

AIRPORT LAYOUT PLAN UPDATE

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CHAPTER 1 – INTRODUCTION

1. INTRODUCTION

1.1. Introduction

Sanford Seacoast Regional Airport (SFM or the Airport) is a growing and thriving general aviation and Regional Airport. This Airport Layout Plan (ALP) Update is the result of continued hangar, apron, and services demand at the Airport even after new hangar construction. This ALP Update aims to create a short-term and medium-term plan to accommodate the existing and anticipated growth with a holistic, long-term perspective in mind.

The process of updating the ALP Update for the Airport requires the collection of baseline information relating to the Airport’s property, facilities, services, tenants, and access. The information was obtained through a variety of sources including site visits, interviews with Airport management and tenants, publicly available online data, future development plans, and examination of Airport records.

The Airport is a public use airport serving the general aviation needs of southern Maine and is a Regional Airport according to the 2023 National Plan of Integrated Airport Systems (NPIAS).



Jet parked at SFM
Source: Sanford Seacoast Regional Airport, 2021

1.1.1. Current Mission, Vision, and Objectives of the Airport

The airport strives to be a financially independent entity within the City of Sanford, Maine. and its mission is to operate, maintain, and preserve a high-quality aviation facility that:

- Is safe, secure, and legal;
- Delivers the highest quality aviation services by providing customer-focused and efficient operations, facilities, staff, and administration;
- Represents the region that it serves and responds to community feedback; and
- Promotes economic development.

The Airport’s vision is to set the standard through leadership, operational skills, and financial self-sufficiency as the desired hometown airport known for providing exceptional services and amenities to residents, visitors, and businesses alike.

As detailed in the Airport’s business plan, the overall goals are to:

- Maintain a high standard of safety, security, and maintenance with the following objectives relating to this study:
 - o Monitor General Audio Recording Device (GARD) system for record keeping, training, planning, and justification of infrastructure needs
 - o Maintain up-to-date tenant contact database
- Reach, maintain, and foster financial self-sufficiency with the following objectives relating to this study:
 - o Accomplish as much in-house as practical e.g. Sanford Airport Solar Maintenance, grant administration, and writing of plans
 - o Sell City-owned non-essential buildings or property and convert to private/ commercial use
 - o Develop uniform guiding documents that promote order, ease of updating, clear cost structure, and reflect current situation
 - o Continue to work together with other City Departments to improve efficiency and reduce redundancy where practical and appropriate
 - o Improve web presence to provide information for

- o potential customers and users as well as current tenants, based pilots, and itinerant users
- o Maintain active membership on appropriate boards and associations
- o Create competitive and attractive business environment to retain existing tenants and recruit new tenants and remain responsive to the needs and successes of existing businesses
- o Continuously evaluate and explore options in the rate and fee structure to maintain competitiveness among airports in Maine and nearby New Hampshire
- o Access, monitor and utilize the GSAXcess® system for the procurement of surplus equipment



Airfield Snow Removal
Source: Southern Maine Aviation, 2022

1.1.2. Goals and Objectives of the Airport Layout Plan Update

The objective of an ALP Update is to provide a planning tool for the airport and FAA that depicts the existing and future facilities at an airport. The ALP Update will be used by the FAA to program future funding assistance and to monitor the airport’s compliance with design standards and grant assurances. An up-to-date FAA-approved ALP showing the proposed airport development is a prerequisite for issuances of grants.

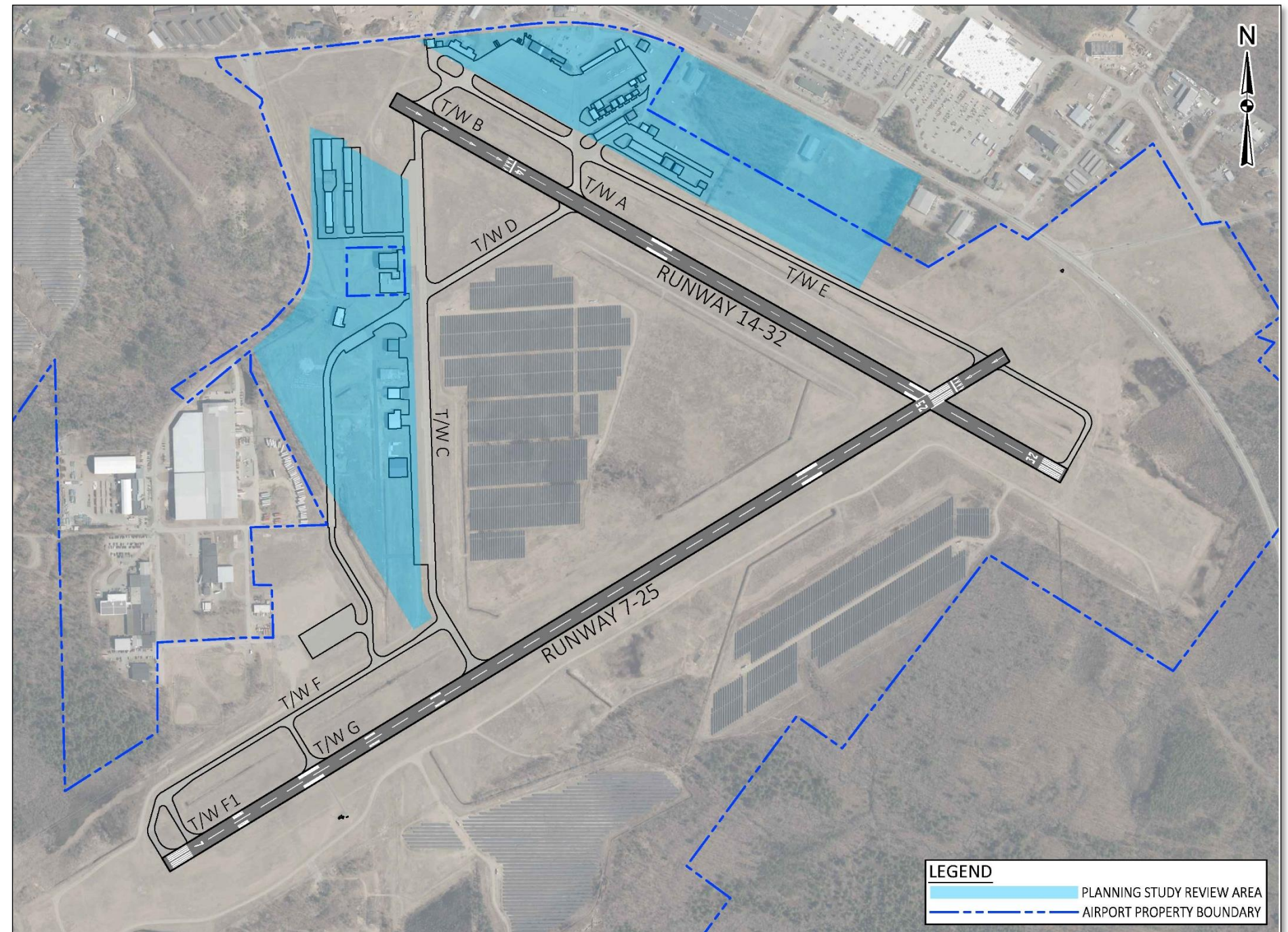
The key goals of this ALP Update and narrative are to identify areas

for future aviation and aviation-related development to support the anticipated growth of the Airport in the short-term. There are two identified areas of evaluation identified for the study as shown in **Figure 1-1**.

The goals and objectives of this ALP Update include:

- Develop a plan to address the short-term demands for aircraft hangars, tie-downs, auto parking, de-icing, and fueling of aircraft.
- Evaluate and recommend alternatives to address aviation and aviation-related development.
- Evaluate the potential acquisition of parcels adjacent to the airport to accommodate required aviation development and access improvements.
- Utilize recently available Automatic Dependent Surveillance-Broadcast (ADS-B) records to improve an understanding of the characteristics of users, and frequency and volumes of peak activity periods.
- Identify the future of Hangar E26 and the Sanford Fire Station.
- Determine the terminal area flow and parking need with changes in access gates.
- Identify aeronautical opportunities for economic sustainability at the airport as required by grant assurances.
- Provide a framework for the financing and implementation activities required for short-term and medium-term development at SFM.
- Seek to obtain approval from the FAA of the resulting ALP.

Figure 1-1: Airport Property and Study Review Areas



Sources: McFarland Johnson, 2022; SFM ALP Update, 2018; National Agriculture Imagery Program (NAIP), 2021



CHAPTER 2 – INVENTORY OF EXISTING CONDITIONS

2. INVENTORY OF EXISTING CONDITIONS

2.1. Airport Property and Regional Setting

The Airport is located approximately five miles southeast of the City of Sanford, Maine’s downtown business district. The City itself is located within York County in southern Maine, 35 miles southwest of Portland, Maine; 60 miles northeast of Manchester, New Hampshire; and 90 miles north of Boston, Massachusetts.

The Airport property is identified in **Figure 1-1** and is comprised of approximately 1,115 contiguous acres around the airfield. The Airport property is bordered on its north and east side by State Route 109, Main Street, largely undeveloped land to its south and sparsely developed property to the west along Gatehouse Road (not shown).



Airport Facility
Source: Sanford Seacoast Regional Airport, 2022

2.1.1. Airside Facilities

Airside facilities at the Airport consist of airfield pavement and equipment in place to support the movement of aircraft such as taxiing, takeoff, and landing.

2.1.1.1. Runways and Taxiways

There are two runways at SFM with details shown in **Table 2-1** and a supporting taxiway system of nine taxiways and two taxilanes. All taxiways meet Taxiway Design Group (TDG) 2 width standards and vary in width from 35 to 50 feet.

Table 2-1: Runways

Runways	Runway 7-25	Runway 14-32
Length	6,389'	4,999'
Width	100'	100'
Runway Design Category (RDC) ¹	C-II-4000	C-II-5000
Pavement Strength	65,000 lbs single wheel 100,000 lbs double wheel	72,000 double wheel
Lighting	high intensity edge lighting four-light precision approach path indicator (PAPI) RWY 7 - Runway End Identifier Lights (REILS)	medium intensity edge lighting
Visual Guidance	RWY 25 - Omni-Directional Approach Lighting System (ODALS)	four-light PAPI

Sources: FAA Airport Data and Information Portal, 2022
(1) 2015 Airport Master Plan, 2022

2.1.1.2. Apron Areas

The Airport currently provides three aircraft parking areas that can accommodate approximately 60 aircraft and provide approximately 408,600 square feet (SF), or ten acres, of pavement area in total. **Figure 2-1** depicts the three aircraft parking areas located at SFM.

The Based Aircraft Apron area (shown in Area 2 of **Figure 2-1**) is located on the eastern side of the airfield and supports multiple hangars. This apron also provides access to the fire station. The apron area measures approximately 99,000 SF and provides 10 painted based aircraft tie-down positions. These tie-downs are provided for small general aviation aircraft.

The Transient Apron area (shown in Area 2 of **Figure 2-1**) is located adjacent to the Based Aircraft Apron area on the eastern side of the airfield and supports the on-site East Fixed Base Operator (FBO) building. The apron provides access to the fuel farm and measures approximately 211,500 SF including 17 painted aircraft tie-down positions (12 small aircraft and five larger tie-downs) spanning 125,400 SF.

Area 1 of **Figure 2-1** is located on the western portion of the airfield.

The apron measures approximately 67,500 SF and is generally used for overflow parking. It provides access to the western portion of the airfield, particularly Taxiway F and Runway 07-25.



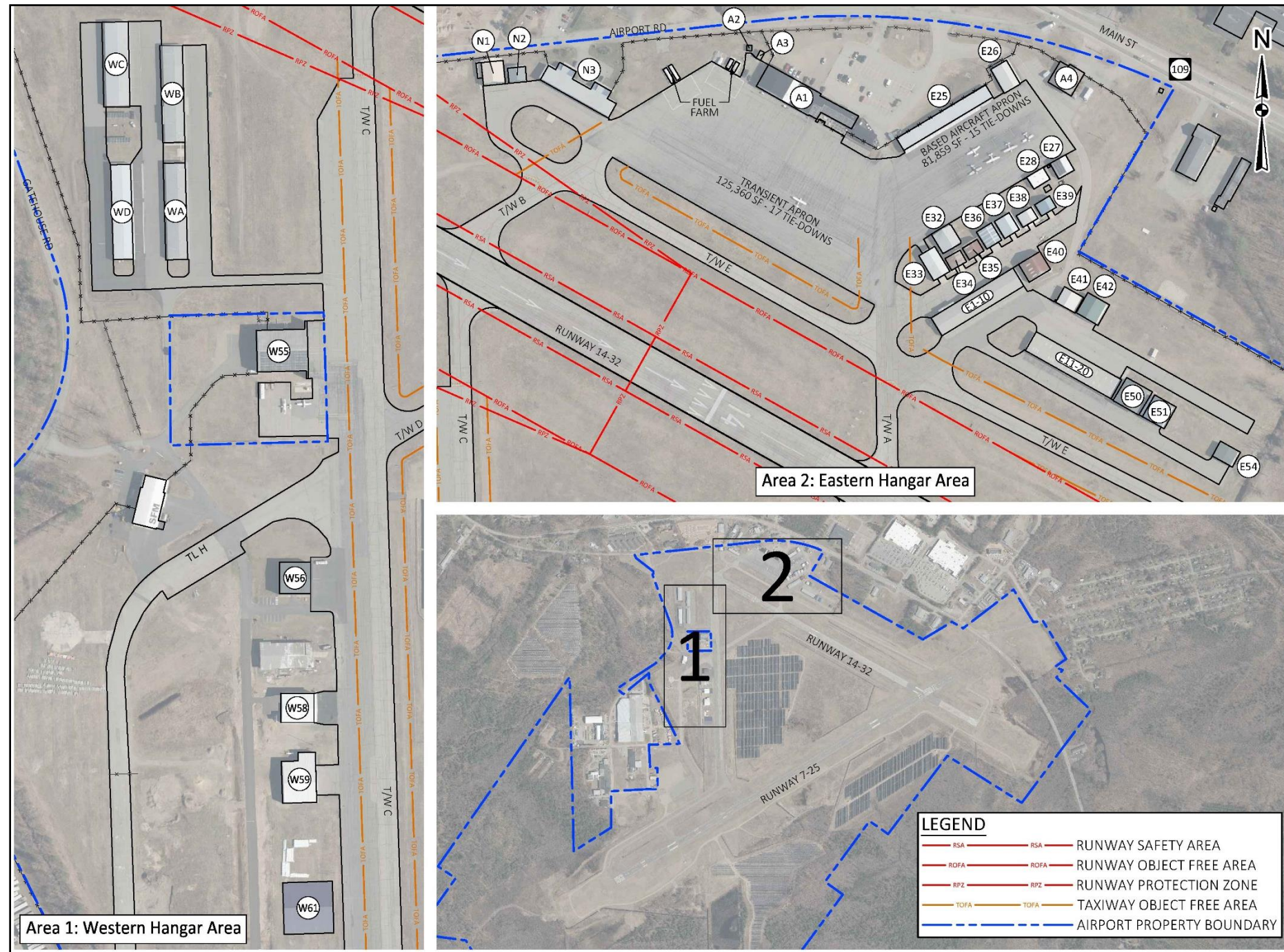
Eastern Airfield Apron
Source: Southern Maine Aviation, 2019

The Airport currently (November 2022) has 115 based aircraft consisting of 96 single engine aircraft, 9 multi engine aircraft, 1 jet, and 9 helicopters. The based aircraft park in private hangars as well as on the based aircraft parking apron. Currently, there is a waitlist of 56 (including four larger sized hangars) based aircraft hangars including current based aircraft owners on tie-downs and student pilots interested in buying a plane.

SFM’s apron areas are regularly utilized for overflow parking (shown in **Figure 2-2** during SFM-hosted events including:

- Young Eagles rallies; fly 60-90 children each time
- 1-2 FAA wings certified safety seminars hosted by Southern Maine Aviation including a fly-in and potluck
- Fireworks for Independence Day
- Halloween Fright or Flight – this can include 20+ aircraft flying in and has had 1,000s of people from the community attend
- Brew Festival – Café and Chamber of Commerce hosted
- Airport 5K
- AOPA fly-ins

Figure 2-1: Existing Buildings and Apron Areas at SFM

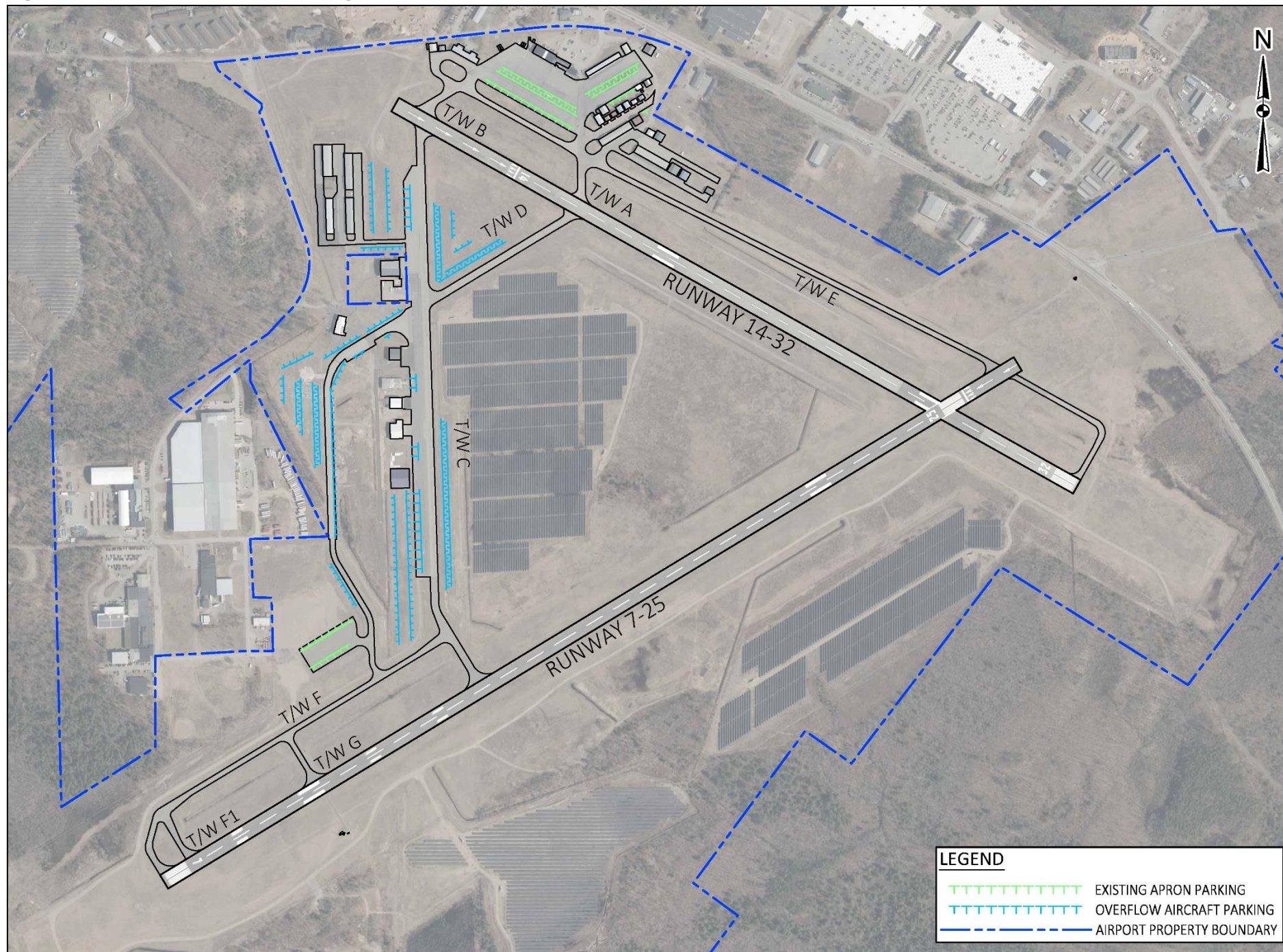


Note: Hangar designations W57 and W60 are not currently in use.
Sources: McFarland Johnson, 2022; SFM ALP Update, 2018; National Agriculture Imagery Program (NAIP), 2021

