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CHAPTER 1

Introduction
INTRODUCTION AND PURPOSE

An Airport Master Plan (AMP) evaluates an airport’s physical facilities, management principals, planned development, and financial foundation for the future. Because the aviation industry is not static, periodic updates are needed to refresh this information and identify future plans and expectations. The San Marcos Regional Airport (HYI) has had some significant changes since the previous airport master plan was completed in 2001. These changes include changes in area economic conditions, increased based aircraft demand, and changes in fleet mix.

This master plan will focus on examining existing facilities, forecasting future aviation demands, identifying the projects necessary to meet that demand, and examining the financial means to achieve the short- and long-term goals for San Marcos Regional Airport. Additionally, the master plan will serve as a tool to aid airport officials in their decision-making regarding San Marcos Regional Airport’s upkeep and future development.

An overview of the AMP process is provided in Figure 1-1.
In addition to the AMP report, an Airport Layout Plan (ALP) drawing set was developed. The ALP is a set of drawings that details the Airport’s current infrastructure and proposed development plans as well as the airspace and properties surrounding the airport. The ALP is reviewed and conditionally approved by the FAA and TxDOT Aviation. The ALP created as part of this project complies with FAA Standard Operating Procedures (SOP) 2.00 – *Standard Operating Procedure for FAA Review and Approval of Airport Layout Plans*.

**SWOT Analysis**

At the beginning of the AMP process a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis was completed to identify key items that needed to be considered during the AMP process. The SWOT analysis was completed with input from numerous stakeholders including:

- City of San Marcos
- Airport Advisory Commission
- Greater San Marcos Partnership
- TxDOT Aviation
- Texas Aviation Partners
- Airport Tenants
Figure 1-2 below provides an overview of the items identified during the SWOT Analysis.
FIGURE 1-2
SWOT ANALYSIS
SAN MARCOS REGIONAL AIRPORT

Strengths
- Developable Land
- Apron Space
- Controlled Airspace (ATCT)
- Close Proximity to Training Areas
- RCO for Contacting AUS TRACON
- High Growth Area
- Proximity to Interstate, Rail and Toll Road
- World-Class FBO
- Well Known in the GA Community
- Diversity of Aviation Business
- Excellent Airside Facilities & Instrument Approach Procedures
- Reverse Commute from Austin & San Antonio
- Proximity to Texas State Univ. & Gary Job Corp.
- Affordable Fees & Pricing
- FM 110 Access & Rebranding
- Foreign Trade Zone (FTZ)
- Commemorative Air Force (CAF)
- Solid Relationships with Government Agencies
- City Support
- Shovel-Ready Development Area
- TxDOT Aviation Impact Study
- Rapid Aeronautical Activity Growth

Weaknesses
- Old Airfield Design
- Old Pavement/Deteriorating Pavement
- Length & Strength of Runways for Future Development
- 3rd Runway Not Supported by FAA Grant Funds
- Water, Waste Water & Fiber Utilities
- Vehicle Access & Curb Appeal
- Vehicle Parking
- No On-Airport Restaurant
- Lack of Zoning
- Lack of Available Hangar Space
- Old Building/Facilities
- Limited Office Space
- Hangars Unable to Accommodate Larger Acft
- No Aircraft Rescue & Fire Fighting (ARFF)
- Drainage Capacity/No Drainage Master Plan
- Lack of Development Incentives
- Poor Community Awareness/Understanding
- Misconception of Gary Job Corp
- Poor Lighting for Ramp Area
- Light Pollution from Gary Job Corp
- Telecommunications Utility Reliability

San Marcos Regional Airport SWOT Results

Opportunities
- Foreign Trade Zone (FTZ)
- Airport Master Plan Development
- Heavy Industry Growth in the Community
- Connectivity for Trucking
- SMART Terminal
- Military Demand Stimulation
- Airport Events
- Texas State Univ/Austin Community College/Gary Job Corp
- Cargo Facilities
- U.S. Customs
- Purchase of Adjacent Property

Threats
- Impacts to Airport from Area Development
- Competing Funding Priorities
- Loss of Labor Force to Austin & San Antonio
- School District
- Caldwell County Aircraft Taxes
- Aeronautical Growth May Harm Community Sentiment
- Competition from Other Regional Airports
- Lack of Marketing Funds
- Floodplain
CHAPTER 2
Inventory
CHAPTER 2: INVENTORY

FACILITIES INVENTORY

As the initial step in the airport master planning process, the inventory is a systematic data collection process that provides an understanding of past and present aviation factors associated with the San Marcos Regional Airport (HYI). A comprehensive inventory, including the following major inventory tasks, was completed to form the basis for airport recommendations throughout the remainder of the Airport Master Plan.

- An on-site inspection of existing facilities was conducted over the course of multiple days to ensure an accurate inventory of airport facilities, equipment, and services.
- Discussions with Airport, local officials, airport users, and airport tenants regarding recent airport trends, operations, infrastructure, and services.
- The collection of airport data and aeronautical background information; a review of historical airport documents, previous airport layout plans, maps, charts, and photographs of airport facilities.
- Review of current and planned on and off-airport land use development and property information, including surrounding land use patterns, existing and proposed transportation developments, infrastructure, and utilities.
- The collection of environmental information related to the airport.

AIRPORT OWNERSHIP

The San Marcos Regional Airport is managed by Texas Aviation Partners (TAP), a private firm, via an airport management contract with the airport’s sponsor – the City of San Marcos. The City Council for the City of San Marcos provides review and approval of all major fund expenditures and development decisions related to airport infrastructure.

The airport also has an Airport Advisory Board that is appointed by the City Council. The responsibilities of the Airport Advisory Board are set forth in the City of San
Marcos’ municipal code. The board’s responsibility is to advise the City Council, City Manager, and airport management on the following matters:

- Methods and matters in recruiting and creating interest in the airport.
- Planning and developing airport services and expansion.

AIRPORT HISTORY

The San Marcos Regional Airport was originally developed as a military airfield (called Gary Air Force Base) in the 1940s to support military flight training operations. The airport continued to be used as a military airfield until the 1960s. In 1966, the airfield was deeded to the City of San Marcos and civil aircraft operations at the airport commenced. When the airport was originally developed, it had four runways. Three of the original runways remain. Runway 4/22 was decommissioned in 2001 and converted into a taxiway – Taxiway Juliet. The original runways were 150 feet in total width. All three of the current runways have since been narrowed to 100 feet in width.

AIRPORT BUSINESS DEVELOPMENT PLAN

An Airport Business Development Plan (ABDP) was completed for the San Marcos Regional Airport in 2013 through a federal grant administered by TxDOT Aviation. The study was led by TAP in collaboration with the City of San Marcos and other partners. The focus of the ABDP was to provide a strategic direction for infrastructure and policy development at the Airport. The ABDP included a high-level inventory of airport facilities, an analysis of the Airport’s competitive position compared to other airports, and a detailed list of near term goals and development objectives. As part of the plan, the following vision statement was developed for the Airport:

“San Marcos Regional Airport will be a premier gateway to the Central Texas region acting as a catalyst for jobs, investment, and innovation by leveraging the area’s emerging economic strengths.”

The vision and goals established as part of the ABDP will be a key consideration throughout the master planning process.
AIRPORT ECONOMIC IMPACT

In 2018, the Texas Department of Transportation – Aviation Division (TxDOT Aviation) completed an economic impact study quantifying the economic impact of airports throughout the State of Texas. The study estimated that the total economic impact of the San Marcos Regional Airport to be:

- 664 Total Jobs
- $22.7 Million in Payroll
- $82.1 Million in Economic Output

Of the 264 general aviation airports within the State of Texas, the San Marcos Airport is within the top 15 in total economic output. This indicates that the San Marcos Regional Airport is a thriving airport surrounded by a strong business and airport user community.

AIRPORT ROLE

The San Marcos Regional Airport’s role is documented in the FAA’s National Plan of Integrated Airport Systems (NPIAS), the FAA’s General Aviation Airports: A National Asset, and the Texas Airport System Plan (TASP). San Marcos Regional Airport is classified as follows in each of the aforementioned documents:

- Designated as a “Reliever” airport under the Texas Airport System Plan.
- Designated as a “National” airport in the NPIAS.
- Identified by the FAA’s Asset study as a “Regional” reliever airport.

TEXAS AIRPORT SYSTEM PLAN (TASP) ROLE

The TASP describes reliever airports as those airports surrounded by a major metropolitan area that provide facilities to relieve congestion at larger commercial service airports in the area. Currently, the San Marcos Regional Airport is designated as a reliever airport for both Austin-Bergstrom International Airport (AUS) and the San Antonio International Airport (SAT). According to the TASP, reliever airports accommodate various class of aircraft (e.g. jets, twin-engine aircraft, single engine aircraft, etc.) and must currently have or be forecasted to have at least 100 based aircraft or 25,000 annual itinerant operations. The San
Marcos Regional Airport currently meets both of these requirements with approximately 200 based aircraft and 39,635 itinerant operations in FY2018.

The TASP does not have any specific minimum design standards for reliever airports. However, the TASP states that reliever airports typically have an Airport Reference Code (ARC) of C-II or D-II. According to the San Marcos Regional Airport’s current Airport Layout Plan (ALP), the current ARC for the Airport is C-II.

**FAA National Plan of Integrated Airport Systems (NPIAS) Role**

The FAA’s National Plan of Integrated Airport Systems (NPIAS) sets minimum standards used to identify airports that are critical to the national air transportation system and are consequently, eligible for federal grant funds through the FAA’s Airport Improvement Program (AIP). The NPIAS report is updated bi-annually and presents a rolling five-year plan related to airport infrastructure and development needs. The most recent NPIAS plan was presented to Congress on September 26, 2018 and is for Fiscal Years (FY) 2019 – 2023. The NPIAS currently includes 3,328 airports in the United States.

Within the NPIAS, airports are classified into one of several categories. Currently, the San Marcos Regional Airport is categorized as a “National” airport under the NPIAS. The NPIAS states that national airports are located in metropolitan areas near major business centers and support flying throughout the nation and world. National airports provide pilots with attractive alternatives to busier primary airports. Of the 3,328 airports identified in the NPIAS, 88 airports in the United States are categorized as “National” airports.

**FAA General Aviation Airport: A National Asset Study**

Beginning in 2010, the FAA began a national review of general aviation airports and their impact within the United States. The study, released in 2012, highlighted a number of benefits of general aviation airports and their impact on the communities they serve. According to the report, the San Marcos Regional Airport is classified as a “Regional” airport. The study goes on to state that regional airports are airports located in metropolitan areas and serve relatively large populations. These airports typically have a substantial amount of charter, jet, and rotorcraft flights.
**Airport Design Standards**

Beyond the TASP, NPIAS, and FAA Asset study designations, the FAA identifies design standards for airports and their operating pavements based on FAA Advisory Circular (AC) 150/5300-13 (current edition), *Airport Design*. Pavement categorization is provided for runways through the Runway Design Code (RDC) classification system while taxiway pavements are designated separately through the Taxiway Design Group (TDG) classification system. The runway with the highest RDC is used to establish an airport’s Airport Reference Code (ARC).

A runway’s RDC is defined by three variables:

1. Aircraft Approach Category (AAC) – The approach speed of the critical aircraft;
2. Aircraft Design Group (ADG) – The wingspan and tail height of the critical aircraft; and,

The critical aircraft is the largest single aircraft or classification of aircraft the runway is expected to serve on a regular basis (500 operations per year or more).

