and LDA on Runway 30L is shortened to 7,276 feet, as summarized in Table 3.3**.**

The existing and future critical aircraft for Runway 12R/30L is the Airbus A220 (ARC C-III) and Gulfstream 650 (ARC D-III), respectively. Airbus publishes airport planning information for its aircraft. The Airbus A220 with a PW1524G engine type requires 6,500 feet to depart on a standard day and 6,900 feet to depart on a hot day (+15°C) at MTOW. With the PW1521G engine, to operate within the 7,200-foot runway, it is limited to an MTOW of 143,000 pounds on a standard day and 141,000 pounds on a hot day. There is more runway length provided than required for the Airbus A220, regardless of the engine, for landing on a dry runway. The Gulfstream 650 has a takeoff distance of 5,858 feet at sea level on a standard day at MTOW. The existing and future critical aircraft can operate on Runway 12R/30L, albeit with some weight restrictions with certain engine models. Due to the surrounding development, no extensions are recommended. However, options to provide a full RSA and ROFA without the use of declared distances should be considered in the alternatives to maximize the length of the existing runway pavement.

Runway 12R/30L Width

For an ARC C-III or D-III runway or aircraft with a MTOW of less than 150,000 pounds, Runway 12R/30L provides the required 100 feet of width. The Airbus A220-300 has a maximum takeoff weight of 156,300 pounds. Therefore, applying the ARC C/D-III standards for aircraft with a maximum takeoff weight of more than 150,000 pounds should be considered in the future. The ARC C/D-III standards for more than 150,000 pounds MTOW include a runway width of 150 feet, shoulder width of 25 feet, and runway blast pad width of 200 feet. It is recommended that widening the runway 50 feet and adding 10 feet to the shoulders be considered in the alternatives analysis.

Runway Lighting and Signage

Runway 12R/30L is equipped with MIRLs, and all runway lighting is LED. MIRL meets the requirements of an instrument approach including lower than 3/4 of a mile. Some airfield signs are LED; however, the remaining signs that are incandescent are recommended to be upgraded to LED. The instrument approaches at VRB have minimums of not less than 3/4 of a mile. To obtain visibility minimums less than 3/4 of a mile, approach lights are required. The alternatives analysis should consider if an approach with less than 3/4 of a mile is feasible at VRB. If it is, a future approach light system will be required on that runway(s).

RSA, ROFA, and ROFZ

As identified under runway length, the perimeter road and fence are within 1,000 feet of the end of Runway 12R, so declared distances are in use to provide the 1,000 feet for the RSA and ROFA for landings and aborted takeoffs on Runway 30L, reducing the LDA and ASDA by 38 feet, as summarized in **Table 3.4**. The ROFZ that extends 200 feet beyond the runway end is clear.

TABLE 3.4: SUMMARY OF DECLARED DISTANCES FOR RUNWAY 12R/30L

Declared Distances				
Runway	**LDA**	**ASDA**	**TORA**	**TODA**
Runway 12R	7,314 feet	7,314 feet	7,314 feet	7,314 feet
Runway 30L	7,276 feet	7,276 feet	7,314 feet	7,314 feet

Sources: FAA ADIP, VRB, accessed March 27, 2023.

The RSA is to be clear of objects, excluding those fixed by function, such as runway lights. It is also to be graded and capable under dry conditions of supporting an aircraft. The FAA has established required longitudinal and traverse grades for an RSA. During the 2023 Part 139 airfield inspection, the FAA identified some areas along Runway 12R/30L that need to have the grading checked. A review of these grades is ongoing.

The ROFA is limited to equipment necessary for air and ground navigation to provide wind tip protection in the event of an aircraft excursion from the runway. The perimeter road at VRB is within the Runway 30L ROFA. It is parallel to the north side of the ROFA and within the corner of the southside ROFA. The perimeter road should be relocated outside the Runway 30L ROFA. Until that occurs, operational controls are used to avoid use of the road within the ROFA when aircraft are present on or approach Runway 12R/30L.

Runway Protection Zone

The goal of an RPZ is to protect people and property on the ground and should remain clear of incompatible land use. While it is recommended to avoid roads within the RPZ, when constructing a new runway or making improvements to a runway, existing roads are acceptable when there are no changes to a runway. When the landing threshold and a runway's end of takeoff length are the same, the larger RPZ — typically the approach RPZ — controls, and only one is depicted on the ALP. When declared distances are in use, there are separate approach and departure RPZs, if departure lengths are reduced.

Runway 12R

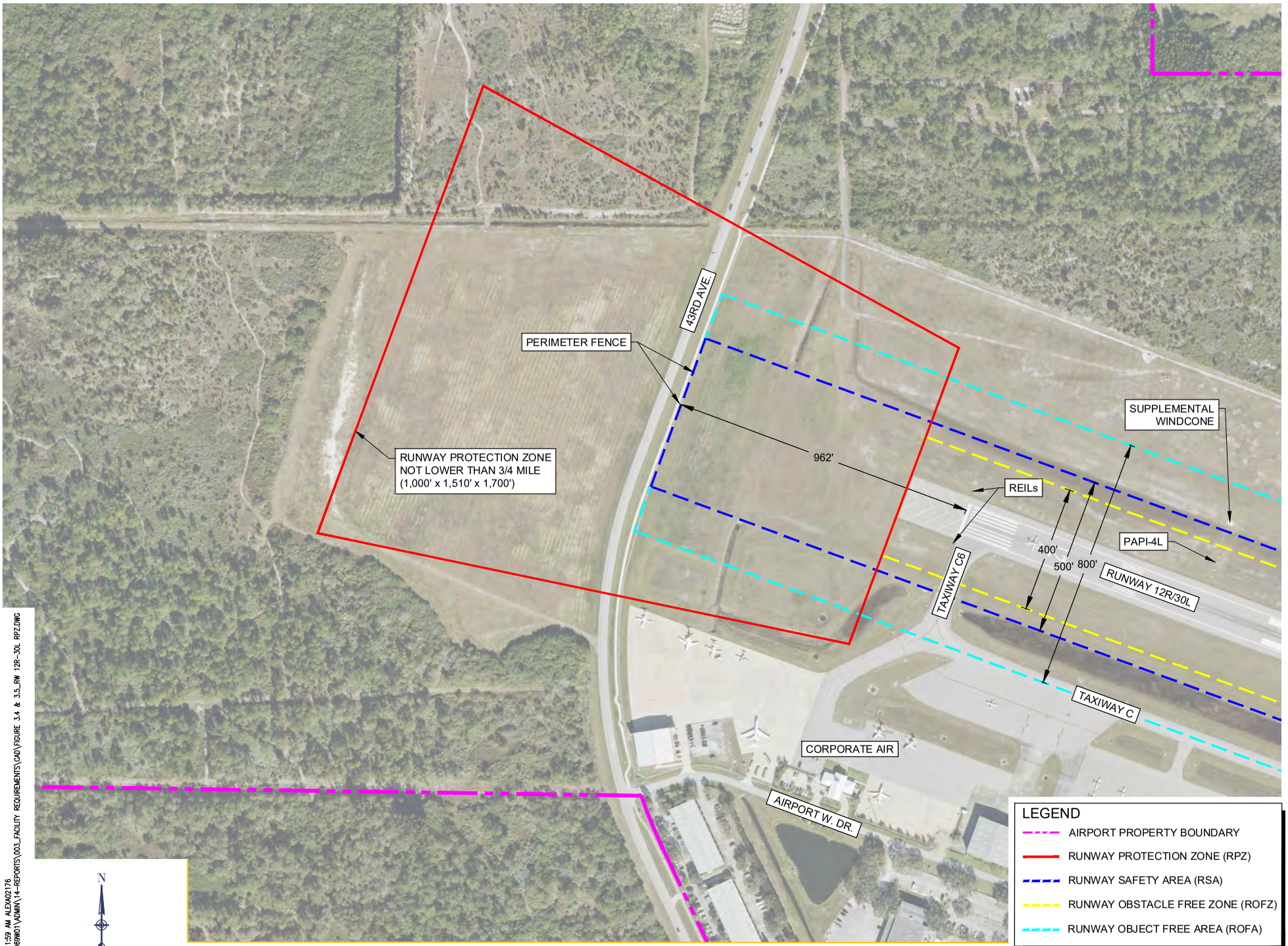
On Runway 12R, 43rd Avenue and the airport's perimeter road and fence are within the RPZ, as depicted on **Figure 3.4**. While objects are present, the airport has fee simple controlling interest over the Runway 12R RPZ, except for the 43rd Avenue right of way, which is publicly owned. If there are no changes to the runway, the FAA considers this condition to be legacy. If there are changes to the runway, including lower approach minimums, improvements to the RPZ need to be considered. This is typically accomplished through an RPZ analysis that considers various alternatives.

Runway 30L

As shown on **Figure 3.5**, several objects are within the RPZ on the Runway 30L end, including Aviation Boulevard, Airport North Drive, the main relief canal, the Indian River County Administration Complex and Water Treatment Plant. The airport owns the majority of the Runway 30L RPZ fee simple. The southeast corner is protected with avigation easements. The Water Treatment Plant was released from the United States government to the City, not airport, in 1953. This release included an easement for right of flight over the parcel. Presently, the City leases some additional property from the airport outside the release area as part of the government sites within the airport property. Since the initial release, Airport Drive North has been modified. The City and airport plan to propose a request of land release from the FAA to do a land swap to better align with the current roads and water plant use as shown on Figure 3.5. An easement will be retained over any airport land swapped to the City.

The portion of the water plant that is within the RPZ are lime beds. These are at ground level and the only time there are people within this area is when maintenance is needed.

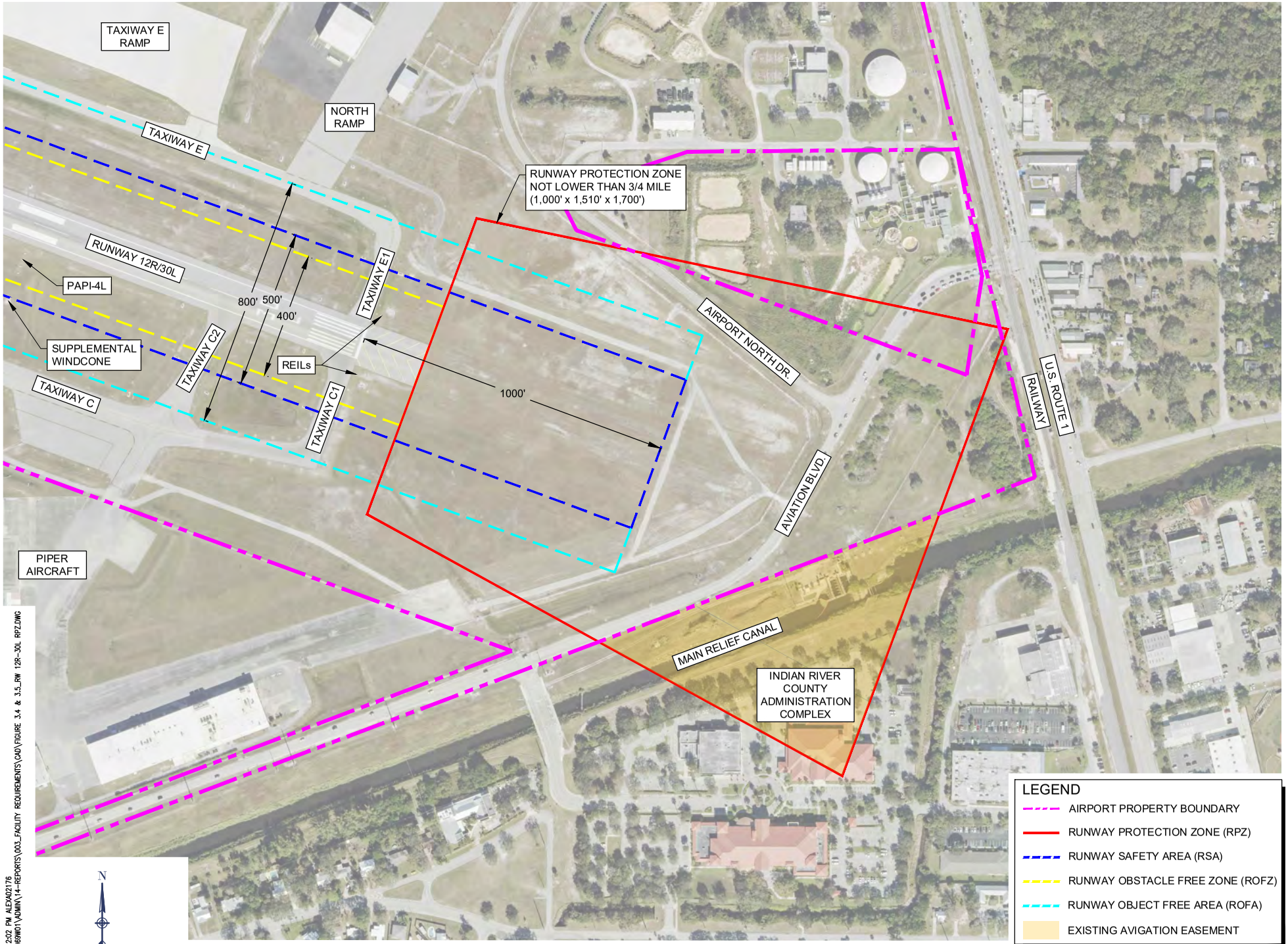
In addition, FDOT is studying alternatives to improve the intersection of U.S. 1 and Aviation Boulevard. All remaining alternatives under consideration are at ground level. The location of the railway and main relief canal limit the opportunities to modify the road system within the Runway 30L RPZ. Any roadway improvements should not be any closer to the runway end than the existing condition. An RPZ analysis was submitted to the FAA for U.S. 1 and Aviation Boulevard as part of the FDOT study. The RPZ analysis was accepted by the FAA.



Source: Airport Property Boundary, Vero Beach Department of Public Works Survey Division, September 2021; Aerial Photography, NV5 GeoSpatial, 2023.

AUG 12, 2024 11:59 AM ALEXA02176
I:\20JOBS\20A00690W01\ADMIN\14-REPORTS\003_FACILITY REQUIREMENTS\CAD\FIGURE 3.4 & 3.5_RW 12R-30L RPZ.DWG

VERO BEACH | HANSON	VERO BEACH REGIONAL AIRPORT MASTER PLAN	RUNWAY 12R RUNWAY PROTECTION ZONE	DRAWN BY: JA CHECKED BY: SZ
			FIGURE 3.4



Source: Airport Property Boundary, Vero Beach Department of Public Works Survey Division, September 2021; Aerial Photography, NV5 GeoSpatial, 2023.

AUG 12, 2024 12:02 PM ALEXA02176
I:\20JOBS\20A00690\01\ADMIN\14-REPORTS\003_FACILITY REQUIREMENTS\CAD\FIGURE 3.4 & 3.5_RW 12R-30L RPZ.DWG

VERO BEACH | HANSON	VERO BEACH REGIONAL AIRPORT MASTER PLAN	RUNWAY 30L RUNWAY PROTECTION ZONE	DRAWN BY: JA CHECKED BY: SZ
			FIGURE 3.5

Runway Visibility Zone and Line of Sight

Runways 12R/30L and 4/22 intersect. Therefore, with a part-time tower, there is an RVZ that should be kept clear. As shown on **Figure 3.6**, a portion of the Skyborne apron that includes 46 aircraft tie-down positions and a portion of the Paris Air apron that includes three helicopter parking positions are within the RVZ. Also, aircraft holding at Taxiway A, Taxiway C5, and Taxiway D would be within the RVZ. The FAA recommends that the apron layout keep aircraft parking positions outside an RVZ. Opportunities to minimize the parking of aircraft within the RVZ should be considered to maximize the visibility within the Runway 12R/30L and Runway 4/22 RVZ.

Runway 12R/30L has a maximum grade change of 0.22% and an effective grade of 0%. Therefore, Runway 12R/30L meets the FAA's standards for a clear line of sight along the length of the runway. Runway 12R/30L was rehabilitated in 2022. The FAA design standards are for no grade changes within 1/4 of the runway or 2,500 feet, whichever is less for a runway serving ADG C or larger aircraft. The first 1,650 feet of Runway 12R have no grade change. This is slightly less than 1/4 of the runway. However, the grade change of 0.08% is nominal. Runway 30L has three minimal grade changes within the last 1/4 of the runway, the greatest being 0.4%. With the existing taxiways at VRB, similar runway grades had to be maintained when the runway was rehabilitated to tie into the taxiways. Because of the flat grades on Runway 12R/30L, no centerline grade changes are recommended.

Pavement Strength and Condition

Runway 12R/30 L was rehabilitated in 2022. Therefore, the pavement is in excellent condition, as discussed in the airfield pavement condition section in Chapter 1 and detailed in Appendix B. The published PCR is 56/F/A/W/T, with a pavement strength of 85,000 pounds single wheel, 115,000 pounds dual wheel, and 220,000 pounds dual tandem. The Airbus A220 at maximum gross weight on a high strength CBR has an ACR of 28[25]. This is below the PCR, so the pavement has adequate strength to serve the Airbus A220, the heaviest aircraft regularly using VRB.