Building	Description	Use	Size (SF)
E1-E10	East Condo	Based Aircraft Storage	11,663
E11-E20	East Condo	Based Aircraft Storage	12,518
E25	East Hangars	Based Aircraft Storage	14,000
E26	East Hangar	Based Aircraft Storage	2,945
E27	East Hangar	Based Aircraft Storage	1,842
E28	East Hangar	Based Aircraft Storage	1,562
E32	East Hangar	Based Aircraft Storage	2,867
E33	East Hangar	Based Aircraft Storage	3,148
E34	East Hangar	Based Aircraft Storage	1,358
E35	East Hangar	Based Aircraft Storage	1,357
E36	East Hangar	Based Aircraft Storage	2,039
E37	East Hangar	Based Aircraft Storage	1,997
E38	East Hangar	Based Aircraft Storage	1,359
E39	East Hangar	Based Aircraft Storage	1,355
E40	East Hangar	Based Aircraft Storage	3,023
E41	East Hangar	Based Aircraft Storage	2,298
E42	East Hangar	Based Aircraft Storage	3,423
E50	East Hangar	Based Aircraft Storage	4,612
E51	East Hangar	Based Aircraft Storage	3,600
E54	East Hangar	Based Aircraft Storage	2,260
W55	TTF FBO	FBO	12,589
W56	West Hangar	Based Aircraft Storage	5,600
W58	West Hangar	Based Aircraft Storage	5,600
W59	West Hangar	Based Aircraft Storage	8,800
W61	West Hangar	Based Aircraft Storage	14,000
A1	East FBO	FBO	12,853
A2	Airport Storage	Non-aeronautical	255
A3	Electric Vault	Non-aeronautical	152
A4	Fire Station	Non-aeronautical	7,152
N1	North Hangar	Based Aircraft Storage	3,440
N2	North Hangar	Based Aircraft Storage	1,572
N3	North Hangar Suites A-D	Based Aircraft Storage	9,360
WA	West Hangars W1-W10	Based Aircraft Storage	12,264
WB	West Hangars W11-W20	Based Aircraft Storage	12,264
WC	West Hangars W21-W30	Based Aircraft Storage	12,945
WD	West Hangars W31-40	Based Aircraft Storage	12,264

Note: Hangar designations W57 and W60 are not currently in use.
Sources: SFM ALP Update, 2018 and City of Sanford, Maine GIS, 2022

Figure 2-2: Overflow Aircraft Parking



Sources: SFM ALP Update, 2018; National Agriculture Imagery Program (NAIP), 2021; Airport Management, 2022

Summer peak seasonality as well as the special events the Airport puts on result in the need for overflow tie-down parking is identified in **Figure 2-2**. Additionally, it should also be noted that potential based aircraft activity is turned away due to limitations in hangar space and availability. Anecdotally, aircraft are being turned away in the summer months when the ramps are full (or do not provide space for a large jet) and in the winter when charters and fractional ownership companies confirm at the beginning of the season that there are no active deicing facilities.

Overflow parking needs also come into play when SFM serves as its role as a reliever airport as designated by the Federal Aviation Administration (FAA). SFM regularly takes in based aircraft and airport businesses when other local airports have runway closures due to rehabilitation, reconstruction, etc. Due to its Reliever designation and having 90 or more based aircraft means SFM continues to be a Regional Airport according to FAA Order 5090.5, *Formulation of the NPIAS and ACIP*.

Table 2-2 shows the number of based, transient, and overflow tie-downs available at the Airport.

Table 2-2: Type and Number of Tie-downs at SFM

Type of Tie-Down	Number	Paved
Based aircraft apron (north)	15	Y
Based aircraft apron (south)	5	N
Transient aircraft apron (north)	36	Y
Transient complex general aviation (GA) (south)	6	Y
Transient small GA (south)	8	Y
Small GA overflow	255	N
Complex GA overflow (ex. Pilatus)	18	Y

Source: Airport Management, 2022

Further details on based aircraft demand is provided in the Forecast Chapter.

2.2. Landside Facilities

Landside facilities at the Airport consist of support buildings and structures typically accessible to the airfield. This section describes the Airport's supporting facilities which aid in the utilization of the airside facilities identified previously in this document. **Figure 2-1** provides an overview of all landside facilities discussed in this section.

2.2.1. East Fixed Base Operator Building

Presently the only on-site FBO, Southern Maine Aviation, is located on the north-eastern portion of the airfield off Airport Road. Through the East FBO's main facility, Southern Maine Aviation provides terminal and lounge amenities to pilots, students, and passengers. The East FBO also provides aviation fuel, aircraft ground handling, oxygen service, aircraft parking (tie-downs or ramp), hangar leasing, aircraft and helicopter maintenance and repairs, and flight training.



East FBO Maintenance Bay
Source: McFarland Johnson, 2022



Perimeter Fencing in Snow
Source: Southern Maine Aviation, 2016



Southern Maine Aviation Helicopter Fueling
Source: Southern Maine Aviation, 2020

While the East FBO offers terminal amenities such as a lounge waiting area, Wi-Fi, beverages for purchase, and check-in desks, the Airport does not currently have a public, airport-owned terminal building and welcome center.

2.2.2. Hangar Facilities and Other Tenant Structures

A variety of hangar facilities have been constructed on the Airport property including 60 nested t-hangars and 29 conventional box hangars. The City currently owns two buildings on the airfield: the airport maintenance shop and the "city hangar", used for aeronautical purposes. The City also owns the South Sanford Fire station, located on airport property, which is used for non-aeronautical purposes through a special temporary use agreement with FAA. The remainder of the buildings located on property are privately owned on Airport land that is subject to a lease agreement with the City.

Figure 2-1 details each of the hangars on Airport property, including description, use, and size.

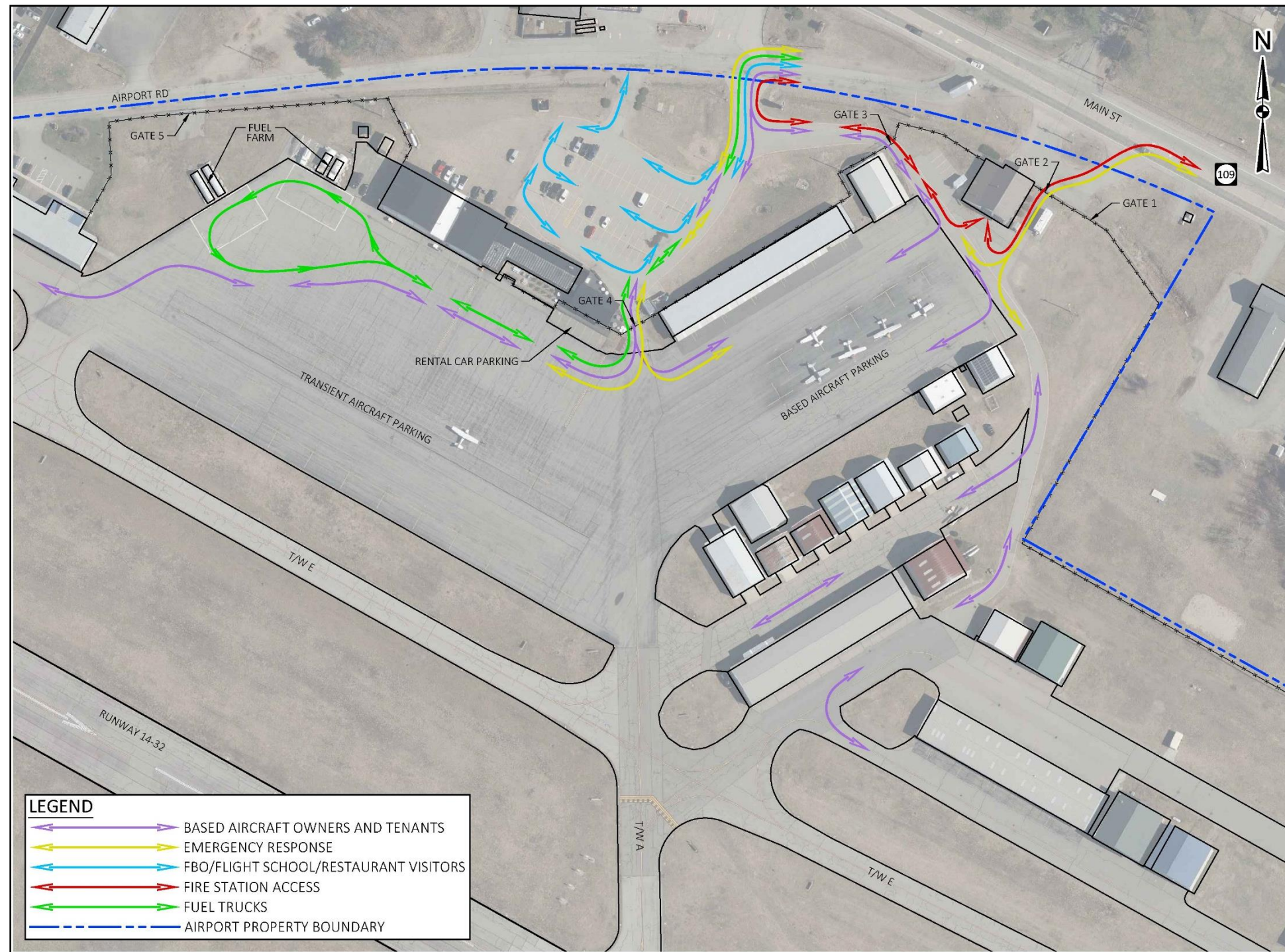
2.2.3. Airport Access, Security, and Vehicle Parking

The Airport is perimeter controlled through eight-foot fencing around the northern portion of the airfield, four-foot fencing around the East FBO area, 10-foot wildlife fencing around the south end, and 6-foot fencing around along the south-eastern portion of the airfield that abuts the large solar farm. The perimeter is also controlled by electronic access gates that are only accessible by authorized personnel. Fencing also acts as a barrier to entry for wildlife.

The East FBO parking lot is located between the East FBO building and Airport Road and is open to the public. There are 52 parking positions and six handicap parking positions, totaling 58 parking positions. Private parking positions for individually owned hangars are accessible to owners and tenants of the privately-owned hangars. **Figure 2-3** depicts the parking positions available, automobile gate use, and vehicle flow at SFM near the East FBO area.

Additionally, rental cars for transient/itinerant jet operators park near Gate 4. There have been considerations for moving the rental car parking outside of the fence for security reasons.

Figure 2-3: Vehicle Gates Flow and Access Gates - East FBO Area



Sources: SFM ALP Update, 2018; National Agriculture Imagery Program (NAIP), 2021; Airport Management, 2022

2.3. Deicing Area

The Airport does not currently have a designated apron or pavement area for deicing operations. All deicing activity is currently done through passive de-icing measures. These passive de-icing measures include: storing aircraft in hangars and allowing the ice to melt passively or using spray bottles.

When all hangars are full, this can lead to aircraft not overnighing at SFM or delays in departures as multiple large aircraft may need to get into a heated hangar for passive deicing.



Aircraft in Snow
Source: Southern Maine Aviation, 2019



CHAPTER 3 – FORECASTS

3. FORECASTS

3.1. Introduction and Forecast Methodologies

Forecasting future activity involves both analytical techniques and subjective considerations. The forecasting approach used in this analysis will be to identify several methodologies to project future aviation demand, apply those methodologies to each forecast area of interest, and identify a preferred forecast of activity growth at the Airport. The preferred forecast will be identified through detailed consideration of the forecast analyses presented in this chapter.

Forecast of aviation demand is presented in this chapter for a short-term, 5-year planning period (2022-2027) and that growth percentage is applied to the full 20-year planning period (2022-2042). The projections of aviation activity provide a basis for determining the type, size, and timing of aviation facility development. As a result, the forecast will influence all subsequent chapters of this report.

The following forecasts and analysis will be developed and presented in this chapter:

- Based Aircraft
- Annual Aircraft Operations
- GA (General Aviation) Passengers
- Comparison to FAA TAF
- Critical Aircraft

3.1.1. Forecast Methodologies

The most reliable approach to estimating future aviation demand is to use a variety of analytical techniques. As such, the forecast prepared and described in this chapter were reviewed using several methodologies. Various methods of forecasting aviation demand exist and are widely used throughout the industry including, regression analysis, trend line analysis, market share analysis, the FAA’s Terminal Area Forecast (TAF), and the FAA’s Aerospace Forecasts Fiscal Year (FY) 2022-2042. These methods have been applied to develop the most accurate forecast possible for SFM and are described in more detail below. An accurate forecast also takes into consideration the role an airport plays in its region. SFM’s role as a reliever airport for the region, its location near tourist destinations and other large/busy airports, and

accessibility to facilities (fuel, runway length, apron space, etc.) are drivers of its growth.

3.1.1.1. Regression Analysis

Regression analysis involves the use of historical data to identify the relationship between a selected dependent variable, such as based aircraft, and independent variables, such as population. When strong correlations exist between dependent and independent variables useful forecasts can be generated. For this forecast effort, however, no correlations were identified, and regression analysis was not used.

3.1.1.2. Trend Analysis

Trend analysis examines historical growth trends in activity at a specific airport and applies the historical trends to current demand levels to produce projections of future activity. Trend analysis assumes that activity, and the factors which have historically affected activity, will continue to influence demand levels at similar rates over an extended period. Linear time series trend projections are typically used to provide baseline forecasts that reflect stable market conditions. Based aircraft, operations, and fuel sales histories were reviewed using this trend analysis and results are shown in **Table 3-1**.

Table 3-1: Trend Analysis Results

	5-year CAGR ¹ percent	10-year CAGR ¹ percent
Total Based Aircraft	5.5	3.3
Total Operations (TAF)	-7.1	-7.4
Total Operations (TFMSC)	3.9	1.9
ADG II Operations	4.8	6.0
AAC C & D Operations	11.7	3.8
Fuel Sale (Total Gallons)	5.6	8.2 ²
Fuel Sale (Avgas/100LL)	2.0	4.9 ²
Fuel Sale (Jet A)	7.4	10.0 ²

¹ CAGR – compound annual growth rate

² Fuel sale history was calculated for an 8-year CAGR due to data provided through 2014.

Sources: FAA TAF, FAA Traffic Flow Management System Counts (TFMSC), Airport records, and McFarland Johnson analysis, 2023.

3.1.1.3. Market Share Analysis

Market share analysis is a method for projecting future aeronautical activity that can be applied to any measure for which a reliable higher-

level forecast is available. Using this methodology historical shares are calculated and used as a basis for projecting future shares. This approach is a “top-down” method of forecasting since forecasts of larger aggregates are used to derive forecasts for smaller elements of the system – in this case Sanford Seacoast Regional Airport. For the market share analysis for SFM, data relative to the State of Maine, the combined States of Maine and New Hampshire, and New England were reviewed for both GA operations and based aircraft. According to the FAA’s TAF, SFM market share is shown the **Table 3-2**.

Table 3-2: Market Share Results

Ratio of SFM to	2012	2017	2022
Maine (based aircraft)	9.0%	9.8%	13.1%
Maine + New Hampshire (based aircraft)	4.4%	4.9%	6.4%
New England (based aircraft)	1.5%	1.7%	2.4%
Maine (operations)	12.9%	10.2%	7.7%
Maine + New Hampshire (operations)	7.7%	6.1%	4.4%
New England (operations)	2.2%	1.7%	1.2%

Sources: FAA TAF, 2023.

3.1.1.4. FAA Terminal Area Forecast (TAF)

The FAA TAF is a basic forecast generated by the FAA that features national and regional growth attributes in its composition. While the local market considerations are minimal, it is a required benchmark in the development of new forecasts which are required to be within 10 percent of the 5-year TAF and 15 percent within the 10-year TAF. The current TAF published by the FAA shows no growth throughout the 20-year planning period. Considering Sanford’s history of growth, the TAF does not provide an accurate forecast for the Airport.

3.1.1.5. FAA’s National Aerospace Forecast

The FAA Aerospace Forecasts FY 2022-2042 provides national growth projections for the aviation industry. The FAA’s Aerospace Forecasts identifies projected compound annual growth rates (CAGR) for GA aircraft through the end of its forecast period (2042). This study did not apply the FAA’s Aerospace Forecasts as it shows both declining single engine GA operations and based aircraft on a national level, which is inconsistent with the operations and based aircraft at SFM. These national trends rates are identified in **Table 3-3** and **Table 3-4**.

Table 3-3: National Operations by Aircraft Type

CAGR	GA Itinerant	GA Local	Air Taxi/Commuter
2010-2021	-0.7%	1.3%	-4.2%
2022-2032	0.8%	1.0%	0.5%
2022-2042	0.6%	0.7%	0.5%

Sources: FAA National Aerospace Forecast FY 2022-2042

Table 3-4: National Based Aircraft Trends by Aircraft Type

CAGR	Single Engine	Multi Engine	Turbo Prop	Turbo Jet	Total Rotorcraft
2010-2021	-1.1%	-2.6%	0.8%	2.9%	-0.3%
2022-2032	-1.0%	-0.6%	0.2%	2.9%	1.5%
2022-2042	-0.9%	-0.3%	0.6%	2.6%	1.5%

Sources: FAA National Aerospace Forecast FY 2022-2042

3.2. Based Aircraft

The number of based aircraft at an airport is an important factor for determining future activity levels and the need for expanding or improving airport facilities. Forecasts of based aircraft are used directly to estimate the need for certain types of facilities, such as hangars and aircraft aprons. At non-towered GA airports, such as SFM, projections of based aircraft also often serve as the basis for developing the forecasts of other components of demand, such as aircraft operations. There are 119 aircraft based at Sanford Seacoast Regional Airport, but the Airport consistently gets up to 132 based aircraft. Some of these 13 based aircraft may be splitting their time between airports and may not be counted toward either airport's based aircraft. The demand for additional hangars in recent years has led to additional hangars on the western portion of the airfield with the most recent T-hangar units. Though there has been recent development that was quickly filled up, the Airport still has a waiting list of about 65 individuals interested in basing their aircraft when hangar space becomes available. The Airport has 10 T-hangar units being designed and out to bid as this chapter is being written (January 2023). The Airport also plans for 36 additional units to be added within the next two to three years, including box hangars and T-hangars. Airports and developers generally have a good idea for true demand for short-term hangar need before construction (due to down payments, etc.).

It should also be noted that at the time this forecast was written, Twitchell Airport announced they would be closing and thus, the

number of based aircraft at SFM may increase to accommodate the aircraft previously based at Twitchell Airport.

3.2.1. Historical Based Aircraft

Airport records are consistent with the FAA TAF for the total number of based aircraft. In the past 10 years, based aircraft have varied from a low of 86 (in 2012) to the current high of 119.

3.2.2. Forecast Based Aircraft

Utilizing the forecast methodologies outlined in the preceding sections, multiple forecast of based aircraft were developed for SFM. These based aircraft projections are depicted in **Figure 3-1** and tabulated in **Table 3-5**.