*Table 2-1* defines the AAC categories. *Table 2-2* documents the ADG categories. *Table 2-3* describes the various approach visibility minimums categories.
### TABLE 2-1
AIRCRAFT APPROACH CATEGORY (AAC)

<table>
<thead>
<tr>
<th>AAC</th>
<th>( V_{\text{REF}} / \text{Approach Speed} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Approach speed less than 91 knots</td>
</tr>
<tr>
<td>B</td>
<td>Approach speed 91 knots or more but less than 121 knots</td>
</tr>
<tr>
<td>C</td>
<td>Approach speed 121 knots or more but less than 141 knots</td>
</tr>
<tr>
<td>D</td>
<td>Approach speed 141 knots or more but less than 166 knots</td>
</tr>
<tr>
<td>E</td>
<td>Approach speed 166 knots or more</td>
</tr>
</tbody>
</table>

*Source: FAA Advisory Circular 150/5300-13 (current edition), *Airport Design*

\(^1\) \( V_{\text{REF}} \) = Landing Reference Speed or Threshold Crossing Speed

### TABLE 2-2
AIRPLANE DESIGN GROUP (ADG)

<table>
<thead>
<tr>
<th>Group #</th>
<th>Tail Height (ft. [m])</th>
<th>Wingspan (ft. [m])</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>&lt; 20' (&lt; 6 m)</td>
<td>&lt; 49' (&lt; 15 m)</td>
</tr>
<tr>
<td>II</td>
<td>20' - &lt; 30' (6 m - &lt; 9 m)</td>
<td>49' - &lt; 79' (15 m - &lt; 24 m)</td>
</tr>
<tr>
<td>III</td>
<td>30' - &lt; 45' (9 m - &lt; 13.5 m)</td>
<td>79' - &lt; 118' (24 m - &lt; 36 m)</td>
</tr>
<tr>
<td>IV</td>
<td>45' - &lt; 60' (13.5 m - &lt; 18.5 m)</td>
<td>118' - &lt; 171' (36 m - &lt; 52 m)</td>
</tr>
<tr>
<td>V</td>
<td>60' - &lt; 66' (18.5 m - &lt; 20 m)</td>
<td>171' - &lt; 214' (52 m - &lt; 65 m)</td>
</tr>
<tr>
<td>VI</td>
<td>66' - &lt; 80' (20 m - &lt; 24.5 m)</td>
<td>214' - &lt; 262' (65 m - &lt; 80 m)</td>
</tr>
</tbody>
</table>

*Source: FAA Advisory Circular 150/5300-13 (current edition), *Airport Design*

### TABLE 2-3
VISIBILITY MINIMUMS

<table>
<thead>
<tr>
<th>RVR (ft.)</th>
<th>Instrument Flight Visibility Category (statute mile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5000</td>
<td>Not lower than 1 mile</td>
</tr>
<tr>
<td>4000</td>
<td>Lower than 1 mile but not lower than ¾ mile</td>
</tr>
<tr>
<td>2400</td>
<td>Lower than 3/4 mile but not lower than 1/2 mile</td>
</tr>
<tr>
<td>1600</td>
<td>Lower than 1/2 mile but not lower than 1/4 mile</td>
</tr>
<tr>
<td>1200</td>
<td>Lower than 1/4 mile</td>
</tr>
</tbody>
</table>

*Source: FAA Advisory Circular 150/5300-13 (current edition), *Airport Design*

\(*\) RVR values are not exact equivalents
Based on the application of FAA airport design criteria, the TASP, a review of the existing facilities, and a review of the current San Marcos Regional Airport’s Airport Layout Plan (ALP), the runways at the Airport carry the following RDC’s:

- Runway 13/31 – C-II-2,400
- Runway 8/26 – B-II-4,000
- Runway 17/35 – B-II-4,000

With a C-II-2,400 RDC, Runway 13/31 is the runway with the highest RDC at the airport. Consequently, the Airport Reference Code (ARC) for the San Marcos Regional Airport is C-II. This designation is consistent with the types of aircraft current using the Airport.

AIRFIELD FACILITIES AND CHARACTERISTICS

This section provides an inventory of the existing airside facilities at the San Marcos Regional Airport. This section specifically inventories the existing runways, taxiways, NAVAIDs, Air Traffic Control Tower (ATCT), and other airside support facilities.

AIRFIELD OVERVIEW

The San Marcos Regional Airport was initially commissioned as a military airfield in the 1940’s. Since then, there have been numerous changes to the airfield. Today, as shown in Figure 2-1, General Airport Layout, the airport has three runways (Runway 8/26, 13/31 and 17/35) accompanied by seven taxiways. The airport also has numerous NAVAIDs and other support facilities that will be discussed in detail in the remainder of this section.
FIGURE 2-1
GENERAL AIRPORT LAYOUT
SAN MARCOS REGIONAL AIRPORT
Runways

The single most important asset at any airport are the runways and their associated systems and protected surfaces. Table 2-4 provides a summary of the San Marcos Regional Airport’s runways and associated systems and surfaces. The runway facilities consist of the runway pavements, markings, lighting, weather reporting systems, Navigational Aids (NAVAIDs), and protected surfaces.

<table>
<thead>
<tr>
<th>TABLE 2-4</th>
<th>RUNWAY FACILITIES AND SYSTEMS</th>
<th>SAN MARCOS REGIONAL AIRPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway 8/26</td>
<td>Runway 13/31</td>
<td>Runway 17/35</td>
</tr>
<tr>
<td>Length (feet)</td>
<td>6,330</td>
<td>5,601</td>
</tr>
<tr>
<td>Width (feet)</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Surface Material/Treatment</td>
<td>Asphalt</td>
<td>Asphalt</td>
</tr>
<tr>
<td>Weight Bearing Capacity (pounds)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single Wheel Gear (SWG)</td>
<td>38,500</td>
<td>23,000</td>
</tr>
<tr>
<td>Dual Wheel Gear (DWG)</td>
<td>56,500</td>
<td>-</td>
</tr>
<tr>
<td>Dual Tandem Wheel (DTW)</td>
<td>106,000</td>
<td>-</td>
</tr>
<tr>
<td>Markings</td>
<td>Non-Precision</td>
<td>Precision</td>
</tr>
<tr>
<td>Runway Lighting</td>
<td>MIRL</td>
<td>MIRL</td>
</tr>
<tr>
<td>Approach/Lighting Aids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precision Approach Path Indicators</td>
<td>No/No</td>
<td>Yes/Yes</td>
</tr>
<tr>
<td>Runway End Identifier Lights</td>
<td>Yes/Yes</td>
<td>No/No</td>
</tr>
<tr>
<td>Approach Lights</td>
<td>No</td>
<td>MALS - RWY 13</td>
</tr>
<tr>
<td>Runway Design Code (RDC)</td>
<td>B-II-4,000</td>
<td>C-II-2,400</td>
</tr>
<tr>
<td>Runway Safety Area (RSA)</td>
<td>150 ft. x 300 ft.</td>
<td>500 ft. x 1,000 ft.</td>
</tr>
<tr>
<td>Runway Object Free Area (ROFA)</td>
<td>500 ft. x 300 ft.</td>
<td>800 ft. x 1,000 ft.</td>
</tr>
<tr>
<td>Runway Obstacle Free Zone (OFZ)</td>
<td>400 ft. x 200 ft.</td>
<td>400 ft. x 200 ft.</td>
</tr>
<tr>
<td>General NAVAIDS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VOR/VORTAC</td>
<td>None on Airport (Closest is Randolph VORTAC - 31.4 NM)</td>
<td></td>
</tr>
<tr>
<td>Weather Reporting Aids</td>
<td>AWOS - 3</td>
<td></td>
</tr>
<tr>
<td>Air Traffic Control Tower</td>
<td></td>
<td>Attended 7 AM to 7 PM Local</td>
</tr>
</tbody>
</table>

Source: FAA Airport/Facility Directory, FAA 5010 Data, Current San Marcos Airport Layout Plan (ALP), Fugro USA Land, Inc. Pavement Evaluation Report, 2019. Pavement strength numbers shown above are from a memo from Fugro USA Land, Inc. to KSA Engineers, Inc. dated February 7, 2019 discussing the structural capacity of the runways. Fugro USA Land, Inc. performed a pavement structural capacity evaluation for the airport in 2015. The pavement strength figures shown in the report differ from the figures currently shown in the current FAA Form 5010 and on the previous Airport Layout Plan.

Based on the results of an airport user/stakeholder survey and discussions with airport users and tenants, the availability of three runway to support aircraft
operations in a variety of wind conditions is a significant positive attribute of the San Marcos Regional Airport.

**Runway 13/31**

Runway 13/31 is the primary runway at the San Marcos Regional Airport, and it is equipped with an Instrument Landing System (ILS), which provides Runway 13 with lower visibility minimums than any of the other runway end at the airport. Runway 13/31 is considered a C-II-2,400 runway under current FAA runway design standards.

Runway 13/31 is 5,601 feet in length and 100 feet in width. The runway is constructed of asphalt and is in good condition. According to the Pavement Structural Capacity Evaluation performed by Fugro USA Land, Inc. the weight bearing capacity for the runway is 23,000 lbs. single wheel. The most recent major runway rehabilitation project was completed in 2017. Runway 13/31 intersects Runway 8/26 (approximately 2,565 feet from the threshold of Runway 13) and intersects the Runway Safety Area (RSA) associated with Runway 17/35 that extends 300 ft. south of the threshold for Runway 35.

Runway 13 is equipped with an ILS system (glideslope and localizer) that is owned and maintained by the Federal Aviation Administration. Both the glideslope and the localizer appear to be in good condition. In addition to the ILS, an RNAV/GPS approach exist to Runway 13 and Runway 31. The Runway Protection Zones (RPZ) at the approach end of Runway 13 and Runway 31 protrude off airport property.

Runway 13/31 is equipped with Medium Intensity Runway Edge Lights (MIRLs), as well as a two-box Precision Approach Path Indicator (PAPI) system for each runway end. Both PAPI systems are set to a standard 3° glide slope angle. Additionally, Runway 13 is equipped with a 1,400 feet Medium-Intensity Approach Light System with Runway Alignment Indicator Lights (MALSR). The MALSR is owned and maintained by the FAA. In general, the runway edge lights, PAPIs, and MALSR are in good condition. However, an issue exists with the power supply for the Runway Alignment Indicator Lights (RAILs) associated with the MALSR system. Consequently, the RAILs on the MALSR system are out of service and are expected to remain out of service in the near future due to the cost related to correcting the issue. The suspected cause of this issue is the consistent ponding that occurs south of TX-21 close to the airport fence line at the approach of Runway 13. During rain
events, water frequently ponds in this area and takes an extended amount of time to dissipate. The outage of the RAILs increases the visibility minimums of the Runway 13 ILS approach to ¾-mile. The inoperability of the RAILs system will be to be a consideration in the future development of the airport.

Both runway ends have precision instrument markings that are in good condition. The markings for Runway 13/31 supersede the markings for Runway 8/26 where the runways intersect because Runway 13/31 has lower approach minimums. The runway hold position markings associated with the runway vary from 250 feet from the runway centerline to 285 feet from the runway centerline.

Runway 13/31 is equipped with a windsock installed at the approach end of Runway 13. The windsock is located approximately 380 feet southwest of the Runway 13/31 centerline and 925 feet from the Runway 13 threshold. Additionally, a second windsock is installed close to the intersection of Runway 13/31 and Runway 8/26. This second windsock is installed southeast of the runway intersection approximately 410 feet from each runway’s respective centerline.

**Runway 8/26**

Runway 8/26 is considered a B-II-4,000 runway under current FAA runway design standards.

Runway 8/26 is 6,330 feet in length and 100 feet in width. The runway is constructed of asphalt and is in good condition. According to the Pavement Structural Capacity Evaluation performed by Fugro USA Land, Inc. the weight bearing capacity for the runway is 38,500 lbs. single wheel, 56,500 lbs. dual wheel, and 106,000 lbs. dual tandem. Runway 8/26 is the runway with the highest weight bearing capacity at the San Marcos Regional Airport. The most recent major runway rehabilitation project was completed in 1990 according to TxDOT records.

Runway 8/26 intersects Runway 13/31 (approximately 2,217 feet from the threshold of Runway 26) and intersects Runway 17/35 at the approach end of the Runway 26. It should be noted that while departures utilizing Runway 26 are infrequent, Runway 17/35 must be used as a taxiway for full-length departures on Runway 26. For this operation, Runway 17/35 is equipped with vertical runway hold position signs (a single sign on each side of Runway 8/26) but surface painted runway hold
position markings have not been installed to prevent unauthorized entry on to Runway 26.

Runway 8/26 is equipped with a RNAV/GPS approach to each runway end. The RPZ at the approach end of Runway 8 protrudes off airport property. The RPZ currently has the following dimensions - 1,000’ x 1,510’ x 1,700’. These dimensions correspond the to the visibility minimums for the RNAV/GPS approach procedure currently established to the end of Runway 8. However, the RPZ dimensions will be reduced and the visibility minimums increased once construction of FM 110, an elevated roadway close to the approach end of Runway 8, commences. When construction starts the RPZ will be reduced to 500’ x 700’ x 1,000’ and the visibility minimums for the approach will be increased to 1 mile.