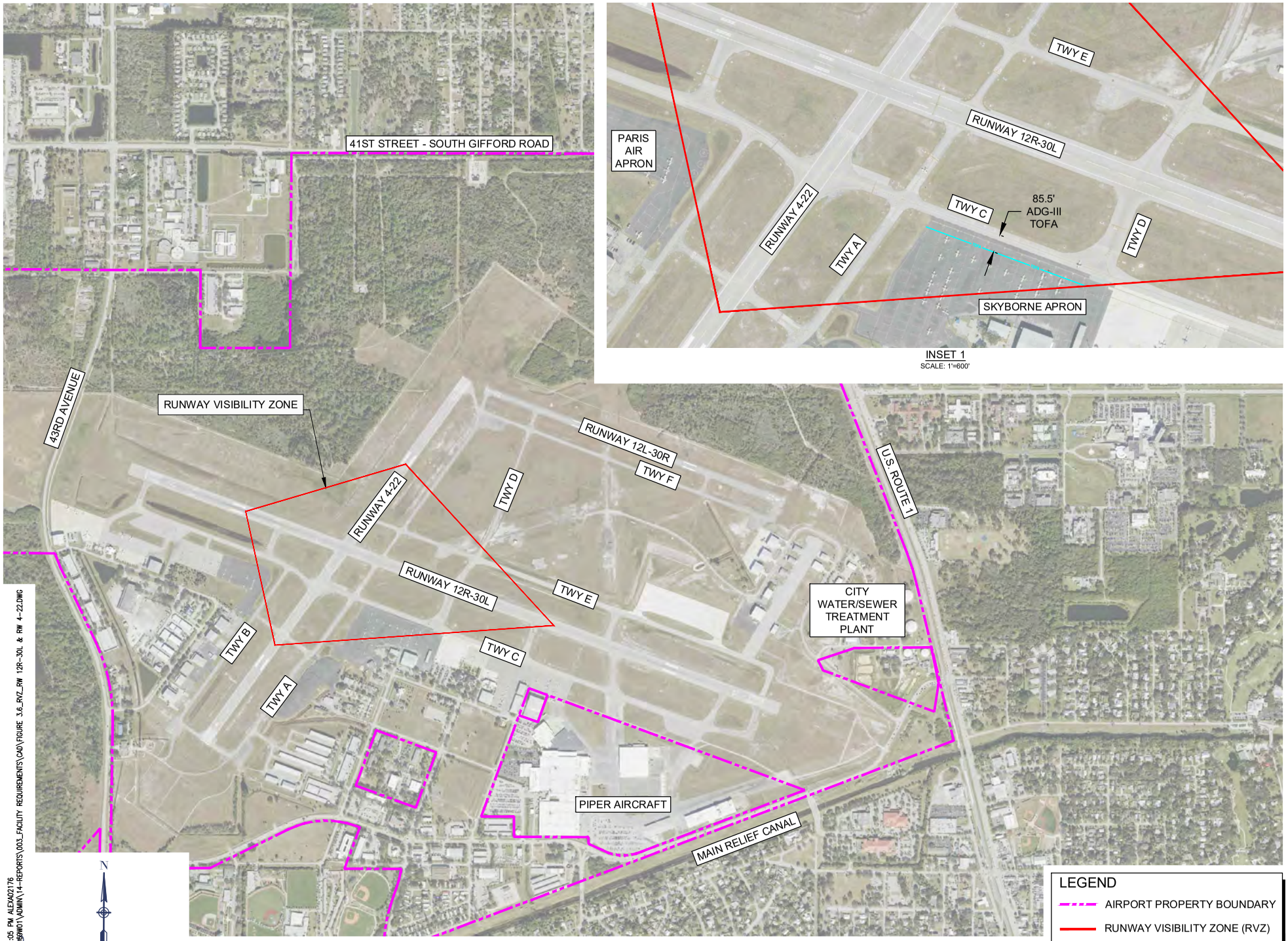
Instrument Approaches and Navigational Aids

Runway 12R/30L is served by LPV RNAV approaches, with minimums of ¾ of a mile visibility, a 256-foot ceiling on Runway 12R, and a 200-foot ceiling on Runway 30L. FAA Table K-1 in *FAA AC 150/5300-13B* depicts the criteria to support instrument flight procedure development, as shown on **Figure 3.7**. For visibility minimums of 3/4 of a mile to less than 1 mile, the minimum approach altitude or the height above touchdown elevation (HAT) minimum is typically 250 feet. At VRB, the HAT minimum for Runway 30L is 200 feet, so the requirement for less than 3/4 of a mile, which includes a HAT of less than 250 feet, should also be considered. With landing minimums of less than 250 feet, the precision obstacle free zone (POFZ) applies to Runway 30L and is in effect during IFR conditions, when an aircraft is on final approach within 2 miles of the runway threshold. The POFZ extends 200 feet beyond the runway end with a width of 800 feet and is clear.

A four-box PAPI system with LEDs is on the left side of both ends of the runway. The runway is also equipped with LED REILs on both runway ends. The REILs on the Runway 30L end are owned and maintained by the FAA.

To obtain lower visibility minimums, an approach lighting system is required. Lower minimums would increase the size of the RPZ to an inner width of 1,000 feet, an outer width of 1,750 feet, and a length of 2,500 feet from an inner width of 1,000 feet, an outer width of 1,510 feet, and a length of 1,700 feet and would lower the slope of the approach surface from 34:1 to 50 to 1. The feasibility of installing an approach light system to enhance instrument approach procedures should be considered during the alternatives analysis.

[25] Airbus, A220 Airport Planning Publication, Issue 030, 2022.



Source: Airport Property Boundary, Vero Beach Department of Public Works Survey Division, September 2021; Aerial Photography, NV5 GeoSpatial, 2023.

AUG 12, 2024 1:05 PM ALEXA02176
I:\20JOBS\20A0086WO1\ADMIN\14-REPORTS\003_FACILITY REQUIREMENTS\CAD\FIGURE 3.6_RVZ_RW 12R-30L & RW 4-22.DWG

VERO BEACH | HANSON	VERO BEACH REGIONAL AIRPORT MASTER PLAN	RUNWAYS 12R/30L & 4/22 RUNWAY VISIBILITY ZONE	DRAWN BY: JA CHECKED BY: SZ FIGURE 3.6

FIGURE 3.7: CRITERIA TO SUPPORT INSTRUMENT FLIGHT PROCEDURE DEVELOPMENT

Standards [1]	Visibility Minimums [1]			
	< 3/4 statute mile (1.2 km)	3/4 (1.2 km) to < 1 statute mile (1.6 km)	≥ 1 statute mile (1.6 km) straight-in	Circling [2] ≥ 1 statute mile (1.6 km)
HAT [3]	≤ 250 ft	≥ 250 ft	≥ 250 ft	≥ 350 ft
POFZ (PA and APV only)	Required	Not Required	Not Required	Not Required
IT-OFZ	Required	Not Required	Not Required	Not Required
ALP [4]	Required	Required	Required	Required
Minimum Runway Length	4,200 ft	3,200 ft [5]	3,200 ft [5]	3,200 ft [5]
Paved Surface	Required	Recommended [6]	Recommended [6]	Recommended [6]
Runway Markings (See AC 150/5340-1)	Precision	Non-precision	Non-precision	Visual
Holding Position Signs and Markings (See AC 150/5340-1, AC 150/5340-18)	Required	Required	Required	Required [6]
Runway Edge Lights [7]	HIRL or MIRL	HIRL or MIRL	MIRL or LIRL	MIRL or LIRL (Required only for night minimums)
Parallel Taxiway [8]	Required	Required	Recommended	Recommended
Approach Lights [9]	Required	Recommended [10]	Recommended [10]	Not Required
VGSI [11]	Recommended	Recommended	Recommended	Recommended
Applicable Runway Design Standards, (Reference online Runway Design Standards Matrix Tool or Appendix G)	Lower than 3/4 mile (1.2 km) visibility minimums	Not lower than 3/4 mile (1.2 km) visibility minimums	Not lower than 1 mile (1.6 km) visibility minimums	Not lower than 1 mile (1.6 km) visibility minimums
Approach or Departure Surface to be Met (Reference paragraph 3.6.1)	See Table 3-3 or Table 3-4	See Table 3-3 or Table 3-4	See Table 3-3 or Table 3-4	Table 3-3
Optimum Survey Type [12]	VGS	VGS	NVGS	NVGS [13]

Note: 1 ft = 0.305 m

3.8. Runway 4/22

Runway 12R/30L and 12L/30R provide less than 95% wind coverage for 10.5 and 13 knots, as shown in Table 1.7. Therefore, a crosswind runway is needed at VRB to provide the FAA-recommended 95% wind coverage. Runway 4/22 is the crosswind runway. While Runway 4/22 is needed to provide the necessary crosswind coverage for up to ARC B-II aircraft, as indicated in the approved forecast, the existing and future critical aircraft for Runway 4/22 is the Gulfstream 450, ARC D-II. Therefore, larger clear areas for ARC D-II aircraft should be provided on Runway 4/22.

Runway 4 has an instrument approach with visibility minimums of 7/8 of a mile, which converts to an RVR of approximately 4,000 feet. Runway 22 has an instrument approach with visibility minimums of 1 mile, which converts to an RVR of approximately 5,000 feet. This results in an existing and future RDC of D-II-5000. If there is no change in instrument approach visibility, the design standards for Runway 4/22 are listed in **Table 3.5** and depicted on **Figure 3.8.**

Runway 4/22 Length

Runway 4/22 is 4,974 feet long by 100 feet wide. Objects located off the Runway 4 end include 43rd Avenue, Aviation Boulevard, and a drainage swale. To provide a clear RSA and ROFA, there are declared distances in use on Runway 22. The location of a drainage swale approximately 972 feet beyond the end of Runway 4 reduces the length of the RSA and ROFA beyond the physical end of Runway 4. To provide a 1,000-foot-long RSA and ROFA beyond Runway 4, the ASDA and LDA on Runway 22 is shortened by 29 feet to 4,945 feet.

When Runway 12R/30L was closed for rehabilitation in 2022, several of the airport's users had to temporarily use other airports due to not having a runway available that was at least 5,000 feet long. FAA AC 150/5325-4B provides guidance to identify the recommended runway length. For runway length analysis, aircraft are grouped by MTOW into less than 12,500 pounds, 12,500 pounds but less than 60,000 pounds, and more than 60,000 pounds.

The ARC B-II to C-II aircraft operating at VRB typically are within the category of 12,500 pounds but less than 60,000 pounds. The FAA used aircraft operating manuals to develop curves for runway lengths for these aircraft. The aircraft are divided into two groups, 75% of fleet and 100% of fleet, and two operating conditions, 60% of useful load and 90% of useful load. Inputs to the runway length tables in FAA AC 150/5325-4B for VRB are airfield elevation (20 feet MSL) and mean maximum temperature of the hottest month (90°F). For aircraft weighing more than 60,000 pounds, the FAA recommends using the aircraft flight manual. However, these manuals are not typically publicly available for business jet aircraft.

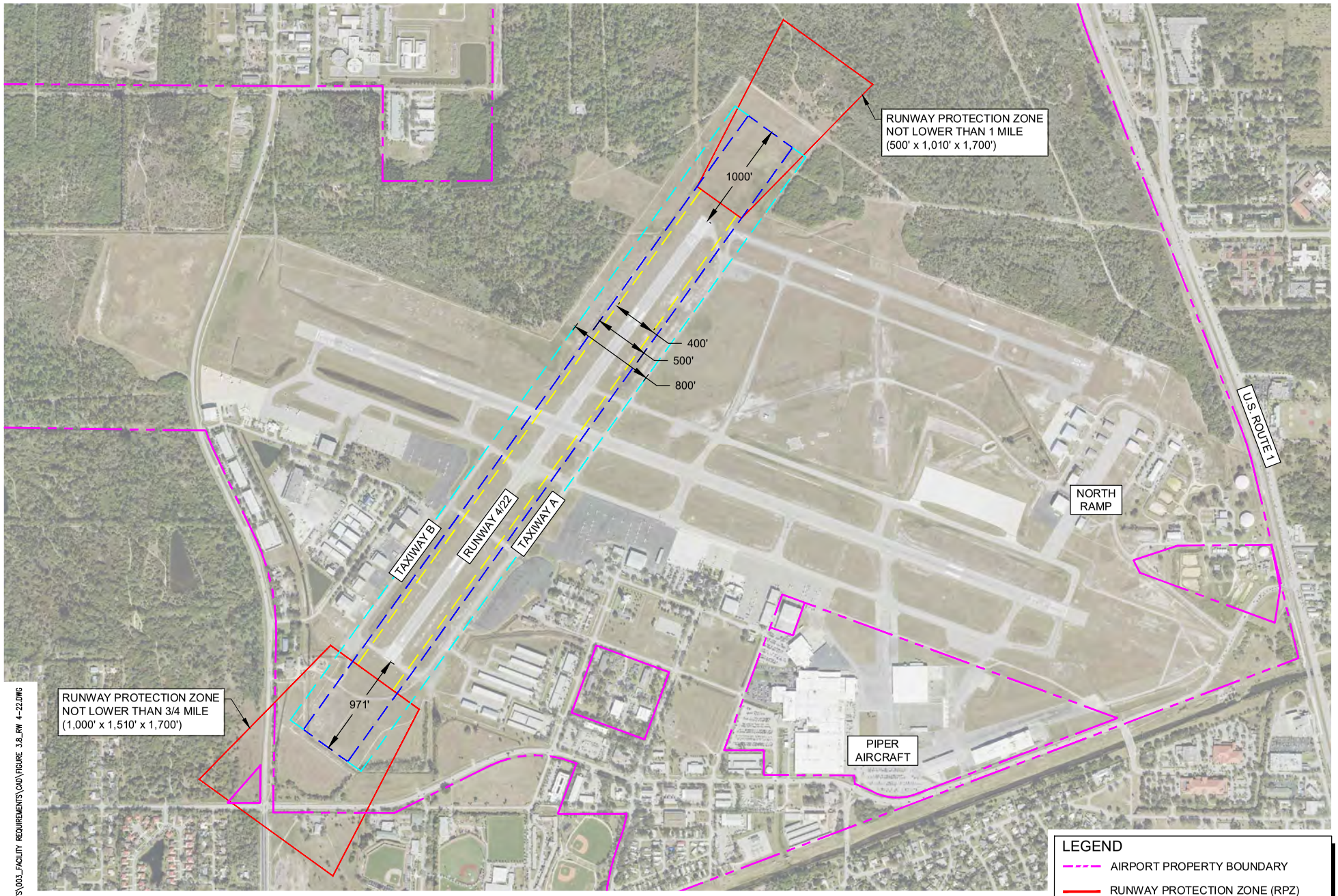
Using the curves in FAA AC 150/5325-4B for aircraft in 75% of the fleet, at 60% useful load they require 4,700 feet and at 90% useful load they require 6,700 feet. One hundred percent of the fleet requires 5,000 feet at 60% useful load and 8,300 feet for 90% useful load. VRB operations by aircraft in 75% of fleet include smaller Cessna Citations, Dassault Falcons, and Learjets, and 100% of the fleet include Bombardier Challenger 600s, larger Cessna Citations, Dassault Falcons, and Learjets.

TABLE 3.5: RUNWAY 4/22 DESIGN STANDARDS

Item Description	Existing Runway 4/22	Future Runway 4/22
Runway Reference Code (ARC)	D-II	D-II
Runway Length	4,974 feet	5,000+ feet
Runway Width	100' (Existing) 100' (Standard)	100'
Runway Shoulder	10'	10
Runway Blast Pad	NA	150' X 120'
Visibility	7/8 mile/1 mile	7/8 mile/1 mile
Runway Design Code (RDC)	D-II-5000	D-II-5000
FAR Part 77 Category	NP(C) – RW 4 NP(C) – RW 22	NP(C) – RW 4 NP(C) – RW 22
Runway Safety Area (length beyond runway end x width)	1,000' x 500' 4 actual beyond: 971' 22 actual beyond: 1,000'	1,000' x 500'
Runway Safety Area (length before runway end x width)	600' x 500'	600' x 500'
Runway Object Free Area (length beyond runway end x width)	1,000' x 800'	1,000' x 800'
Runway Object Free Area (length before runway end x width)	600' x 800'	600' x 800'
Runway Obstacle Free Zone (length beyond runway x width)	200' x 400'	200' x 400'
Approach Runway Protection Zone (length x inner width x outer width)	1,700' x 1,000' x 1,510'/ 1,700' x 500' x 1,010'	1,700' x 1,000' x 1,510'/ 1,700' x 500' x 1,010'
Departure Runway Protection Zone (length x inner width x outer width)	1,700' x 500' x 1,010'	1,700' x 500' x 1,010'
Runway Marking	Nonprecision	Nonprecision
Runway Lighting	Medium Intensity	Medium Intensity
Runway Centerline to Taxiway Centerline Separation	350-–400' (Existing) 300' (Standard)	350–400' (Existing) 300' (Standard)

Sources: FAA AC 150/5300-13B, dated March 31, 2022; FAA Airport Data and Information Portal (ADIP), accessed March 31, 2023.

Notes: NP(C): nonprecision approach runway larger than utility with visibility minimums greater than 3/4 mile.



Source: Airport Property Boundary, Vero Beach Department of Public Works Survey Division, September 2021; Aerial Photography, NV5 GeoSpatial, 2023.

VERO BEACH | HANSON	VERO BEACH REGIONAL AIRPORT MASTER PLAN	RUNWAY 4/22 DESIGN STANDARDS	DRAWN BY: JA CHECKED BY: SZ
			FIGURE 3.8

AUG 12, 2024 1:07 PM ALEXA02176
I:\20J08S\20A00869W01\ADMIN\14-REPORTS\003_FACILITY REQUIREMENTS\CAD\FIGURE 3.8_RW 4-22.DWG

In addition, runway length requirements for the most common ARC B-II, C-I and C-II, and D-I and D-II aircraft operating at VRB were evaluated. The readily available information is for a dry, standard day (59°F and 29.92 in Hg at sea level) at maximum takeoff weight. While VRB is close to sea level, the mean maximum daily temperature at VRB is 90°F. The higher temperatures require longer runway length. The data in **Table 3.5** is for MTOW, so some adjustment in weight could occur in higher temperatures, but commonly a longer runway length is needed. With the FAA runway length curves recommending at least 5,000 feet for 100% of fleet at 60% useful load, and based on the data in **Table 3.6**, up to 5,700 feet is needed to accommodate these aircraft closer to MTOW.