Low Growth: The market share analysis of SFM and other airports in the New England Region shows that SFM's based aircraft market share have grown as a percentage of Maine, combined Maine and New Hampshire, and New England (shown in **Table 3-1**). If SFM maintains the current 2.2 percent based aircraft market share of New England based aircraft, the Airport will experience an approximately 1.1 percent CAGR of based aircraft within the 20-year planning period.

Medium Growth: The medium forecast scenario represents the middle of forecast operations at SFM. This scenario takes into consideration the historical 10-year based aircraft CAGR of 3.3 percent SFM has experienced. This scenario also aligns with the organic growth the Airport is already experiencing. There are 10 additional T-hangar units that are out to bid as of Spring 2022 to be constructed in the Summer of 2022. There are additional hangar projects planned that would continue to provide space for people currently on the waitlist.

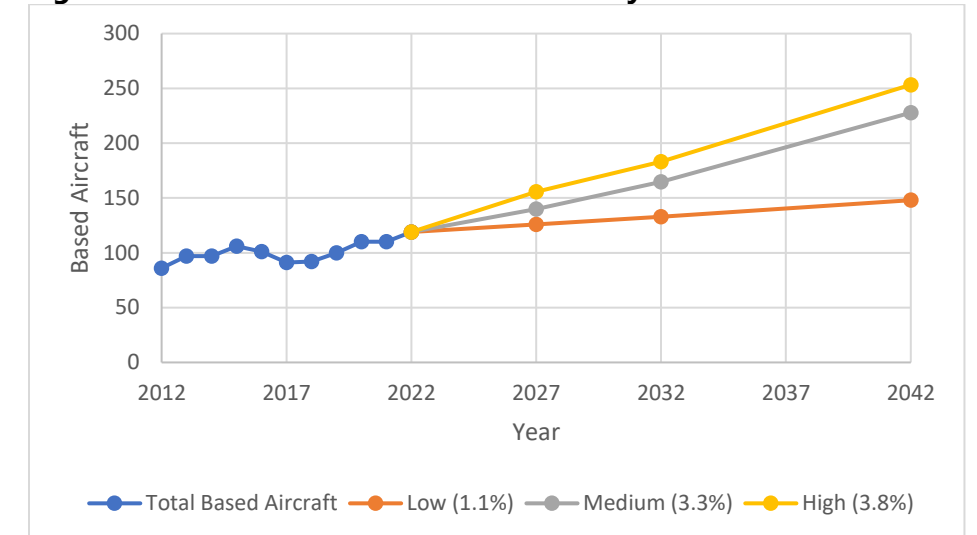
High Growth: The high forecast scenario represents the high end of forecast operations at SFM. This scenario considers the 5-year based aircraft CAGR of 5.5 percent (which also matches the 5-year total fuel sale CAGR). These forecast trends are also consistent with the current/short-term demand at the Airport, with recent hangar development, and a remaining demand for more development. This high growth rate is applied to the first five years of the forecast period after which the 10-year 3.3 percent CAGR is applied for the remainder of the planning period.

Table 3-5: Based Aircraft Forecast Summary

	Low (1.1%) - 2022 New England Market Share	Medium (3.3%) - 10-year Trend Analysis	High (3.8%) - 5-year Trend Analysis
2027	126	140	156
2032	133	165	183
2042	148	228	253

Sources: FAA TAF, Airport Records, and McFarland Johnson analysis, 2023

Figure 3-1: Based Aircraft Forecast Summary



Sources: FAA TAF, Airport records, and McFarland Johnson analysis, 2023

Based on the growth at SFM, it is anticipated that the medium-growth forecast is very likely to occur based on planned development at SFM (as described at the beginning of this section) and was chosen as the preferred alternative. Actual growth will occur based on demand. **Table 3-6** breaks down the preferred based aircraft by type of aircraft. It is anticipated that multi-engine, jet and other aircraft will increase their presence and single-engine based aircraft will grow but represent 68 percent of total based aircraft compared 81 percent in 2022.

Table 3-6: Based Aircraft Preferred Forecast Summary By Type

	Single Engine	Multi Engine	Jet	Rotorcraft	Other
2022	96	9	1	9	4
2027	108	12	3	11	6
2032	122	17	5	13	8
2042	155	27	11	18	16

Source: McFarland Johnson analysis, 2023

3.3. Annual Aircraft Operations

The FAA defines an aircraft operation as a takeoff or a landing and categorizes the operations by aircraft type and purpose. These categories include commercial (air taxi), GA (both recreational and corporate), and military. The forecasting of these operations by category is used in planning buildings, runways, taxiways, and other airport infrastructure.

3.3.1. Historical Operations by Type

It is common to collect aircraft operations records from airport control towers at airports for the most accurate historical data. However, SFM is a non-towered airport, which usually have inaccurately recorded operations counts. To address that, the state of Maine implemented a record collection effort through the General Audio Recording Device (GARD) system program, SFM has been recording operations using the GARD system that uses radio clicks to estimate aircraft operations counts. The GARD data was collected but this system does not accurately, nor consistently record the operation counts, and has resulted in incomplete data sets. It is likely that the GARD data accounts for approximately 50-60% of total aircraft operations.

Per FAA requirements, all aircraft operating in Class A, B, C, and Class E above 10,000 feet are required to have automatic dependent surveillance – broadcast (ADS-B) equipment and beginning in 2020 SFM has been equipped with an ADS-B system that has been recording traffic counts. Though the ADS-B data provides insight into the airport operations, the historical data does not provide more than a year of consistent data and is therefore insufficient to serve as historical data. In this case, the FAA TAF, is the only consistent source of aircraft operations at the Airport. This historical data for aircraft operations is presented in **Table 3-7**.

Table 3-7: Historical Aircraft Operations

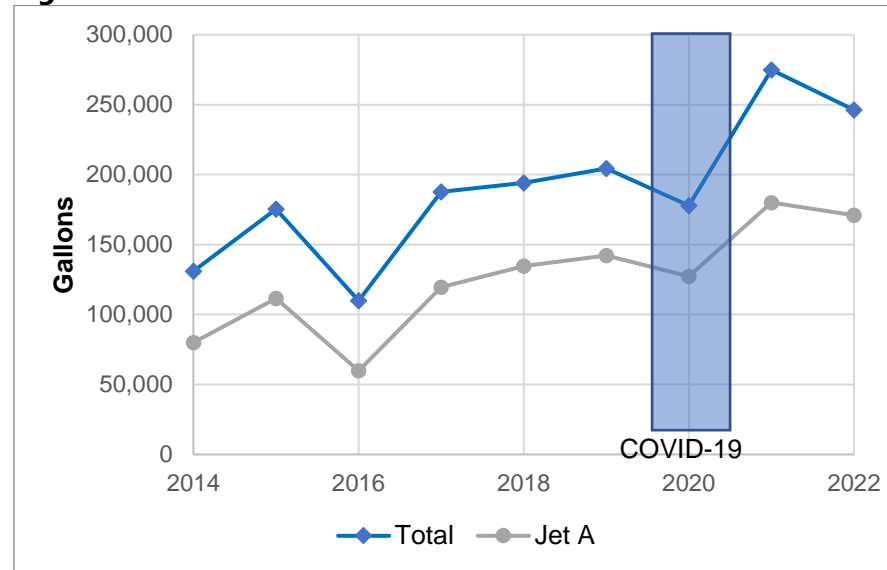
Year	Military	Itinerant	GA Local	Total
2012	50	31,900	47,200	79,100
2013	50	31,900	47,200	79,100
2014	30	19,140	28,320	47,460
2015	30	19,140	28,320	47,460
2016	30	19,140	28,320	47,460
2017	100	21,112	32,000	53,112
2018	100	21,112	32,000	53,112

Year	Military	Itinerant	GA Local	Total
2019	100	21,112	32,000	53,112
2020	100	8,738	28,000	36,738
2021	100	8,738	28,000	36,738
2022	100	8,738	28,000	36,738

Source: FAA Terminal Area Forecast, 2023

Though the GARD system acts as a baseline to count operations, there unfortunately has been a lack of reliable GARD data with gaps in data over the past 5 years. Therefore, the historical operations trend analysis was not a good predictor of forecast operations. This study also analyzed the historical fuel sales data as an indicator of operations at the Airport. **Figure 3-2** detailed a history of the total fuel sales at SFM. This historical data for aircraft operations is presented in **Table 3-7**.

Figure 3-2: Historic Fuel Sales



Source: Airport fuel sales records, 2023

3.3.2. Forecast Operations by Type

The following forecast methodologies were used/developed to allow for a range of options for forecasted operations at SFM. The summary results are shown in **Table 3-8** and **Figure 3-3**.

Low/No Growth – The FAA TAF is a basic forecast generated by the FAA that features national and regional growth attributes in its composition. The current TAF published by the FAA shows no growth

throughout the 20-year planning period. This methodology represents the low-end forecast operations at SFM.

Medium Growth – The medium forecast scenario represents the middle of forecast operations at SFM. This scenario is derived from a combination of FAA’s Aerospace Forecasts, fuel sale growth, and the TFMSC 10-year total operations growth. The result of this forecast is a CAGR of 1.4 percent for the forecast years.

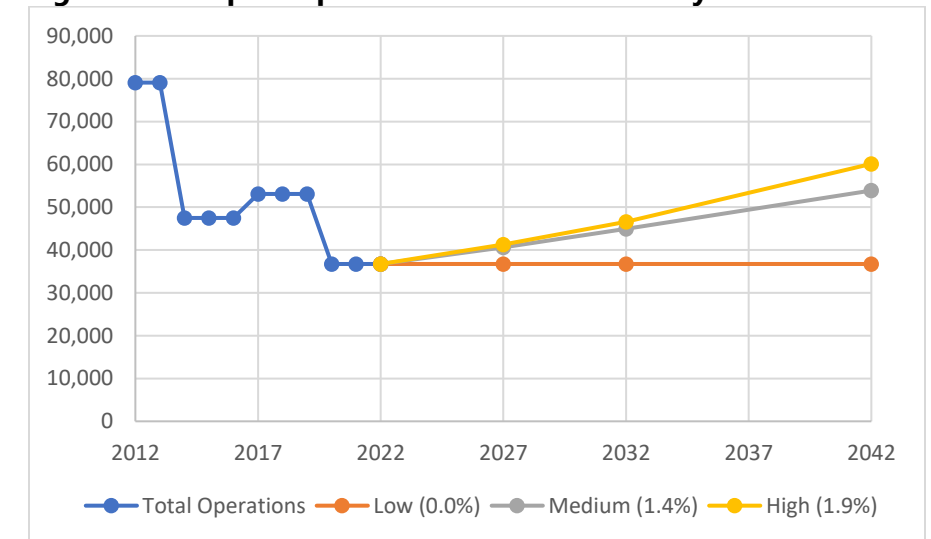
High Growth – The high forecast scenario represents the high end of forecast operations at SFM. This scenario considers the past five years of historical fuel sales growth. The 5-year CAGR of Avgas/100LL was applied to the GA local and itinerant operations and the 5-year CAGR of Jet A fuel sales was applied to the air taxi operations. This resulted in a total airport operations CAGR of 1.9 percent for forecast years.

Table 3-8: Operations Forecast Summary

	Low (0.0%) – FAA TAF	Medium (1.4%) - Combination	High (1.9%) – 5-Year Fuel Sale Growth
2027	36,738	40,590	41,295
2032	36,738	44,912	46,573
2042	36,738	53,891	60,118

Sources: FAA TAF and McFarland Johnson analysis, 2023

Figure 3-3: Airport Operations Forecast Summary



Source: McFarland Johnson analysis, 2023

While the 5-year CAGR of fuel sale growth was applied to the High Growth forecast, the 8-year CAGR is even higher, which could indicate a growth of operations above and beyond the High Growth Forecast

and/or a higher frequency of larger aircraft operating at SFM. This also aligns with the TFMSC trend analysis for total operations, combined ADG II and larger operations, and combined AAC C and D operations. Therefore, the High Growth Forecast was chosen as the preferred operations forecast. The break-down of the preferred operations forecast by type is shown in **Table 3-9**. Air taxi and 10 percent of GA itinerant operations are forecast to grow at the 5-year CAGR of Jet A fuel sales growth and GA local and 90 percent of the GA itinerant operations are forecast to grow at the 5-year CAGR of Avgas/100LL fuel sales growth. Military operations are anticipated to remain constant.

Table 3-9: Operations Forecast Summary by Type

Year	Air Taxi	GA Local	GA Itinerant	Military	Total Operations
2027	2,147	30,930	8,118	100	41,295
2032	3,072	34,168	9,233	100	46,573
2042	6,293	41,694	12,031	100	60,118

Source: McFarland Johnson analysis, 2023

3.3.3. Peaking Characteristics

Annual projections provide a good overview of activity at an airport but fail to reflect operational characteristics of the facility. In many cases, facility requirements are not driven by annual demand but rather by the capacity shortfalls and delays experienced during times of peak operational activity. Therefore, forecasts are developed for the peak month, the average day in the peak month (ADPM), and the peak hour of the ADPM. The values for these metrics were calculated using the methodology in FAA Advisory Circular 150/5360-13A, *Airport Terminal Planning*, with exception of the peak month calculation. Airport peaking characteristics were calculated using the following assumptions:

- **Peak Month Operation:** This level of activity is defined as the calendar month when peak aircraft operations occur. At SFM, the peak month is generally in the summer (July/August) with occasional September peaks. In the past ten years, the average peak month operations as a total of annual operations according to FAA’s TFMSC is 18.1 percent.
- **Average Day/Peak Month (ADPM):** This level of operation is defined as the average day within the peak month

determined by dividing peak month operations by number of days within the peak month (in this case 30).

- **Design Hour Operation:** This level of operation is defined as the peak hour within the design day, assuming 12 percent of daily operations in the design hour.

The peaking characteristics for operations in the recommended forecast scenario is detailed in **Table 3-10**.

Table 3-10: Forecast Operations Peaking Characteristics

Year	Peak Month	ADPM	Peak Hour
2022	6,650	222	27
2027	7,474	249	30
2032	8,430	281	34
2042	10,881	363	44

Source: McFarland Johnson analysis, 2023

3.4. GA Passengers

GA passengers are defined as the boarding (enplaning) and getting off (deplaning) of an aircraft. For SFM, GA passengers consist of passengers traveling to/from the Airport (itinerant traffic) using GA facilities. Unlike commercial airline passengers and charters, the number of GA passengers are not recorded by either the FAA or the Airport.

To estimate GA passenger enplanements at the Airport, guidance pertaining to the sizing of GA Terminal Buildings contained in *ACRP Report 113, Guidebook on General Aviation Facility Planning (ACRP 113)* is utilized to establish a reasonable point of reference. ACRP 113 states that for planning purposes, a factor of 2.5 people (pilots and passengers) can be assumed. For this analysis, the planning factor of 2.5 people is applied to baseline GA itinerant operations to determine the reasonableness of the Airport’s GA passenger and crew estimate. Additionally, as the intent of this analysis is to forecast passenger enplanement, the factor was also reduced to 1.5 people per GA itinerant operation. The results are presented in **Table 3-11**.

Table 3-11: Passenger Enplanements Summary

			GA Passengers and Crew	GA Passengers
Baseline Operations	GA Itinerant		7,138	7,138
Planning Factor			2.5	1.5
Baseline GA Passengers			17,845	10,707
2042 GA Passengers			30,078	18,047

Source: McFarland Johnson analysis, 2023

3.5. Comparison to FAA TAF

If an airport is included in the FAA TAF, any new aviation activity forecast needs to be reviewed and approved by the agency before they can be applied to further analyses. During this review the FAA looks to see if the based aircraft and annual operations forecast differ from the TAF by less than ten percent in the first five-year period and 15 percent in the first 10-year period. To express the relationship between the FAA forecast for SFM and that developed in this report **Table 3-12** compares each for both based aircraft and operations.

Table 3-12: Comparison to TAF Summary Table

	Baseline	2027	2032	2042
FAA TAF				
Total Operations	36,738	36,738	36,738	36,738
Based Aircraft	119	119	119	119
Master Plan Forecast				
Total Operations	36,738	41,295	46,573	60,118
Based Aircraft	119	140	165	228
Percent Difference from TAF				
Total Operations		12.40%	26.77%	63.64%
Based Aircraft		17.65%	38.37%	91.47%

Sources: FAA TAF and McFarland Johnson analysis, 2023

For GA and reliever airports, such as SFM, FAA AC 150/5070-7B, *Airport Master Plans*, identifies that “when the 5- and 10-year forecast is less than 100,000 annual operations or 100 based aircraft, the forecast does not need to be reviewed at FAA Headquarters.” The forecast operations do not exceed 100,000 annual operations and the existing based aircraft already exceed 100 based aircraft. Given that 10 new T-hangar units will be constructed in 2022, if the based aircraft increase

to 129 by the end of the calendar year 2022, the 2027 based aircraft numbers are less than nine percent difference in 2027.

3.6. Critical Aircraft

The methodologies described in FAA AC 150/500-17, *Critical Aircraft and Regular Use Determination*, were used to determine the current and future critical aircraft for the Airport. Ten-year historical operations data from the FAA TFMSC was used to determine the critical aircraft for SFM. While this source does not capture 100 percent of all airport activity, particularly local operations not filing formal flight plans, the database does provide a reasonable understanding of airport activity and should be the most accurate with respect to the more complex aircraft as they are more likely to fly under IFR with a filed flight plan.

Table 3-13 reveals the level of airport activity by AAC and ADG for calendar year 2022. During this period, a significant number of combined AAC B and C aircraft and ADG II aircraft operations were identified through this database. Based on the 10-year CAGR of 3.8 percent of combined AAC C and D operations at SFM, it is anticipated that within the 20-year planning period, the combined C and D operations will exceed 500. This may be achieved earlier considering the 5-year CAGR for AAC C and D operations was 11.7 percent.

Table 3-13: 2022 Critical Aircraft Table

Airplane Design Group	Aircraft Approach Category				Grand Total
	A	B	C	D	
I	669	110	41	3	823
II	40	438	149	34	661
III		4	12	18	34
IV			2		2
Grand Total	709	552	204	55	1,520

Source: FAA TFMSC, 2023

The operations data by AAC and ADG for the 2022 calendar year, determines that the existing critical aircraft for SFM is the Cessna Citation Excel/XLS. The proposed critical aircraft is anticipated to be a Bombardier Challenger 600-type aircraft as detailed in **Table 3-14**.

Based on 2021 and 2022 TFMSC data, SFM is a TDG 1B airport. Should the 10-year CAGR of combined TDG 2¹, 2A, and 2B aircraft continue for the next 10 years, SFM will become a TDG 2A airport.

Table 3-14: Critical Aircraft Characteristics

Characteristics	Existing: Cessna Citation Excel/XLS
Length	52.50'
Wingspan	56.33'
Tail Height	17.17'
MTOW	20,200 pounds
Approach Speed	117 knots
AAC	B
ADG	II
TDG	1B

Characteristics	Proposed: Bombardier Challenger 600
Length	68.42'
Wingspan	64.33'
Tail Height	20.67'
MTOW	41,100 pounds
Approach Speed	125 knots
AAC	C
ADG	II
TDG	1B

Sources: FAA AC 150/5300-13B, <https://bjtonline.com/business-jet-news/cessna-citation-xls>, and [https://commons.wikimedia.org/wiki/File:Canadair_CL500_Challenger_604_\(4826809923\).jpg](https://commons.wikimedia.org/wiki/File:Canadair_CL500_Challenger_604_(4826809923).jpg)



¹ TDG 2 is included since the FAA's TFMSC still carries the old designation prior to FAA AC 150/5300-13B change of splitting out TDG 2 aircraft.