Runway 8/26 is equipped with MIRLs and a set of REILs at each end of the runway. The MIRLs are in good condition. The REILs are old and out of service. The need to repair/replace the REILs will be a consideration in establishing the future development plan for the airport. Neither runway end is equipped with a visual approach navigational aid such as a PAPI or a VASI (Visual Approach Slope Indicator).

Both runway ends have non-precision instrument markings that are in good condition as the runway was restriped in April 2019. The pavement markings for Runway 8/26 are superseded by the runway markings for Runway 13/31 where the two runways intersect because Runway 13/31 has lower approach minimums. The runway hold position markings associated with the runway vary from 250 feet from the runway centerline to 300 feet from the runway centerline.

Runway 8/26 is equipped with a windsock installed at the approach end of Runway 8, approximately 410 feet south of the Runway 8/26 centerline and 790 feet from the Runway 8 threshold.

**RUNWAY 17/35**

Runway 17/35 is considered a B-III-4,000 runway under current FAA runway design standards.

Runway 17/35 is 5,214 feet in length and 100 feet in width. The runway is constructed of asphalt and is in good condition. According to the Pavement
Structural Capacity Evaluation performed by Fugro USA Land, Inc. the weight bearing capacity for the runway is 28,000 lbs. single wheel and 43,500 lbs. dual wheel. The most recent major runway rehabilitation project was completed in 2008 according to TxDOT records. Runway 17/35 intersects Runway 8/26 approximately 1,860 feet from the threshold of Runway 35. Additionally, the RSA at the approach end of Runway 35 extends onto Runway 13/31.

The runway is equipped with MIRLs, as well as a two-box PAPI system for Runway 17. These lighting systems are in good condition.

RNAV/GPS approaches currently exist to both runway ends. The RPZ at the approach end of Runway 35 protrudes off airport property. Both runway ends have non-precision instrument markings that are in good condition as the runway was restriped in March 2019. The pavement markings for Runway 17/35 are superseded by the runway markings for Runway 8/26 where the two runways intersect because Runway 8/26 is the longer runway and because the intersection occurs close to the threshold of Runway 26. The runway hold position marking on Taxiway Juliet at the approach end of Runway 17 is approximately 200 feet from the runway centerline.

No runway hold position markings exist on Runway 17/35 where it intersects Runway 8/26. Since Runway 17/35 is used as a taxiway to reach the approach end of Runway 26, runway hold position markings should be installed on Runway 17/35 to protect aircraft using Runway 8/26. Figure 2-2 identifies the locations where the additional runway hold position markings should be installed on Runway 17/35.
Runway 17/35 is equipped with a windsock installed at the approach end of Runway 17, approximately 400 feet west of the Runway 17/35 centerline and 1,010 feet from the Runway 17 threshold.

**Taxiways/Taxilanes**

Aircraft move from the runways to the businesses/hangars on the airfield via taxiways and taxilanes. Each taxiway and taxilane is designated with a unique name and is designed to accommodate anticipated aircraft operations based on an established Taxiway Design Group (TDG) and Aircraft Design Group (ADG) for the critical aircraft expected to use the taxiway. The existing San Marcos Regional Airport’s taxiway system layout, its alignment with current TDG and ADG based taxiway design standards, and the taxiway system’s surface painted markings and lighting are discussed in this section.

**Taxiway System Layout and Configuration**

The San Marcos Regional Airport has a taxiway system that was originally designed before many of the current FAA taxiway design standards and practices were established. The airport was originally constructed as a military airfield and, consequently, many aspects of the existing airfield’s taxiway layout are similar to other military fields designed around the same time (e.g. fewer taxiways, multiple runways, runways used as taxiways to reach other runways, etc.). The design standards and practices used for military airfields during that time are distinctly different from current airport design standards and practices. Current airport design standards place a strong focus on establishing the necessary runway infrastructure to meet wind coverage, capacity, and demand requirements and establishing a sophisticated taxiway system to support the safe and efficient use of the runways (e.g. full-length parallel taxiway systems, multiple runway exit taxiways, etc.).

Since the existing taxiway system at the San Marcos Regional Airport does not possess many of the attributes that make recently designed taxiway systems efficient and safer, taxiway layout is expected to be a significant consideration in the creation of the airport’s future development plan.
Taxiway Design Group (TDG) Standards

The TDG is a classification system for taxiways/taxilanes based on an airplane’s landing gear dimensions. Specifically, the outer to outer main gear width and the cockpit to main gear distance. The greater the distance between the main gear struts and/or the greater the distance between the nose wheel and main gear, the higher the TDG. The TDG for a given aircraft is identified by the use of Figure 2-3, and the application of the specific safety parameters outlined in AC 150/5300-13 (current edition).

Since the taxiway system at the San Marcos Regional Airport was designed prior to the establishment of current taxiway design standards, the taxiways at the airport do not directly align with current TDG based standards for taxiway widths and fillets. However, in general, most taxiways at the airport meet the current taxiway width requirements for TDG II (35 feet in width) and TDG III (50 feet in width) standards.

Table 2-5 provides an overview of the existing taxiways at the San Marcos Regional Airport including their current width, TDG, pavement composition, pavement condition, and supporting taxiway lighting.
## TABLE 2-5
TAXIWAYS
SAN MARCOS REGIONAL AIRPORT

<table>
<thead>
<tr>
<th>Taxiway</th>
<th>Width (ft)</th>
<th>Material</th>
<th>Condition</th>
<th>TDG</th>
<th>Lighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (ramp area)</td>
<td>75</td>
<td>Concrete</td>
<td>Poor</td>
<td>3</td>
<td>MITL</td>
</tr>
<tr>
<td>A (approach of RWY 8)</td>
<td>50</td>
<td>Asphalt</td>
<td>Fair</td>
<td>3</td>
<td>MITL</td>
</tr>
<tr>
<td>B</td>
<td>40</td>
<td>Asphalt</td>
<td>Fair</td>
<td>2</td>
<td>MITL</td>
</tr>
<tr>
<td>C (north of TWY A)</td>
<td>42</td>
<td>Asphalt</td>
<td>Fair</td>
<td>2</td>
<td>MITL</td>
</tr>
<tr>
<td>C (south of TWY A)</td>
<td>50</td>
<td>Concrete</td>
<td>Poor</td>
<td>3</td>
<td>MITL</td>
</tr>
<tr>
<td>E</td>
<td>42</td>
<td>Asphalt</td>
<td>Fair</td>
<td>2</td>
<td>MITL</td>
</tr>
<tr>
<td>F</td>
<td>50</td>
<td>Asphalt</td>
<td>Fair</td>
<td>3</td>
<td>MITL</td>
</tr>
<tr>
<td>J</td>
<td>50</td>
<td>Asphalt</td>
<td>Good</td>
<td>3</td>
<td>MITL</td>
</tr>
<tr>
<td>K</td>
<td>35</td>
<td>Concrete</td>
<td>Good</td>
<td>2</td>
<td>MITL</td>
</tr>
</tbody>
</table>

**Source:** Garver.

**NOTE:** Pavement condition determinations were made based on general observations by Garver, input from the City of San Marcos, airport management, and TxDOT, and previous pavement studies. A Pavement Condition Index report was completed by the Texas A&M Transportation Institute in 2017 and an independent pavement evaluation was completed by Fugro USA Land, Inc. in 2015. Good, Fair, and Poor rating classifications are defined by the FAA under AC 150/5320-17A. In general, pavement classified as “good” requires minor ongoing maintenance, pavement classified as “fair” requires preservative treatments, crack sealing, and surface treatment, pavement classified as “poor” requires structural improvements.

### Aircraft Design Group (ADG) Standards for Taxiways

Another aspect of taxiway layout and design are the establishment and protection of Taxiway Safety Areas (TSA) and Taxiway Object Free Areas (TOFA). The TSA is a defined surface alongside the taxiway that is prepared and suitable for reducing the risk of damage to an aircraft deviating from the taxiway. The purpose of the TSA is to protect an aircraft from damage if the aircraft leaves the taxiway for any reason. The TOFA is an area centered on a taxiway or taxilane centerline that must be kept clear of objects except those objects that need to be located in the TOFA for air navigation or aircraft ground maneuvering purposes. The size of both of the TSA and TOFA are based on the ADG (described in Table 2-2) of the critical aircraft expected to use each taxiway. Currently, the Taxiway Safety Area (TSA) is 79 feet wide and the Taxiway Object Free Area (TOFA) is 131 feet wide for all the taxiways at San Marcos Regional Airport as the airport’s current critical aircraft as defined on the airport’s existing Airport Layout Plan is in the ADG II category.
**Taxiway Pavement Condition**

As shown in Table 2-5, taxiway pavement condition will be key consideration in the development of the Airport’s future development plan. The established existing taxiway pavement condition was established based on general observations by Garver, previous pavement studies, and input from TxDOT Aviation, the City of San Marcos, and Texas Aviation Partners. Multiple taxiways were classified as having “fair” or “poor” pavement condition. The taxiways aligned with the primary ramp area (e.g. Taxiway Alpha and Charlie) are in the worst condition. The airport currently is pursuing FAA supplemental discretionary funding to rehabilitate Taxiways Alpha and Charlie and has a design effort underway for the rehabilitation.

**Taxiway Markings and Lighting**

All taxiways at the San Marcos Regional Airport have taxiway centerline markings. The markings are generally in good to fair condition. Additionally, all taxiways at the airport have MITLs that are in good condition.

**General Airfield Lighting and Signage**

Sufficient airfield lighting and signage is an important part of maintaining an airfield’s safe operational status. This section discusses the general airfield lighting and signage systems at the San Marcos Regional Airport that were not previously covered in the runway and taxiway sections.

**Airport Beacon**

At night or in poor conditions, pilots identify an airport by locating the rotating beacon; a lighting feature designed to provide alternating white and green lights that can be seen for up to 10 miles from the airfield. The beacon at the San Marcos Regional Airport is located on top of the existing Air Traffic Control Tower (ATCT) facility and is in good condition. The airport has a back-up beacon on top of the Graham Tower, a historic World War II era control tower located at the airport, that can be used if the primary beacon fails. The back-up beacon is located approximately 1,250 ft. south of the Runway 8/26 centerline and 1,930 ft. east of the Runway 8 threshold.
Airfield Signage

Proper airfield signage is essential for promoting good situational awareness and to support pilot wayfinding as they taxi to/from the runways to other locations at the airport. Currently, the airport has an illuminated sign system across the entire airfield that generally appears to support proper wayfinding throughout the airfield environment.

There have been multiple reports of pilots taxiing northbound on Taxiway Charlie adjacent to the ramp and missing the west-bound turnoff on to Taxiway Alpha. Solutions to this issue will be evaluated in future portions of this master plan.

Another signage consideration was noted at the approach end of Runway 26 on Runway 17/35. According to AC 150/5340-18F, Standards for Airport Sign Systems, runway hold position signs should be installed on both sides of a runway at its intersection with another runway if either of the runways is used as a taxiway. Runway 17/35 is typically used as a taxiway to reach the approach end of Runway 26 as no taxiway exists to the Runway 26 end. Currently, only a single runway hold position sign is installed on the north and south sides of Runway 17/35 at its intersection with Runway 8/26. Runway hold positions signs should be installed on both edges (eastern and western) of Runway 17/35 where it intersects Runway 8/26. Figure 2-4 shows the locations where the additional signs should be installed. This will be a consideration in the establishment of the future development plan for the airport.
**Navigational Aids (NAVAID)**

NAVAIDs, located on the field or at other locations in the region, are specialized equipment that provide pilots with electronic guidance and visual references in an effort to execute instrument approaches and point-to-point navigation. This section discusses the NAVAIDs currently located at or near the San Marcos Regional Airport and/or that play a role in how the airport is used.

**Precision Approach Path Indicators (PAPIs)**

PAPIs are visual NAVAIDs that provide pilots with a visual indication of whether they are following an established glide path during an approach to a runway end. Based on the pilot’s location relative to the established glide path, the PAPI system will provide the pilot with a visual indication of whether they are higher, lower, or on the established glide path.