TABLE 3.6: RUNWAY LENGTH FOR COMMON ARC B-II TO D-II AIRCRAFT OPERATING AT VRB

Aircraft Type	ARC	MTOW (pounds)	Balanced Field Takeoff (standard conditions)	Landing Distance (dry, standard conditions)
Challenger 300	C-II	38,850	4,810 feet	3,833 feet
Challenger 600	C-II	41,250	6,200 feet	4,150 feet
Citation Excel	B-II	20,000	4,060 feet	4,917 feet
Citation Latitude	B-II	30,800	3,580 feet	2,480 feet
Citation X	B-II	36,100	5,480 feet	4,693 feet
Falcon 900 EX	B-II	48,300	5,215 feet	3,750 feet
Falcon 2000LXS	B-II	42,800	4,675 feet	2,260 feet
G450	D-II	74,600	5,770 feet	3,260 feet
Gulfstream IV	D-II	73,200	5,700 feet	4,992 feet
Learjet 45	C-I	20,500	4,350 feet	4,063 feet
Learjet 60	C-I	23,500	5,450 feet	5,208 feet

Source: GlobalAir.com, accessed September 18, 2023.

Also, because VRB is supporting commercial service, it is interested in the potential of a backup Part 139 runway. Therefore, the alternatives analysis should consider improvements to Runway 4/22 to meet Part 139 standards.

Runway 4/22 Width

Runway 4/22 provides 100 feet of width and 10-foot shoulders, which meet the design standards for ARC D-II aircraft. Paved blast pads are only required for runways with ADG-III as the critical aircraft. Therefore, paved blast pads are not required for Runway 4/22.

Runway Lighting and Signage

Runway 4/22 is equipped with MIRLs, and all runway lighting is LED. Some airfield signs are LED; however, the remaining signs that are incandescent are recommended to be upgraded to LED.

RSA, ROFA, and ROFZ

A drainage swale is approximately 972 feet from the Runway 4 end of pavement. Therefore, declared distances are in use to provide the standard RSA and ROFA beyond the declared usable end of the runway. This reduces the ASDA and LDA for Runway 22. The published declared distances for Runway 4/22 are summarized in **Table 3.7**. The ROFZ extending only 200 feet beyond the runway end is clear.

TABLE 3.7: SUMMARY OF DECLARED DISTANCES FOR RUNWAY 4/22

Declared Distances				
Runway	**LDA**	**ASDA**	**TORA**	**TODA**
Runway 4	4,974 feet	4,974 feet	4,974 feet	4,974 feet
Runway 22	4,945 feet	4,945 feet	4,974 feet	4,974 feet

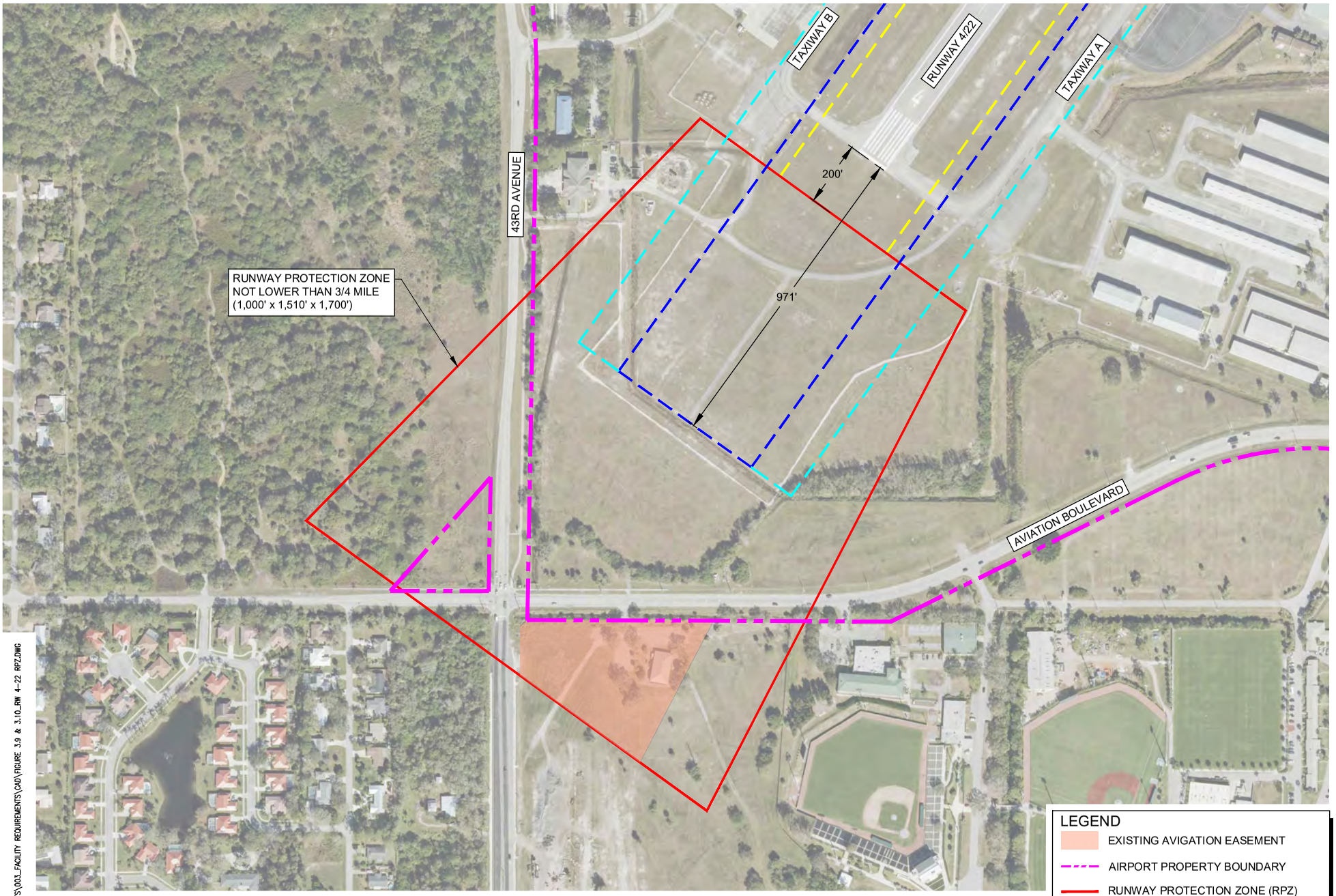
Source: FAA ADIP, VRB, accessed March 27, 2023.

The ARFF access road traverses the Runway 4 RSA and ROFA. This road connects the ARFF station to Taxiways A and B. FAA design standards allow for an RSA width of only 400 feet on C/D-II runways. The ARFF access road connection to Taxiway B is outside a 400-foot wide RSA. The connection to Taxiway A traverses through the RSA. This road is used in emergencies and is needed to assist the airport in meeting the required ARFF response time. However, the grades and bank angles may not meet RSA grading standards. Therefore, options to improve or eliminate these roads should be evaluated in the alternatives. The ROFZ extending only 200 feet beyond the runway end is clear.

The Runway 12L RSA overlaps the Runway 22 RSA. FAA AC 150/5300-13B recommends avoiding overlapping RSAs to allow sufficient space for entrance taxiway and associated marking and signage. As part of considering improvements to Runway 4/22, providing a standard RSA and ROFA without the use of declared distances and eliminating the overlapping RSAs should be considered. These alternatives should include the consideration of entrance taxiways.

Runway Protection Zone

Similar to the primary runway, the landing threshold and end of takeoff length available on Runway 4/22 are the same. Therefore, only one RPZ is depicted on both runway ends. On Runway 4, 43rd Avenue, Aviation Boulevard, and the ARFF access road are within the RPZ, as depicted on **Figure 3.9**. As shown on **Figure 3.10**, a private airport access road is within the Runway 22 RPZ. Most of the Runway 4 RPZ is on airport property or has an avigation easement. Approximately eight additional acres of avigation easement are needed in the Runway 4 RPZ to protect the current larger RPZ due to the publication of an improved instrument approach procedure since the initial easement was acquired. The entire Runway 22 RPZ is on airport property.



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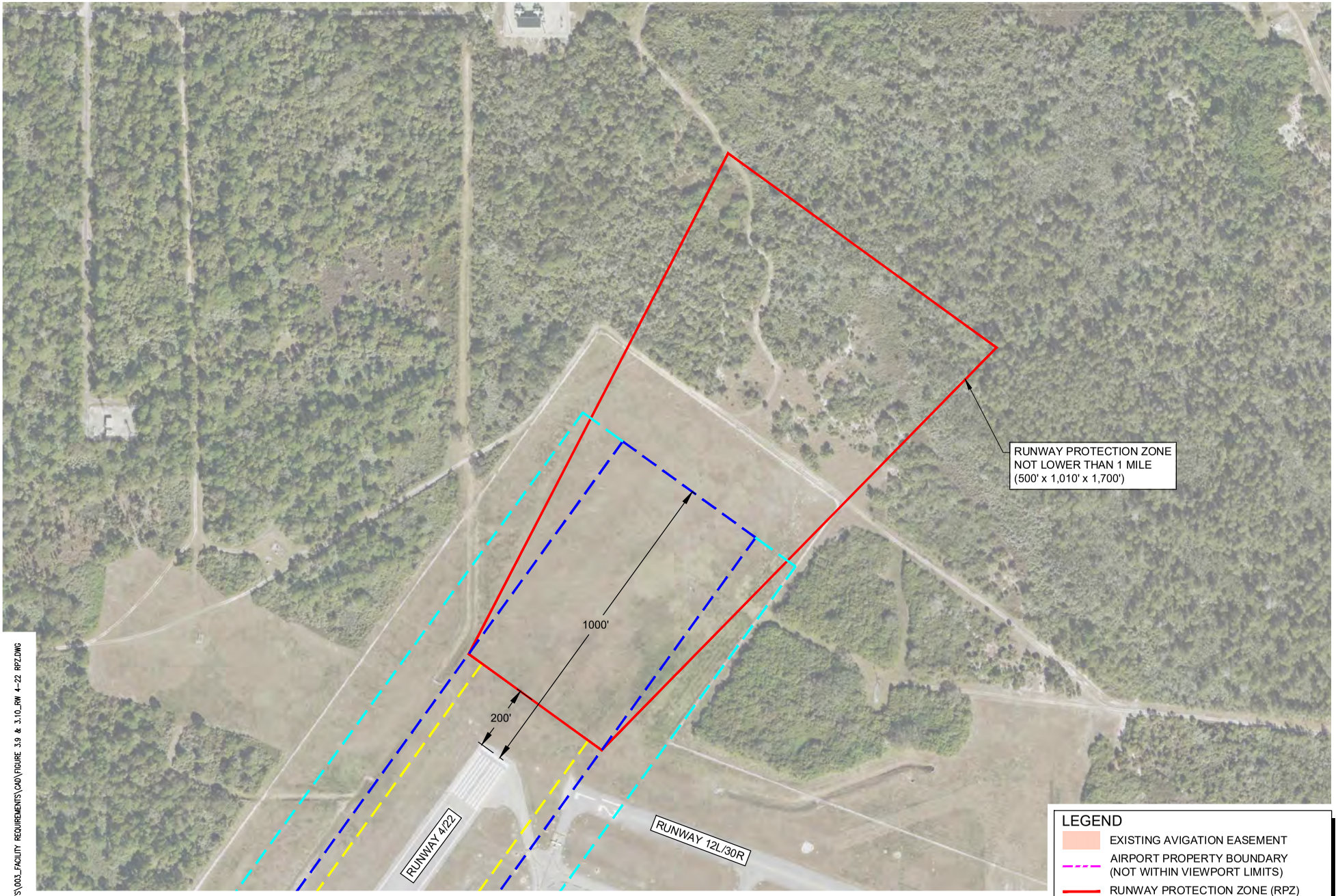
GRAPHIC SCALE IN FEET

Source: Airport Property Boundary, Vero Beach Department of Public Works Survey Division, September 2021; Aerial Photography, NV5 GeoSpatial, 2023.

VERO BEACH | HANSON	VERO BEACH REGIONAL AIRPORT MASTER PLAN	RUNWAY 4 RUNWAY PROTECTION ZONE	DRAWN BY: JA CHECKED BY: SZ
			FIGURE 3.9

AUG 12, 2024 1:10 PM ALEXA02176
I:\20JOBS\20A00869W01\ADMIN\14-REPORTS\003_FACILITY REQUIREMENTS\CAD\FIGURE 3.9 & 3.10_RW 4-22 RPZ.DWG



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0 400

GRAPHIC SCALE IN FEET

Source: Airport Property Boundary, Vero Beach Department of Public Works Survey Division, September 2021; Aerial Photography, NV5 GeoSpatial, 2023.

VERO BEACH | HANSON

VERO BEACH REGIONAL AIRPORT MASTER PLAN	RUNWAY 22 RUNWAY PROTECTION ZONE	DRAWN BY: JA CHECKED BY: SZ	FIGURE 3.10

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I:\20JOBS\20A00869W01\ADMIN\14-REPORTS\003_FACILITY REQUIREMENTS\CAD\FIGURE 3.9 & 3.10_RW 4-22 RPZ.DWG

Runway Visibility Zone and Line of Sight

Refer to the Runway 12R/30L Runway Visibility Zone and Line of Sight section for details on the RVZ between Runway 4/22 and Runway 12R/30L.

While Runway 4/22 and Runway 12L/30R do not intersect, they are converging runways, with the extended runway centerlines intersecting. **Figure 3.11** depicts the recommended area to be kept clear based on the takeoff decision speed (v1) associated distance. This area is clear and should be considered during the development of the alternatives analysis.

Runway 4/22 has a maximum grade change of 0.10%. The effective runway gradient for Runway 4 and Runway 22 is -0.1% and 0.1%, respectively, which is within FAA design standards for ARC D-II. The FAA design standards are to avoid grade changes in the first quarter of the runway from the threshold or 2,500 feet, whichever is less for a runway serving AAC D or larger aircraft. The Runway 4 and 22 ends have minimal grade changes of 0.02% and 0.03%, respectively.

Pavement Strength and Condition

Runway 4/22 was rehabilitated in 2013. This project included the reduction of the runway shoulders. At the time of this airport master plan, the pavement is in good condition. The published PCR is 41/F/B/W/T, with a pavement strength of 30,000 pounds single wheel, 115,000 pounds dual wheel, and 220,000 pounds dual tandem. The MTOW of a Gulfstream 450 is 74,600 pounds on dual wheels, which is less than the published pavement strength. Thus, Runway 4/22 has adequate weight-bearing capacity for the existing and future critical aircraft.

Instrument Approaches and Navigational Aids

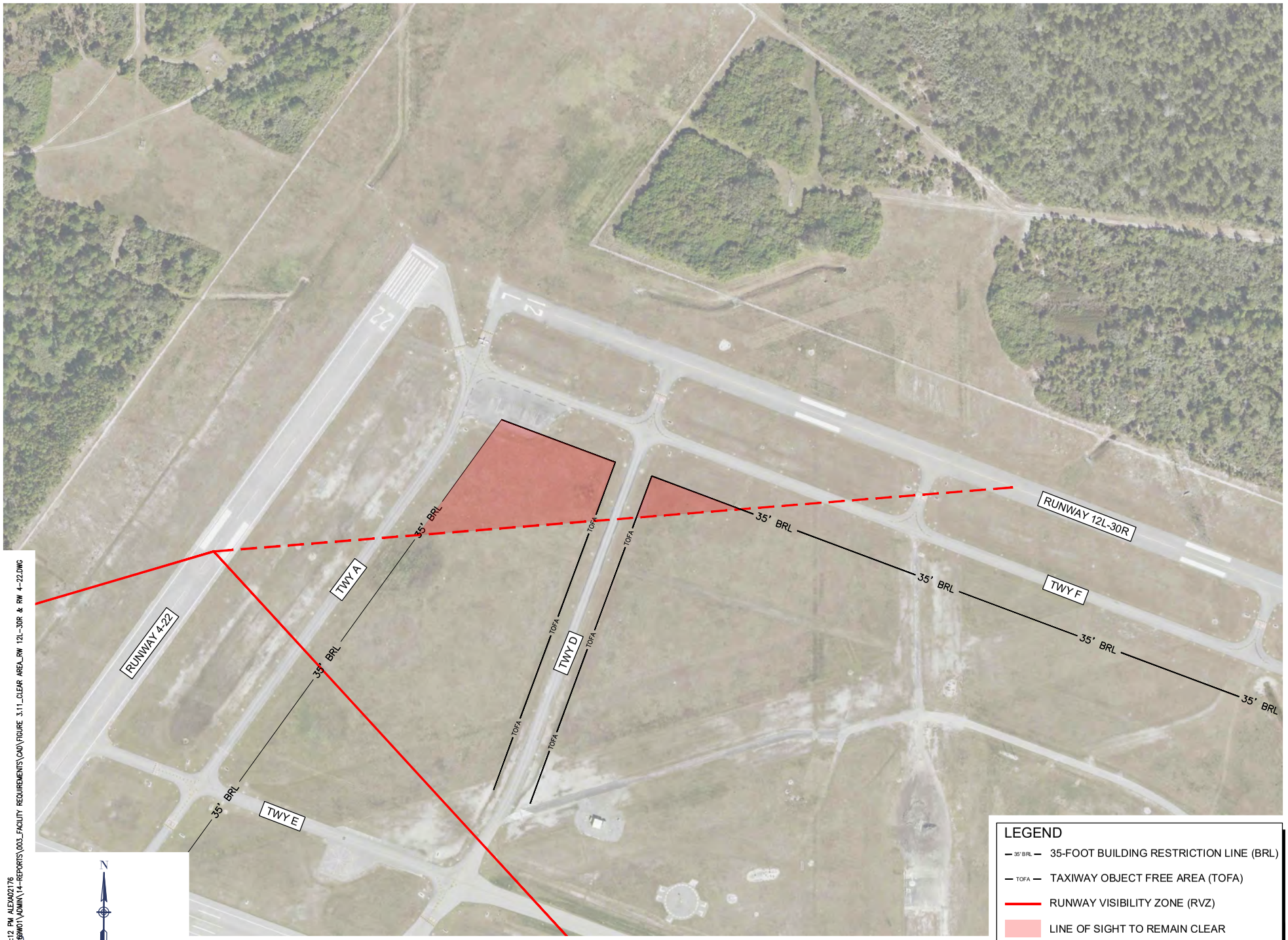
Runways 4 and 22 have LPV RNAV approaches with visibility minimums of 7/8 of a mile and a HAT of 273 feet on Runway 4 and 1-mile visibility and a HAT of 317 feet on Runway 22. Table K-1 in FAA AC 150/5300-13B depicts the criteria to support instrument flight procedure development, as previously shown on Figure 3.7. For visibility minimums of 3/4 of a mile to less than 1 mile, the HAT minimum can be as low as 250 feet. The current HAT for runways 4 and 22 is higher than 250 feet. Therefore, during the preparation of the ALP, the controlling objects for each runway will be identified to determine if any improvements in approach minimums are feasible.