CHAPTER 4 – FACILITY REQUIREMENTS

4. FACILITY REQUIREMENTS

4.1. Introduction

This chapter presents the facility requirements necessary to accommodate existing and forecasted demand at Sanford Seacoast Regional Airport (SFM). The facility requirements are based upon several sources, including the aviation demand forecasts presented in *Chapter 3* and Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5300-13B. The findings of this chapter serve as the basis for the formulation of airport alternatives and development recommendations. The major components of this chapter are listed below:

- Hangars
- Aprons
- GA Terminal/FBO Development
- Deicing Services
- East FBO Building Automobile Parking
- Automobile Vehicle Flow and Gates
- Highest and Best Use Review

4.2. Hangars

General aviation (GA) hangars are planned for based and transient aircraft. Hangar requirements are calculated based on the size and quantity of aircraft. Since aircraft vary in size, different planning factors are used to calculate the approximate hangar space requirements for the projected based aircraft at the Airport:

- 1,200 square feet (SF) for single-engine, rotor aircraft, and light sport aircraft (Cessna 172/Beechcraft Baron-type aircraft)
- 1,600 SF for multi-engine/turboprop aircraft (Beach Duchess/Piper Seminole-type aircraft)
- 3,200 SF for small jet aircraft (Embraer Phenom/Learjet-type aircraft)

4.2.1. Hangar Demand Assumptions

Ideally, all aircraft would be hangared to protect them from the elements, especially in the winter months. While this may not be

¹ Individual hangars include box hangars less than 6,500 SF or t-hangars.

feasible, this chapter will review the range of needs based on the existing percentage of aircraft hangared up to full based aircraft hangar coverage.

It is assumed that approximately:

- 92% of single-engine aircraft, 50% of jets, 9% of helicopters, and 100% of multi-engine, gliders, and ultra-light aircraft will be stored in individual hangars¹
- 2% of single engine, 50% of jets, and 91% of helicopters will be stored in conventional hangars
- 6% of single-engine aircraft will be based on tie-downs

While the assumptions of where aircraft will be stored is useful for planning, it is important to recognize that several different hangar combinations can be developed at the Airport. Since the calculations here are dependent on square footage per aircraft, there are multiple ways to meet that square footage target through constructing different numbers of individual/t-hangars and conventional hangars. Hangar layouts will further be addressed in *Chapter 5, Alternatives*.

4.2.2. Based Aircraft Hangar Demand

Chapter 3 shows the results of the forecasts of based aircraft. Each individual hangar holds one aircraft. While the square footage is important to know during construction, this Airport Layout Plan simply determines the number of aircraft that are projected to need an individual hangar. **Table 4-1** shows the individual hangar needs.

Table 4-1: Individual Hangars Needed by 2042

Individual Hangars	2023	2027	2032	2042
Single Engine (92% in Individual Hangars)	113	128	139	190
Single Engine (95% in Individual Hangars) ¹	118	134	145	198
Existing Supply	91	91	91	91
Total Need	22-27	37-43	48-54	99-107

¹ For flexibility if a larger percentage of single engine aircraft are stored in individual hangars. This may result in a lower need for conventional and tie-down space.

Sources: FAA ADIP and McFarland Johnson analysis, 2024

Individual hangars, like aircraft, come in multiple sizes. Some individual hangars should be built larger to support larger aircraft lengths and wingspans, based upon demand.

Conventional hangars can house multiple aircraft. **Table 4-2** shows the analysis of both the assumptions outlined previously and the conventional hangar demand should 100% of aircraft be stored in hangars. The 90 percent of single-engine aircraft stored in individual hangars are not included in this calculation.

Table 4-2: Conventional Hangars Needed through 2042

Conventional Hangars	2023	2027	2032	2042
Existing Assumptions (SF)	23,600	25,200	32,000	50,300
100% Aircraft Hangared (SF)	30,900	32,600	40,300	60,900
Existing Supply (SF)	22,800	22,800	22,800	22,800
Total Need (SF)	800-8,100	2,400-9,800	9,200-17,500	27,500-38,100

Source: McFarland Johnson analysis, 2024

Based on the calculations, the Airport is likely to need at least 99 new individual hangars (which could be accommodated in 9-10 t-hangar buildings) and 3-4 new conventional hangars (assuming approximately 10,000 SF per conventional hangar) over the planning period.

If individual hangars are not built immediately, there may be a higher short-term need for conventional hangars to store aircraft that may ultimately move to individual hangars.

Recommendation: New individual hangar and conventional hangar space should be identified in the near term. A full build-out should be determined to maximize the long-term aviation use efficiency of the Airport. The timing of hangar construction is on an as-needed basis. Growth at SFM could occur faster than forecast and hangar construction timing will reflect actual needs.

4.3. Aprons

There are four components that typically determine the required apron area for GA users. They are:

- Based aircraft parking
- Itinerant aircraft parking
- Aircraft fueling area
- Staging and maneuvering areas

The sum of these components determines the total area of apron required to meet the forecasted level of GA activity at the airport.



Source: Airport Management, Oct. 2023

4.3.1. Based Aircraft Parking

The Based Aircraft Apron is in the northern portion of the Eastern Hangar Area. It spans approximately 81,900 SF and has 15 airplane design group (ADG) I tie-down spots. When a large business jet, such as a Global Express or large Gulfstream, arrives at the Airport, this aircraft parks at the western end of the Based Aircraft Apron and can block up to five based aircraft tie-downs.

Table 4-3 shows how many parking spots are projected to be needed through 2042. These results show a need for one new based aircraft tie-down to be built if a separate ADG III transient parking space is

available during the peak season (and six if no additional ADG III parking is provided). The size of this apron could vary based on the type of aircraft parking. In the short term, unpaved areas could be used as overflow based aircraft tie-down parking.

Table 4-3: Based Aircraft Parking Spots Needed

Based Aircraft Tie-downs	2023	2027	2032	2042
Based Aircraft Tie-downs (SE)	7	7	8	10
Existing Supply (paved)	15	15	15	15
Existing Supply (unpaved)	5	5	5	5
Total Need	0	0	0	0

Source: McFarland Johnson analysis, 2024

Recommendation: Construct new based aircraft tie-down parking as demand arises.

4.3.2. Itinerant Aircraft Parking

There are three paved itinerant (transient) paved aircraft parking aprons throughout the Airport in addition to one paved overflow and one unpaved overflow areas as shown in **Figure 4-2**. **Table 4-4** shows transient apron spaces as previously identified in *Chapter 2*.

Table 4-4: Itinerant Aircraft Apron Supply

Type of Tie-Down	Number	Paved
Transient Apron (north)	36 ¹	Y
<u>South Transient Apron</u>		
Transient complex general aviation (GA)	6 ²	Y
Transient small GA	8	Y
Sub-total Transient – 11 ADG II + 20 ADG I OR 50 ADG I		
Small GA overflow (see Figure 2-2)	255	N
Overflow Complex Parking (ex. Pilatus)	18	Y

¹ This area is commonly used as five ADG II and 12 ADG I spaces. ADG II aircraft take up more than one ADG I space.

² These can accommodate ADG II aircraft.

Source: McFarland Johnson analysis, 2024

This results in total transient apron space at the Airport of 191,000 SF and approximately 50,500 SF of overflow apron (which is in poor/very poor condition).

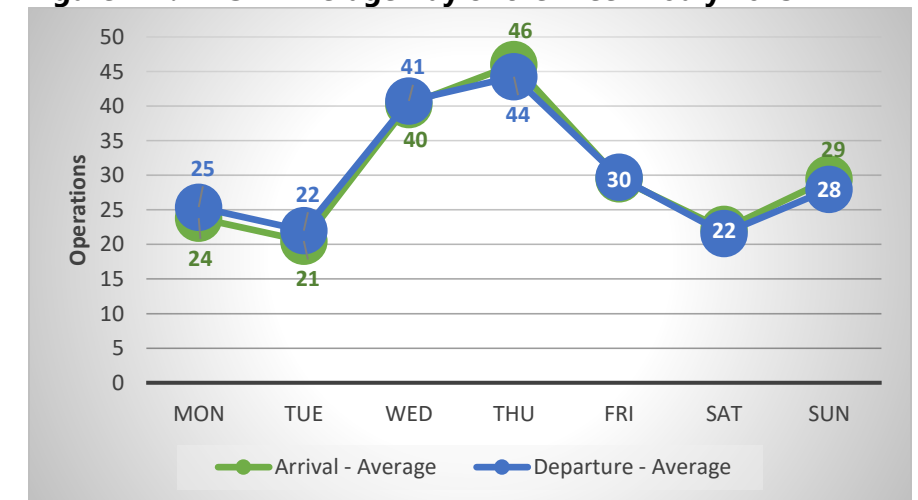
Figure 4-1 shows that peak arrivals occur on Wednesdays and Thursdays (and are still high on Fridays and Sundays) and peak departures occur Wednesdays and Thursdays (and are also high on

Fridays and Sundays). Additionally, the comparison of the peak month as identified in the FAA's Traffic Flow Management System Count (TFMSC) and Automatic Dependent Surveillance-Broadcast (ADS-B) peak month results are shown in **Table 4-5**. Since the ADS-B ADPM is within this range, the ADS-B average day of the peak month (ADPM) was used for the baseline.

Parking demand for itinerant aircraft was determined under the following assumptions:

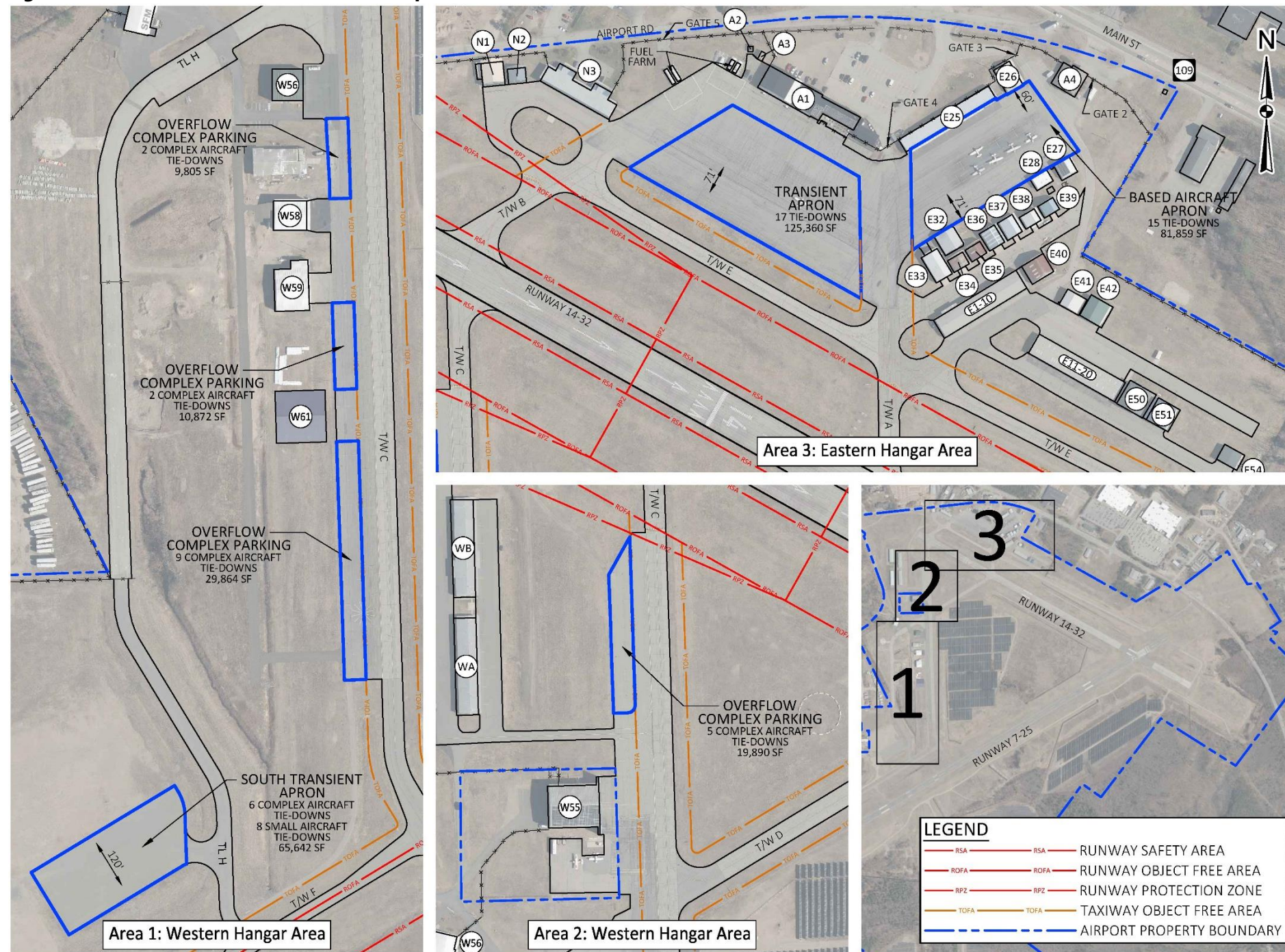
- Identify the ADPM by reviewing ADS-B day of the week arrivals data for July (see **Figure 4-1**)
- Assume 47 percent of these aircraft will require transient parking space during the day
- Adjust the ADPM since ADS-B data represents only approximately 46 percent of GARD operations
- Assume that 40 percent of transient aircraft stay one night, 10 percent stay two nights, and 5 percent stay three nights
- Allow an area of 3,240 SF per transient propeller aircraft (ADG I) and rotorcraft, 7,200 SF for ADG II turbine aircraft, and 21,500 SF for an ADG III aircraft (ex. Global Express) due to the need for taxiing space and the consideration of aircraft of different sizes
- Assume a fleet mix of 73 percent ADG I, 20 percent ADG II, two percent ADG III, and five percent helicopters
- Aircraft generally stay for a few hours, so three peak hour arrival aircraft in addition to overnight aircraft will need space on the apron at the same time

Figure 4-1: ADS-B Average Day of the Week – July 2023



Sources: ADS-B and McFarland Johnson analysis, 2024

Figure 4-2: Based and Transient/Itinerant Apron Details



Sources: Airport management and McFarland Johnson, 2024

Table 4-5: ADPM Transient Aircraft on Ramp

GA Itinerant + Air Taxi Operations	Peak Month (12.1%) (ADS-B)	Peak Month (19.5%) (TFMSC)	ADPM	
Baseline	8,638	1,043	1,685	30-48
2027	10,265	1,240	2,003	35-56
2032	12,305	1,486	2,401	41-66
2042	18,324	2,213	3,575	57-93

Sources: FAA TFMSC, ADS-B, and McFarland Johnson analysis, 2024

Table 4-6 shows ADPM apron demand. Actual demand may be higher for above-average demand days or needed sooner based on actual operations growth and should the ratio of larger aircraft to smaller aircraft change in the future.

Table 4-6 shows that SFM regularly needs the overflow apron areas. Approximately 173,000 SF of additional apron space is anticipated to be needed within the planning period above and beyond the existing 191,000 SF.

Table 4-6: Apron Sizing Demand (SF)

	ADG I	ADG II	ADG III	Helo/ Other	Total	Additional Need*
Baseline	99,500	57,200	43,000	6,800	206,500	15,500
2027	125,200	69,100	43,000	8,600	245,900	54,900
2032	143,900	94,700	43,000	8,600	290,200	99,200
2042	178,500	110,500	64,500	10,400	363,900	172,900

* bold text indicates a need exceeding existing overflow apron areas

Source: McFarland Johnson analysis, 2024

Considering the occasional ADG III operation, it would be prudent to build a hangar large enough to house one of these larger operations of approximately 120-foot by 120-foot hangar. This area could reduce the need for transient apron parking and serve as a base for fixed base operator (FBO) services and passive deicing, as discussed in Sections 4.4 and 4.5.

Recommendation: Construct an additional ~173,000 SF of apron space and/or build hangars to be able to house transient aircraft to reduce the apron demand within the planning period.

4.3.3. Aircraft Fueling Truck Access

The existing fueling area is located near the East FBO Building/transient apron and fuel trucks service aircraft both on the east and west side of the Airport. This section reviews both fuel delivery access and fuel trucks for aircraft fueling.

Fuel delivery trucks drive through the East FBO parking lot, enter the airfield through Gate 3, and drive on the airside to the fuel farms. Ideally, these fuel delivery trucks would have a separate access road and gate and minimize or eliminate driving on aircraft ramps.

The fuel trucks for aircraft refueling are not registered to operate on public streets. They need to remain on airport property and drive across the approach end of Runway 14 on Taxiways B and C, since there is no paved perimeter road that connects the east and west side of Runway 14.

Eliminating fuel trucks from crossing Runway 14, can increase safety (especially at an untowered airport like SFM) by reducing the potential for runway incursions and/or incidents and foreign object debris (FOD) on runways.

Recommendation: Construct a paved road to connect the east and west side of Runway 14.

4.3.4. Staging and Maneuvering Areas

As shown in **Figure 4-2**, ADG II taxiway object free area (TOFA) is clear for the taxiways shown. The South Transient Apron has approximately 120 feet between aircraft, which provides a full ADG II TOFA and allows ADG II aircraft to operate unrestricted.

The Based Aircraft Apron and Transient Apron have a taxilane spanning 71 feet wide between rows of aircraft, which limits those taxilanes to ADG I wingspans. One row on the Based Aircraft Apron is 60 feet wide. Aircraft with larger than 30-foot wingspans should proceed with caution in this area as full ADG I taxilane wingtip clearances are not provided. The pilot in command is responsible for determining if their aircraft will maintain wingtip clearance.

Recommendation: The Airport should continue to monitor taxiway and taxilane limitations and provide standard separation, when possible.

4.4. GA Terminal/FBO Development

The East FBO Building may look like a terminal building, but it is an FBO and a restaurant. There is no public space in the East FBO Building. The building was constructed in the 1960s and has poor or no compliance with Americans with Disabilities Act (ADA) access throughout. A flight planning area is available, but this is generally only used by the flight school.

A GA terminal provides space for offices, waiting area, flight planning, concessions, storage, and other amenities for pilots and passengers. GA terminals also provide the first and last impression of the airport and local area that GA pilots and passengers experience. Based on the Airport's existing and forecast operations, the following assumptions were used to calculate area needs:

- The number of GA operations conducted during the peak hour of the ADPM was calculated using data from the forecast chapter. Both arriving and departing GA pilots/passengers could use the terminal at the same time. Likewise, both local and itinerant operations would require terminal space at the Airport.
- The peak hour operations were estimated to have an average of 2.5 people on board (pilots and passengers).
- An area of 150 SF was used for each peak hour pilot/passenger to determine the space requirements. This value accommodates all functions of a full-service GA terminal building including FBO counter space, waiting area, snack room, office space, pilot's lounge, restrooms, training area, circulation space, etc.

Additionally, the following services were identified as services needed for an FBO development to service existing and growing business jet operations at SFM:

- Oxygen refills for high-altitude-flying aircraft
- Anti-icing TKS® fluid refills for aircraft with deicing technology
- External air conditioning units

- Tire refill (nitrogen vs oxygen)
- Onboard lavatories services
- Aircraft wash rack

These types of services would require specialized people/training to service these aircraft.