The San Marcos Regional Airport has PAPI systems on the ends of Runways 13, 31 and 17. PAPI systems are manufactured in a 2-box and a 4-box configuration. The systems currently installed at the airport are 2-box systems.

The established glide path for each of the existing PAPI systems at the San Marcos Regional Airport is 3 degrees. The PAPI’s at the Airport are owned by the City of San Marcos and are generally in good condition. The PAPIs were installed in 2015.

**Runway End Identifier Lights (REILs)**

REILs are visual NAVAIDs that provide pilots with a visual indication of where a runway end is located. REILs are typically installed in areas where light pollution could potentially cause a pilot difficulty in identifying the threshold of a runway.

The San Marcos Regional Airport has REIL systems on the ends of Runways 8 and 26. The REILs are not operational. This will be a consideration in the establishment of the future development plan for the airport.
**Very High Frequency Omni-Directional Range/Tactical Aircraft Control (VORTAC)**

Currently, Very High Frequency Omni-Directional Ranges (commonly referred to as VORs) are still used for aerial navigation. These systems emit a signal that aircraft can follow or track to move from point-to-point and conduct an instrument approach for landing at an airport. Tactical Aircraft Control systems (commonly referred to as TACANs) are similar systems used for military purposes. When these systems are co-located together, they are referred to as a VORTAC.

The closest VORTAC for the San Marcos Regional Airport, the Randolph VORTAC, is located 31.4 miles southeast of the airport. The Centex VORTAC is located 33.9 miles north of the field and is used as part of the ILS/LOC approach to Runway 13. The 215-degree radial from the Centex VORTAC is used to define the outer marker for the ILS approach for Runway 13.

**Non-Directional Beacon (NDB)**

NDBs are an older ground based navigational technology that is still used in some places to provide redundant navigational capabilities at airports. NDBs emit a signal that aircraft can fly to when they are in close proximity to the NDB station. Currently, NDBs are used as a basis for instrument approach procedures and for marker locations (e.g. typically the outer marker) associated with ILS approaches. The San Marcos Regional Airport currently has an NDB located approximately 5.5 NM northwest of the airport directly under the flight path for Runway 13. The NDB is used as the basis for the NDB approach to Runway 13 and as the outer marker associated with the ILS approach for Runway 13.

**Instrument Landing System (ILS)**

ILS are the most accurate ground based runway approach navigation system currently in the industry. ILS are composed of two ground based navigation aids: a localizer (LOC) and a glide slope (GS). When conducting an ILS approach, these two systems (the LOC and the GS) provide horizontal and vertical guidance in concert to aid a pilot in executing an instrument approach to a runway end.

Currently, the San Marcos Regional Airport only has an ILS approach to Runway 13. The glideslope associated with the approach is located at the approach end of
Runway 13, approximately 450 feet northeast of the runway centerline and approximately 1,175 feet east of the Runway 13 threshold. The localizer for the approach is located at the far end of the runway approximately 1,275 feet southeast of the threshold for Runway 31. Both the localizer and the glide slope are owned and maintained by the FAA.

**Instrument Approach Procedures (IAPs)**

NAVAIDs and GPS satellites are critical to the development of Instrument Approach Procedures (IAPs) at an airport. Currently, there are eight IAPs published for the San Marcos Regional Airport. Details for these approaches are in Table 2-6.

**TABLE 2-6**

**INSTRUMENT APPROACH PROCEDURES**

**SAN MARCOS REGIONAL AIRPORT**

<table>
<thead>
<tr>
<th>Runway End</th>
<th>Approach Type</th>
<th>Visibility Minimums</th>
<th>Ceiling Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway 13</td>
<td>ILS/LOC</td>
<td>LPV DA: Categories A, B, C, D &amp; E – 3/4-mile*</td>
<td>839’ MSL/250’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LNAV/VNAV DA: Categories A, B, C, D &amp; E – 1-mile</td>
<td>910’ MSL/321’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LNAV MDA: Categories A &amp; B – 1-mile</td>
<td>1,120’ MSL/531’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LNAV MDA: Categories C, D &amp; E – 1 1/2-mile</td>
<td>1,120’ MSL/531 AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Circling: Category A &amp; B – 1-mile</td>
<td>1,120’ MSL/525’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Circling: Category C – 1 3/4-mile</td>
<td>1,240’ MSL/645’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Circling: Category D – 2 1/4-mile</td>
<td>1,320’ MSL/725’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Circling: Category E – 2 3/4-mile</td>
<td>1,340’ MSL/745’ AGL</td>
</tr>
<tr>
<td>Runway 8</td>
<td>RNAV/GPS</td>
<td>LPV DA: Categories A, B, C, D &amp; E – 3/4-mile**</td>
<td>839’ MSL/250’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LNAV/VNAV DA: Categories A, B, C, D &amp; E – 1-mile</td>
<td>910’ MSL/321’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LNAV MDA: Categories A &amp; B – 1-mile</td>
<td>1,120’ MSL/531’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LNAV MDA: Categories C, D &amp; E – 1 1/2-mile</td>
<td>1,120’ MSL/531 AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Circling: Category A &amp; B – 1-mile</td>
<td>1,120’ MSL/525’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Circling: Category C – 1 3/4-mile</td>
<td>1,240’ MSL/645’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Circling: Category D – 2 1/4-mile</td>
<td>1,320’ MSL/725’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Circling: Category E – 2 3/4-mile</td>
<td>1,340’ MSL/745’ AGL</td>
</tr>
<tr>
<td>Runway 13</td>
<td>RNAV/GPS</td>
<td>LPV DA: Categories A, B, C, D &amp; E – 1/2-mile</td>
<td>793’ MSL/200’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LNAV/VNAV DA: Categories A, B, C, D &amp; E – 5/8-mile</td>
<td>946’ MSL/353’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LNAV MDA: Categories A &amp; B – 1/2-mile</td>
<td>1,120’ MSL/527’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LNAV MDA: Categories C, D &amp; E – 1-mile</td>
<td>1,120’ MSL/525’ AGL</td>
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<tr>
<td></td>
<td></td>
<td>Circling: Category A &amp; B – 1-mile</td>
<td>1,120’ MSL/525’ AGL</td>
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<tr>
<td></td>
<td></td>
<td>Circling: Category C – 1 3/4-mile</td>
<td>1,240’ MSL/645’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Circling: Category D – 2 1/4-mile</td>
<td>1,320’ MSL/725’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Circling: Category E – 2 3/4-mile</td>
<td>1,340’ MSL/745’ AGL</td>
</tr>
<tr>
<td>Runway 17</td>
<td>RNAV/GPS</td>
<td>LPV DA: Categories A, B, C, D &amp; E – 1 1/8-mile</td>
<td>960’ MSL/365’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LNAV/VNAV DA: Categories A, B, C, D &amp; E – 1 1/2-mile</td>
<td>1,052’ MSL/457’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LNAV MDA: Categories A &amp; B – 1-mile</td>
<td>1,060’ MSL/465’ AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LNAV MDA: Categories C, D &amp; E – 1 3/8-mile</td>
<td>1,060’ MSL/465 AGL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Circling: Category A – 1-mile</td>
<td>1,080’ MSL/485’ AGL</td>
</tr>
</tbody>
</table>
As part of the inventory analysis for the San Marcos Regional Airport Master Plan, a survey was conducted of airport users and stakeholders seeking to understand the attributes of the Airport they felt were a strength or weakness of the airport. An attribute of the airport that was universally identified as a strength was that the Airport has RNAV/GPS approaches to all the runway ends and an ILS system. The availability of IAPs to all runway ends and the ILS ensures that the Airport is highly accessible during wide array of weather and wind conditions.

**Source:** FAA Digital – Terminal Procedures Publication (d-TPP) Website. *- Due to the RAILs associated with the Runway 13 MALSR system being out of service, the current minimums for the Runway 13 ILS approach is ¾ mile. **- When FM 110 is constructed the minimums for the Runway 8 RNAV/GPS approach will be increased to at least 1 mile.
Weather Reporting

The San Marcos Regional Airport has an Automated Weather Observation System (AWOS) - 3 that is the primary source of wind direction, velocity, and altimeter data for weather observation purposes at the Airport. The AWOS-3 is an automated sensor suite that reports weather conditions over a discrete radio frequency for pilots to receive real-time weather information. The San Marcos Regional Airport’s AWOS-3 information can be received by calling 512-353-8005 or obtained from the airport’s Automated Terminal Information System (ATIS), which is broadcast on 120.825 MHz. However, the ATIS system has had a history of outages. When an outage occurs current weather information is not available via the ATIS frequency. The AWOS-3 is co-located with the glide slope at the approach end of Runway 13. The AWOS-3 is owned and maintained by the FAA. It is in good condition.

Wind and Traffic Indicators

While automated weather analysis and reporting systems such as an AWOS are a tremendous asset to an airport, it is important that pilots are provided with a visual indication of wind speed and direction while operating at an airport. For this purpose, airports are typically equipped with one or more wind direction indicators. The most common type of wind indicator used at airports are windsocks because they are relatively easy to install and maintain. The San Marcos Regional Airport is equipped with one primary windsock and four supplemental windsocks.

The primary windsock is located approximately 385 feet north of the Runway 8/26 centerline and approximately 2,150 feet east of the threshold of Runway 8. The windsock is lighted for nighttime operations and is equipped with a segmented circle. There are no landing strip indicators or traffic pattern indicators associated with the segmented circle. The primary windsock and segmented circle are in good condition. The location of the four supplemental windsocks are:

- **Supplemental Windsock #1** – Located close to the approach end of Runway 13, approximately 380 feet southwest of the Runway 13/31 centerline and 925 feet from the Runway 13 threshold.
- **Supplemental Windsock #2** – Located southeast of the intersection of Runway 8/26 and Runway 13/31. Approximately 410 feet from each runway’s respective centerline.
Supplemental Windsock #3 – Located approximately 410 feet south of the Runway 8/26 centerline and 790 feet from the Runway 8 threshold.

Supplemental Windsock #4 – Located approximately 400 feet west of the Runway 17/35 centerline and 1,020 feet from the Runway 17 threshold.

All four of the supplemental windsocks are in good condition but are not lighted for nighttime operations.

**Air Traffic Control Tower (ATCT)**

The San Marcos Air Traffic Control Tower opened in October 2011 and provides air traffic control services between the hours of 7 AM and 7 PM local time 7 days a week, 365 days per year. Specifically, the facility provides ground control, tower control, and clearance delivery services for aircraft using the airport. The facility is part of the FAA’s contract tower program and, consequently, is operated by Robinson Aviation Inc., commonly called RVA. There are no airfield line-of-sight issues associated with the existing tower. Based on the inventory survey conducted as part of this Airport Master Plan project, the users and stakeholders for the San Marcos Regional Airport see the existing ATCT facility as a key asset that makes the airport safer and attractive for future growth. The San Marcos ATCT facility was recently named the 7th best general aviation airport ATCT facility by FltPlan.com. There have been some reported maintenance issues with the ATCT facility since it opened in 2011 that will be a consideration in future development plans.
**AIRCRAFT CIRCULATION**

The efficient movement of aircraft through the airfield system of runways and taxiways is important to reducing delay and ensuring the safety of aircraft operations. Since the San Marcos Regional Airport does not have parallel runways and there is a central area for hangars and aircraft parking, aircraft primarily circulate to/from the active runway in a circular pattern which minimizes the potential for conflicts in aircraft movements. However, based on discussion with ATCT, airport tenants, and pilots the following airfield circulation issues were noted and will be a consideration in the future development plan:

- **Long Taxi Route to Runway 17** – The taxi route from the central ramp area to the approach end of Runway 17 is very long as there is no direct route from the ramp area to the approach end of the runway.
- **No Aircraft Run-up Available at the Approach End of Runway 17** – A run-up area for small aircraft does not exist at the approach end of Runway 17, which sometimes contributes to congestion for aircraft departures on Runway 17.
- **Poor Taxiway Access to Runway 26** – There is not a taxiway that allows access to the approach end of Runway 26. Consequently, Runway 17/35 must be used as a taxiway.

**TERMINAL AREA FACILITIES**

The terminal area facilities are those central to the business operations of an airport. They support transition from the airfield to landside businesses and then into community infrastructure. Terminal area facilities typically include Fixed Based Operator (FBO) facilities, aircraft storage facilities of various types (e.g. T-hangars and box hangars), aeronautical businesses (e.g. maintenance, salvage, etc.), aircraft parking aprons and other support facilities like fuel storage and delivery.
**Fixed Based Operators (FBOs)**

The San Marcos Regional Airport has two FBO facilities – Berry Aviation and Redbird Skyport.