A four-box PAPI system is on the left side of the runway on both runway ends. The Runway 4 PAPIs are LED and FAA-maintained, and the Runway 22 PAPIs are incandescent and airport-owned and -maintained. The runway is also equipped with incandescent REILs on both runway ends. In future lighting projects, it is recommended to upgrading the Runway 22 PAPIs and REILS to LED at the end of their useful life.

3.9. Runway 12L/30R

Runway 12L/30R is a parallel runway per the ASV and is classified as a secondary runway needed to meet the level of operations at VRB. As such, it is considered eligible for FAA funding. The separation between the parallel runway centerlines is 2,185 feet. With a separation of at least 700 feet, simultaneous independent VFR landings and takeoffs are allowed when the tower is open and closed.

VRB has two flight schools. When the winds favor the parallel runways, the tower uses Runway 12L/30R for training, especially for touch-and-go operations. It is common for the Runway 12L/30R pattern to be full and have training as well as have large aircraft waiting to depart on the primary runway. Runway 12L/30R also accommodates some transient operations.



Source: Airport Property Boundary, Vero Beach Department of Public Works Survey Division, September 2021; Aerial Photography, NV5 GeoSpatial, 2023.

AUG 12, 2024 1:12 PM ALEXA02176
I:\20JOBS\20A0089W01\ADMIN\14-REPORTS\003_FACILITY REQUIREMENTS\CAD\FIGURE 3.11_CLEAR AREA_RW 12L-30R & RW 4-22.DWG

VERO BEACH | HANSON	VERO BEACH REGIONAL AIRPORT MASTER PLAN	RUNWAYS 12L/30R & 4/22 LINE OF SIGHT TO REMAIN CLEAR	DRAWN BY: JA CHECKED BY: SZ FIGURE 3.11

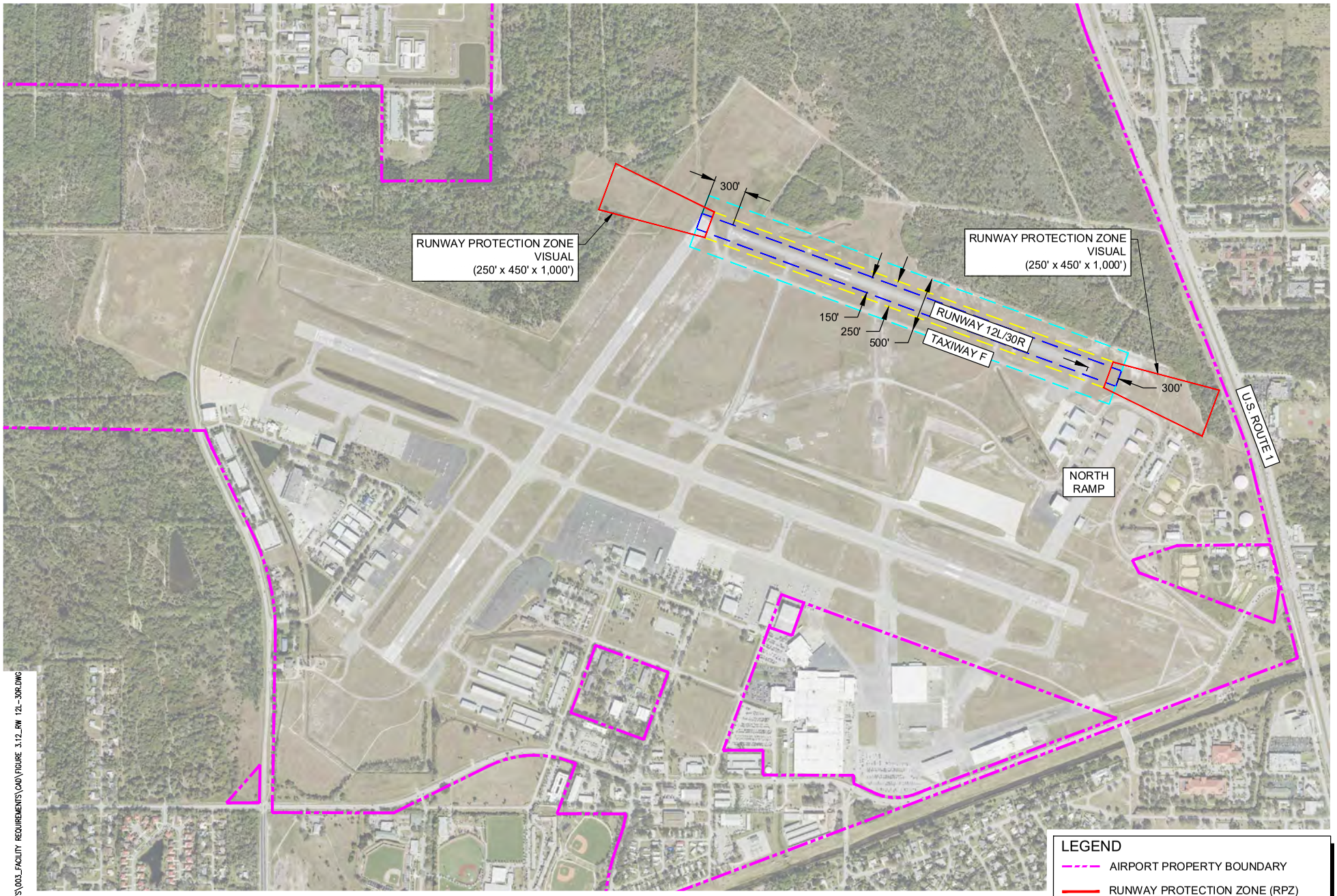
The existing and future critical aircraft for Runway 12L/30R is the King Air 200, ARC B-II small. Runway 12L/30R is a visual runway with no published instrument approach. This results in an existing and future RDC of B-II-5000. The design standards for Runway 12L/30R are listed in **Table 3.8** and depicted on **Figure 3.12**.

TABLE 3.8: RUNWAY 12L/30R DESIGN STANDARDS

Item Description	Existing/Future Runway 12L/30R
Runway Length	3,504 feet
Runway Width	75 feet
Runway Reference Code (ARC)	B-II Small
Visibility	Visual
Runway Design Code (RDC)	B-II Small-5000
Runway Width	75’ (Actual) 75’ (Standard)
FAR Part 77 Category	VIS(A) – RW 12L VIS(A) – RW 30R
Runway Safety Area (length beyond runway end x width)	300’ x 150’
Runway Safety Area (length before runway end x width)	300’ x 150’
Runway Object Free Area (length beyond runway end x width)	300’ x 500’
Runway Object Free Area (length before runway end x width)	300’ x 500’
Runway Obstacle Free Zone (length beyond runway x width)	200’ x 250’
Approach Runway Protection Zone (length x inner width x outer width)	1,000’ x 250’ x 1,510’
Departure Runway Protection Zone (length x inner width x outer width)	1,700’ x 500’ x 450’
Runway Marking	Basic
Runway Lighting	Medium Intensity
Runway Centerline to Taxiway Centerline Separation	240’ (Actual) 240’ (Standard)

Sources: FAA AC 150/5300-13B, dated March 31, 2022; FAA Airport Data and Information Portal (ADIP), accessed March 31, 2023.

Notes: VIS(A): visual approach utility runway.



LEGEND

- AIRPORT PROPERTY BOUNDARY
- RUNWAY PROTECTION ZONE (RPZ)
- RUNWAY SAFETY AREA (RSA)
- RUNWAY OBSTACLE FREE ZONE (ROFZ)
- RUNWAY OBJECT FREE AREA (ROFA)

N

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GRAPHIC SCALE IN FEET

Source: Airport Property Boundary, Vero Beach Department of Public Works Survey Division, September 2021; Aerial Photography, NV5 GeoSpatial, 2023.

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I:\20JOBS\20A00690W01\ADMIN\14-REPORTS\003_FACILITY REQUIREMENTS\CAD\FIGURE 3.12_RW 12L-30R.DWG

VERO BEACH | HANSON

VERO BEACH REGIONAL AIRPORT MASTER PLAN	RUNWAY 12L/30R DESIGN STANDARDS	DRAWN BY: JA CHECKED BY: SZ	FIGURE 3.12

Runway 12L/30R Length

Runway 12L/30R is 3,504 feet long by 75 feet wide. Per FAA AC 150/5325-4B, for small aircraft with fewer than 10 passenger seats at 100% of the fleet, the required runway length is approximately 3,600 feet. Per coordination with airport staff, the existing length of Runway 12L/30R is sufficient for multiengine training, although the flight schools prefer to have the multiengine aircraft use the primary runway when activity allows. Any reduction in length on Runway 12L/30R would make it undesirable to use for multiengine operations. Therefore, at a minimum, the existing length should be maintained on Runway 12L/30R.

Runway 12L/30R Width

Runway 12L/30R provides 75 feet of width, which meets the design standards for ARC B-II small aircraft. Paved blast pads are only required for runways with a critical aircraft of an ADG-III or higher. Therefore, paved blast pads are not required for Runway 12L/30R.

Runway Lighting and Signage

Runway 12L/30R is equipped with MIRLs, and all runway lighting is LED. Some airfield signs are LED; however, the remaining signs that are incandescent are recommended to be upgraded to LED.

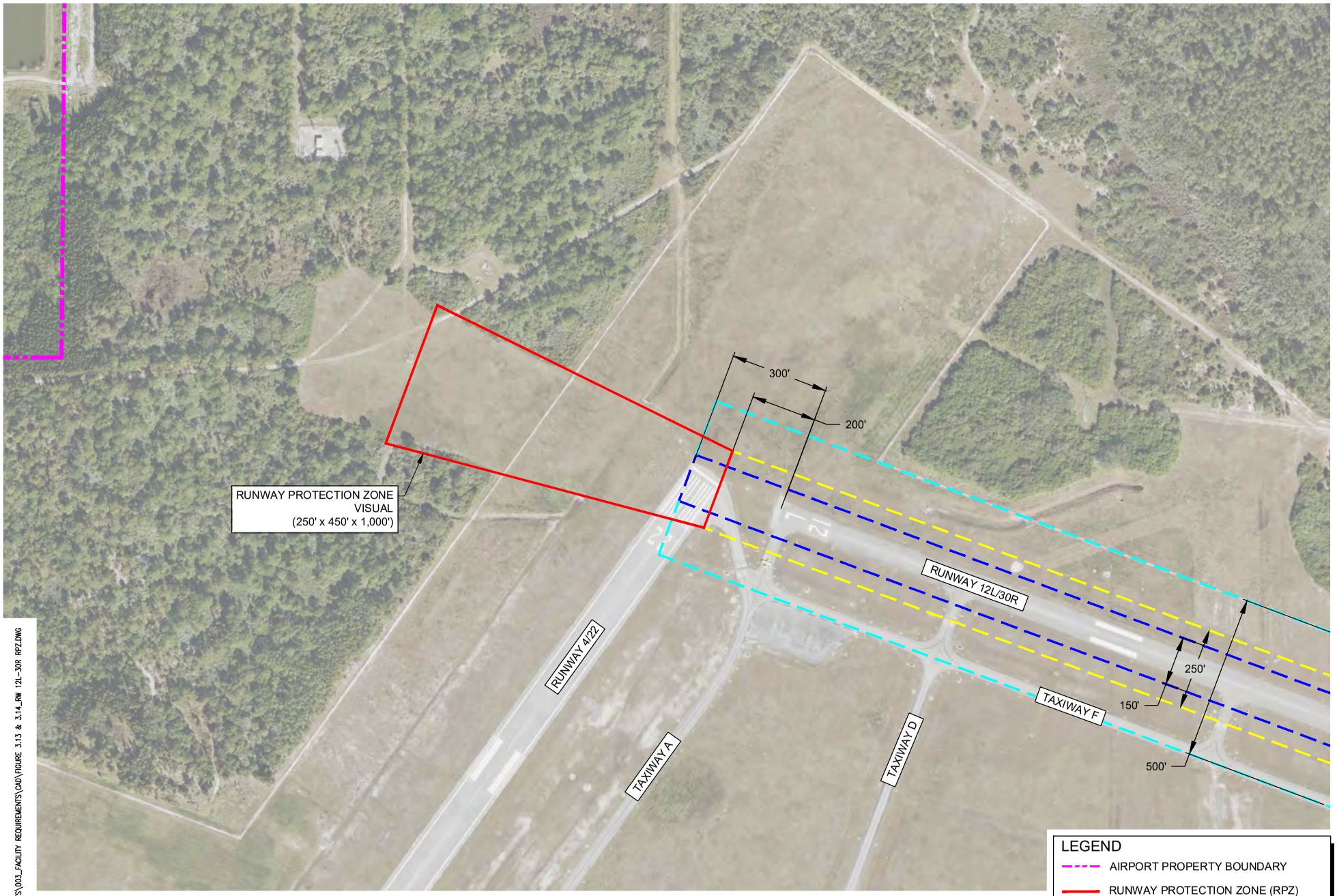
RSA, ROFA, and ROFZ

Runways 12L/30R and 4/22 converge but do not intersect, resulting in the runways having overlapping RSAs. FAA standards recommend avoiding overlapping RSAs to increase the margin of safety and minimize operational limitations.[26] The utility of Runway 12L/30R needs to remain the same by supporting flight training operations. Due to the proximity of existing development adjacent to the north ramp near the Runway 30R end, any changes to the runway length should be evaluated on the Runway 12L end during the alternatives analysis. The evaluation should consider the overlapping RSAs and modifying the parallel taxiway end connector to Runway 4/22, per FAA design standards.

Runway Protection Zone

No declared distances with reduced runway length are in place on Runway 12L/30R, so the landing and takeoff lengths of Runway 12L/30R are the same at 3,504 feet. Therefore, only one RPZ is depicted on both runway ends. On Runway 12L, the Runway 22 end and Taxiway A2 connector are within the RPZ, as depicted on **Figure 3.13**. As shown on **Figure 3.14**, the RPZ off the Runway 30R end is clear. Runway 22 and Taxiway A2 within the Runway 12L RPZ will be addressed in the alternatives analysis as part of considering alternatives to address the overlapping RSAs.

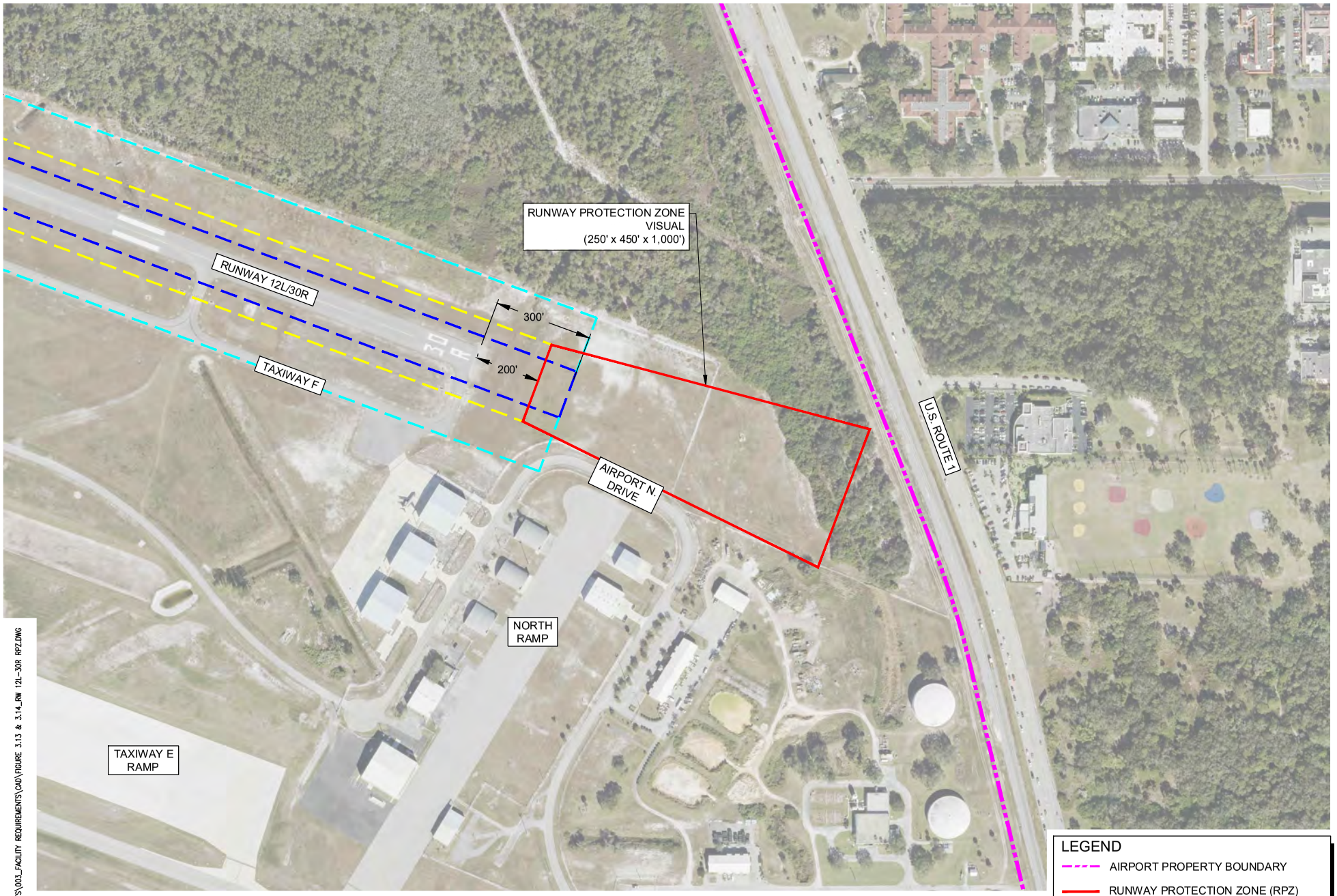
[26] Federal Aviation Administration, AC 150/5300-13B: *Airport Design*, dated March 31, 2022.