Considering the range of peak hour operations, it is estimated that 7,000 – 11,000 SF are needed now and 11,000 – 18,000 SF of GA terminal/FBO space would be needed by the end of the planning period.

Recommendation: Construct or expand the existing East FBO Building to accommodate FBO/GA terminal space of approximately 7,000 – 11,000 SF in the short term and 11,000 – 18,000 SF in 2042. This includes space for public access plus additional space for FBO services listed above. This area could be attached to hangar space identified in Sections 4.2.2, 4.3.2, and 4.5. Actual building size depends on actual growth, use, and architectural layout.

4.5. Deicing Services

SFM does not currently have deicing capability – neither active nor passive. Active deicing would be in the form of deicing fluid and passive deicing would be in the form of hangar space to prevent icing or warm up aircraft to thaw built-up ice on aircraft wings and fuselage. There are no hangars that can hold jets.

SFM gets calls about twice per week every November and December and once per week February through April inquiring about deicing. Operations end up going to Portland Jetport instead of SFM.

Active deicing services are a business decision to determine the cost compared to demand and would be made by an FBO operator. Active deicing would also include the need for permitting and storage of deicing fluid and equipment.

On the other hand, passive deicing could be provided by constructing a large hangar that can house the type of aircraft that can fly in icing conditions and are currently operating at the Airport. This type of hangar would not just be used for passive deicing but could be used for transient/itinerant space all year round. The need for additional hangar space was previously identified in Sections 4.2.2 and 4.3.2. As

other Maine airports have seen, constructing a large hangar that can hold the size of aircraft authorized to fly in icing conditions, increases winter operations.

Recommendation: Construct a hangar spanning approximately 120 by 120 feet to use for passive deicing and transient/itinerant hangar space year-round.

4.6. East FBO Building Automobile Parking

The existing FBO Building automobile parking lot has 52 parking spaces and six handicap parking spaces, totaling 58 parking spaces. This parking lot is being used by the following users:

- Restaurant and beer garden
- Flight school
- FBO
- Rental car/itinerant/charter parking

As previously mentioned, private parking positions for individually owned hangars are accessible to owners and tenants of the privately-owned hangars. Additionally, rental cars for transient/itinerant jet operators park near Gate 4. It is uncommon to have rental cars and transient/itinerant operator parking inside the fence. For security reasons, these types of parking spaces should be made available outside of the fence.

Estimating the restaurant and beer garden at 100 percent capacity filled and the flight school during their peak time at 1.5 people per vehicle, a need for approximately 111 existing parking spaces has been identified, compared to the existing 58 car parking spaces. This need goes up to 124 within the planning period.

With increasing operations, the need for rental car/itinerant parking is anticipated to increase throughout the planning period. This does not include any based aircraft parking needs.

Recommendation: Increase the parking lot to accommodate 111 parking spaces in the short term and over 124 in the long term. This does not include any hangar parking. At the time of the parking lot expansion, including the over 120 total parking spaces may be the most cost-effective way to accommodate long-term need and provide demand flexibility.

4.7. Automobile Vehicle Flow and Gates

As previously discussed in *Chapter 2*, there are five gates near the East FBO Building area that are in review of this study.

Gate 1: is a manual swing gate on the east side of the South Sanford Fire Station and is not shown in **Figure 4-2**. This gate is not used by airport tenants.

Gate 2: is a motorized access gate east of the South Sanford Fire Station. This gate is used for fire station access as well as emergency response.

Gate 3: is a motorized gate next to Hangar E26 and provides access for based aircraft owners and tenants as well as South Sanford Fire Station access.

Gate 4: is a low, long gate between the restaurant and Hangar E25. Gate 4 is used by fuel delivery trucks, FBO access, access to the rental car parking spaces, based aircraft owners and tenants, and emergency response.

Gate 5: is a pedestrian gate along Airport Road behind the Jet A fuel tanks.

Additionally, based aircraft owners, fuel trucks, delivery trucks, trash trucks, and emergency vehicles use the parking lot area to access different parts of the airfield.

The following challenges were identified:

- Congestion of all kinds of different vehicles and users using the same access road into the parking lot
- Gates 3 and 4 are opening a lot and someone could accidentally or purposely piggy-back onto the airfield
- Ideally, rental car parking should be outside of the fence so that people visiting the Airport, who are flying in on an itinerant flight and are not familiar with the Airport, nor have experience driving on airports, do not have access to the airfield

Recommendation: Reconfigure and separate different vehicle access for a more streamlined and secure parking and gate access flow. This could reduce congestion and improve security at the Airport.

4.8. Highest and Best Use Review

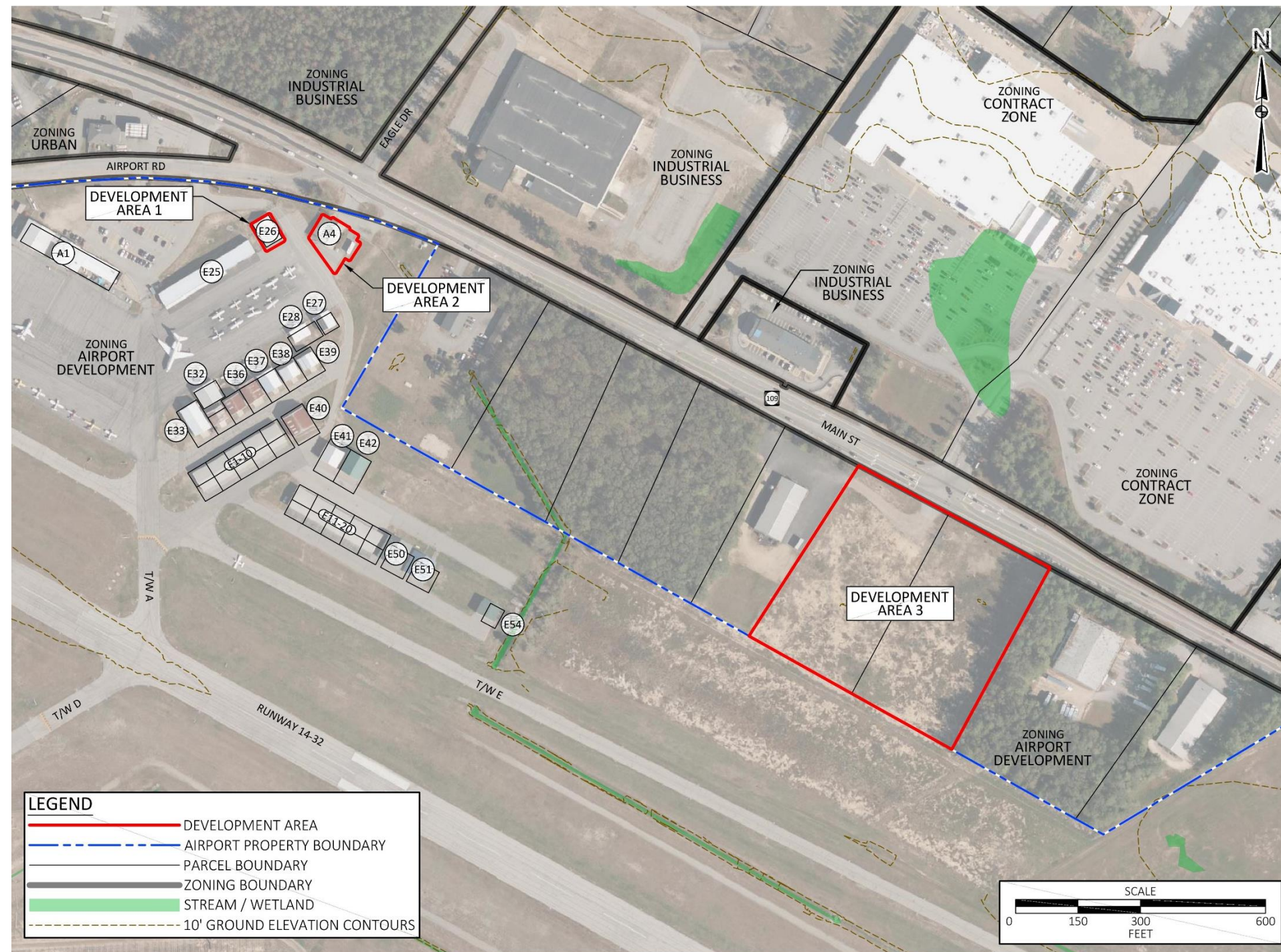
There are specific real estate and land use development opportunities that require, or are significantly enhanced by, the presence of an airport. This unique characteristic of airports and the positive economic and community impacts that may be derived from the measured and appropriate development of airport lands can bring significant benefit to the surrounding community. This task reviews existing market and real estate relationships, and current lands available for development. The next steps are to determine which types of land use and development are appropriate for and desired by the Airport and develop a land use plan for these areas that will guide desired development at the Airport.

The purpose of this section is to conduct a brief evaluation of the highest or best use of the available development areas based on their physical characteristics, legal restrictions, and current market conditions. Highest or best use is defined as: "The reasonably probable and legal use of vacant land or an improved property, which is physically possible, appropriately supported, financially feasible, and that results in the highest value" (*The Appraisal of Real Estate, 13th Edition, The Appraisal Institute, 2008, Page 277*). The purpose of the highest or best use analysis is to identify the most profitable, competitive use to which the property can be deployed based on market forces. The highest or best use analysis is a systematic examination of the subject property and its position in the competitive real estate market. The four criteria for highest or best use that the property must meet include:

- Physically possible
- Legally permissible
- Financially feasible
- Maximally productive

Various areas on Airport property have been identified for possible development. Specifically, the potential development areas illustrated in **Figure 4-3** have been reviewed against overall development constraints, including FAA required operational and safety considerations and environmental conditions, zoning, environmental constraints, meeting the comprehensive plan of the City of Sanford,

Figure 4-3: Potential Development Areas and Zoning



Sources: City of Sanford Zoning map Dec. 2019 and McFarland Johnson, 2024

and based on conversations with the City of Sanford Chamber of Commerce and Economic Growth Council.

4.8.1. Zoning

All the areas currently in review are in Sanford’s Airport Development Zone (AD). The purpose of AD:

“is to create an area that includes the Airport, adjacent clear zones and adjacent properties with potential for providing support services to the airport and to promote the smooth and efficient functioning of the airport. All land use and development in this zone shall comply with all applicable federal, state and local laws, including, without limitation, Federal Aviation Administration (FAA) rules and regulations, Maine Department of Transportation rules and regulations and airport lease agreements. All land use and development within the AD Zone shall be compatible with the goals and objectives of the Comprehensive Plan, as may be amended from time to time, and the Airport Master Plan, as may be amended from time to time.” <https://ecode360.com/36885819#36885819>

The following use is considered non-standard for all parcels this close to an airport and are not considered as part of this study:

- Residential: due to potential noise impacts
- Agriculture: small lots, major roadway, wildlife attractant, pollution from major roadway
- Utility/solar: Sanford installed the largest solar installations in the State of Maine and on any airport in the world; no additional solar was considered

4.8.2. Highest or Best Use Review

The purpose of this section is to conduct a brief evaluation of the highest or best use of the available development areas based on their physical characteristics, legal restrictions, and current market conditions. These parcels were chosen to be the most likely development areas to focus on for short-term/mid-term timeframe. Additional parcels may be reviewed during future planning studies.

The highest or best use review relies on the findings of local conditions and meetings with the City of Sanford Chamber of Commerce and Economic Growth Council including need for industrial, commercial, and residential. It was also noted that Fortune 500 companies are

inquiring for a site that corporate personnel can fly in and out on the same day to inspect their facilities (aeronautical demand). The Chamber of Commerce and Economic Growth Council generally support airport expansion within the Airport Development Zone.

It should be noted that some of the development areas have physical characteristics that could allow for multiple land uses on one property. In this review, the most likely land use option is stated along with possible supplemental or alternative development components. The following sections outline the subsequent highest or best use identified for each development area.

4.8.2.1. Development Area 1

Development Area 1 is Hangar E26, which is located next to Gate 3 on the north side of the airfield. The hangar is inside the airport fence with airside access and located on Airport property.

There is a stormwater detention basin behind Hangar E26 and the t-hangar building (E25) next to it. Any modification to this structure would result in a review and potential changes to the stormwater mitigation and conveyance.

Due to the site’s location, uses other than aeronautical use would interfere with the existing and future airport operations. A couple of aeronautical use options include:

1. Revitalize existing hangar
2. Build new hangar
3. Reconfigure the access road and fencing
4. Provide stormwater drainage

Highest or Best Use: Aeronautical/Airport Purpose

4.8.2.2. Development Area 2

Development Area 2 is the Sanford Fire Station located off Maine Street/SR-109. It has both airside and landside access but is for non-

aeronautical use. Utilities are accessible from Main Street/SR-109 for easy accessibility.

The building was constructed in 1984 and is used as cold storage for the City of Sanford and has exceeded its useful life. A stormwater swale runs through this development area and connects to the riverine that runs parallel to Taxiway E, under Taxiway E, and then off Airport property. Reconfiguration of the Sanford Fire Station building would result in a review and potential changes to the stormwater mitigation and conveyance.

Due to the site’s location, aeronautical use is the highest and best use since it connects to the airfield and provides both airside and landside access. Additionally, SFM has a need for additional apron and hangar space. Development Area 2 is prime real estate for aeronautical development – either aircraft storage, maintenance, or an aviation-related business that would benefit from the airside-landside interface.

Highest or Best Use:

1. **Aeronautical/Airport Purpose**
2. Mixed use (Aeronautical/Airport Purpose and Commercial/Industrial)

4.8.2.3. Development Area 3

Development Area 3 is approximately 6.1 acres in size and is located off Main Street/SR-109 across the street from Walmart and Lowe’s. These two parcels are vacant and connect to airport property along Taxiway E. The size of this parcel allows for flexibility including phased development opportunities. This area has been “for sale” for a while, indicating that this parcel may not be ideal for existing commercial, industrial, and/or residential needs Sanford is experiencing, which plays into the review of the highest and best use of this area.

Landside access and frontage is along Main Street/SR-109 and utilities run along the road for easy accessibility. The site has airside frontage along Taxiway E, which is a full-length parallel taxiway to the crosswind Runway 14-32. The site is also in proximity to existing aviation facilities. The site benefits from good topography and is the largest of the development areas in size with sufficient physical characteristics to allow for several development options. However, this site has significant airside access and is well suited for future aviation expansion, which could include additional general aviation or fixed base operator facilities. Thus, the highest or best use for Development Area 3 is to meet future aeronautical development requirements of the Airport, especially given its recent growth and demand identified as part of this project.

It is recommended that the two parcels be acquired in fee rather than allowing a through-the-fence agreement, which the FAA is trying to eliminate at airports across the country.

A second supplemental option for this site could be for commercial development. This is only a second supplemental option as there are commercial development opportunities in other proximate locations, whereas the Airport has a large need for additional development with limited opportunities for airside access parcels. For either use, surface transportation and traffic signal would need to be evaluated and the site would require stormwater mitigation (either on-site or through Best Management Practices).

Highest or Best Use:

1. **Aeronautical/Airport Purpose**
2. Mixed use (Aeronautical/Airport Purpose and Commercial/Industrial)
3. Commercial/Industrial (Non-Aeronautical)

4.8.2.4. Highest and Best Use Review Summary

A summary of this sections review and recommendations is shown in **Table 4-7**.

Table 4-7: Highest and Best Use Review Summary

Development Area	Size	Airside Access	Landside Access	Municipality	Zoning	First Choice	Second Choice	Third Choice	Notes
1	0.1 acres	Yes	No	City of Sanford	Airport Development	Aeronautical/Airport Purpose	n/a	n/a	1. Within the airport fence. 2. Near stormwater detention basin.
2	0.3 acres	Yes	Yes	City of Sanford	Airport Development	Aeronautical/Airport Purpose	Mixed Use	n/a	1. Utilities are accessible from the road. 2. A stormwater swale runs through this site. 3. Airside-landside interface.
3	6.1 acres	Yes	Yes	City of Sanford	Airport Development	Aeronautical/Airport Purpose	Mixed Use	Commercial/Industrial	1. Off airport property and vacant. 2. Utilities are accessible from the road. 3. Airside-landside interface. 4. Flexibility with its size.

Source: McFarland Johnson analysis, 2024

4.9. Facility Requirements Summary

Table 4-8 summarizes the results of the facility requirements analysis.

Table 4-8: Summary of Support Facility Requirements

Item/Facility	Existing Facility or Capacity	Ultimate Requirement	Recommendation
Hangars (Section 4.2)	Individual hangars: 91 Conventional hangars: 22,800 SF	Individual hangars: 190-198 Conventional hangars: 50,300-60,900 SF	Individual hangars: 99-107 Conventional hangars: 27,500-38,100 SF
Based Aircraft Parking (Section 4.3.1)	15 paved 5 unpaved	10 paved	0 paved
Itinerant Aircraft Parking (Section 4.3.2)	191,000 SF apron 50,500 SF overflow	363,900 SF	172,900 SF
Aircraft Fueling Area (Section 4.3.3)	No paved perimeter road; fuel trucks drive across Runway 14	Improve safety by fuel truck not accessing Runway 14	Construct a paved road to connect the east and west side of Runway 14
Staging and Maneuvering Areas (Section 4.3.4)	Limitations on certain taxilanes	Provide standard wingtip clearance	Continue to monitor taxiway and taxilane limitations and provide standard separation, when possible
GA Terminal/FBO Development (Section 4.4)	None	11,000 – 18,000 SF	11,000 – 18,000 SF
Deicing Services (Section 4.5)	None	120' by 120' hangar for passive deicing	120' by 120' hangar for passive deicing
East FBO Building Automobile Parking (Section 4.6)	58	124	66
Automobile Vehicle Flow and Gates (Section 4.7)	5 gates	Separate different vehicle access for a more streamlined and secure parking and gate access flow	Reconfigure and separate different vehicle access for a more streamlined and secure parking and gate access flow. This could reduce congestion and improve security at the Airport
Highest and Best Use Review (Section 4.8)	Development Area 1: Aeronautical Development Area 2: Non-aeronautical Development Area 3: Vacant/off-Airport	Development Area 1: Aeronautical Development Area 2: Aeronautical Development Area 3: Aeronautical	Acquire two parcels and protect for aeronautical development

Source: McFarland Johnson analysis, 2024



CHAPTER 5 – ALTERNATIVES

5. ALTERNATIVES

5.1. Introduction

The Alternatives chapter documents a variety of development alternatives to accomplish the recommended facility improvements identified in Chapter 4, *Facility Requirements*. These alternatives were reviewed, refined, and evaluated across multiple factors while meeting prescribed safety standards, facilitating demand projections, and minimizing environmental and community impacts.

This chapter is organized around a series of development alternatives, often evolving between themselves and across the chapter sections. These alternatives depict opportunities to address airport design considerations and position the Airport to meet proposed demands. Alternatives for each functional area were broadly identified and select alternatives were further considered, refined to meet the needs of the Airport, and compared to evaluation criteria. Tenant Workshop #2 was held on Aug. 6, 2024, to garner feedback from airport management, users, and tenants. Preferred alternatives were selected to represent the unconstrained 20-year development plan. This chapter covers:

- Facility Requirements summary
- East FBO (fixed base operator) area parking and vehicular traffic flow
- Short-term apron and hangar alternatives
- Aeronautical use off-airport development alternatives
- Short-term preferred alternative
- Full build-out/hangar alternative

5.2. Facility Requirements Summary

Table 5-1 provides a summary of Chapter 4, *Facility Requirements*.