**Berry Aviation**

Berry Aviation is an FBO, flight charter, and specialized aviation services company based at the San Marcos Regional Airport. Berry was formed in 1983 and now has approximately 200 employees.

The FBO facility for Berry Aviation is located on the western side of the airport close to the approach end of Runway 8. The facility provides a full array of FBO services and facilities including a pilot's lounge, flight planning facility, conference/meeting room, WiFi, courtesy cars, aircraft ground services, and Jet A/100LL fuel service. Additionally, self-service fueling is available for 100LL.

The terminal facility for the FBO is approximately 3,600 square feet and is in good condition. The facility has 40 vehicle parking spots including two American Disabilities Act (ADA) accessible spaces. Berry Aviation FBO is open seven days a week from 6 AM to 9 PM local.

**Redbird Skyport**

Redbird Skyport is an FBO located immediately west of the ATCT along Airport Drive. The facility was constructed and opened in late 2011 and provides a full array of FBO services and facilities including a pilot's lounge, flight planning facility, conference/meeting rooms, WiFi, courtesy cars, aircraft ground services, and Jet A/100LL fuel service. The primary facility - which is a combination FBO, hangar, classroom, and event center – is approximately 30,000 square feet and is in good condition.
Redbird Skyport has received numerous awards for their services and facilities.

The facility has a vehicle parking lot with 59 parking spots including three American Disabilities Act (ADA) accessible spaces. Redbird Skyport is open seven days a week from 6 AM to 10 PM local.

**AVIATION RELATED BUSINESSES AND TENANTS**

In addition to the two FBOs, the San Marcos Regional Airport has a number of aeronautical businesses and tenants that provide an array of services to the aircraft owner and pilots. The following commercial aeronautical businesses (excluding the FBOs) and tenants are currently based at the San Marcos Regional Airport:

- **Blue Skies Aviation** – An aircraft maintenance, inspection, and repair business. Provides specialized services such as custom interiors and propeller balancing.
- **Civil Air Patrol** – The Civil Air Patrol (CAP) Texas Wing 435th known as the David Lee “Tex” Hill Squadron operates from the airport.
- **Coast Flight** – A flight training operator.
- **Commemorative Air Force** – The Central Texas Wing of the Commemorative Air Force (CAF). Conducts aircraft restoration and maintenance activities on historic aircraft and hosts multiple airport events.
- **E.M.A.P.A.** – An aircraft parts and maintenance business.
- **Gafford Aero** – An aircraft maintenance, inspection, and repair business.
- **Kerner Aircraft Services** – Private T-hangar operation.
- **McKee Avionics** – An avionics sales, repair, services, and installation business. General aircraft maintenance services.
- **Texas State Aviation** – A flight training operator.
- **Specialized Aero and Tejas AeroServices** – Aircraft maintenance, inspection, salvage, and customization business.
Aircraft Storage/Hangar Facilities

With the exception of aircraft stored outdoors and tied down directly to the ramp/apron, most aircraft are typically stored in either a box hangar or a T-hangar. A box hangar is a stand-alone structure, typically in the shape of a box, that is used to store one or more aircraft. In some instances, box hangars may include buildouts for office or workshop areas that are not used for aircraft storage. Box hangars are sometimes referred to using other terms such as executive, common, maintenance, or corporate hangars depending on how the hangar is used. Box hangars can be constructed in a wide array of sizes to meet the needs of various aircraft.

T-hangars are individual aircraft storage units typically connected together as part of a single structure. T-hangars are commonly used to store smaller aircraft such as single engine piston aircraft and, in some cases, light twin-engine aircraft. The San Marcos Regional Airport has numerous box hangar and T-hangar facilities used for aircraft storage.

Tables 2-7 through 2-8 and Figures 2-5 through 2-6 provides an overview of the hangars currently established at the San Marcos Regional Airport including their size, ownership, leaseholder, and condition.

In total, San Marcos Regional Airport has approximately 469,150 square feet of hangar space. However, a portion of this hangar space is used for non-aircraft storage purposes such as office space, workshop area, etc.

A key consideration related to hangar space is that the airport does not have any available hangar facilities large enough to accommodate many of the larger corporate jets flying today (e.g. Gulfstream, Embraer, etc.). These larger corporate jets are becoming more common as many older and smaller corporate aircraft are being retired and new and larger aircraft are being purchased. This will be a consideration as part of the alternatives process.
<table>
<thead>
<tr>
<th>Building Number</th>
<th>Hangar Type</th>
<th>Hangar Address</th>
<th>Area (sq. ft.)</th>
<th>Hangar Condition</th>
<th>City Owned (Y/N)</th>
<th>Lease Holder</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Box Hangar</td>
<td>1749 Airport Dr.</td>
<td>57,600</td>
<td>Good</td>
<td>Y</td>
<td>Berry Aviation</td>
</tr>
<tr>
<td>2</td>
<td>Box Hangar</td>
<td>1748 Airport Dr.</td>
<td>28,880</td>
<td>Good</td>
<td>N</td>
<td>Berry Aviation</td>
</tr>
<tr>
<td>3</td>
<td>Box Hangar</td>
<td>1747 Airport Dr.</td>
<td>6,300</td>
<td>Fair</td>
<td>Y</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>4</td>
<td>Box Hangar</td>
<td>1745 Airport Dr.</td>
<td>2,400</td>
<td>Fair</td>
<td>Y</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>5</td>
<td>Box Hangar</td>
<td>1741 Airport Dr.</td>
<td>2,400</td>
<td>Fair</td>
<td>Y</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>6</td>
<td>Box Hangar</td>
<td>1737 Airport Dr.</td>
<td>3,000</td>
<td>Fair</td>
<td>Y</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>7</td>
<td>Box Hangar</td>
<td>1735 Airport Dr.</td>
<td>1,800</td>
<td>Fair</td>
<td>Y</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>8</td>
<td>Box Hangar</td>
<td>1731 Airport Dr.</td>
<td>2,000</td>
<td>Fair</td>
<td>Y</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>9</td>
<td>Box Hangar</td>
<td>1733 Airport Dr.</td>
<td>2,000</td>
<td>Fair</td>
<td>N</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>10</td>
<td>Box Hangar</td>
<td>1739 Airport Dr.</td>
<td>3,000</td>
<td>Fair</td>
<td>Y</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>11</td>
<td>Box Hangar</td>
<td>1743 Airport Dr.</td>
<td>3,500</td>
<td>Fair</td>
<td>Y</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>12</td>
<td>Box Hangar</td>
<td>1753 Airport Dr.</td>
<td>2,000</td>
<td>Fair</td>
<td>Y</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>13</td>
<td>Box Hangar</td>
<td>1813 Airport Dr.</td>
<td>7,200</td>
<td>Good</td>
<td>Y</td>
<td>Coast Flight</td>
</tr>
<tr>
<td>14</td>
<td>Box Hangar</td>
<td>1821 Airport Dr.</td>
<td>3,500</td>
<td>Fair</td>
<td>Y</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>15</td>
<td>Box Hangar</td>
<td>1823 Airport Dr.</td>
<td>2,400</td>
<td>Fair</td>
<td>N</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>16</td>
<td>Box Hangar</td>
<td>1825 Airport Dr.</td>
<td>4,800</td>
<td>Good</td>
<td>N</td>
<td>Redbird Skyport</td>
</tr>
<tr>
<td>17</td>
<td>Box Hangar</td>
<td>1815 Airport Dr.</td>
<td>6,000</td>
<td>Good</td>
<td>Y</td>
<td>Blue Skies Aviation</td>
</tr>
<tr>
<td>18</td>
<td>Box Hangar</td>
<td>1832 Airport Dr.</td>
<td>3,600</td>
<td>Good</td>
<td>Y</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>19</td>
<td>T-Hangar</td>
<td>1833 Airport Dr.</td>
<td>4,000</td>
<td>Fair</td>
<td>Y</td>
<td>Gafford Aero</td>
</tr>
<tr>
<td>20</td>
<td>T-Hangar</td>
<td>1833 Airport Dr.</td>
<td>6,250</td>
<td>Fair</td>
<td>Y</td>
<td>City-Owned T-Hangar</td>
</tr>
<tr>
<td>21</td>
<td>T-Hangar</td>
<td>1831 Airport Dr.</td>
<td>10,250</td>
<td>Fair</td>
<td>Y</td>
<td>City-Owned T-Hangar</td>
</tr>
<tr>
<td>22</td>
<td>T-Hangar</td>
<td>1829 Airport Dr.</td>
<td>12,900</td>
<td>Fair</td>
<td>Y</td>
<td>City-Owned T-Hangar</td>
</tr>
<tr>
<td>23</td>
<td>Box Hangar</td>
<td>1838 Airport Dr.</td>
<td>12,150</td>
<td>Good</td>
<td>Y</td>
<td>McKee Avionics</td>
</tr>
<tr>
<td>24</td>
<td>T-Shelter</td>
<td>1949 Airport Dr.</td>
<td>15,500</td>
<td>Fair</td>
<td>Y</td>
<td>City-Owned T-Shelter</td>
</tr>
<tr>
<td>25</td>
<td>T-Hangar</td>
<td>1951 Airport Dr.</td>
<td>10,800</td>
<td>Fair</td>
<td>N</td>
<td>Kerner Air Services</td>
</tr>
<tr>
<td>26</td>
<td>T-Hangar</td>
<td>1953 Airport Dr.</td>
<td>10,800</td>
<td>Fair</td>
<td>N</td>
<td>Kerner Air Services</td>
</tr>
<tr>
<td>27</td>
<td>T-Hangar</td>
<td>1955 Airport Dr.</td>
<td>10,800</td>
<td>Fair</td>
<td>N</td>
<td>Kerner Air Services</td>
</tr>
<tr>
<td>28</td>
<td>T-Hangar</td>
<td>1957 Airport Dr.</td>
<td>10,800</td>
<td>Fair</td>
<td>N</td>
<td>Kerner Air Services</td>
</tr>
<tr>
<td>29</td>
<td>Box Hangar</td>
<td>TBD</td>
<td>8,050</td>
<td>Good</td>
<td>Y</td>
<td>Under Construction</td>
</tr>
</tbody>
</table>

**Source:** Garver, 2019.
FIGURE 2-5
WESTERN MAIN RAMP – HANGAR FACILITIES
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019.
### TABLE 2-8
EASTERN MAIN RAMP – HANGAR FACILITIES
SAN MARCOS REGIONAL AIRPORT