Source: Airport Property Boundary, Vero Beach Department of Public Works Survey Division, September 2021; Aerial Photography, NV5 GeoSpatial, 2023.

AUG 12, 2024 1:17 PM ALEXA02176
I:\20JOBS\20A00869W01\ADMIN\14-REPORTS\003_FACILITY REQUIREMENTS\CAD\FIGURE 3.13 & 3.14_RW 12L-30R RPZ.DWG

VERO BEACH | HANSON	VERO BEACH REGIONAL AIRPORT MASTER PLAN	RUNWAY 12L RUNWAY PROTECTION ZONE	DRAWN BY: JA CHECKED BY: SZ
			FIGURE 3.13



Source: Airport Property Boundary, Vero Beach Department of Public Works Survey Division, September 2021; Aerial Photography, NV5 GeoSpatial, 2023.

AUG 12, 2024 1:18 PM ALEXA02176
I:\20JOBS\20A00869W01\ADMIN\14-REPORTS\003_FACILITY REQUIREMENTS\CAD\FIGURE 3.13 & 3.14_RW 12L-30R RPZ.DWG

VERO BEACH | HANSON	VERO BEACH REGIONAL AIRPORT MASTER PLAN	RUNWAY 30R RUNWAY PROTECTION ZONE	DRAWN BY: JA CHECKED BY: SZ
			FIGURE 3.14

Runway Visibility Zone and Line of Sight

As discussed under Runway 4/22, while Runway 12L/30R and Runway 4/22 do not intersect, they are converging runways, with the extended runway centerlines intersecting. Figure 3.11 depicts the area recommended to be kept clear and should be considered in the alternatives analysis.

Runway 12L/30R has a maximum grade change of -0.05%. The effective runway gradient for Runway 12L and Runway 30R is 0%. This meets the FAA design standards. The FAA design standards require avoiding grade changes in the first quarter of the runway from the threshold for a runway serving AAC B aircraft. The Runway 12L/30R ends have minimal grade changes of -0.10% and -0.13%, respectively.

Pavement Strength and Condition

At the time of this airport master plan, the Runway 12L/30R pavement is in fair condition, with a published PCR of 8/F/B/Y/T and a pavement strength of 12,500 pounds. Runway 12L/30R is a utility runway that supports small aircraft with an MTOW of 12,500 pounds single wheel, so the pavement strength is adequate.

Instrument Approaches and Navigational Aids

Both ends of Runway 12L/30R have visual approaches only. As a shorter parallel runway to the primary runway, which is used for VFR student training, and with instrument approaches to both ends of the primary runway, no changes to the visual approaches to Runway 12L/30R are recommended.

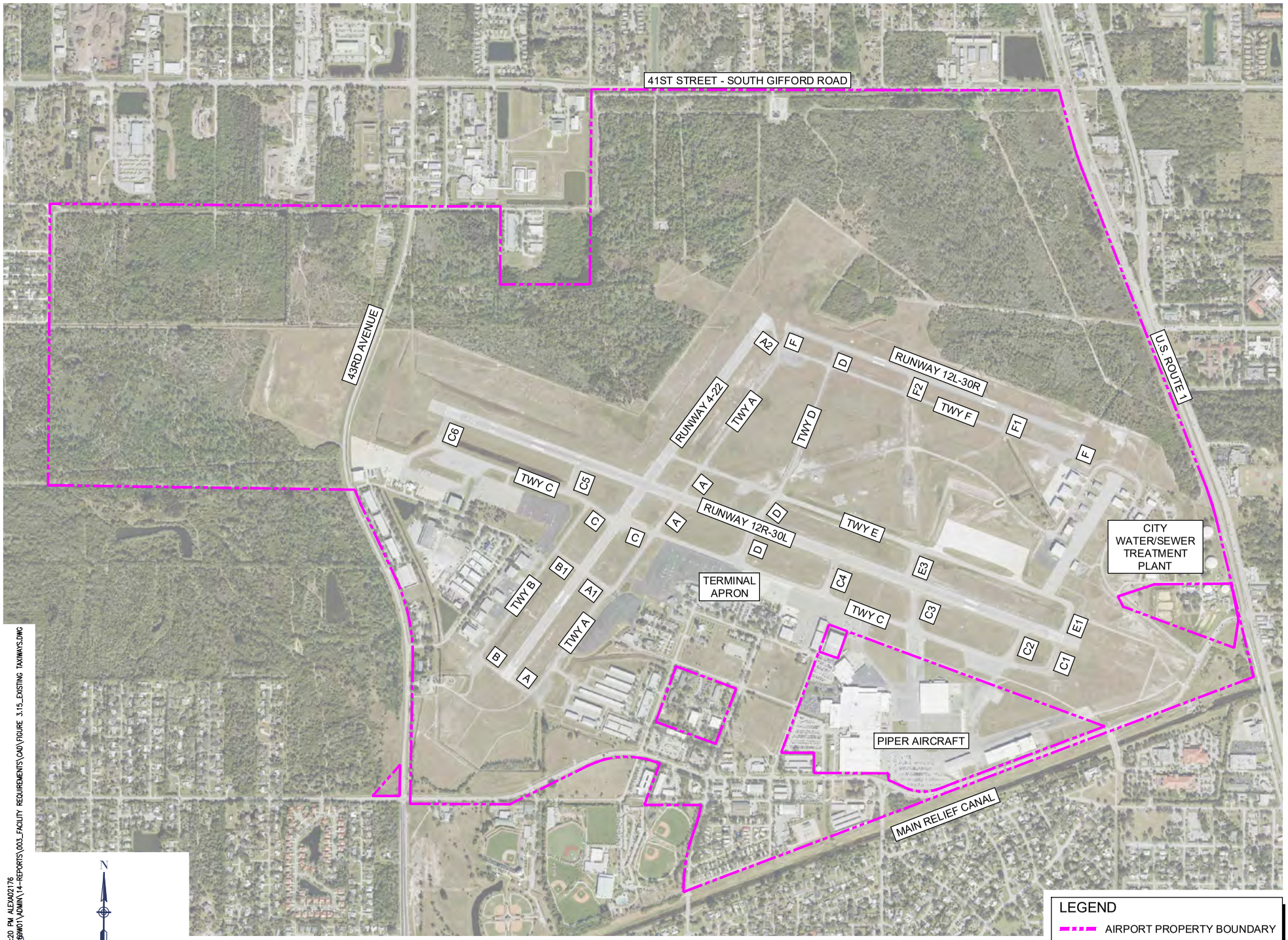
A two-box PAPI system is on the left side of both ends of the runway. Both PAPI systems are incandescent. In future lighting projects, it is recommended to upgrade both sets of PAPIs to LED when they reach the end of their useful life.

3.10. Taxiway Requirements

Taxiway facilities at an airport are established to enhance the safety and operational efficiency of the airfield. Taxiways minimize runway occupancy time by promoting quick entry and exit from the runway, as well as movement between terminal and hangar areas. Taxiways also provide access to and from the runways to terminal areas and aprons. Taxiways are located within the movement area on the airfield, which is under air traffic control when the ATCT is open from 7 a.m. to 9 p.m. daily. Taxilanes provide access from taxiways to aircraft parking and other terminal areas. The taxi speeds on a taxilane are generally no more than 15 miles per hour. Taxilanes are typically located in the nonmovement area outside air traffic control, but if the tower can see, the area controllers may offer guidance.

There are various types of taxiways and taxilanes that make up a taxiway system, including full-length parallel, partial parallel, entrance/exit, connector, bypass, and crossfield taxiways and apron edge and hangar taxilanes. Run-up areas are typically adjacent to a taxiway outside the taxiway object free area (TOFA). FAA AC 150/5300-13B recommends providing engine run-up areas for performing engine ground run-ups and requires locating them to minimize the exposure of engine exhaust in areas of public congregation and areas outside the air operations area (AOA). **Figure 3.15** depicts the existing taxiways at VRB.

Design standards vary for taxiways versus taxilanes and the sizes of critical aircraft using them. Similar to runways, safety and object free surfaces surround the taxiways and taxilanes to enhance the safety of aircraft movements. These surfaces include taxiway safety area (TSA), TOFA, and taxilane object free area (TLOFA).



LEGEND

AIRPORT PROPERTY BOUNDARY

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Source: Airport Property Boundary, Vero Beach Department of Public Works Survey Division, September 2021; Aerial Photography, NV5 GeoSpatial, 2023.

AUG 12, 2024 1:20 PM ALEXA0176
I:\20JOBS\20A0086W01\ADMIN\14-REPORTS\003_FACILITY REQUIREMENTS\CAD\FIGURE 3.15_EXISTING TAXIWAYS.DWG

VERO BEACH | HANSON

VERO BEACH REGIONAL AIRPORT MASTER PLAN

EXISTING TAXIWAYS

DRAWN BY: JA

CHECKED BY: SZ

FIGURE 3.15

The TSA, TOFA, and the taxiway to taxiway/taxilane or fixed or movable objects are based on the ARC of the critical aircraft for the surface.

The taxiway pavement, shoulder width, and edge safety margin are based on the TDG, which is discussed below.

Table 3.9 summarizes the taxiway and taxilane design standards based on the critical aircraft of each runway. Taxiways that serve more than one runway should be designed for the largest critical aircraft of either runway. If a hangar area only serves A/B-I small aircraft, it can be designed to those standards. If a taxiway serves a hangar area for aircraft larger than the runway it serves, the TDG may need to be larger.

TABLE 3.9: STANDARD TAXIWAY AND TAXILANE REQUIREMENTS PER RUNWAY

Runway (ARC)	Runway to Taxiway Separation	Taxiway Safety Area (TSA)	Taxilane Object Free Area (TLOFA)	Taxiway Object Free Area (TOFA)	Taxiway Centerline to Fixed or Movable Object	Taxilane Centerline to Fixed or Movable Object
Runway 12R/30L (Ex.: C-III; Fut.: D-III)	400’	118’	158’	171’	85.5’	79’
Runway 4/22 (Ex. and Fut.: D-II)	300’ 400’ – lower than 3/4 mile	79’	110’	124’	62’	55’
Runway 12L/30R (Ex. and Fut.: B-II Small)	240’ 300’ – lower than 3/4 mile	79’	110’	124’	62’	55’

Source: FAA AC 150/5300-13B, dated March 31, 2022.

Notes: Ex.: Existing; Fut.: Future

Taxiway Design Groups

The FAA uses a taxiway design methodology that focuses on taxiway geometry by determining the proper turning radii and taxiway fillet geometry. This methodology is known as the TDG and is used to minimize excess taxiway pavement and increase pilot situational awareness. Taxiways and taxilanes are designed to enhance safety by avoiding runway incursions. The design standards for taxiways are for “cockpit over centerline” taxiing, with pavement wide enough to allow a certain amount of wander. This wander limit is known as the taxiway edge safety margin (TESM) and is measured from the outside of the aircraft’s main gear to the edge of the taxiway pavement. Each aircraft is categorized in a TDG, which considers the main gear width (MGW) and cockpit to main gear length (CMG). The existing and future TDG associated with each runway is summarized in **Table 3.10**.

TABLE 3.10: SUMMARY OF TDG PER RUNWAY

Runway	Taxiway Design Group (TDG)	
	Existing	Future
Runway 12R/30L	TDG 3	
Runway 4/22	TDG 2A	
Runway 12L/30R	TDG 2A	

Source: VRB Airport Master Plan: Forecast Chapter, prepared by ESA, 2023.

Taxiway Designations

FAA AC 150/5340-18G: Standards for Airport Sign Systems recommends using guidelines and standards for designating taxiways. For a runway with a parallel taxiway, alphanumeric designators are used at the entrance and exit taxiways at the ends of and along the runway. Apply an increasing, sequentially numbered pattern from one runway end to the other, such as A1, A2, …, A5.[27] Taxiways that do not conform to these standards are not required to be updated until an airport signage plan, an airport layout plan, or a future development occurs. At the time of this airport master plan, four taxiway end connectors at runways 4 (both sides) and 12L/30R at VRB do not have alphanumeric designations and should be updated with the next associated taxiway project. **Figure 3.16** indicates the taxiway redesignations recommended at VRB.

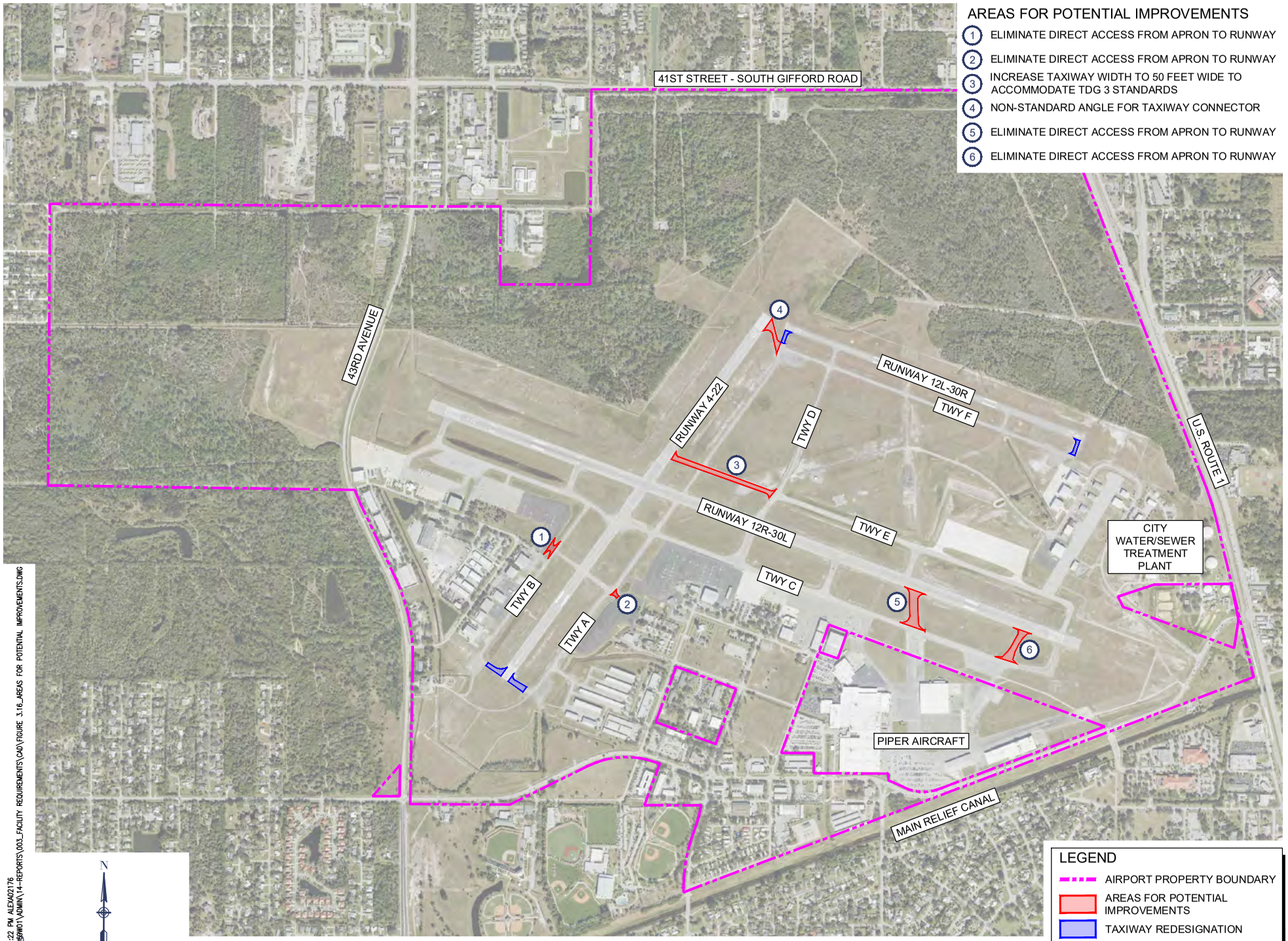
Taxiway Areas Previously Identified for Potential Improvements

Appendix J in FAA AC 150/5300-13B provides guidance to help prevent runway incursions and meet airfield design standards. Areas that should be analyzed include direct apron-to-runway access, wide expanses of pavement at runway-taxiway intersections, an entrance taxiway intersecting a runway not at a right angle, and a wide expanse of holding bay pavement. The taxiways previously identified for improvements at VRB include A1 (direct connection), B1 (direct connection; improvement project in progress), C2 (not 90 degrees), C3 (direct connection and not 90 degrees), A at the end of Runway 22 (not 90 degrees), and widening E 50 feet from D to Runway 4/22. As shown on **Figure 3.16**, these areas should be addressed when projects adjacent to the identified areas are completed.

FAA Hot Spots

A hot spot is a location on an airport movement area where heightened attention by pilots and drivers is necessary[28]. The FAA identifies these hot spots on airport diagrams. These airport diagrams assist pilots in planning for the safest taxi path possible, especially at an airport they may not be familiar with. The ways to improve hot spots should be addressed, as feasible, when construction in the area is contemplated. As depicted on **Figure 3.17**, VRB has one FAA hot spot at the intersection of Runway 4/22 and Taxiway C. Taxiway C has different separation distances from Runway 12R/30L on each side of Runway 4/22. Alternatives to straighten Taxiway C where it crosses Runway 4/22 should be considered. The addition of runway guard lights, flashing lights at the runway hold line, can be used to increase pilot situational awareness and should be considered for this area.