Table 5-1: Facility Requirements Summary

Item	Short-term (2027)	Long-Term (2042)
Hangars		
Individual	128-134	190-198
Conventional (SF)	25,200-32,600	50,300-60,900

Item	Short-term (2027)	Long-Term (2042)
Based aircraft parking	7 paved	10 paved
Itinerant aircraft parking (SF)	245,900	363,900
Aircraft fueling area	Fuel truck clear of runway	Fuel truck clear of runway
Staging and maneuvering areas	Meet FAA standards	Meet FAA standards
GA terminal/FBO development (SF)	7,000-11,000	11,000-18,000
Deicing services	Potential passive deicing	Passive deicing
East FBO building auto parking	111	124
Automobile flow and gates	Reconfigure and decongest	Reconfigure and decongest

Source: McFarland Johnson analysis, 2024

Additionally, during the review with Airport management, and stakeholders at Tenant Workshop #2, the following items were noted. This is not a comprehensive list, and no alternatives were created to address these, but per the scope, these items are being noted:

- Taxiway E is not parallel to Runway 14-32
- Larger business jets sometimes back-taxi on Runway 14-32 from Runway 7-25 to Taxiway A instead of taxiing on Taxiway E
- Taxiways A and D do not intersect Runway 14-32 at a perpendicular angle
- Pilots must decide which direction to go from Runway 14-32 exiting on Taxiway A prior to leaving the runway environment
- Runway 14 does not have a taxiway at the departure end of the runway
- The next planning study should review if Taxiways A and D cross Runway 14-32 in the high-energy section of the runway

5.3. East FBO Area Parking and Vehicular Traffic Flow

As noted previously, the East FBO area experiences congestion both in the parking lot and with vehicular traffic flow. Additionally, a review of Hangar E26 and the fire station was completed to identify the best use for those areas. Two alternatives (**Figure 5-1** and **Figure 5-2**) were reviewed and compared to each other to identify the recommended alternative.

5.3.1. East FBO Area Alternative 1

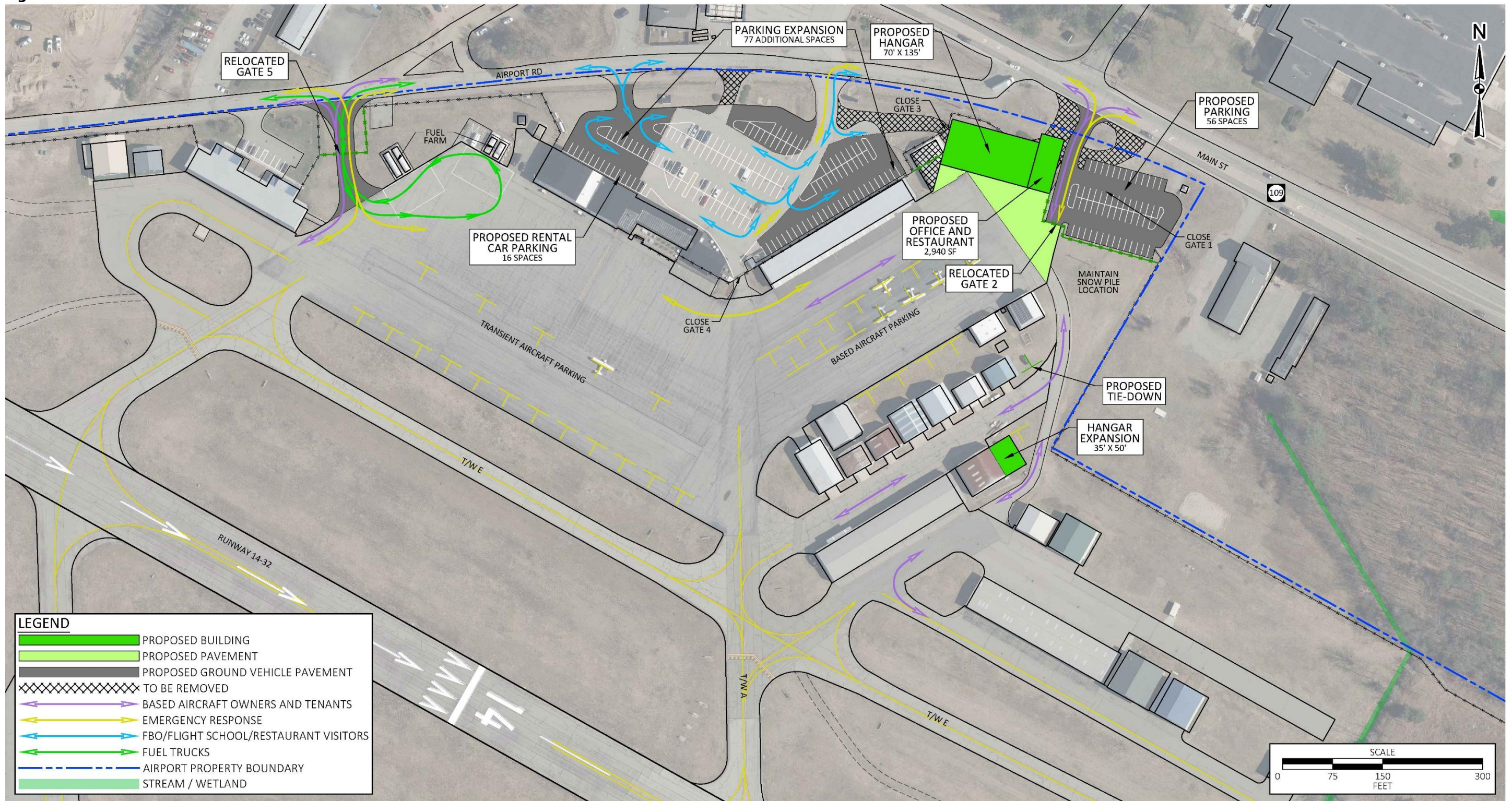
East FBO Area Alternative 1 was created to maximize the prime Airport real estate that has both airside and landside access in this area, which results in maximizing development in the area available. This alternative proposes a reconfiguration of the vehicular gates, removal of Hangar E26 and the fire station, relocation of the restaurant, a new access road/relocated Gate 5, parking lot expansion, and hangar storage/general aviation (GA) terminal space. This alternative is shown in **Figure 5-1**. Additionally, the proposed development is built near the existing pavement to minimize environmental impacts to the drainage system in place.

5.3.1.1. Alternative Benefits

This alternative has the following benefits:

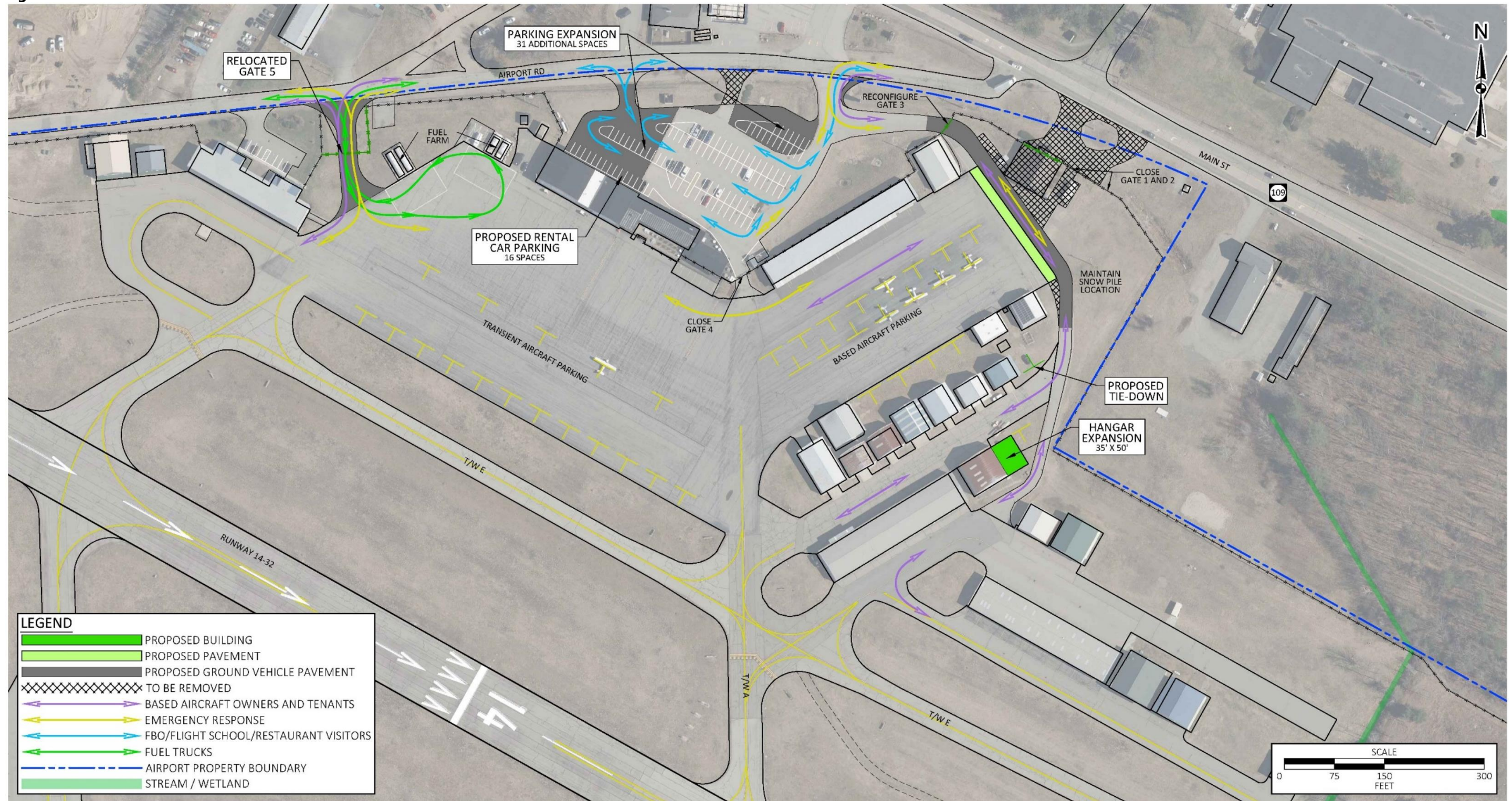
- Provides adequate automobile parking spaces within the East FBO area as well as the future hangar/office/restaurant space
- Separates different vehicle users and therefore de-congests access routes.
- Limits gates for based aircraft owners and tenants to prevent piggy-backing and therefore enhances airfield safety.
- Reconfigures the access point to Airport Road to improve flow and safety.
- Allows for GA terminal facilities near the restaurant and main parking area.
- Provides access at the relocated Gate 5 for tractor-trailers to minimize driving within the fence. This gate provides adequate turning pavement and enough space to be clear of Airport Road when operating Gate 5.

Figure 5-1: East FBO Area – Alternative 1



Sources: Maine Orthoimagery Municipal Sanford, 2022, and McFarland Johnson, 2024

Figure 5-2: East FBO Area – Alternative 2



Sources: Maine Orthoimagery Municipal Sanford, 2022, and McFarland Johnson, 2024

5.3.1.2. Alternative Drawbacks

This alternative has the following drawbacks:

- Provides access to/from State Route (SR) 109/Main Street, which is a busy and fast road and has a history of accidents. The response at Tenant Workshop #2 indicated that this would be a safety concern.
- Limits access along the Based Aircraft Apron to only Airplane Design Group (ADG) I aircraft (aircraft that have wingspans of 49 feet or less) to be able to access the proposed hangar. The size of the hangar would be better suited for larger, ADG II or III aircraft, which would not be able to access it. Since ADG I aircraft prefer individual hangar storage, this type of layout is not ideal.
- Limits existing snow storage. Average winters fill up the entire existing open area between Gates 1 and 2 and the existing airfield pavement with a high pile of snow. Due to the grade of the Based Aircraft Apron, existing snow removal vehicles cannot plow the snow toward Taxiway A but only downhill toward SR-109/Main Street. This alternative could result in the closure of part of the proposed development and/or damage to the proposed fence.
- Proposes construction over a drainage ditch, which may need additional environmental review and could increase costs.

5.3.2. East FBO Area Alternative 2

East FBO Area Alternative 2 was created to de-congest vehicular access based on feedback received from users/tenants. This alternative proposes a reconfiguration of the vehicular gates, removal of the fire station, and a new access road/relocated Gate 5. This alternative is shown in **Figure 5-2**. It should be noted that even though no additional development is shown off SR-109/Main Street, there may be demand to build a general aviation terminal building or other development within the planning period.

5.3.2.1. Alternative Benefits

This alternative has the following benefits:

- Provides adequate automobile parking spaces within the East FBO area based on the flight school relocating to the west.
- Separates different vehicle users and therefore de-congests access routes.
- Limits gates for based aircraft owners and tenants to prevent piggy-backing and therefore enhances airfield safety.
- Reconfigures the access point to Airport Road to improve flow and safety.
- Provides access to the relocated Gate 5 for tractor-trailers to minimize driving within the fence. This gate provides adequate turning pavement and enough space to be clear of Airport Road when operating Gate 5.
- Reconfigures Gate 3 to allow tractor-trailers access to the airfield, as needed.
- Maintains existing snow pile location and area.
- Provides flexibility for future development with airside/landside access including GA terminal space.
- Provides flexibility for stormwater planning.

5.3.2.2. Alternative Drawbacks

This alternative has the following drawback: Does not develop prime airside/landside area (but still allows flexibility for developing it in the future).

5.3.3. East FBO Area Alternatives Comparison

This section compares the two build alternatives to the existing conditions at the Airport. The evaluation criteria reviewed were:

- **Improves congestion:** Does this alternative improve congestion at gates by streamlining the types of users per gate?
- **Accommodates parking needs:** Does this alternative provide adequate parking spaces for existing and future needs of the East FBO area?
- **Meets operational needs:** Does this alternative meet the need for the operational use of the airport and its unique needs for aircraft storage, aircraft movement, vehicular gate access, and snow removal?

- **Minimizes environmental impacts:** Does this alternative minimize environmental impacts, where possible?

Table 5-2 shows a comparison of East FBO Area Alternatives 1 and 2 and how they meet the evaluation criteria. Alternative 1 does not meet the operational needs of the Airport due to the location and safety of access to the large hangar off the Based Aircraft Apron. In addition, only ADG I aircraft could access this hangar.

Table 5-2: Comparison of East FBO Area Alternatives 1 and 2

Evaluation Criteria	Alternative 1	Alternative 2
Improves congestion	✓	✓
Accommodates parking need	✓	✓
Meets operational needs	✗	✓
Minimizes environmental impacts	✓	✓

Source: McFarland Johnson analysis, 2024

Since East FBO Area Alternative 1 does not meet the operational needs identified for the Airport, the preferred alternative is East FBO Area Alternative 2.

5.4. Short-Term Apron and Hangar Alternatives

As identified in Chapter 4, *Facility Requirements*, **Table 5-3** shows the short-term (2027) facility need identified for SFM.

Table 5-3: Short-Term (2027) Airside Needs

	2027 Additional Need
Individual hangars	37-43
Conventional hangars	2,400 – 9,800 SF
Based aircraft parking	0
Itinerant aircraft parking	54,900 SF

Source: McFarland Johnson analysis, 2024

These numbers are estimates and development could occur earlier or later, depending on actual demand. The Airport is experiencing based aircraft growth slightly faster than forecast, which could accelerate the need for additional hangar and apron space in the short term.

Two alternatives were reviewed and compared to each other to identify the recommended alternative. Some of the considerations that went into the short-term alternative development include the long-term vision of the Airport, keeping similar types of operations

and similar aircraft sizes in proximity to each other, creating the most efficient use of space, identifying the most effective “next step” for building hangars and aprons, and protecting for existing design standards.

5.4.1. Short-Term Apron and Hangar Alternative 1

Short-term Apron and Hangar Alternative 1 is shown in **Figure 5-3**. The focus of this alternative was to accommodate small aircraft in t-hangars whenever possible. T-hangar building WE is shown as proposed, but construction was completed in 2024. This alternative meets:

- Short-term hangar demand
- Short-term apron demand (itinerant aircraft parking)

Since this alternative meets the higher end of individual hangars needs as identified in Chapter 4, *Facility Requirements*, additional conventional hangar need is on the lower end of the identified needs. Conventional hangars start at 6,500 SF per SFM’s minimum standards documentation. Therefore, until the need gets to 6,500 SF, no short-term conventional hangars are shown.

5.4.2. Short-Term Apron and Hangar Alternative 2

Short-term Apron and Hangar Alternative 2 is shown in **Figure 5-4**. The focus of this alternative was to accommodate small aircraft individual hangars – both box and t-hangars. T-hangar building WE is shown as proposed, but construction was completed in 2024. This alternative meets:

- Short-term hangar demand
- Short-term apron demand (itinerant aircraft parking)

Since this alternative meets the higher end of individual hangars needs as identified in Chapter 4, *Facility Requirements*, additional conventional hangar need is on the lower end of the identified needs. Conventional hangars start at 6,500 SF per SFM’s minimum standards documentation. Therefore, until the need gets to 6,500 SF, no short-term conventional hangars are shown. Construction of the proposed

hangar W57 (between existing W56 and W58) results in the loss of two complex overflow parking spaces that will need to be relocated.

5.4.3. Short-Term Apron and Hangar Alternative Comparison

Both build alternatives meet the short-term demand for hangar and apron space. The layouts were reviewed by Airport management, operations, tenants, and users, and the unanimous preference was for Short-Term Apron and Hangar Alternative 1 as the most effective way to accommodate the growing demand at SFM. While all developments are likely to be privately funded, t-hangar buildings are generally more cost effective to construct on a per aircraft basis. The GA terminal location will be reviewed further.

5.5. Aeronautical Use Off-Airport Development Alternatives

Based on the highest and best use analysis conducted in Chapter 4, *Facility Requirements*, three build alternatives were created to review the off-airport development opportunities. Office/public terminal space is shown as a single-story area, whereas on the final preferred alternative is shown to represent a two-story building for efficiency.

5.5.1. Off-Airport Development Alternative 1

This alternative proposes acquiring two parcels of land between SR-109/Main Street and Airport property. This alternative shows a partial build-out option of large conventional hangars, relocation of the helicopter area, and GA terminal space. This alternative could result in the relocation of the restaurant on the second floor of the hangar and is shown in **Figure 5-5**.