<table>
<thead>
<tr>
<th>Building Number</th>
<th>Hangar Type</th>
<th>Hangar Address</th>
<th>Area (sq. ft.)</th>
<th>Hangar Condition</th>
<th>City Owned (Y/N)</th>
<th>Lease Holder</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>Box Hangar</td>
<td>1981 Airport Dr.</td>
<td>3,000</td>
<td>Good</td>
<td>Y</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>31</td>
<td>Box Hangar</td>
<td>1983 Airport Dr.</td>
<td>2,400</td>
<td>Good</td>
<td>Y</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>32</td>
<td>Box Hangar</td>
<td>1985 Airport Dr.</td>
<td>3,000</td>
<td>Good</td>
<td>Y</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>33</td>
<td>Box Hangar</td>
<td>1982 Airport Dr.</td>
<td>5,600</td>
<td>Good</td>
<td>N</td>
<td>Blue Skies Aviation</td>
</tr>
<tr>
<td>34</td>
<td>Box Hangar</td>
<td>1984 Airport Dr.</td>
<td>3,250</td>
<td>Good</td>
<td>Y</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>35</td>
<td>Box Hangar</td>
<td>1986 Airport Dr.</td>
<td>2,400</td>
<td>Good</td>
<td>N</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>36</td>
<td>Box Hangar</td>
<td>1991 Airport Dr.</td>
<td>4,800</td>
<td>Good</td>
<td>N</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>37</td>
<td>Box Hangar</td>
<td>1993 Airport Dr.</td>
<td>2,000</td>
<td>Good</td>
<td>N</td>
<td>Redbird Skyport</td>
</tr>
<tr>
<td>38</td>
<td>Box Hangar</td>
<td>1995 Airport Dr.</td>
<td>3,900</td>
<td>Good</td>
<td>N</td>
<td>Private Non-Commercial Hangar</td>
</tr>
<tr>
<td>39</td>
<td>Multi Box Hangars</td>
<td>2000 Airport Dr.</td>
<td>17,500</td>
<td>Good</td>
<td>N</td>
<td>Officers Club</td>
</tr>
<tr>
<td>40</td>
<td>Multi Box Hangars</td>
<td>2010 Airport Dr.</td>
<td>12,700</td>
<td>Good</td>
<td>N</td>
<td>Officers Club</td>
</tr>
<tr>
<td>41</td>
<td>Box Hangar</td>
<td>2049 Airport Dr.</td>
<td>10,900</td>
<td>Poor</td>
<td>Y</td>
<td>Texas State Aviation</td>
</tr>
<tr>
<td>42</td>
<td>Box Hangar</td>
<td>2081 Airport Dr.</td>
<td>30,000</td>
<td>Good</td>
<td>N</td>
<td>Redbird Skyport</td>
</tr>
<tr>
<td>43</td>
<td>Box Hangar</td>
<td>2175 Airport Dr.</td>
<td>32,000</td>
<td>Good</td>
<td>N</td>
<td>Berry Aviation</td>
</tr>
<tr>
<td>44</td>
<td>Box Hangar</td>
<td>2191 Airport Dr.</td>
<td>6,300</td>
<td>Good</td>
<td>N</td>
<td>JSJ Aviation</td>
</tr>
<tr>
<td>45</td>
<td>Box Hangar</td>
<td>2193 Airport Dr.</td>
<td>5,600</td>
<td>Good</td>
<td>N</td>
<td>JSJ Aviation</td>
</tr>
<tr>
<td>46</td>
<td>Box Hangar</td>
<td>2192 Airport Dr.</td>
<td>5,600</td>
<td>Good</td>
<td>N</td>
<td>Caroline Aviation</td>
</tr>
<tr>
<td>47</td>
<td>Box Hangar</td>
<td>2194 Airport Dr.</td>
<td>5,600</td>
<td>Good</td>
<td>N</td>
<td>Caroline Aviation</td>
</tr>
<tr>
<td>48</td>
<td>Box Hangar</td>
<td>2249 Airport Dr.</td>
<td>33,330</td>
<td>Good</td>
<td>Y</td>
<td>Commemorative Air Force</td>
</tr>
<tr>
<td>49</td>
<td>Box Hangar</td>
<td>2275 Airport Dr.</td>
<td>14,640</td>
<td>Good</td>
<td>Y</td>
<td>Specialized Aero</td>
</tr>
<tr>
<td>50</td>
<td>Box Hangar</td>
<td>2295 Airport Dr.</td>
<td>10,000</td>
<td>Good</td>
<td>N</td>
<td>Specialized Aero</td>
</tr>
</tbody>
</table>

Source: Garver, 2019.
FIGURE 2-6
EASTERN MAIN RAMP – HANGAR FACILITIES
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019.
AIRCRAFT PARKING APRON

The San Marcos Regional Airport has two primary ramp areas, the Ramp Side Development Area and the Taxiway Kilo Development Area Ramp.

Ramp Side Development Area

The Ramp Side Development Area, shown in Figure 2-7, was constructed when the airport was originally developed in the 1940s as a military base. In total, the ramp is approximately 2,350,000 square feet (53.95 acres) and is entirely constructed of concrete with the exception of some small areas immediately in front of hangar developments that are asphalt. The ramp is used extensively for aircraft parking and movement.

FIGURE 2-7
RAMP SIDE DEVELOPMENT AREA
SAN MARCOS REGIONAL AIRPORT

The concrete ramp area is in fair to poor condition. There are multiple areas on the ramp where the pavement is spalling and producing aggregate. The condition of the ramp was a significant concern voiced by tenants and airport users as part of the inventory survey conducted at the beginning of this Master Plan study. The Airport is developing near term solutions to mitigate safety issues related to the ramps condition. TxDOT Aviation is engaged in these discussions and in identifying potential rehabilitation options considering funding constraints. The ramp will be a primary consideration in the remainder of this plan.
As part of the inventory survey several pilots stated that there is insufficient lighting on the ramp at night.

Currently, there are 69 painted aircraft tie-down spaces on the main ramp. Some of these are used for transient aircraft while others are used for permanent aircraft parking/storage.

A large portion of the ramp close to the Commemorative Air Force (CAF) hangar is used for vehicle parking associated with events hosted by the CAF. Some hangar facilities have been constructed on top of the ramp including the Kerner T-hangar facility, the T-shades, and a hangar associated with the Specialized Aero facility.

**Taxiway Kilo Development Area Ramp**

The Taxiway Kilo Development Area Ramp, shown in Figure 2-8, is a ramp area constructed of concrete immediately adjacent to the entrance of the airport and in close proximity to TX-21.
This area was developed in 2013 to encourage new hangar development. The ramp is approximately 147,000 square feet and is in good condition. Currently, a new hangar is planned for construction as shown in Figure 2-5.

**Fuel Storage Facility**

Redbird Skyport and Berry Aviation both have fuel farms that have storage tanks for both 100LL and Jet A fuel. Redbird Skyport has two Above-Ground Storage Tanks (ASTs), one for Jet A and one for 100LL. Both tanks are 12,000 gallons and are in good condition.

Berry Aviation has two ASTs, one for Jet A and one for 100LL. Both tanks are 10,000 gallons and are in good condition. The tanks are owned by the City but maintained by Berry Aviation. Berry Aviation also has a small 100LL tank (1,000 gallons), which they own, located immediately adjacent to the main ramp and their FBO building that is used for self-service 100LL fueling. The existing fuel farms are in good condition and are sufficient to meet the fuel needs of existing airport users.
LANDSIDE FACILITIES

Landside facilities are those that support the movement of personnel and property to/from the airport to the surrounding community. Landside facilities typically include access roads and vehicle parking areas.

VEHICLE PARKING

Sufficient vehicle parking is critical to the operation of an airport. Typically, people arrive at the airport in a personal vehicle and park it while conducting business on airport property. With the exception of the vehicle parking associated with the FBO facilities, very little designated vehicle parking exists. Below is a list of the designated vehicle parking areas available at the airport:

- Berry Aviation Main Hangar – 16 parking spaces
- Coast Flight Building – 14 parking spaces
- CAF Hangar – 18 parking spaces
- City-Owned T-Hangar Lot – 13 parking spaces
- Texas State Aviation Hangar – Unmarked parking lot
- Civil Air Patrol Building – Unmarked parking lot
- Taxiway Kilo Development Area – 24 parking spaces

Since limited vehicle parking is available, vehicles are frequently parked inside hangars or on aircraft apron/ramp areas. During interviews with airport tenants and based on the inventory survey results, the limited vehicle parking is a concern that needs to be addressed as part of the airport’s future development plan.

ROADWAY ACCESS

Currently, the San Marcos Regional Airport only has a single access road (Airport Drive) that connects to TX-21. Airport Drive is constructed of asphalt and is generally in good condition. It was noted that sometimes areas of standing water occur along Airport Drive during periods of heavy rain.

Additionally, during interviews with airport tenants and stakeholders, several people mentioned that Airport Drive is difficult for larger vehicles to use because
the road has several sharp curves. Consequently, larger delivery vehicles (e.g. large trucks, 18-wheelers, etc.) are typically allowed onto the main ramp and then escorted to hangars or other facilities using the surface painted vehicle service roads on the ramp.

The alignment of Airport Drive is constrained by the airport’s close proximity to Gary Job Corp and the presence of above ground utility lines on the northern edge of the roadway. Consequently, realigning Airport Drive would likely require the acquisition of property currently owned by Gary Job Corp and/or the relocation of utilities and airside facilities immediately north of Airport Drive.

It was also noted by several tenants that Airport Drive has several aesthetic detractors such as the chain link fence with three strains of barbed-wire immediately to the south of the roadway on the Gary Job Corp property line and the above ground utility lines north of Airport Drive. The alignment of Airport Drive and the aesthetic quality of the route will be a consideration in the future development plan.

AIRSPACE

The San Marcos Regional Airport operates in a moderately complex airspace environment as it is close to multiple other public use airports including Lockhart, New Braunfels, Luling, and Austin-Bergstrom International Airport. Additionally, there are several small private airports in the immediate area including Fentress, White Wings, Roland, and Alison.

The airspace around the San Marcos Regional Airport is classified as Class D airspace during the hours the ATCT is operational (e.g. 7 AM to 7 PM, 7 days a week). When the ATCT is not in operation, the airspace reverts to Class E airspace.

Fentress Airport is home to a skydiving operation which can impact air traffic patterns at the San Marcos Regional Airport depending on wind direction. Additionally, the San Marcos Regional Airport is approximately 3.5 NM east of Texas State University’s Bobcat Stadium which is used by the Texas State University’s football team. During games, a Temporary Flight Restriction (TFR) is issued for the airspace surrounding the stadium. When in effect, the TFR impacts air traffic
patterns at the airport as the stadium is located directly under the flight path for Runway 8/26.

**Figure 2-9** shows San Marcos Regional Airport’s airspace and the surrounding area.

**FIGURE 2-9**
AIRSPACE
SAN MARCOS REGIONAL AIRPORT

**Utilities**

The availability of sufficient and reliable utilities are critical to encouraging and supporting development at an airport. Existing and prospective tenants are particularly interested in having access to electric, water, wastewater, and telecommunication utilities (including fiber).

**Figure 2-10** depicts the existing electrical, water, wastewater, and stormwater utility layouts at the San Marcos Regional Airport. In general, there were no significant concerns regarding existing electrical, water, wastewater, and stormwater utilities identified during the inventory process related to existing facilities. The most
significant utility related concern identified during the inventory process was the availability of reliable telecommunications utilities including fiber to support high-speed internet access and Voice Over IP (VOIP) services. Currently, there is not an accessible fiber line available to tenants along Airport Drive. Tenants that need fiber for their facilities have had to pay for the installation of fiber lines for their facility.

The availability of water, wastewater, and telecommunications utilities are a concern related to on airport development along TX-21 as these utilities are not currently available north of the Taxiway Kilo Development Area. However, the City of San Marcos plans to begin design of a 12-inch waterline extension from Airport Drive to William Pettus Rd. in FY 2020 which will serve developments along TX-21. The City of San Marcos also has a planned capital project to extend wastewater and stormwater into the area north of the Kilo Development Area in 2024. This project will extend wastewater and stormwater utilities from the Kilo Development Area up to the MALSR for Runway 13. Design is expected to begin in 2022.
FIGURE 2-10
UTILITY LAYOUT
SAN MARCOS REGIONAL AIRPORT

Source: City of San Marcos, 2019.


**Airport Development Areas**

As part of the Airport Master Plan process it is critical to identify and document portions of the airport’s existing property that can be used for future development. Development at airports can be either aeronautical (e.g. hangars, FBOs, aeronautical businesses, etc.) or non-aeronautical (e.g. gas stations, retail, industrial, etc.). According to FAA policy, available land should primarily be considered for aeronautical development purposes. However, in instances where the FAA agrees that aeronautical development is not likely or practical, then non-aeronautical development can be considered. Non-aeronautical developments can provide a significant source of revenue for an airport and provide financial stability during periods of low aeronautical activity.

The San Marcos Regional Airport has multiple parcels of land that could be used for future aeronautical or non-aeronautical development. **Figure 2-11** shows the various parcels of land that the airport is currently marketing for development purposes.

It should be noted that approximately 40 acres of property underneath and to the north and south of FM 110 has been designated as a Foreign Trade Zone (FTZ).
SURROUNDING AREA DEVELOPMENT

The development of properties surrounding an airport can have a significant impact on future airport development plans and opportunities. These impacts can have a positive impact on the airport as they can provide opportunities for new development and stimulate additional aeronautical activity at the airport. However, they can also have a negative impact and limit the potential to expand airport facilities in the future.