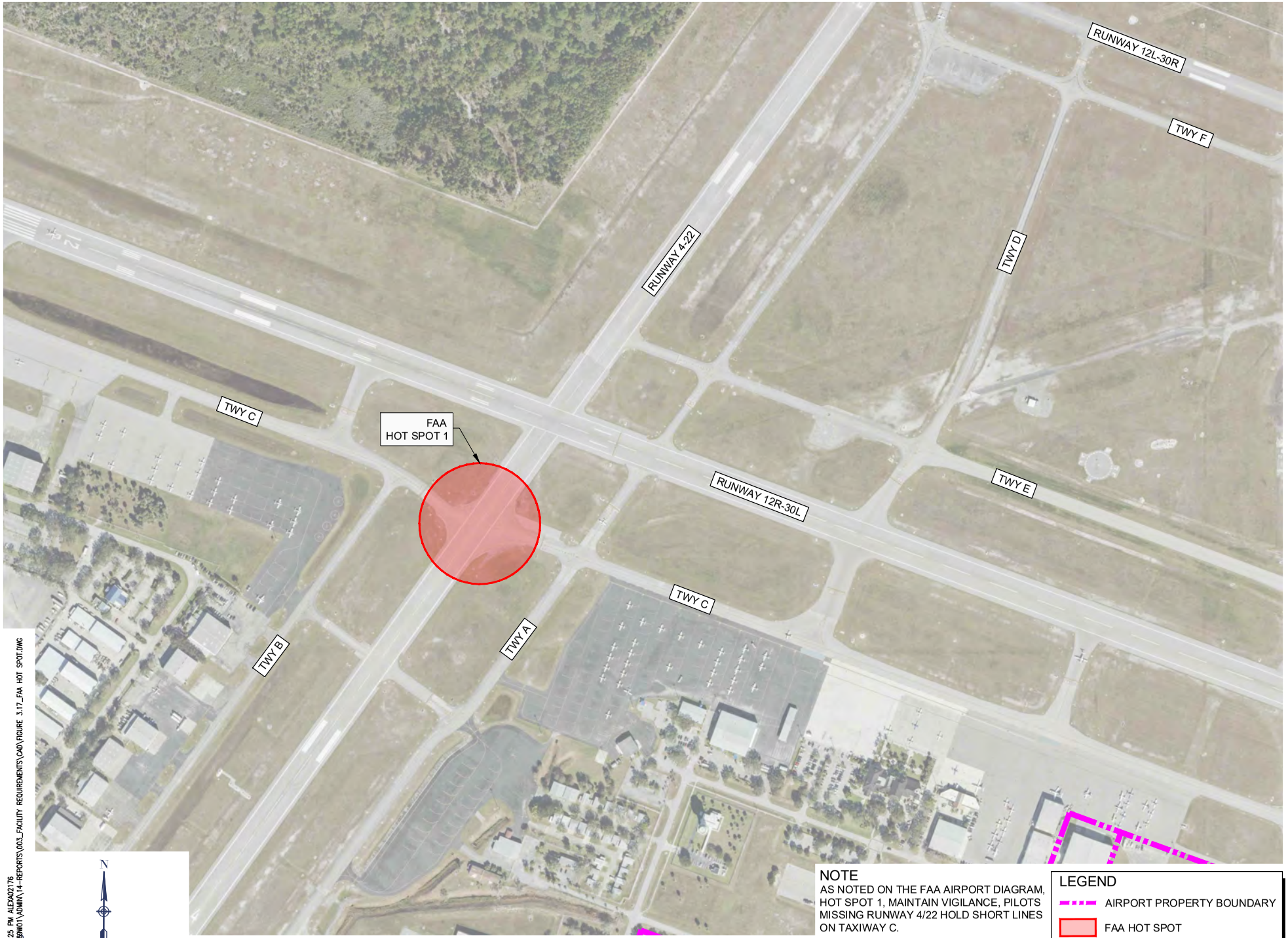
[27] FAA AC 150/5340-18G, dated December 23, 2020.
[28] FAA, Hot Spot Standardized Symbology, Hot Spot Standardized Symbology | Federal Aviation Administration (faa.gov), accessed March 28, 2023.



Source: Airport Property Boundary, Vero Beach Department of Public Works Survey Division, September 2021; Aerial Photography, NV5 GeoSpatial, 2023.

AUG 12, 2024 1:22 PM ALEXA0176
I:\20JOBS\20A0089W01\ADMIN\14-REPORTS\003_FACILITY REQUIREMENTS\CAD\FIGURE 3.16_AREAS FOR POTENTIAL IMPROVEMENTS.DWG

VERO BEACH | HANSON	VERO BEACH REGIONAL AIRPORT MASTER PLAN	AREAS FOR POTENTIAL IMPROVEMENTS	DRAWN BY: JA CHECKED BY: SZ FIGURE 3.16



NOTE
AS NOTED ON THE FAA AIRPORT DIAGRAM, HOT SPOT 1, MAINTAIN VIGILANCE, PILOTS MISSING RUNWAY 4/22 HOLD SHORT LINES ON TAXIWAY C.

LEGEND
- AIRPORT PROPERTY BOUNDARY
- FAA HOT SPOT

Source: Airport Property Boundary, Vero Beach Department of Public Works Survey Division, September 2021; Aerial Photography, NV5 GeoSpatial, 2023; FAA Hot Spot, Federal Aviation Administration, October 2023.

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VERO BEACH | HANSON

VERO BEACH REGIONAL AIRPORT
MASTER PLAN

FAA HOT SPOT

DRAWN BY: JA
CHECKED BY: SZ

FIGURE 3.17

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I:\20JOBS\20A00880W01\ADMIN\14-REPORTS\003_FACILITY REQUIREMENTS\CAD\FIGURE 3.17_FAA HOT SPOT.DWG

Taxiways

A summary of the design standards for each taxiway is shown in **Table 3.11**. Only a portion of Taxiway E does not meet the width required for the TDG and needs to be considered for improvements. Other taxiway geometric improvements should also be considered, as detailed in the following sections.

TABLE 3.11: SUMMARY OF INDIVIDUAL TAXIWAYS DESIGN STANDARDS

Taxiway	Existing Width (feet)	Existing TDG	Meets FAA Standards
A	35'/50'	2B/3	Yes
A1	50'	3/4	Yes
A2	35'	2A/2B	Yes
B	35'	2A/2B	Yes
B1	35'	2A/2B	Yes
C	50'	3/4	Yes
C1	75'	5/6	Yes
C2	75'	5/6	Yes
C3	75'	5/6	Yes
C4	70'	3/4	Yes
C5	60'	3/4	Yes
C6	60'	3/4	Yes
D	35'/75'	2B/6	Yes
E	40'	2A/2B	No
F	35'	2A/2B	Yes
F1	35'	2A/2B	Yes
F2	35'	2A/2B	Yes

Source: VRB Airport Layout Plan prepared by Ricondo, 2016.

Taxiway A

Taxiway A is a full-length parallel taxiway on the east side of Runway 4/22. Taxiway A north of Runway 12R/30L is 35 feet wide and south of Runway 12R/30L is 50 feet wide, which meet TDG 2A standards. The Runway 4/22 and Taxiway A separation varies at 350 feet and 400 feet, which meets ADG-II standards of at least 300 feet for ADG II with visibility minimums not lower than 3/4 of a mile. To straighten Taxiway A, the adjacent apron would require modification, which will be considered in the alternatives analysis.

Including the two end connectors, starting from the Runway 4 end, Taxiway A has five connectors: A, A1, C, E, and A2. At the time of this airport master plan, the end connector on the Runway 4 end is designated as A. To comply with FAA standards, an alphanumeric designator should be added to this end connector. A1 and A2 should be redesignated, as needed. A1 provides direct apron-to-runway access and is not consistent with FAA guidelines. To eliminate this, a portion of A1 should be relocated. Per FAA AC 150/5300-13B, Appendix J, A2 on the Runway 22 end does not intersect the runway at a right angle. The acute angle reduces the pilot's vision, and the taxiway geometry increases the width of the pavement. FAA standards for taxiway connectors that are not high-speed exits should be at 90-degree angles. Therefore, alternatives to reconfigure Taxiway A2 should be considered. There is an engine run-up area at the south end of Taxiway A. When landing on Runway 4, taxiways C and E are at least 2,000 feet from the runway end and can serve as exit taxiways for smaller aircraft. When landing on Runway 22, taxiways C and A1 can serve as exit taxiways. The quicker an aircraft can exit a runway, the higher the runway capacity.

Taxiway B

Taxiway B is a partial parallel taxiway on the west side of Runway 4/22. The taxiway starts on the Runway 4 end and extends north to Taxiway C. Taxiway B is 35 feet wide and meets TDG 2A standards. It has a 375-foot taxiway centerline to the Runway 4/22 centerline separation, which meets ADG-II standards of at least 300 feet for ADG II with visibility minimums not lower than 3/4 of a mile. The location of Taxiway B is constrained by the adjacent development. The chart supplement for VRB indicates the use of Taxiway B for any aircraft with a wingspan larger than 79 feet is at the pilot's discretion.

There are three taxiway connectors: B, B1, and C. The entrance taxiway on the Runway 4 end is designated as Taxiway B. To comply with FAA standards, an alphanumeric designator should be added to this end connector. Taxiway B1 provides direct apron-to-runway access. Taxiway B1 or the stub connector between Taxiway B and the west ramp should be realigned to eliminate direct access, per FAA design standards. VRB has developable areas west of Runway 4/22, so extending Taxiway B the full length of Runway 4/22 should be considered. There is a run-up area at the south end of Taxiway B. When landing on Runway 4, Taxiway E is at least 2,000 feet from the runway end and can serve as an exit taxiway for smaller aircraft. When landing on Runway 22, taxiways C and B1 can serve as exit taxiways. The quicker an aircraft can exit a runway, the higher the runway capacity.

Taxiway C

Taxiway C is a full-length parallel on the south side of Runway 12R/30L. Taxiway C is 50 feet wide and meets TDG 3 standards. The Runway 4/22 and Taxiway A separation varies at 400 feet to 475 feet, which meets ADG-III standards of at least 400 feet. Consideration should be given to straightening Taxiway C with 400 feet of separation to eliminate the transition where it crosses Runway 4/22, an identified FAA hot spot. This would also open an additional 75 feet for the apron area south of Taxiway C.

There are eight taxiway connectors. Starting from the Runway 30L end, they are C1, C2, C3, C4, D, A, C5, and C6. C3 provides direct apron access from Piper Aircraft to Runway 12R/30L. Alternatives should be evaluated to eliminate the direct apron-to-runway access. The updated FAA taxiway design standards in FAA AC 150/5300-13B recommend rounding the corners of end taxiways to assist pilots in distinguishing between the runway and taxiway pavement. When Taxiway C is rehabilitated in the future, rounding the end should be considered.

Taxiway C2 can serve as a bypass taxiway to allow departures if an aircraft is on C1, waiting for an IFR flight plan clearance. However, Taxiway C2 does not connect with Runway 30L at a 90-degree angle and provides direct runway-to-apron access with Piper Aircraft. Alternatives should be evaluated to eliminate the direct apron-to-runway access while maintaining a bypass taxiway. Adding a taxiway connector on the Runway 12L end that can serve as a bypass taxiway should also be considered. There are engine run-up areas at both ends of Taxiway C.

Taxiway D

Taxiway D provides crossfield access from the Skyborne apron south of Runway 12R/30L to runways 12L, 30R, and 22 on the north side of the airfield. The portion of Taxiway D between Taxiway C and Runway 12R/30L is 75 feet wide and Taxiway D north of Runway 12R/30L is 35 feet wide, which meet TDG 2A standards. Because the portion north of Runway 12R/30L is used primarily to provide access to Runway 12L/30, which is designed for small aircraft only, the width of Taxiway D in this area is sufficient.

Taxiway E

Taxiway E is a partial parallel taxiway north of Runway 12R/30L. Taxiway E east of Taxiway D to the Runway 30L end is 50 feet wide. Taxiway E has lease separations preserving ADG-IV TLOFA. There are four taxiway connectors. Starting from the Runway 30L end, they are: E1, E3, D, and A. Taxiway E west of Taxiway D to Runway 4/22 is 40 feet wide. This portion of Taxiway E should be widened to 50 feet to serve TDG 3 aircraft. There is a compass calibration pad within the ROFA south of Taxiway E between taxiways D and A. Relocation of the compass calibration pad should be planned.

VRB has developable areas north of Runway 12R/30L, so extending Taxiway E the full length of Runway 12R/30L should be considered. Any extension of Taxiway E should be able to serve ADG III and TDG 3 aircraft.

Taxiway F

Taxiway F is a full-length parallel taxiway on the south side of Runway 12L/30R. The taxiway is 35 feet wide and meets TDG 2A standards. There is 240 feet of separation between Runway 12L/30R and Taxiway F, meeting ADG II standards with visual approaches. The chart supplement for VRB indicates use of Taxiway F for any aircraft with a wingspan larger than 79 feet is at the pilot's discretion.

There are five connectors: F, F1, F2, D, and A. At the time of the airport master plan, the Runway 30R end connector is designated as Taxiway F. To comply with FAA standards, an alphanumeric designator should be added to this end connector. F1 and F2 should be redesignated, as needed. There is an engine run-up area on each end of Taxiway F.

In summary, the following taxiway improvements should be evaluated in the alternatives analysis:

- Redesignate four taxiway end connectors (A and B on the Runway 4 end, A on Runway 22 and F on Runway 12L/30R).
- Eliminate direct apron-to-runway connections at A1, B1, C2, and C3.
- Realign Taxiway A2 at Runway 22, Taxiway C2, and Taxiway C3 to be perpendicular to the runway.
- Widen Taxiway E to 50 feet, from Taxiway D to Runway 4/22.
- Add a bypass taxiway at the Runway 12R end.
- Realign Taxiway C to a 400-foot runway centerline to taxiway centerline separation from Taxiway B to the end of Runway 30L.
- Extend Taxiway B to a full-length parallel taxiway.
- Extend Taxiway E to a full-length parallel taxiway.

3.11. Airfield Facilities

Airport Traffic Control Tower

The ATCT was relocated to the southeast corner of Cherokee Drive and Flight Safety Drive in 2003. This location was selected to provide better visibility by minimizing tower controllers looking into the sun. An ATCT needs a clear line of sight to all movement areas in the airfield, including runways and taxiways. During the inventory site visit and tenant interviews, the tower staff indicated no line of sight issues. A detailed ATCT siting study was conducted before the existing ATCT was constructed. Therefore, it is important that all planning for future airport facilities protect the ATCT's clear line of sight to all airfield movement areas.

Electrical Vault

At the time of this airport master plan, the airfield electrical vault is considered to be an adequate size and in good condition, including the equipment that controls the airfield systems. However, due to normal use, replacements and/or upgrades to equipment will be needed over the 20-year planning horizon. Electrical upgrades to existing equipment should be considered as part of any future airfield lighting, signage, or navigational aid projects and at the end of their useful life.

Navaids and Weather Equipment

At the time of this master plan, VRB was equipped with a rotating beacon, ASOS, and wind cones.

Rotating Beacon

The rotating beacon is north of Runway 12L/30R in the northeast quadrant of the airport. The equipment is accessed by a private dirt road available to airport staff and is surrounded by dense vegetation, which makes it difficult to maintain. Therefore, other locations should be evaluated during the alternatives analysis. Any beacon location considered needs to avoid the beacon shining into the ATCT cab.

ASOS

The ASOS is approximately 20 years old and is owned by the National Weather Service. The equipment is in the midfield area, adjacent to Taxiway E. Because of the location of the ASOS and the height restrictions associated with its siting, future midfield development is limited. To alleviate the siting restrictions in this area and expand the area available for development, relocating the ASOS is desired. Other locations for the ASOS should be considered in the alternatives analysis.

Wind Cones

A segmented circle and primary lighted wind cone are in the midfield area, adjacent to Taxiway E. Future midfield development in this location would need to be aware as to not obstruct the segmented circle and lighted wind cone from pilots in the air and on the ground. For best use and flexibility of the available space for future midfield development, the relocation of the segmented circle and wind cone is recommended. Supplemental wind cones are on the left side of each runway end. At the time of this master plan, all the supplemental wind cones are operational, except for the wind cone near the Runway 22 end. This supplemental wind cone must be replaced and should be coordinated with the Runway 22 end alternatives.

Compass Calibration Pad

The compass calibration pad is on the south side of Taxiway E and west of Taxiway D within the ROFA. It should be relocated outside of the ROFA. A compass calibration pad needs to be located away from materials that could create magnetic interference. The alternatives analysis will consider options to relocate the compass calibration page, per the FAA AC 150/5300-13B guidance that the center of the pad should be located[29]:

- a minimum of 600 feet from magnetic objects, e.g., parking lots, busy roads, railroad tracks, high voltage electrical transmission lines, or cables carrying direct current
- a minimum of 300 feet from buildings, fuel lines, and electrical or communication cable conduits, if they contain magnetic materials
- a minimum of 150 feet from runway and taxiway light bases, airfield signs, ducts, and grates for drainage, if they contain iron, steel, or ferrous materials
- clear of any critical area for electronic navaid facilities
- not penetrate the OFZ, safety areas, OFAs, etc.

3.12. Advanced Air Mobility

There has been a strong interest in the Florida market from operators of advanced air mobility (AAM) aircraft and vertiport developers. At the time of this airport master plan, VRB has a developer interested in building a vertiport at VRB. Therefore, the alternatives analysis should consider how AAM and a vertiport can be accommodating at VRB. *FAA Engineering Brief 105: Vertiport Design* provides guidance until the FAA releases an advisory circular.

3.13. Commercial Service Facilities

The requirements for commercial service facilities were based on the continued development of passenger service at VRB, meetings with airport management, site visits, and guidance in *FAA AC 150/5360-13A: Airport Terminal Planning*. The following sections outline the different factors considered, along with the associated assumptions, to derive the requirements for the basic functional areas of the commercial service facilities.