5.5.1.1. Alternative Benefits

This alternative has the following benefits:

- Provides Airport flexibility with additional land
- Allows utility access from SR-109/Main Street
- Relocates the helicopter operations, which decongests the East FBO area
- Meets the short-term and long-term needs for GA terminal space

- Meets the short-term and long-term needs for conventional hangar space
- Meets the short-term and long-term need for apron (itinerant aircraft parking) space
- Remains clear of stream/wetland buffers

5.5.1.2. Alternative Drawbacks

This alternative has the following drawbacks:

- Requires the acquisition of property
- Increases costs due to the increased land acquisition

5.5.2. Off-Airport Development Alternative 2

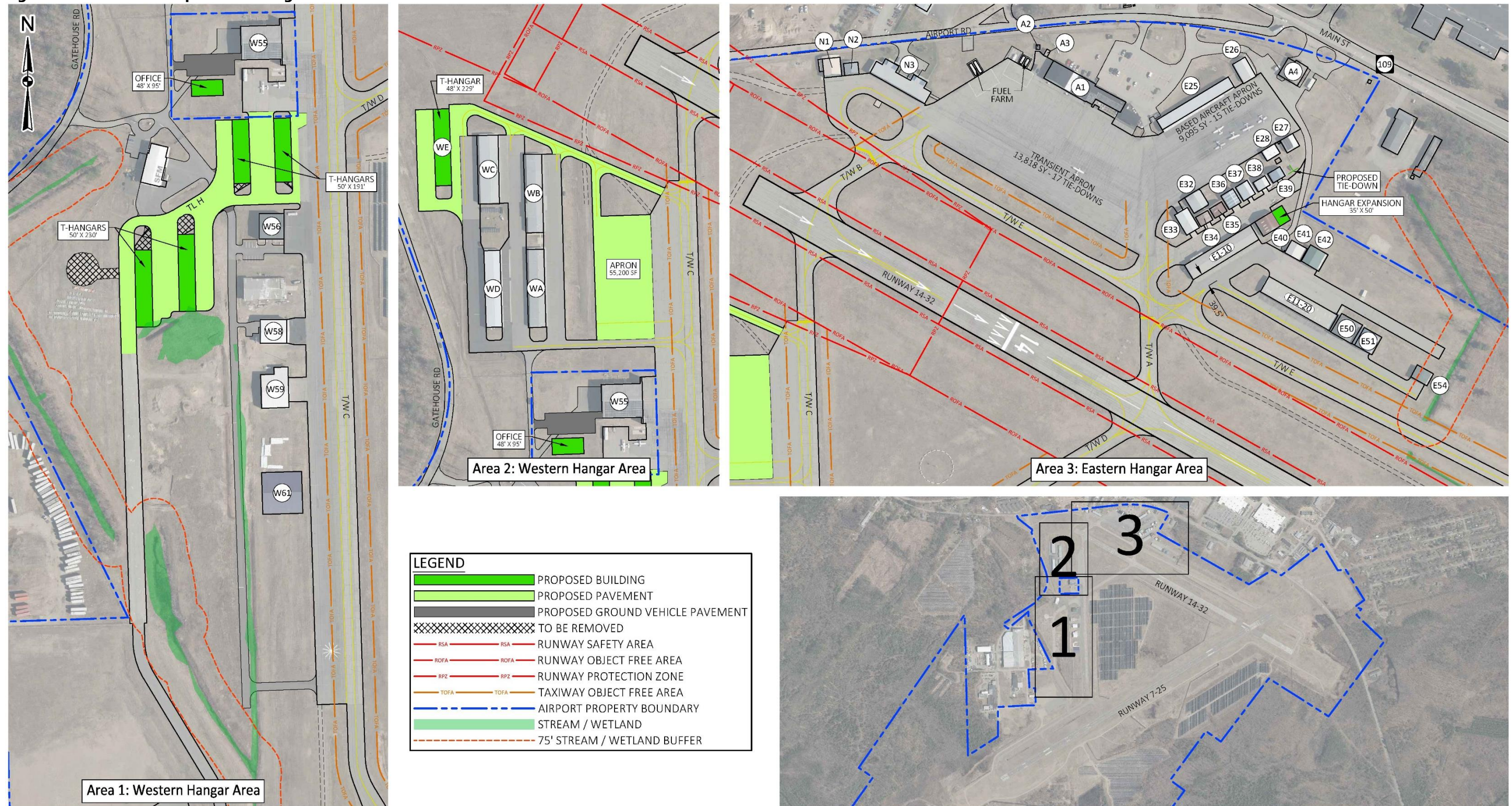
This alternative proposes acquiring one of the two parcels of land and identifies the other parcel as being potentially developed by the City of Sanford for multi-modal access. This alternative shows a full build-out option of large conventional hangars, relocation of the restaurant, relocation of the helicopter area, and construction of GA terminal space. This alternative is shown in **Figure 5-6**.

5.5.2.1. Alternative Benefits

This alternative has the following benefits:

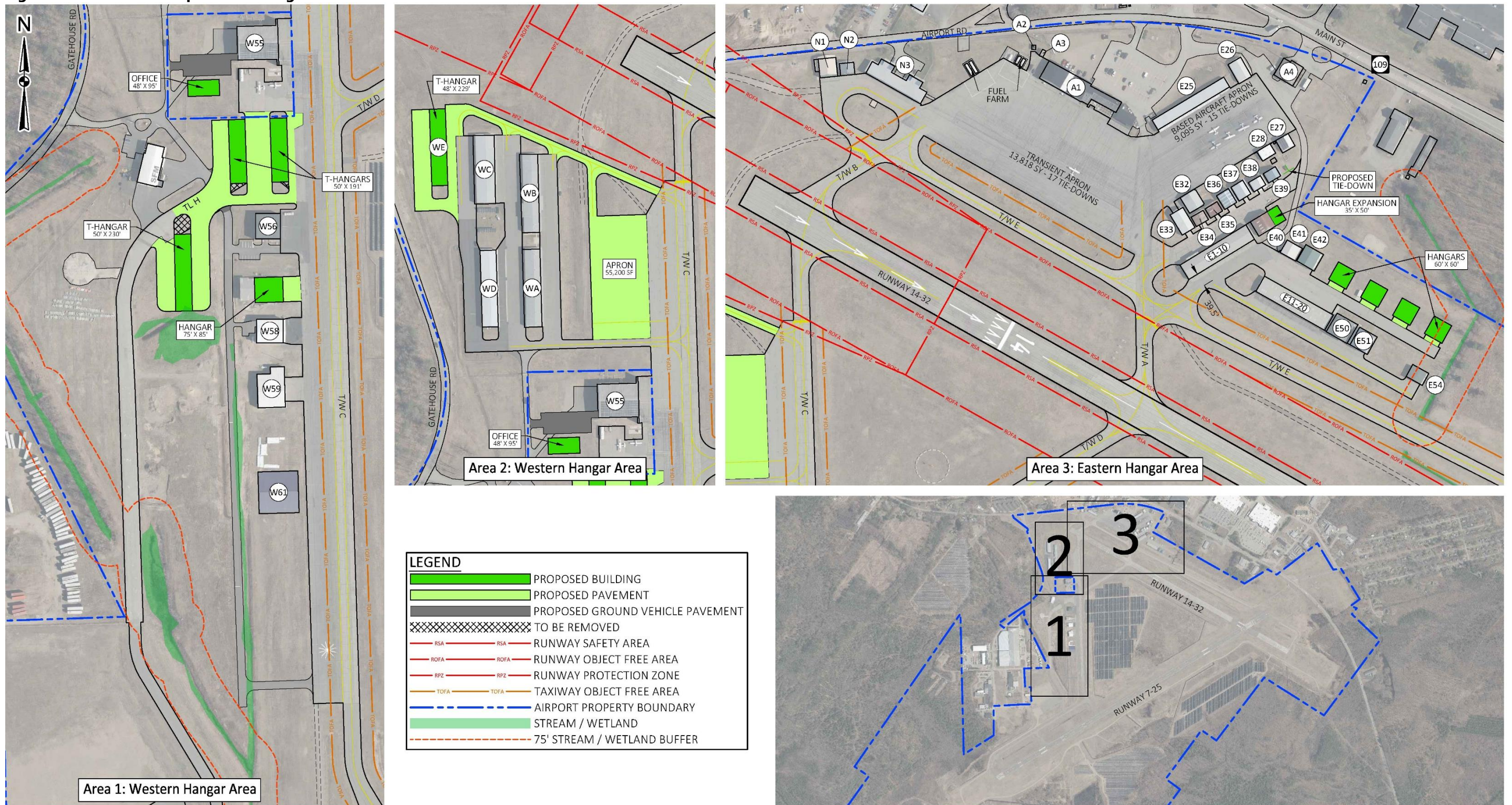
- Allows utility access from SR-109/Main Street
- Relocates the helicopter operations, which decongests the East FBO area
- Meets the short-term and long-term needs for GA terminal space
- Meets the short-term and long-term needs for conventional hangar space
- Meets the short-term and long-term needs for apron (itinerant aircraft parking) space
- Maximizes the use of Airport space available
- Remains clear of stream/wetland buffers
- Allows for a multi-modal collaboration with the City of Sanford
- Allows flexibility for additional development should demand occur faster than forecast

Figure 5-3: Short-Term Apron and Hangar Alternative 1



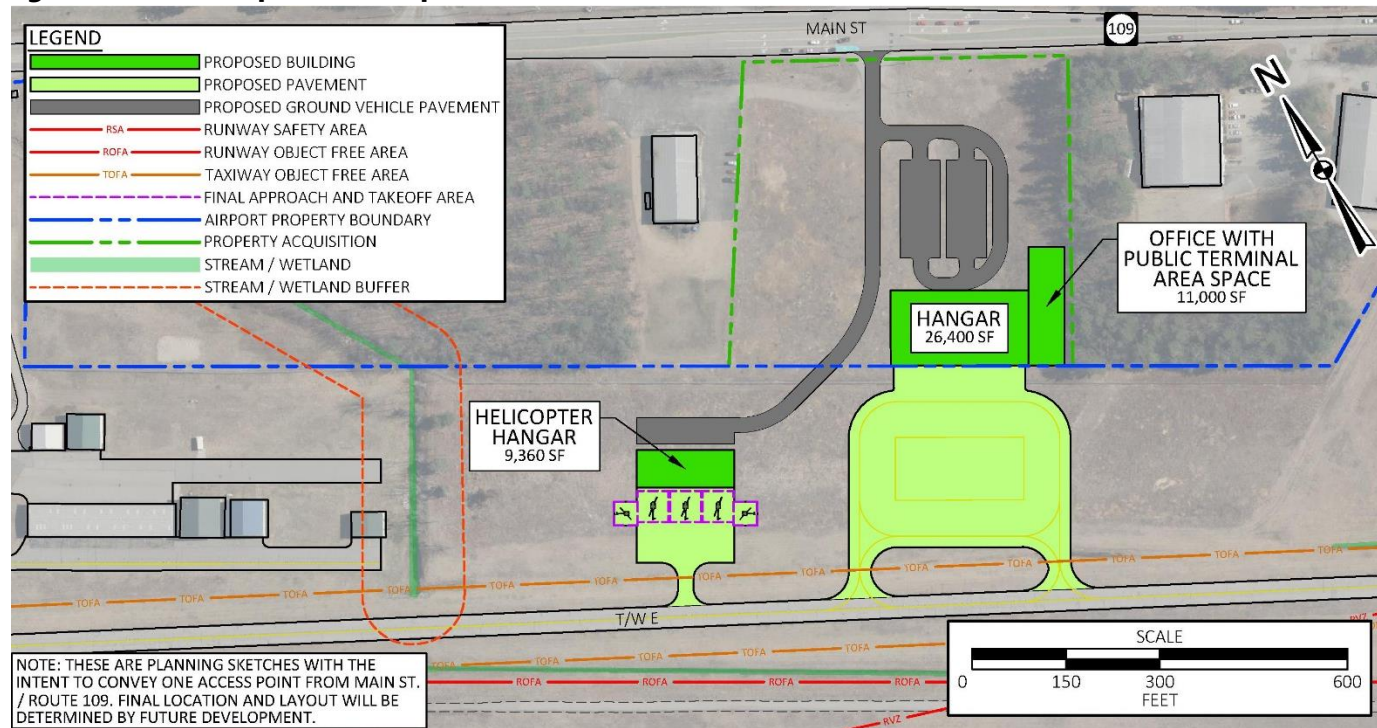
Sources: Maine Orthoimagery Municipal Sanford, 2022, and McFarland Johnson, 2024

Figure 5-4: Short-Term Apron and Hangar Alternative 2



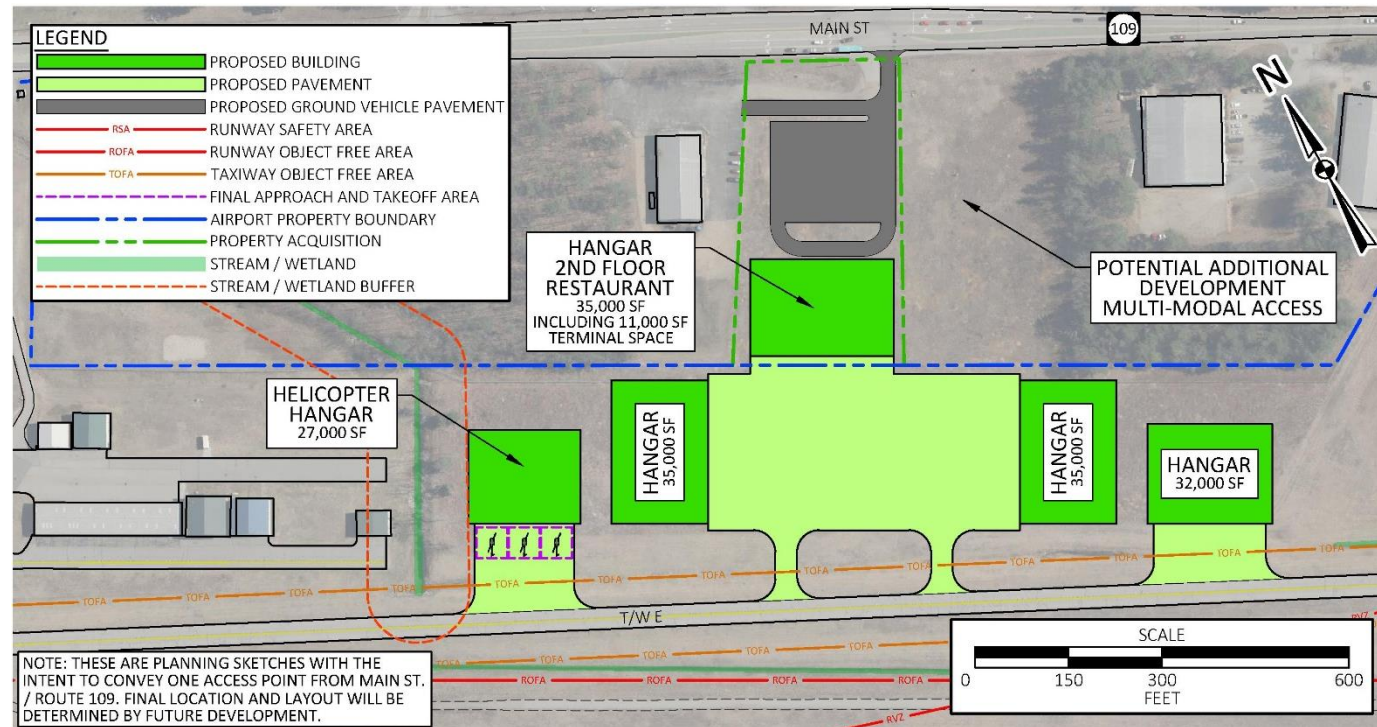
Sources: Maine Orthoimagery Municipal Sanford, 2022, and McFarland Johnson, 2024

Figure 5-5: Off-Airport Development Alternative 1



Sources: Maine Orthoimagery Municipal Sanford, 2022, and McFarland Johnson, 2024

Figure 5-6: Off-Airport Development Alternative 2



Sources: Maine Orthoimagery Municipal Sanford, 2022, and McFarland Johnson, 2024

5.5.2.2. Alternative Drawbacks

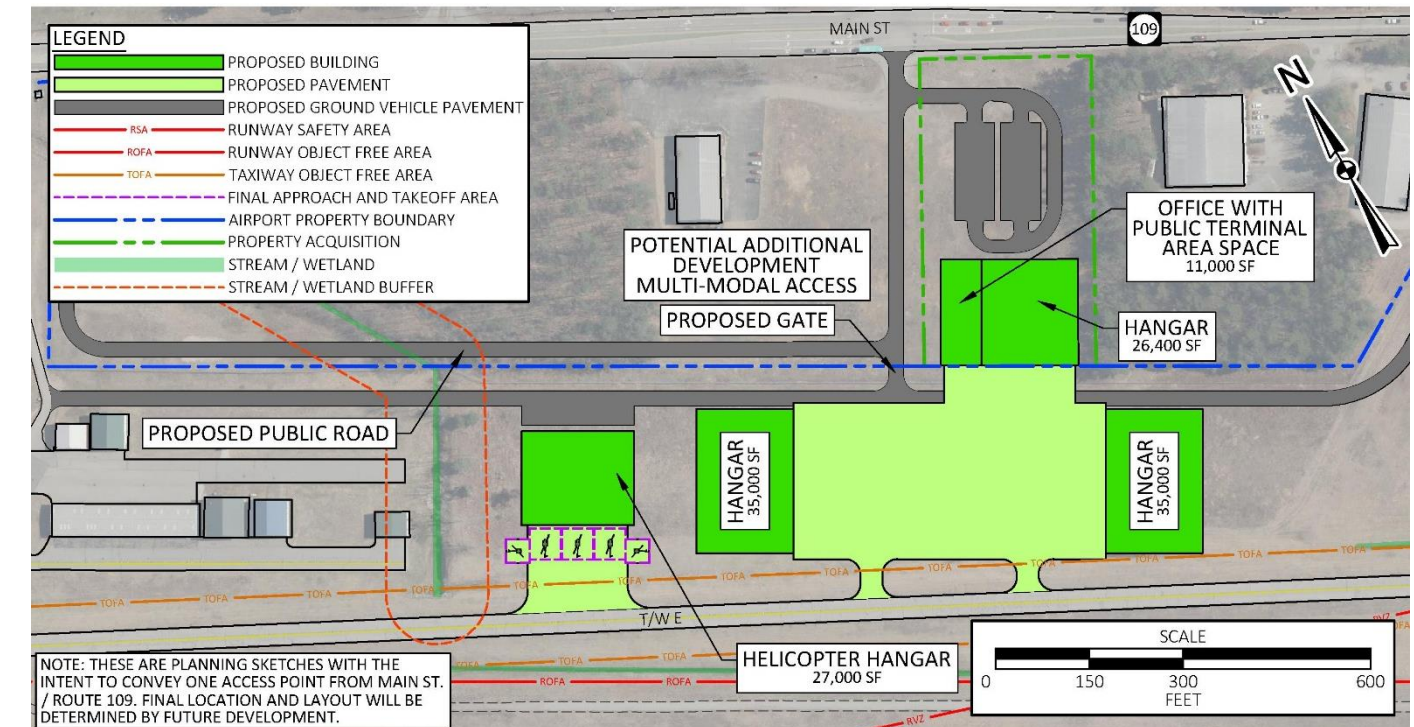
This alternative has the following drawbacks:

- Requires acquisition of property
- Limits roadway/parking access without revisions to the hangar locations/sizes
- Trusts the City of Sanford will build and maintain the access road off airport property

5.5.3. Off-Airport Development Alternative 3

This alternative recommends acquiring one parcel of land and identifies the other parcel as being potentially developed by the City of Sanford for multi-modal access. This alternative shows a full build-out option of large conventional hangars, relocation of the helicopter area, construction of GA terminal space, and could result in a relocation of the restaurant. This alternative is the result of discussions at Tenant Workshop #2. This alternative is shown in Figure 5-7.

Figure 5-7: Off-Airport Development Alternative 3



Sources: Maine Orthoimagery Municipal Sanford, 2022, and McFarland Johnson, 2024

5.5.3.1. Alternative Benefits

This alternative has the following benefits:

- Relocates the helicopter operations, which decongests the East FBO area
- Meets the short-term and long-term needs for GA terminal space
- Meets the short-term and long-term needs for conventional hangar space

- Meets the short-term and long-term needs for apron space (itinerant aircraft parking)
- Maximizes the use of Airport space available
- Remains clear of stream/wetland buffers
- Allows for a multi-modal collaboration with the City of Sanford
- Protects for both airside and landside roadway access and secure landside parking
- Allows flexibility for additional development should demand occur faster than forecast

5.5.3.2. Alternative Drawbacks

This alternative has the following drawbacks:

- Requires the acquisition of property
- Limits roadway/parking access without revisions to the hangar locations/sizes
- Trusts the City of Sanford will build and maintain the access road off airport property
- Allows utility access from SR-109/Main Street

5.5.4. Off-Airport Development Alternatives Comparison

This section compares the three build alternatives to the existing conditions at the Airport. The evaluation criteria reviewed were:

- **Meets Facility Requirements:** Does this alternative meet the needs of the airport for the planning period?
- **Provides flexibility:** Does this alternative provide flexibility for future growth and changing aviation environments?
- **Minimizes costs:** Does this alternative minimize cost impacts, where possible? It is anticipated that most buildings will be funded by private parties.
- **Minimizes environmental impacts:** Does this alternative minimize environmental impacts, where possible?