Figure 2-12 provides an overview of the planned developments in the areas surrounding the San Marcos Regional Airport. Each one of these developments is briefly described below:

- **Residential Developments** – There are currently two large residential developments planned immediately north of the airport. The smaller residential development is under the flight path associated with Runway 13/31. The larger residential development, further to the north, is under the flight path for Runway 17/35.
- **Industrial Development** – The industrial development area immediately south of Gary Job Corp. is known as the SMART Terminal development. This is an industrial development site that is expected to utilize the airport and the existing rail line.
- **Mixed Development** – There is a large mixed development area (e.g. residential, retail, industrial, etc.) known as the Cotton Center planned southeast of the airport.
- **FM 110 Development** – Farm-to-Market (FM) Road 110 is a new roadway that will pass immediately west of the airport. The City of San Marcos is in the process of completing a land release with the Federal Aviation Administration (FAA) to release the portion of airport property that the roadway will be located on to the State of Texas. FM 110 will be connected to TX-21 close to the airport entrance.
- **Yarrington Rd. Extension** – A study is currently underway to evaluate the potential extension of Yarrington Road south of TX-21.
These surrounding area development plans will be a consideration in the development of the ultimate development plan for the airport.

**FIGURE 2-12**
SURROUNDING AREA DEVELOPMENT
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019.

**AIRPORT POLICIES**

Effective airport policies such as Airport Rules and Regulations, Minimum Standards, Height Hazard Zoning Ordinances, and Rates and Charges are critical to
supporting the growth and development of an airport. This section discusses the application of these documents at the San Marcos Regional Airport.

**Airport Rules and Regulations**

The San Marcos Regional Airport has established Airport Rules and Regulations to protect the safe, secure, and efficient operation of the airport. The Rules and Regulations have been approved by the San Marcos City Council and published as part of the City of San Marcos' municipal code. A review of the Rules and Regulations was completed as part of this Master Plan process. No significant deficiencies were identified as part of the review.

**Airport Minimum Standards**

The San Marcos Regional Airport has established Minimum Standards for commercial operations on the airport. The primary purpose of Airport Minimum Standards is to ensure a sufficient minimum level of service is provided to airport patrons and to support the fair and equal treatment of commercial businesses operated at the airport. A review of the current Minimum Standards was completed as part of this Master Plan process. No significant deficiencies were identified as part of the review.

**Height Hazard Zoning Ordinances**

The establishment of height hazard zoning ordinances are critical to prevent development that could impact the safety of air navigation and future airport development. A height hazard zoning ordinance was originally established for the San Marcos Regional Airport in 1984. However, the ordinance has not been updated since and is not a functional consideration in the evaluation of future development proposals. The establishment of a new height hazard zoning ordinance will be a complex task as four different jurisdictions are responsible for portions of the land surrounding the airport include Hays County, City of San Marcos, City of Martindale, and Caldwell County.
**Airport Rates and Charges**

This section discusses the San Marcos Regional Airport’s current rates and charges policies and how they compare to other airports.

**Current Rates and Charges**

The establishment of uniform rates and charges are essential to promoting the financial self-sufficiency of an airport and for ensuring an airport is competitive in attracting tenants and new development. The City of San Marcos owns all the land associated with the San Marcos Regional Airport and many of the hangars and other facilities located on airport grounds. Below is a current list of the rates and charges established by the airport:

- **Ground Lease Rates**
  - $0.20 - $0.40 per square foot (SF) per year
  - Max Term 40 years

- **Hangar Rates**
  - T-Hangar - $200 per month and 1-year term
  - T-Shelter - $85 per month and 1-year term
  - Shared Hangar - $350 per month per aircraft and 1-year term
  - Private Hangar - $1.80 per SF per year and 5-year term
  - Commercial Hangar - $2.00 - $3.00 per SF per year
    - Based on term and amenities

- **Other Charges**
  - Storage Unit - $75 per month and 1-year term
  - Reserved Tie-Down - $50 - $75 per month and 1-year term
  - Agricultural Lease - $11.47 per acre per year

In addition to traditional facility and ground leases, the San Marcos Regional Airport also has an agricultural lease with a local farmer to conduct farming operations on 975 acres of airport property not currently being used for development.
Financial Benchmarking Assessment

As part of this inventory analysis, a financial benchmarking assessment was completed comparing the San Marcos Regional Airport's rates, charges, lease terms/methodologies, and property development practices with other Texas Airports. A total of nine airports were included in the benchmarking analysis. Those airports include:

- **Local/Regional Airports** – Airports in close proximity to the San Marcos Regional Airport. Some commercial service airports are included in this group but the analysis is restricted to only the general aviation aspects of those airports.
  - New Braunfels Regional Airport
  - Austin Executive Airport
  - Austin-Bergstrom International Airport
  - San Antonio International Airport
- **Reliever Airports** – Other designated reliever airports in the State of Texas.
  - Addison Airport
  - Dallas Executive Airport
  - Conroe North Houston Regional Airport
  - Sugar Land Regional Airport
- **Airports with Foreign Trade Zones (FTZ)** – Other airports with an established FTZ in the State of Texas.
  - El Paso International Airport

The results of the assessment are expected to be utilized to develop new rates, charges, lease terms/methodologies, and property development practices to make the preferred development plan, defined later in this Master Planning process, a reality.

**EXISTING ENVIRONMENTAL OVERVIEW**

This section provides an overview of the known environmental factors that should be considered as part of the master planning process.
**HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES**

The National Historic Preservation Act of 1966 requires that an initial review be made to determine if any properties in or eligible for inclusion in the National Register of Historic Places are within the area of a proposed action's potential environmental impact. The Archaeological and Historic Preservation Act of 1974 provides for the survey, recovery, and preservation of significant scientific, pre-historic, historical, archaeological, or paleontological data when such data may be destroyed or irreparably lost due to a federal, federally funded, or federally licensed project.

An online query through the Texas Historical Commission (THC) revealed that there are not any historic site locations in the immediate airport vicinity. The closest site that the query identified is approximately 1.80 miles south of the Airport on SH 80.

The City of San Marcos has its own Historic Preservation Commission focused on protecting historic structures, landmarks, and other aspects of the area pertinent to the community’s history. Two facilities located at the airport have been designated as local historic structures by the City of San Marcos Historic Preservation Commission:

- Commemorative Air Force Hangar located at 2249 Airport Drive
- Graham Air Control Tower located at 1921 Airport Drive

Both of these structures were identified as local historic landmarks by the Historic Preservation Commission in 2007. Consequently, modifications to these facilities may require the review of the City of San Marcos Historic Preservation Commission.

**FISH, WILDLIFE, AND PLANTS**

The Endangered Species Act requires each federal agency to ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of any habitat of such species. As defined by the U.S. Fish and Wildlife Service (USFWS), an Endangered Species is any species of wildlife whose continued existence as a viable component of the state's wild fauna is determined to be in jeopardy. A Threatened Species is any species of wildlife that appears likely, within the foreseeable future, to become an endangered species.
As provided by the Texas Parks and Wildlife Department (TPWD), several threatened and endangered species are currently listed for Caldwell County. **Table 2-9** lists the threatened and endangered species identified through the online query for Caldwell County. None of these species have been observed on airport property. The San Marcos Regional Airport completed a Wildlife Hazard Assessment (WHA) in 2017. The results of the WHA showed no activity from any of the threatened or endangered species identified in Table 2-9. However, future coordination with USFWS and TPWD may be necessary prior to commencing any major construction project at the San Marcos Regional Airport to confirm that no hazard to an endangered or threatened species is being created.

**TABLE 2-9**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Genus/Species</th>
<th>Federal Status</th>
<th>State Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Peregrine Falcon</td>
<td><em>Falco peregrinus anatum</em></td>
<td>DL</td>
<td>T</td>
</tr>
<tr>
<td>Artic Peregrine Falcon</td>
<td><em>Falco peregrinus tundrius</em></td>
<td>DL</td>
<td></td>
</tr>
<tr>
<td>Bald Eagle</td>
<td><em>Haliaeetus leucocephalus</em></td>
<td>DL</td>
<td>T</td>
</tr>
<tr>
<td>Peregrine falcon</td>
<td><em>Falco peregrinus</em></td>
<td>DL</td>
<td>T</td>
</tr>
<tr>
<td>Whooping Crane</td>
<td><em>Grus Americana</em></td>
<td>LE</td>
<td>E</td>
</tr>
<tr>
<td>Wood Stork</td>
<td><em>Mycteria americana</em></td>
<td></td>
<td>T</td>
</tr>
<tr>
<td><strong>Birds</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue Sucker</td>
<td><em>Cycleptus elongatus</em></td>
<td></td>
<td>T</td>
</tr>
<tr>
<td><strong>Fishes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red wolf</td>
<td><em>Canis rufus</em></td>
<td>LE</td>
<td>E</td>
</tr>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>False spike mussel</td>
<td><em>Fusconaia mitchelli</em></td>
<td></td>
<td>T</td>
</tr>
<tr>
<td>Golden orb</td>
<td><em>Quadrula aurea</em></td>
<td>C</td>
<td>T</td>
</tr>
<tr>
<td>Texas pimpleback</td>
<td><em>Quadrula petrina</em></td>
<td>C</td>
<td>T</td>
</tr>
<tr>
<td><strong>Mollusks</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cagle’s map turtle</td>
<td><em>Graptemys caglei</em></td>
<td></td>
<td>T</td>
</tr>
<tr>
<td>Texas horned lizard</td>
<td><em>Phrynosoma cornutum</em></td>
<td></td>
<td>T</td>
</tr>
<tr>
<td>Timber Rattlesnake</td>
<td><em>Crotalus horridus</em></td>
<td></td>
<td>T</td>
</tr>
<tr>
<td><strong>Reptiles</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Texas wild-rice</td>
<td><em>Zizania texana</em></td>
<td>LE</td>
<td>E</td>
</tr>
<tr>
<td><strong>Plants</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source:* U.S. Fish and Wildlife Service and the Texas Parks and Wildlife Department; T = State Listed Threatened; E = State Listed Endangered; DL = Federally Delisted; LE = Federally Listed Endangered; LT = Federally Listed Threatened; C = Federal Candidate for Listing.
**FEMA Floodplain Map**

Flooding can hamper the safe operation of an airport and make it difficult to develop property on or around an airport. The City of San Marcos is in the process of updating their floodplain maps with the Federal Emergency Management Agency (FEMA). The current Floodplain Map the City uses to regulate development is shown in Figure 2-13.

None of the existing airfield facilities at the San Marcos Regional Airport are located within the 100-year floodplain (shown in blue). However, a portion of the airport entrance road and the Taxiway Kilo Development Area are located within the 500-year floodplain (shown in orange). A regulatory floodway (shown in hatched red) and a 100-year floodplain do pass through the western most portion of Airport property that has not been developed.

**FIGURE 2-13**

FEMA FLOODPLAIN MAP
SAN MARCOS REGIONAL AIRPORT

Source: City of San Marcos
**Farmlands**

The Farmland Protection Policy Act (FPPA) regulates federal actions with the potential to convert farmlands to non-agricultural uses. The FPPA is intended to minimize the impact that federal programs have on the unnecessary and irreversible conversion of farmland to non-agricultural uses. As part of this master plan project, an online inquiry was completed using the USDA Web Soil Survey System to determine whether any property surrounding the airport is considered prime farmland. According to the USDA Web Soil Survey System the vast majority of the property surrounding the airport is classified as prime farmland. Figure 2-14 shows the results of the online inquiry. All areas shown in green are considered prime farmland.

**FIGURE 2-14**
**Prime Farmland Map**
SAN MARCOS REGIONAL AIRPORT

Source: USDA WebSoil Survey
**HAZARDOUS MATERIALS, SOLID WASTE, AND POLLUTION**

Based on research completed as part of this project and discussions with airport stakeholders, there are no known hazardous materials, solid waste, or pollution hazards on or immediately adjacent to the airport. However, an inactive landfill site is located immediately east of the airport close to the approach end of Runway 26. The landfill site has been capped. The presence of this landfill will be a consideration in future development plans at the airport.

**NOISE**

Based on research completed as part of this project and discussions with airport stakeholders, there are no known noise related issues related to airport operations.

**AIR AND WATER QUALITY**

The impacts that an airport can have on local air and water quality should be a major consideration in the growth and development of an airport. There are no known issues at the San Marcos Regional Airport related to water quality or air and water pollution at this time.
CHAPTER 3

Activity Forecasts
CHAPTER 3: ACTIVITY FORECASTS

INTRODUCTION

Forecasting aviation activity helps the airport sponsor identify potential changes in aeronautical activity at the airport that could drive future airport facility and equipment needs. In subsequent chapters of this Master Plan, the preferred demand forecasts described in this chapter are used to identify the type, extent, and timing of future aviation development.