[29] FAA AC 150/5300-13B, dated March 31, 2022

Development of Passenger Service

The activity forecasts in Chapter 2 projected the level of air carrier operations and passenger enplanements expected through 2043, including potential high- and low-growth scenarios. These projections included the need to accommodate up to 55,500 enplanements and were based on the initial seven-month schedule from Breeze Airways when the forecasts were prepared. The schedules included flights using the airline's 118-seat Embraer ERJ-195 and 126-seat Airbus 220-300. Since then, operational and passenger data from Breeze became available, including flight schedules through the end of 2023. Additionally, Breeze has also reconfigured some of its Airbus 220-300 aircraft with 137 seats. Thus far, the passenger service activity has met or exceeded expectations, with no flight cancellations and a higher-than-expected average passenger flight load. This resulted in VRB recording 21,104 annual enplanements between February and August 2023, the first seven months of operations for Breeze. This study's activity forecasts projected 20,300 enplanements for that period.
During the inaugural months of operations in 2023, Breeze Airways did not offer service at VRB every day, and the schedule was limited to two flights per day (one in the morning and one in the afternoon). Between June and September 2023, there were no flights scheduled for Tuesdays and Wednesdays. Based on the latest published schedules from Breeze Airways, beginning in October 2023, two flights will be conducted every day. In November 2023 and running through the end of the year, a third flight is scheduled every Sunday, Tuesday, and Thursday, resulting in 17 flights per week. On the days with three flights, initially there are two flights in the morning and one in the afternoon. This shifts halfway through November to one flight in the morning and two in the afternoon for the rest of the year. No 2024 schedules were available at the time of this analysis.

Air Carrier Operations

Typically, due to the uncertainties associated with long-term activity forecasting, PALs are established to represent future points at which different facility improvements would be required. For commercial service facilities, PALs are usually based on passenger enplanement thresholds and, for some analyses, peak-hour enplanements. This demand-based approach allows certain improvements to correlate to when the future PAL is reached, rather than a set point in time.

A peaking analysis for the passenger service operations was not included in the activity forecasts chapter because there was no data.

In June 2023, the city passed a resolution to formalize the method that rates and charges were applied to any commercial airline operating at VRB. Within the resolution, block times were created for each air carrier operation. These were established due to the limited size and capacity of the terminal building with respect to life-safety requirements, as well as Transportation Security Administration (TSA) screening capability. At the airport director's discretion, the block times set two hours before and one hour after each flight to prevent the overcrowding of facilities with overlapping flights and to accommodate delays.

Given the circumstances at VRB, establishing PALs based on passenger enplanements does not provide much value. For example, under the current practices, the commercial terminal facilities could accommodate four flights a day (two in the morning and two in the afternoon) to include the block time before and after each flight. In theory, if the 126-seat Airbus 220-300 configuration operated by Breeze Airways was scheduled for each of the four daily flights and the average 80% percent load factor from the activity forecasts applied, VRB could realize nearly 142,000 annual enplanements. This is 2 1/2 times the passenger enplanements projected for 2043 and 60% more than the high-growth scenario envisioned. Therefore, in lieu of PALs, the commercial service facilities for VRB are more dependent on the number of overlapping or simultaneous flights, as well as the desire to continuously improve the overall passenger level of service. For some of the terminal building areas, this was evident during the few occasions when a departure delay resulted in an overlap of two flights. During these conditions, the problems experienced were primarily due to the limited space in the secure passenger holdroom but also in other areas, such as the outbound baggage screening and make-up areas.

Terminal Building Requirements

As described in FAA AC 150/5360-13A, master plans usually only include basic information, which can be applied to a more detailed terminal planning process when needed. Given the unique characteristics of the passenger service activity at VRB, requirements for the terminal building were based on a high-level evaluation of the space required to increase the level of passenger service, as well as the potential to accommodate more than one flight simultaneously. The functional elements of the terminal building have been grouped into those needed for the departing and arriving passenger functions. **Table 3.12** provides details on these functional elements, as well as the improvements being designed for construction in 2024 to improve the level of service.

TABLE 3.12: EXISTING AND SHORT-TERM TERMINAL BUILDING FACILITIES

	Existing		After 2024 Improvements	
Departing Passengers				
Check-In Counters	66 SF	2 positions	66 SF	
Check-In Queuing	344 SF	1 queue	576 SF	Relocates rental cars
Outbound Baggage Screening and Make-Up	343 SF	1 EDS machine Bag make-up outside	343 SF	
Passenger Security Screening Equipment	446 SF	1 TSA lane	446 SF	
Passenger Security Screening and Queuing	745 SF	1 queue	745 SF	
Holdroom	1,742 SF	120 seats	2,223 SF	Additional 481 SF
Restrooms (secure side)	423 SF		423 SF	
Arriving Passengers				
Baggage Claim and Arrivals Lounge	0 SF	Bag claim outside	1,027 SF	Bag claim outside
Restrooms (nonsecure side)	0 SF		440 SF	
Rental Car Queuing	87 SF		65 SF	New rental car space
Rental Car Counter	145 SF		125 SF	New rental car space
TOTAL SPACE	**4,341 SF**		**6,479 SF**	

Notes: All areas have been estimated based on available drawings for past and future terminal improvements. EDS: explosive detection screening; SF: square feet. Source: ESA, 2023 analysis.

As shown in Table 3.12, the improvements planned for 2024 will increase the passenger terminal facilities by 50% to achieve the goal of improving the level of passenger service.

Departing Passenger Spaces

The general spaces required for departing passenger services are summarized in the following sections. It should be noted that this high analysis does not include every space required, such as the areas for offices, storage, janitorial functions, and the mechanical and structural components of the building. These will be incorporated as part of the actual design.

Check-In Areas

The approximate processing time per passenger for a single, traditional check-in counter is between two and five minutes. This varies, based on whether the passenger needs full check-in services, just a boarding pass, or other assistance. As such, the two positions at VRB have the potential to check in up to 60 passengers per hour. The check-in counters open two hours before a flight's scheduled departure time. With a range of 126 to 137 seats on the Airbus 220-300, there is typically enough time to check in passengers, given that some passengers arrive two hours before their flight, the flights are not always full, and a certain number of passengers will check in online. Additional check-in capabilities should be considered to increase the level of service and would be required if processing passengers overlaps for more than one flight.

The queuing area for passengers checking in is limited to between the check-in counters and the rental car facilities in the terminal building lobby. This area is frequently congested before a flight, because the check-in counters are near the front doors of the terminal, the queuing line for the passenger security screening, and the general circulation to other areas of the terminal building. For lower-activity terminals, a general rule is to provide a queuing area 35 feet deep for at least the width of the check-in counter. For the two check-in positions at VRB, this would be approximately 400 square feet. As shown in Table 3.12, the area would increase from 344 to 576 square feet, providing more queuing space. This space should be at least 1,000 square feet to support four check-in positions (with lobby circulation) to process passengers of more than one flight with overlapping times.

Outbound Baggage Screening and Make-Up

The type of explosive detection screening (EDS) equipment at VRB can screen approximately 225 bags per hour. As such, the single unit is adequate for processing the 126- to 137-seat Airbus 220-300 flights, considering that not every passenger will check a bag. A second unit may be required if two flights have departure times within an hour of each other. In addition to a higher screening rate, a second EDS unit would provide redundancy to avoid hand inspections of each checked bag if the single unit went offline.

Once screened, outbound baggage is loaded onto airline carts for the departing aircraft. While this function begins inside the building, there is no dedicated outbound baggage make-up area. The airline carts are outside, in a secure area adjacent to the terminal. Ideally, the space at VRB should be doubled to enable a portion of the baggage make-up to occur inside the building prior to being loaded onto the carts. To accommodate overlapping flights, the overall space for outbound baggage screening and make-up would also need to double if a second EDS unit were added. The outside areas used by the carts will be significantly improved in 2024 to provide a wider paved path and a looped route, versus the current configuration of one way in and one way out.

Passenger Security Screening

The average throughput for the type of security screening at VRB is approximately 150 passengers per hour. As such, the single TSA passenger security screening lane is adequate to process the passengers and flight crews for the 126- to 137-seat Airbus 220-300 flights. However, a larger overall security screening area is desired to provide additional space for the TSA staff and their functions, as well as a higher level of passenger service. Given the processing rate of the TSA lane, a second lane would not be required, even for two flights departing within a short period of each other. However, the TSA and passenger screening areas should be increased approximately 50% to better accommodate two overlapping flights.

Holdroom

The holdroom area provides approximately 120 seats in just under 1,750 square feet of space. This area will be expanded by nearly 500 square feet as part of the 2024 improvements, which would provide additional space and seating. While certainly an improvement for the level of service, additional space would still be required to accommodate the passengers of two overlapping flights who have cleared security.

There are two common ways to calculate holdroom requirements. One is to apply a standard area based on the maximum aircraft size served. The approximate area used for narrow-body aircraft like the Airbus 220-300 is 2,500 square feet. The other is to estimate the demand based on the estimated gate requirements in the peak hour of operation. For planning purposes, up to 5,000 square feet should be planned to provide enough secure passenger holdroom space to accommodate all the passengers of two overlapping flights. Additionally, this area would account for the space required to expand the restroom facilities and provide concessions for passengers on the secure side of the terminal. Concessions not only improve the level of passenger service, they create an opportunity for increased revenue generation. Ultimately, airport management may work with a concessionaire to determine appropriate concessions based on the airport's passenger profile. At smaller terminals such as VRB, this typically would be a small shop or kiosk with grab-and-go types of food, beverages, and other sundries.

Arriving Passenger Spaces

The general spaces required for arriving passenger services are summarized in the following sections. As with the departing passenger areas, the following sections do not include an assessment of every space required, just the major functional areas.

Baggage Claim and Arrival Lounge

The baggage claim area is outside the terminal building. The airline carts pull up to an area where passengers who have exited the secure side of the commercial terminal facilities can retrieve their bags. This outside baggage claim area and the sidewalks between it and the terminal building will be improved as part of the 2024 terminal improvements. These will primarily consist of expanding and covering the areas for passengers.

Additionally, part of the building will be renovated during the 2024 improvements to provide inbound passengers with a dedicated arrivals lounge. This area will include approximately 1,000 square feet of nonsecure circulation space for arriving passengers and people meeting them. The renovations also include new restroom facilities and an area to relocate the rental car facilities, which are currently in the terminal building lobby.

While the new arrivals lounge space and its current features will increase the level of service for passengers, ultimately, the inbound terminal facilities need to incorporate the baggage claim area as part of the structure. For planning purposes, doubling the circulation space would enable a single baggage device to be integrated into the terminal facilities. Space to accommodate a second rental car company in the future should also be considered.

Summary of Terminal Building Requirements

Table 3.13 provides an overview of the space required for the different functional elements of the terminal building necessary to support overlapping flights with a high level of passenger service. As with the current terminal facilities, it is assumed that any future terminal improvements will meet local building codes, including Americans With Disabilities Act provisions. The 12,430 square feet of space identified is nearly twice as much as what will be available once the 2024 terminal improvements are complete. This space and the features required are addressed further in the alternatives analysis.

TABLE 3.13: TERMINAL BUILDING REQUIREMENTS TO SUPPORT OVERLAPPING FLIGHTS

	Space and Features Required	
Departing Passengers		
Check-In Counters	150 SF	4 positions
Check-In Queuing	1,000 SF	2 queues
Outbound Baggage Screening and Make-Up	1,500 SF	2 EDS machines Bag make-up inside
Passenger Security Screening Equipment	700 SF	1 TSA lane with more space
Passenger Security Screening and Queuing	1,200 SF	1 queue with more space
Holdroom	5,000 SF	For 2 aircraft departures
Restrooms (secure side)	0 SF	Included with holdroom
Arriving Passengers		
Baggage Claim and Arrivals Lounge	2,000 SF	Bag claim inside
Restrooms (nonsecure side)	500 SF	
Rental Car Queuing	130 SF	2 rental car companies
Rental Car Counter	250 SF	2 rental car companies
TOTAL SPACE	**12,430 SF**	

Source: ESA, 2023 analysis.

Airside Facilities for Commercial Aircraft

Runway 12R/30L and parallel Taxiway C are designed to accommodate a majority of the passenger airline narrow-body fleet, including the Embraer ERJ-195 and Airbus 220-300 aircraft operated by Breeze Airways. Therefore, only the number of aircraft parking positions is addressed for the airside facilities necessary to support commercial aircraft operations.

During the preparation of this master plan, a second aircraft parking position was delineated on the commercial service hardstand apron immediately northwest of the terminal building. The parking positions can simultaneously accommodate two of the larger Airbus 220-300 aircraft. As such, no additional parking positions are required to accommodate the activity projected.

3.14. General Aviation Facilities

VRB, with more than 200 based aircraft and annual operations exceeding 133,000, supports a variety of GA traffic. Based on the historical activity and projected growth in the forecast chapter, there is a high demand for aeronautical development, including a hangar waiting list for 90 aircraft.

The flight schools have 75 aircraft based at VRB. Their single-engine aircraft are tied down on the apron within their leasehold when not in use. Therefore, they were omitted from the GA future facility development calculations. Hangar capacity at VRB is 100%. Almost all based aircraft, except for the single-engine aircraft used by the flight schools, are or are desired to be stored in hangars. Therefore, the GA facility development calculations are based on the assumption that all future based aircraft will require hangar storage. The following section provides additional information on the calculations used to determine the future GA development.

Aircraft Hangar Requirements

There are various types and sizes of hangars at VRB to support the high aeronautical demand. These hangars include small and medium T-hangars, executive hangars, and large corporate hangars. At the time of this airport master plan, VRB has multiple private hangar developments in process that will provide 32 T-hangars, 10 small box hangars, three medium to large hangars totaling approximately 54,800 square feet and six large box hangars totaling 86,500 square feet. These ongoing projects will be included to help meet the GA facility demand over the planning period but fall short of addressing the full forecasted demand. Future alternative concepts will depict areas to be reserved for T-hangars, small box hangars, and large box hangars for flexibility to meet the forecasted demand, based on the hangar square footage required to meet the demand, as shown in **Table 3.14**.

To project the future hangar needs, the total future based aircraft exceeding flight school aircraft were identified. The flight school aircraft were assumed to grow by 10% during the 20-year forecast period. These future based aircraft were then identified by size, based on the aviation forecasts. There are some aircraft on the VRB basedaircraft.com list that are registered at other airports or at Piper. These were excluded from the future GA facility development requirements. After identifying the total future needs, the existing hangar facilities were subtracted to identify the number of new hangar facilities needed. For planning purposes, it was assumed that the single-engine aircraft would require T-hangar space and larger aircraft would be housed in box hangars. To project the future square footage for box hangars, 3,000 square feet was used for multiengine aircraft, based on the King Air 200 as a representative multiengine aircraft. Using the Dassault Falcon as a representative aircraft, 7,100 square feet was used for jets, and 2,000 square feet was used for helicopters.

As depicted in Table 3.14, an additional 68 hangars for single-engine aircraft, 45,000 square feet of multiengine hangars, 184,600 square feet of jet hangars and 18,000 square feet for helicopters will be required during the planning period. These are the total future needs. The private hangar development in process will be considered in the alternatives analysis when identifying options to meet these future hangar needs at VRB. These hangar facilities should be implemented to align with the PALs.

TABLE 3.14: SUMMARY OF FUTURE GA HANGAR FACILITY DEVELOPMENT

	Based Aircraft		
Total 2022	216		
Skyborne Airline Academy	44		
Paris Air	31		
2022 Total Aircraft in Hangars	**141**		
Total 2043	334		
Skyborne Airline Academy	52		
Paris Air	37		
2043 Total Aircraft in Hangars	**245**		
	Number of Aircraft		
Aircraft Type	**2022**	**2043**	**Net Difference**
Single-Engine	70	138	68
Multiengine	38	53	15
Jet	16	42	26
Helicopter	3	12	9
Aircraft Registered at Another Airport	10	10	0
Aircraft at Piper	4	4	0
2043 Future Hangar Needs			
T-Hangars (Single-Engine)	Total Units to Meet Future Demand		68 units
Small Box Hangar (Multiengine)	Additional Multiengine Aircraft Square Footage		15 aircraft 45,000 SF
Large Box Hangars (Jets)	Additional Jet Aircraft Square Footage		26 aircraft 184,600 SF
Box Hangar (Helicopter)	Additional Helicopters Square Footage		9 Helicopters 18,000 SF

Aircraft Parking Aprons

Except for the commercial service parking positions, the apron facilities at VRB are within tenant leaseholds. During the inventory process, no tenants identified the need for additional apron area for regular operations. During special events and around the winter holidays, there are times when additional aircraft parking areas are needed. At these times, the airport has identified overflow areas, including the engine run-up pads and some paved areas along taxiways. As described in the RVZ section, the other facility need is to minimize aircraft parking within the RVZ when the tower is closed, which will be addressed as part of the alternatives analysis.

3.15. Other Airport Support Facilities

Aircraft Rescue and Firefighting

Fire Station No. 3 is on the southwest side of the airport, adjacent to 43rd Avenue near the Runway 4 end. With the start of commercial service operations, VRB upgraded to an ARFF Index B, which includes air carrier aircraft at least 90 to 126 feet long. VRB has three vehicles, including the recently acquired 1993 Oshkosh T-1500. VRB meets the FAA ARFF requirements of a three-minute response time to the midpoint of the furthest commercial service runway. Therefore, the ARFF station meets FAA requirements, and no changes are needed. Based on the aviation forecast, no change in ARFF index is anticipated during the planning period.

As long as there are fewer than five average daily departures by the A220-300, largest aircraft regularly operated at VRB, the current ARFF Index B is sufficient. Should operations increase to an average of five or more daily departures, by the A220-300 or larger aircraft then an increase to ARFF Index C would be required. This increase in ARFF Index would require larger ARFF vehicles resulting in the need for a larger ARFF station to house the vehicles. The existing Fire Station No. 3 serves as the ARFF rescue to VRB, as well as emergency response to the surrounding community. Therefore, to meet the need for future ARFF Index C and not impact any existing emergency response, a standalone ARFF station that can accommodate ARFF Index C to serve VRB should be planned.