Table 5-4 compares Off-Airport Development Alternatives and how they meet the evaluation criteria.

Table 5-4: Comparison of Off-Airport Development Alternatives

Evaluation Criteria	No Build	Alt. 1	Alt. 2	Alt. 3
Meets Facility Requirements	✘	✓	✓	✓
Provides flexibility	✘	✓	✓	✓
Minimizes costs	✓	✘	✓	✓
Minimizes environmental impacts	✓	✓	✓	✓

Source: McFarland Johnson analysis, 2024

Since the goal is to meet facility requirements and provide the Airport with flexibility, the No Build alternative is not a reasonable option. Alternatives 2 and 3 provide the best benefits at the lowest impacts but are reliant on the City of Sanford to build and maintain an access road (although this is not shown in Off-Airport Development Alternative 2, access to a potential new portion of the perimeter road would look the same as in Off-Airport Development Alternative 3).

Based on the results of Table 5-4 and feedback from the Airport and stakeholders, the preferred alternative is Off-Airport Development Alternative 3.

5.6. Short-Term Preferred Alternative

The Short-Term Preferred Alternative combines the preferred East FBO Area, Short-Term Apron and Hangar, and Off-Airport Development Alternatives and is shown in Figure 5-8 and consolidates the office/public terminal area by making it two stories. This alternative meets all 2027 facility requirements as shown in Table 5-5.

Table 5-5: Comparison of Short-Term Preferred Alternative to 2027 Facility Requirements

Item	Short-term (2027)	Needs Met
Hangars		
Individual	128-134	✓
Conventional (SF)	25,200-32,600	✓
Based aircraft parking	7 paved	✓
Itinerant aircraft parking (SF)	245,900	✓
Aircraft fueling area	Fuel truck clear of runway	✓
Staging and maneuvering areas	Meet FAA standards	✓
GA terminal/FBO development (SF)	7,000-11,000	✓

Item	Short-term (2027)	Needs Met
Deicing services	Potential passive deicing	✓
East FBO building auto parking	111	✓
Automobile flow and gates	Reconfigure and decongest	✓

Source: McFarland Johnson analysis, 2024

The timing of these projects is all based on demand and could occur sooner or later, depending on Airport growth. The helicopter hangar is one area where the current helicopter operator in Hangar N3 could move to, which would open additional space for an airside/landside opportunity. Should the helicopter operations move somewhere else on the airfield, this area would be available for conventional hangar space with a different use.

Potential impacts to stream/wetland/drainage will be reviewed on a case-by-case basis and will be avoided and/or mitigated as appropriate to meet current standards and guidance.

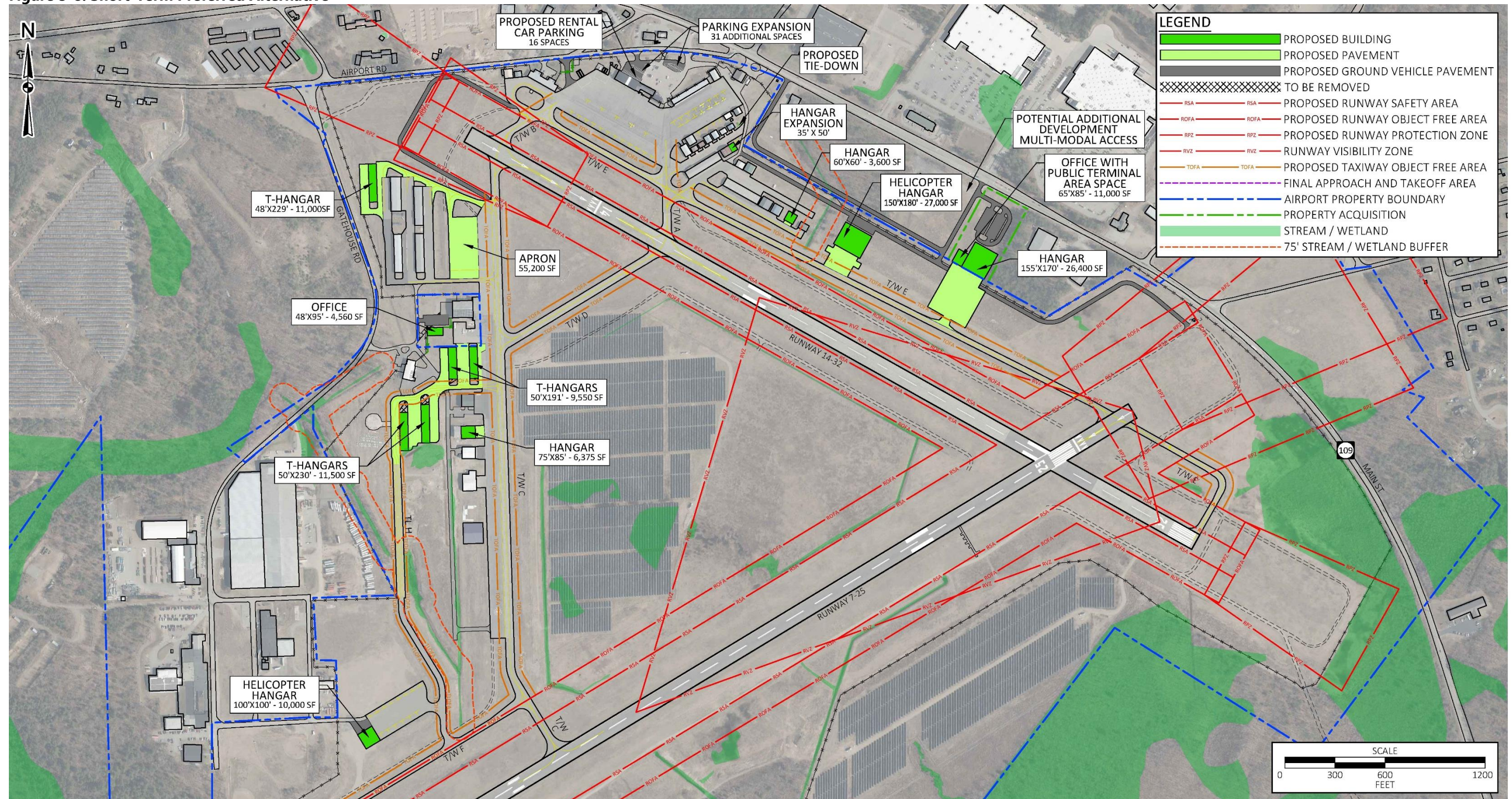
Short-term/Phase 1 projects include:

- New fuel truck access road, fence, and motorized gate
- East FBO parking lot expansion
- Proposed northeast development (road, parking lot, taxilane, and new apron)
- Taxilane H modifications
- New t-hangar taxilane
- New apron area off Taxiway C
- New perimeter road around Runway 14
- New perimeter road with motorized gate on the northeast

5.7. Full Build-Out/Hangar Alternative

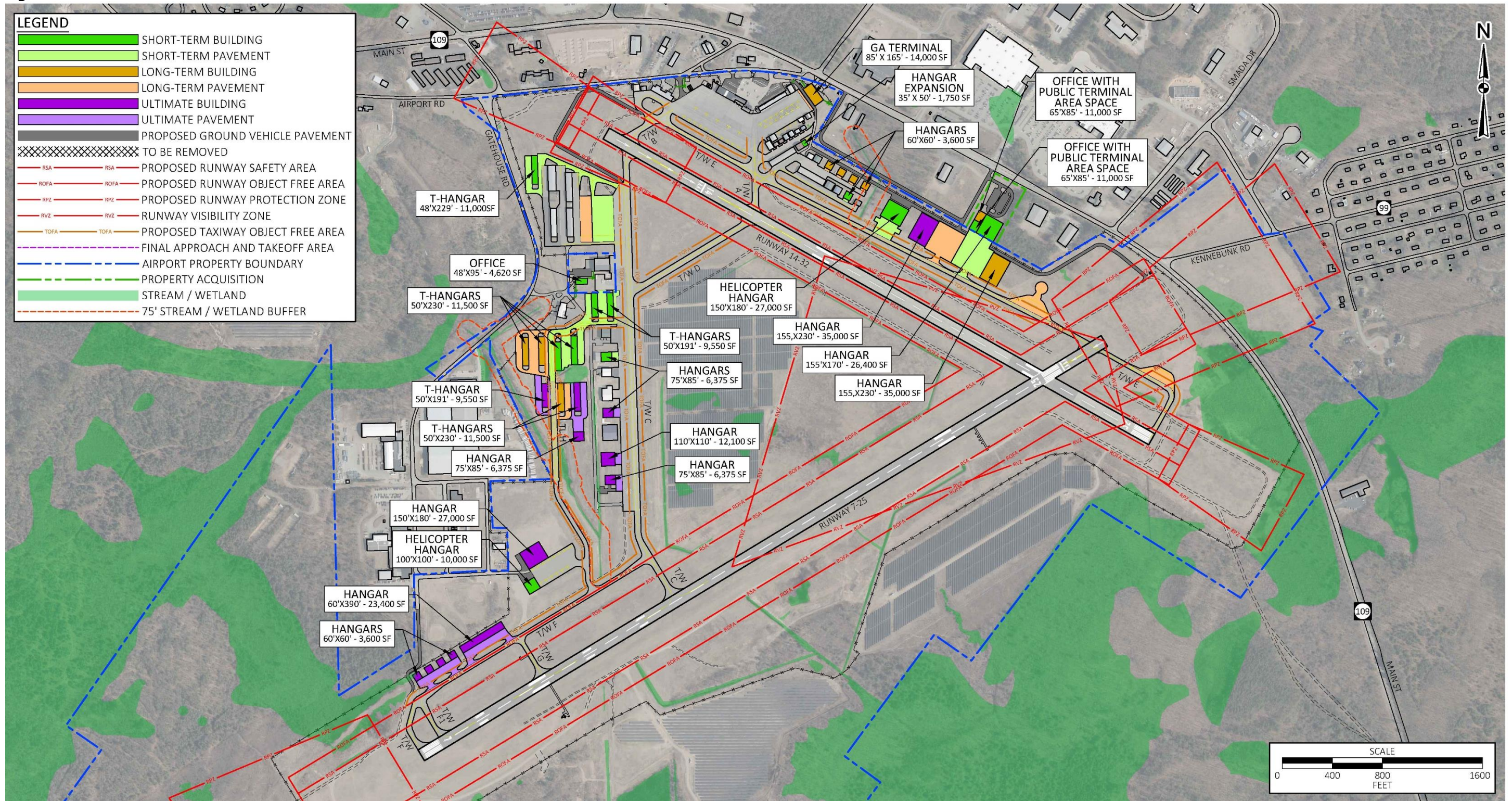
The full build-out option is shown in Figure 5-9. This is a planning-level view of what ultimate development could look like within the 20-year planning period and beyond. The goal of this is to provide a holistic view of the build-out opportunities, keep similar aircraft sizes in the same area for pavement and spacing efficiencies, and protect for the most effective use of the Airport. Ultimate development timing and hangar sizes and types will be dependent on actual demand and will likely vary from this drawing.

Figure 5-8: Short-Term Preferred Alternative



Sources: Maine Orthoimagery Municipal Sanford, 2022, and McFarland Johnson, 2024

Figure 5-9: Full Build-Out Alternative



Sources: Maine Orthoimagery Municipal Sanford, 2022, and McFarland Johnson, 2024

Areas of note include:

- Proposed hangars are shown at least 50 feet apart to meet fire codes. For additional efficiency of space, fire walls could be constructed between buildings allowing for closer spacing or shared walls, thus maximizing potential hangar storage.
- For the ultimate East FBO area parking lot expansion, the following are recommendations to consider for stormwater/drainage purposes:
 - A permit history should be conducted to determine the existing stormwater area between the parking lot and Building E25. Potential options could include (but are not limited to): soil filters, open air detention (pond), underground chambers, and infiltration chambers. Groundwater depths would be a limiting factor for infiltration chambers (groundwater should be at least six to seven feet below the surface, ideally 10 feet or more).
- Taxiing is proposed to be in a circular fashion heading south on Taxilane H and north on Taxiway C to prevent head-to-head situations that may occur in an area with so many hangars.
- The new t-hangar taxilane should help with circular traffic to prevent head-to-head situations.
- Vehicles with access to the Presidential Lane automobile gate should be trained to cross an active taxiway/taxilane.

This alternative meets the long-term needs as shown in **Table 5-6**.

Table 5-6: Comparison of Full Build-Out Alternative to 2042 Facility Requirements

Item	Long-term (2042)	Needs Met
Hangars		
Individual	190-198	✓
Conventional (SF)	50,300-60,900	✓
Based aircraft parking	10 paved	✓
Itinerant aircraft parking (SF)	363,900	✓
Aircraft fueling area	Fuel truck clear of runway	✓
Staging and maneuvering areas	Meet FAA standards	✓

Item	Long-term (2042)	Needs Met
GA terminal/FBO development (SF)	11,000-18,000	✓
Deicing services	Passive deicing	✓
East FBO building auto parking	124	✓
Automobile flow and gates	Reconfigure and decongest	✓

Source: McFarland Johnson analysis, 2024

The Airport Layout Plan (ALP) will show both off-airport alternative parcels to be acquired for prudent planning purposes.

Comprehensive Department of Environmental Protection permitting may provide an effective tool for efficient long-term growth and should be considered. Additionally, the following sub-sections were considered as part of this full build-out/hangar alternative:

- Electrical access to hangars/electric vehicles/aircraft charging and
- Compass calibration pad siting review.

5.7.1. Electrical Access to Hangars/Electric Vehicles/ Aircraft Charging

If possible, new hangars should be built with easy access to electricity.

For purposes of electric charging, it is recommended that two areas be considered as priority areas:

- The location of the existing Fire Station could provide 3-phase power off SR-109/Main Street for electric aircraft charging stations. This could be extended to the parking lot for electric vehicle charging as well. The first round of electric aircraft are mostly ADG I aircraft and could taxi past the hangars and based aircraft tie-downs without issues.
- The new off-airport development would also have to access 3-phase power off SR-109/Main Street for electric aircraft charging stations on the new apron area.

Level 2 chargers for vehicles in parking lots could use single-phase power and therefore have more opportunities to be built in more locations around the airport. It is anticipated that the first wave of electric aircraft will be for commercial purposes only.

5.7.2. Compass Calibration Pad Siting Review

A compass calibration pad is a paved area where aircraft can calibrate the aircraft's magnetic compass. This allows the pilot to determine the deviation error in the magnetic compass and adjust accordingly. The compass calibration pad is one of multiple tools to perform aircraft compass calibration.

FAA AC 150/5300-13B, Change 1, (AC -13B) has standards to locate the pad as noted in Section 6.9.1.1. These were reviewed and considered as part of the potential siting locations identified. Prior to final location identification, it should be confirmed that the area still meets these standards, the standards have not changed, the recommended practices of AC -13B Section 6.9.1.2 and design considerations from AC -13B Section 6.9.1.3 are met, and all standards from AC -13B Section 6.9 and Appendix F were incorporated.

The existing compass calibration pad is located on the southern portion of the overflow complex with GA aircraft parking parallel to Taxilane H as shown in **Figure 5-10**. This figure also shows three potential sites for relocating the compass calibration pad (compass rose) to, which will be discussed further in the sub-sections. Blue areas meet the recommended separations from existing on and off-airport buildings and known utility lines and points. Before finalizing a location, further study should be completed to be fully aware of all utilities surrounding sites and any changes that occurred both on and off airport property to meet the full recommendations at the time of design and construction. Additionally, given the focus on safety and minimizing runway crossings, especially at nontowered airports, it may be worth considering building one compass calibration pad on either side of Runway 14-32 near both high-density areas of aircraft storage (both based and itinerant).

5.7.2.1. Compass Calibration Pad Alternative 1

This site is located parallel to Taxiway E near the approach end of Runway 25. This location meets the recommended separation to the proposed development and is located approximately 250 feet from the property line.

One risk with this location is that an incompatible use could be built off airport property but within 600 feet of the center of the pad.

Incompatible uses within 600 feet of the pad are large parking lots, busy roads, railroad tracks, high-voltage electrical transmission lines, or cables carrying direct current (either above or below ground). While most of these are unlikely to be built in that location, the Airport should be aware of these and fully consider these during any review of proposed development in the Airport Development Zone.

Other than its location in proximity to the property line, this is an ideal location for the relocated compass calibration pad. One item of note is that this location requires aircraft that are based on the west side of the Airport to cross a runway to access this site.

5.7.2.2. Compass Calibration Pad Alternative 2

This site is located off Taxilane H near the intersection of Sky Tech Lane, Rubb Lane, and Kostis Lane. This location meets the recommended separation to the proposed development and is located approximately 226 feet from the property line.

Like Compass Calibration Pad Alternative 1, one risk is the location of off-airport incompatible land uses. This includes what looks like an existing storage area of metal storage pods, which may impact the reading of the compass calibration pad as it is within 600 feet of the center of the proposed pad. If this site is evaluated and the storage pods do not influence the magnetic measurements, this location has the benefit of being close to the higher density of demand should t-hangar construction continue on the west side of the Airport as forecast.

On the other hand, this large area may be better suited to protect for further airfield development needs, stormwater drainage, or snow storage.

5.7.2.3. Compass Calibration Pad Alternative 3

This site is located off Taxiway F at the end of the extended Gate House Road. This location eliminates four individual hangars to meet the recommended separation to the proposed development and is located approximately 100 feet from the property line.

Like the other two alternatives, one risk is the location of off-airport incompatible land uses. This area may be better suited to protect for further airfield development needs.

5.7.2.4. Next Steps

The next steps to relocate the existing compass calibration pad are:

- Confirm the location meets most current siting standards as outlined in AC -13B or current documentation.
- Identify detailed on and off-airport utility lines for siting criteria. Small anomalies may be acceptable if the magnetic surveys indicate no effect on any magnetic measurements on the paved portion of the compass calibration pad.
- Perform preliminary magnetic surveys to determine whether the angular difference between true and magnetic north measured at any point does not differ from the angular difference measured at any other point:
 - By more than half a degree (30 minutes of arc) within a space between two feet and six feet above the grade elevation of the pad, and
 - Over an area within a 250-foot radius from the center of the pad.

5.7.2.5. Maintenance

The FAA recommends that magnetic surveys of existing compass calibration pads be conducted at regular intervals of five years or less. Additionally, a magnetic survey should be conducted after a major construction of utility lines, buildings, or any other structures within 600 feet of the center of the pad or any construction within 150 feet of the center of the pad.

Additionally, the pavement should be maintained and new development should be built within the distance parameters identified in AC -13B.

Figure 5-10: Potential Compass Calibration Pad Areas



Sources: FAA AC 150/5300-13B, Change 1; SFM ALP; Maine Orthoimagery Municipal Sanford, 2022; and McFarland Johnson analysis, 2024