As discussed in the Runway 4 RSA and ROFA section, there is a need to redevelop the ARFF road due to unsuitable grades and excessive bank angles. Therefore, evaluating modifications to the ARFF road or ARFF station location should be considered during the alternatives analysis.

Airport Operations Facility

The airport operations facility was completed in 2014. The building is approximately 8,000 square feet and accessed via a security gate south of the west industrial area off Flight Safety Drive. This facility stores large vehicles, mowers, and equipment owned by the airport. Automobile parking is on the east side of the building and includes 10 standard spaces. At the time of this master plan, additional storage space for airport operations equipment is needed. The alternatives analysis will consider opportunities to reserve space to expand the airport operations facility.

Fuel Farms

There are seven active fuel farms, including two self-serve fuel farms, at VRB. The fuel farms provide a fuel capacity of 65,000 gallons of Jet A, 49,000 gallons of 100LL, 500 gallons of autogas, and 500 gallons of diesel. There are three fuel farms on the west ramp, operated by Corporate Air, Paris Air, and Continental Jet. Three of the remaining four fuel farms are near the terminal area. These fuel farms are operated by Sun Aviation and Skyborne. One fuel farm is just outside the AOA at the corner of Cherokee Drive and Piper Drive and provides a driveway for tractor trailer access. Davis Development on the north ramp also has a fuel system for its operations. At the time of this airport master plan, the fuel farms are in good working condition and meet airport needs. All the fuel farms are operated by private entities. No requests to reserve additional areas for fuel farms were received from these tenants during the inventory process.

Alternate Fuel Systems

With increasing technology, electric aircraft continue to make advancements in the aviation industry. During the alternatives analysis, available space should be protected to provide charging stations for electric aircraft within the existing airfield and consider other opportunities to accommodate electric aircraft that support the aviation

ARFF industry's AAM initiative. Hydrogen power for aircraft is also under development. This may require future storage for hydrogen for fueling aircraft.

Perimeter Fence and Security Access Gates

Perimeter fencing and security updates were completed in late 2019. The 52 security gates on VRB are shown on **Figure 3.18**. The 2019 improvements included the partial removal of the fence, removal of manual and pedestrian gates, and upgrades to 8-foot-high chain-link fence with three strands of barbed wire. These improvements took place in the terminal area, north ramp, and west airfield. The perimeter fence on the north side of the airfield along the tree line was upgraded to a height of 10 feet. This consisted of 2 feet below-ground, 7 feet above-ground and 1 foot of barbed wire. There is a need to upgrade the perimeter fence on the south side of the airport, similar to the improvements completed to the north side, to help prevent wildlife access. Therefore, perimeter/wildlife fence alternatives are recommended during the alternatives analysis.

Additional security cameras are required to enhance the security at airport facilities. Security cameras around the T-hangars and a camera at the security gate off Flight Safety Drive is needed, at a minimum. Also, additional security cameras to provide visibility of the taxilanes between the T-hangars is needed.

3.16. Landside Facilities

Landside facilities, including vehicle ground access, pedestrian access, and automobile parking, are essential to efficient movement around an airport.

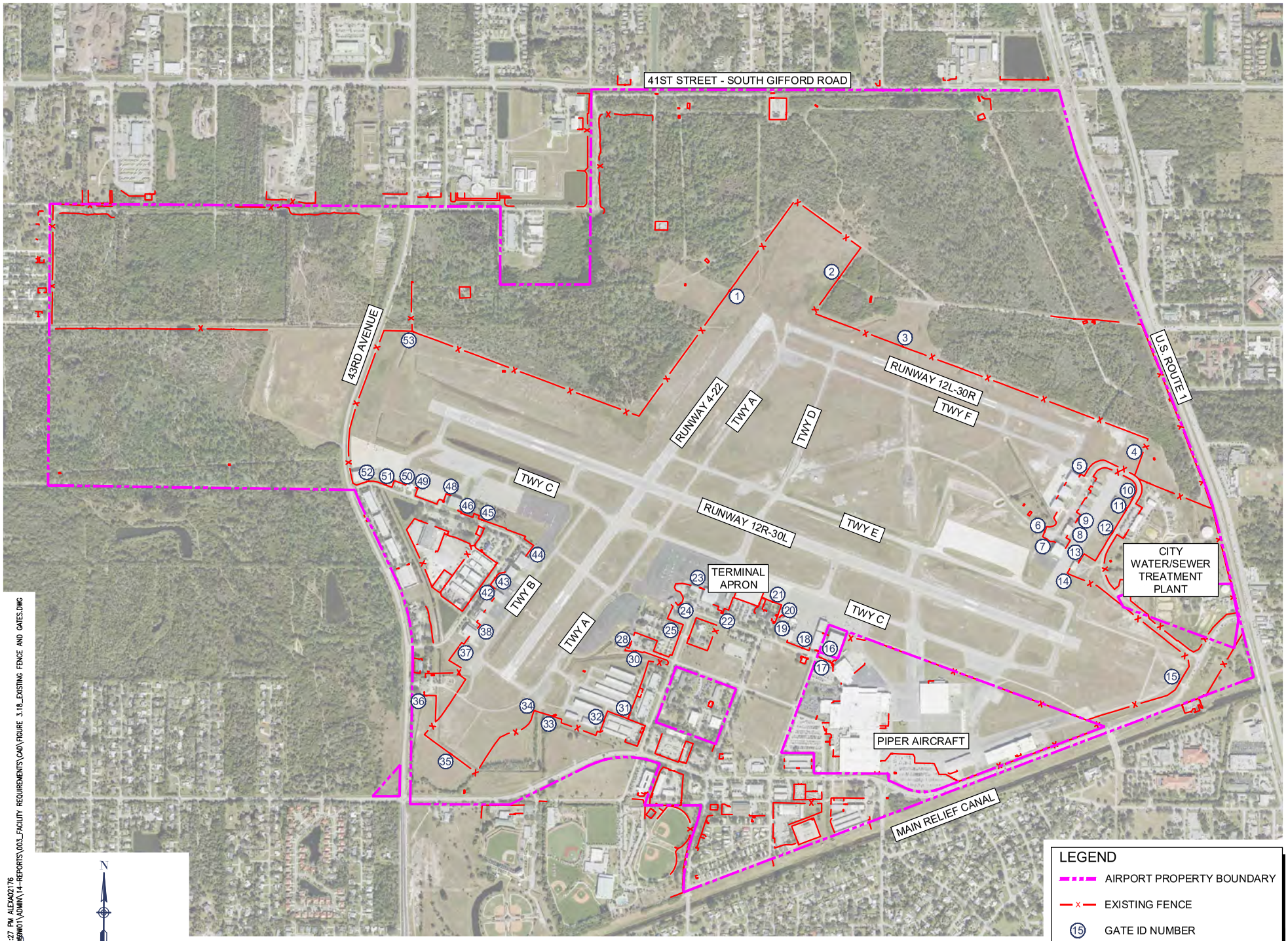
Vehicle Ground Access

As shown on **Figure 3.19**, four primary vehicle access roads surround VRB. These surrounding roads include 41st Street to the north, U.S. 1 to the east, Aviation Boulevard to the south, and 43rd Avenue to the west. The city of Vero Beach plans to widen Aviation Boulevard from 43rd Avenue to U.S. 1. At the time of this airport master plan, an ongoing project development and environment (PD&E) study is evaluating improvements to the intersection of State Road 5/U.S. 1 and Aviation Boulevard. This intersection is within the Runway 30L RPZ. In coordination with the airport, the PD&E study has eliminated all alternatives that included an overpass or underpass, so as not to adversely impact airport operations.

Within airport property, VRB owns the roads and right of way. This allows the airport to modify the roadway system if needed to support the expansion of airport operations. VRB is responsible for the maintenance of the roads within airport property. The roads are public use and used primarily for aviation-related access. Some of the city-planned improvements to Airport Boulevard are within the airport-owned portion. Depending on the funding source, a change of ownership of the right of way may be required. Because VRB is a surplus property airport (deeded from the federal government after military use ceased), any proposed change of ownership will require a land release by the FAA.

Pedestrian Access

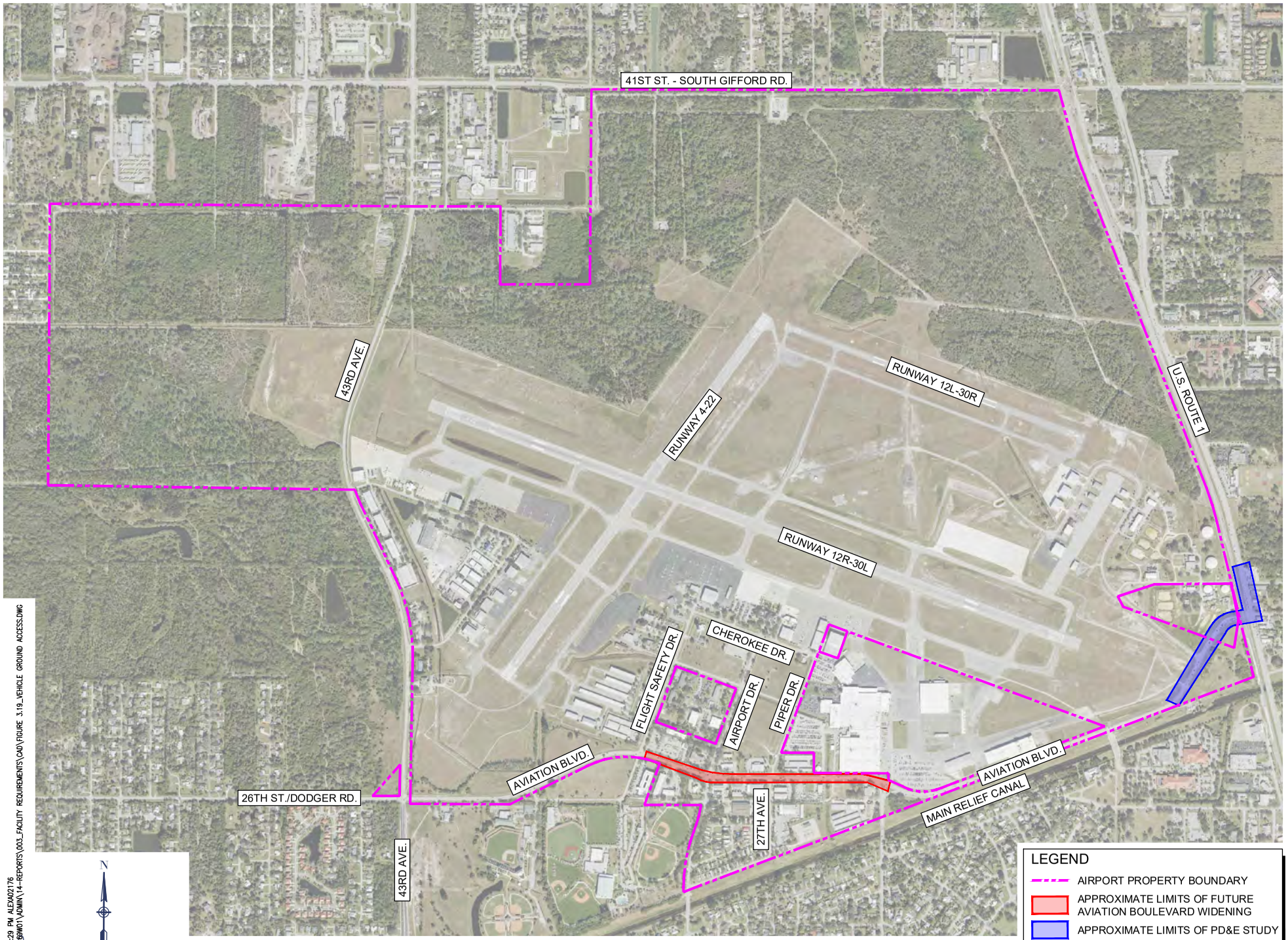
Crosswalks from the long-term parking lots south of Cherokee Drive provide passengers access to the terminal. To assist with the demand of additional passengers and visitors caused by increased commercial service operations, pedestrian access improvements, including lighted crosswalks and signs, should be considered.



Source: Airport Property Boundary, Vero Beach Department of Public Works Survey Division, September 2021; Aerial Photography, NV5 GeoSpatial, 2023.

AUG 12, 2024 1:27 PM ALEXA02176
I:\20JOBS\20A0086W01\ADMIN\14-REPORTS\003_FACILITY REQUIREMENTS\CAD\FIGURE 3.18_EXISTING FENCE AND GATES.DWG

VERO BEACH | HANSON	VERO BEACH REGIONAL AIRPORT MASTER PLAN	EXISTING PERIMETER FENCE AND SECURITY GATES	DRAWN BY: JA CHECKED BY: SZ FIGURE 3.18



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GRAPHIC SCALE IN FEET

Source: Airport Property Boundary, Vero Beach Department of Public Works Survey Division, September 2021; Aerial Photography, NV5 GeoSpatial, 2023.

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I:\2DJOBS\20A0086W01\ADMIN\14-REPORTS\003_FACILITY REQUIREMENTS\CAD\FIGURE 3.19_VEHICLE GROUND ACCESS.DWG

VERO BEACH | HANSON

VERO BEACH REGIONAL AIRPORT MASTER PLAN

SURROUND VEHICLE GROUND ACCESS ENHANCEMENTS

DRAWN BY: JA
CHECKED BY: SZ

FIGURE 3.19

Automobile Parking

The primary automobile parking areas are around the terminal building in short- and long-term parking areas. Additional automobile parking areas are adjacent to the FBOs, Corporate Air and Sun Aviation, and the flight training schools, Skyborne and Paris Air. Vehicle parking for the city hangars and T-hangars in the general aviation area are generally inside or adjacent to the hangars.

FIGURE 3.20: SHORT-TERM PARKING

Automobile Parking Near Terminal Area

Automobile parking is available adjacent to the terminal building. Parking is divided into two areas: short- and long-term parking. As shown on **Figure 3.20**, short-term parking is north of Cherokee Drive, adjacent to the terminal building. This area has 111 parking spaces, including standard, compact, and accessible spaces.

As shown on **Figure 3.21** and **Figure 3.22**, long-term parking is south of Cherokee Drive and divided into two areas: Lot A and Lot B. Lot A has 51 spaces and Lot B has 82 spaces, totaling 133 long-term parking spaces. The pavement is in good condition, requiring only routine maintenance. A parking study conducted for the Breeze Airways' operations indicated 150–200 additional parking spaces may be needed to support passenger service. The alternatives analysis should consider additional areas for parking to meet the needs of commerical service operations. Other businesses at VRB and Piper Aircraft have their own designated parking areas. Piper Aircraft has expressed the need to VRB for additional automobile parking near their facility. With the initiation of passenger service, provisions for taxi, transportation network companies, and other ground transportation options should be considered in the alternatives analysis.

FIGURE 3.21: LONG-TERM PARKING – LOT A

FIGURE 3.22: LONG-TERM PARKING – LOT B

Automobile Parking Near FBOs

Automobile parking is available at both the FBOs at VRB. The FBOs are Corporate Air and Sun Aviation. Corporate Air is on the west side of the airfield, and Sun Aviation is east of the terminal building. The FBOs have automobile parking areas available within their leaseholds that are outside the control of the airport. Potential areas that could be available for additional lease space for tenants should be identified during the alternatives analysis. The next subsections provide additional automobile parking details for both FBOs.

Corporate Air

Landside access to Corporate Air is by Airport West Drive via 43rd Avenue. Corporate Air has a parking area west of the FBO terminal that includes 13 standard parking spaces and two accessible spaces, as shown on **Figure 3.23**. During the inventory process, it was observed that the grass area across the street from the FBO terminal building is used for overflow parking. An automobile parking area should be considered to accommodate the overflow parking.

Sun Aviation

Sun Aviation is on the east side of the terminal building and accessed via Cherokee Drive. Sun Aviation has 43 parking spaces south of the FBO terminal, as shown on **Figure 3.24**. Sun Aviation did not indicate a need for additional parking. However, at the time of this airport master plan, Hertz would use the grass area south of Cherokee Drive for overflow parking. Additional rental car parking should be considered in the alternatives analysis.

Nonaeronautical Parking and Connectivity

VRB is in the process of adding 26 parking spaces and pedestrian walkway improvements to the north side of the automobile parking along 26th Street/Dodger Road between Airport Drive and Bonanza Lane to better support the businesses in this area. This will improve the connection of the area to the terminal for pedestrians or bicycles.

FIGURE 3.23: CORPORATE AIR AUTOMOBILE PARKING

FIGURE 3.24: SUN AVIATION AUTOMOBILE PARKING

3.17. Nonaeronautical Facilities

Based on the aviation forecasts, the aviation use at VRB is projected to continue to grow. During the alternatives analysis, areas will be identified that could accommodate aeronautical development within the airport property. Areas that must be protected, such as city wells or environmentally sensitive areas, will be taken into account when development is being considered. After that occurs, areas without potential airfield access could be considered for nonaeronautical use.

As detailed in Section 1.20, VRB houses a wide range of nonaeronautical development. Nonaeronautical development has the potential to provide additional revenue to the airport to diversify the revenue stream and help support airport operations. The opportunity for other types of nonaeronautical development, compatible with airport operations, should be considered in the alternatives analysis after all aeronautical needs are met.

3.18. Facility Requirements Summary

The section has identified opportunities to improve the facilities at VRB to better meet current and future demands. Within the 20-year planning period, the activity at VRB is forecast to continue to grow. Based aircraft are projected to increase from slightly more than 200 aircraft to more than 300 aircraft, with growth in all sizes of based aircraft. To accommodate this growth, additional hangar facilities of various sizes will be needed. Passenger enplanements are projected to increase to more than 50,000, which will require additional terminal building, ground transportation, and parking facilities. Operations are projected to increase to more than 300,000 annual operations, higher than the pre-COVID-19 peak. The airfield facilities will need to be maximized through runway and taxiway improvements to avoid significant operational delays as activity increases. Alternatives will be developed to identify options to meet these demands, starting with the airfield and progressing toward potential nonaeronautical development. In addition to considering the facility requirements, the alternatives will consider environmental factors, as identified in the environmental overview.

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