Aeronautical activity levels at an airport are often influenced by the types of aviation services offered, the general business environment at the airport, and the business environment within the local/regional community. In addition, factors such as vigorous local airport marketing, tourism, increased industrialization, changes in transportation preferences, and fluctuations in the national, regional, and local economy all influence aviation demand.

As a result, aviation activity forecasts are developed in accordance with national trends and regional/local influences and, in context with the inventory findings, are developed as a guide for future development with the expectation that the facilities needed to support the forecasted demand will be available as demand dictates. This chapter examines aviation activity trends and the numerous factors that have influenced those trends in the United States, Texas, and the region the San Marcos Regional Airport serves.

FORECASTING INTERVALS AND PLANNING ACTIVITY LEVELS (PALs)

Master Plan aviation activity forecasts are traditionally completed in 5-year increments for a 20-year planning horizon. For this Master Plan, the first forecast year has been identified as 2019 and the last forecast year has been identified as 2039. As a result, aeronautical activity will be forecasted for the following years:

- 2019
- 2024
- 2029
- 2034
- 2039
However, it is important to note that aviation demand can fluctuate substantially over a 20-year period as the industry and economic condition are fluid and constantly changing. As a result, the activity levels identified for a particular forecast year may occur earlier or later in the 20-year planning horizon. Since actual changes in aeronautical activity levels should be the key driver behind making future airport capital improvement decisions, the forecasting years identified earlier have each been designated as a Planning Activity Level (PAL) as shown below:

- PAL 1 – 2019
- PAL 2 – 2024
- PAL 3 – 2029
- PAL 4 – 2034
- PAL 5 – 2039

The actual realization of the activity levels identified within each of these Planning Activity Levels should be used to guide future development as opposed to the forecasted years those activity levels are expected to occur. To perpetuate this approach, the identified PALs will be used in future chapters when discussing development decisions.

**Socioeconomic Data**

An assessment of national, state, and regional economic conditions must be conducted to gain a better understanding of the relationship between historic and future aviation activity levels within an airport's area of influence. This information is essential and directly influences an airport's activity forecast. Therefore, the following socioeconomic information – population, employment, and median family income – has been collected to understand current economic conditions and influence assumptions that should be involved in the development of the aviation demand forecasts for the San Marcos Regional Airport.

For the analysis of socioeconomic information, information was reviewed for the following areas:

- **Key Socioeconomic Influence Areas**
  - Hays and Caldwell Counties (combined)
  - Austin-Round Rock Metropolitan Statistical Area (MSA)
  - San Antonio-New Braunfels Metropolitan Statistical Area (MSA)
Comparative Socioeconomic Areas
- State of Texas
- United States

Hays and Caldwell Counties, the Austin-Round Rock MSA, and the San Antonio-New Braunfels MSA have all been identified as areas where socioeconomic changes could play a significant role in influencing future aeronautical activity at the airport. It should be noted that the San Marcos Regional Airport currently attracts tenants, based aircraft, and aeronautical users from all of these areas. As a result, it is important that the socioeconomic trends of each of these areas are evaluated to identify potential impacts on the airport. Socioeconomic information for the State of Texas and the United States will be used primarily for comparative purposes.

**Population**

Population growth can be directly tied to the success and growth of an airport supporting a given population set. Consequently, population trends, and their expected rate of change, provide insight into an area’s economic potential.

**Table 3-1** shows the historic population figures and estimates for Hays and Caldwell counties, the San Antonio-New Braunfels Metropolitan Statistical Area (MSA), the Austin-Round Rock MSA, the State of Texas, and the United States between 2010 and 2017.

**TABLE 3-1**

<table>
<thead>
<tr>
<th>Year</th>
<th>United States</th>
<th>Texas</th>
<th>Austin-Round Rock MSA</th>
<th>San Antonio - New Braunfels MSA</th>
<th>Hays and Caldwell County</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>311,644,280</td>
<td>25,674,681</td>
<td>1,769,045</td>
<td>2,197,139</td>
<td>202,422</td>
</tr>
<tr>
<td>2012</td>
<td>313,644,280</td>
<td>26,059,203</td>
<td>1,805,637</td>
<td>2,234,964</td>
<td>205,732</td>
</tr>
<tr>
<td>2013</td>
<td>316,234,505</td>
<td>26,448,193</td>
<td>1,865,031</td>
<td>2,274,504</td>
<td>214,643</td>
</tr>
<tr>
<td>2014</td>
<td>318,622,525</td>
<td>26,956,959</td>
<td>1,911,175</td>
<td>2,321,610</td>
<td>223,194</td>
</tr>
<tr>
<td>2015</td>
<td>321,039,839</td>
<td>27,469,114</td>
<td>1,982,266</td>
<td>2,381,690</td>
<td>233,994</td>
</tr>
<tr>
<td>2016</td>
<td>323,405,935</td>
<td>27,862,596</td>
<td>2,036,386</td>
<td>2,421,643</td>
<td>242,107</td>
</tr>
<tr>
<td>2017</td>
<td>325,719,178</td>
<td>28,246,049</td>
<td>2,078,917</td>
<td>2,476,459</td>
<td>249,722</td>
</tr>
<tr>
<td>AAGR</td>
<td>0.75%</td>
<td>1.67%</td>
<td>2.92%</td>
<td>2.12%</td>
<td>3.89%</td>
</tr>
</tbody>
</table>

**Source:** TDC Population Estimates and Projections, US Census Population Estimates
All areas reviewed in this analysis have experienced steady growth over the seven-year period, with Hays and Caldwell counties combined experiencing the highest Average Annual Growth Rate (AAGR) of 3.89% annually. It should also be noted that the population growth rates for the Austin-Round Rock MSA (2.92% annually) and the San Antonio-New Braunfels MSA (2.12% annually) have significantly exceeded the population growth rates for the State of Texas (1.67% annually) and the United States (0.75% annually) as a whole during the same period of time.

This analysis indicates that the region where the San Marcos Regional Airport is located has grown at a rapid pace with the area immediately surrounding the airport (e.g. Hays and Caldwell County) growing faster than the region as a whole. In fact, Hays County has consistently been named one of the fastest growing counties in the United States during this time period.

While historic population trends can provide an indication of future activity, it is also important to analyze population projections for the future. Table 3-2 shows future population projections for Hays and Caldwell counties (combined), the San Antonio-New Braunfels MSA, the Austin-Round Rock MSA, the State of Texas, and the United States between 2018 and 2050.

<table>
<thead>
<tr>
<th>Year</th>
<th>United States</th>
<th>Texas</th>
<th>Austin-Round Rock MSA</th>
<th>San Antonio-New Braunfels MSA</th>
<th>Hays and Caldwell County</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>327,892,000</td>
<td>28,716,213</td>
<td>2,133,977</td>
<td>2,527,653</td>
<td>259,469</td>
</tr>
<tr>
<td>2019</td>
<td>330,269,000</td>
<td>29,193,378</td>
<td>2,189,870</td>
<td>2,579,823</td>
<td>269,133</td>
</tr>
<tr>
<td>2024</td>
<td>341,963,000</td>
<td>31,685,217</td>
<td>2,480,246</td>
<td>2,852,257</td>
<td>321,335</td>
</tr>
<tr>
<td>2029</td>
<td>353,008,000</td>
<td>34,345,084</td>
<td>2,799,579</td>
<td>3,138,069</td>
<td>383,839</td>
</tr>
<tr>
<td>2034</td>
<td>363,003,000</td>
<td>37,142,136</td>
<td>3,153,488</td>
<td>3,430,042</td>
<td>458,682</td>
</tr>
<tr>
<td>2039</td>
<td>371,871,000</td>
<td>40,078,100</td>
<td>3,542,493</td>
<td>3,730,816</td>
<td>546,534</td>
</tr>
<tr>
<td>2044</td>
<td>379,861,000</td>
<td>43,209,927</td>
<td>3,969,412</td>
<td>4,047,608</td>
<td>650,853</td>
</tr>
<tr>
<td>2049</td>
<td>387,419,000</td>
<td>46,619,895</td>
<td>4,441,555</td>
<td>4,387,838</td>
<td>776,838</td>
</tr>
<tr>
<td>2050</td>
<td>388,922,000</td>
<td>47,342,417</td>
<td>4,542,827</td>
<td>4,459,030</td>
<td>805,195</td>
</tr>
<tr>
<td>AAGR</td>
<td>0.58%</td>
<td>2.03%</td>
<td>3.53%</td>
<td>2.39%</td>
<td>6.57%</td>
</tr>
</tbody>
</table>


Based on future population projections provided by the Texas Demographic Center (TDC), it is expected that the population of the region where the San Marcos
Regional Airport is located will continue to grow at a rapid pace that far exceeds the State of Texas and the United States. Hays and Caldwell counties are expected to see the highest growth rates of the areas included in this analysis by a significant margin.

Based on the analysis of historic and future population projections, it is expected that the population growth within the area will positively influence aeronautical activity at the San Marcos Regional Airport.

**EMPLOYMENT**

Another key socioeconomic factor that is vitally important to evaluating the aeronautical activity potential of an airport is employment data. A region's employment characteristics typically serve as a foundational element for the health of the regional economy and the health of the regional economy is closely linked to aeronautical activity.

**Table 3-3** provides jobs data for Hays and Caldwell counties (combined), the San Antonio-New Braunfels MSA, the Austin-Round Rock MSA, and the State of Texas between 2010 and 2017.

<table>
<thead>
<tr>
<th>Year</th>
<th>Texas</th>
<th>Austin-Round Rock MSA</th>
<th>San Antonio - New Braunfels MSA</th>
<th>Hays and Caldwell County</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>11,244,632</td>
<td>865,461</td>
<td>943,771</td>
<td>89,962</td>
</tr>
<tr>
<td>2011</td>
<td>11,535,095</td>
<td>897,490</td>
<td>965,023</td>
<td>93,183</td>
</tr>
<tr>
<td>2012</td>
<td>11,818,675</td>
<td>931,584</td>
<td>987,374</td>
<td>96,446</td>
</tr>
<tr>
<td>2013</td>
<td>12,052,646</td>
<td>966,601</td>
<td>1,010,632</td>
<td>101,105</td>
</tr>
<tr>
<td>2014</td>
<td>12,360,368</td>
<td>1,003,686</td>
<td>1,038,583</td>
<td>106,377</td>
</tr>
<tr>
<td>2015</td>
<td>12,493,197</td>
<td>1,036,120</td>
<td>1,063,052</td>
<td>111,670</td>
</tr>
<tr>
<td>2016</td>
<td>12,702,122</td>
<td>1,080,115</td>
<td>1,097,577</td>
<td>118,338</td>
</tr>
<tr>
<td>2017</td>
<td>12,960,595</td>
<td>1,116,938</td>
<td>1,125,240</td>
<td>122,328</td>
</tr>
<tr>
<td>AAGR</td>
<td>2.18%</td>
<td>4.15%</td>
<td>2.75%</td>
<td>5.14%</td>
</tr>
</tbody>
</table>

*Source: Texas Workforce Commission - TRACER System*

**Table 3-4** provides additional employment data for Hays and Caldwell counties (combined), the State of Texas, and the United States between 2005 and 2016.
TABLE 3-4
EMPLOYMENT DATA

<table>
<thead>
<tr>
<th>Year</th>
<th>United States</th>
<th>Texas</th>
<th>Hays and Caldwell County</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Establishments</td>
<td>Annual Payroll ($1,000)</td>
<td>Number of Establishments</td>
</tr>
<tr>
<td>2005</td>
<td>7,499,702</td>
<td>$4,482,722,481</td>
<td>497,758</td>
</tr>
<tr>
<td>2006</td>
<td>7,601,160</td>
<td>$4,792,429,911</td>
<td>509,080</td>
</tr>
<tr>
<td>2007</td>
<td>7,705,018</td>
<td>$5,026,778,232</td>
<td>521,408</td>
</tr>
<tr>
<td>2008</td>
<td>7,601,169</td>
<td>$5,130,509,178</td>
<td>522,336</td>
</tr>
<tr>
<td>2009</td>
<td>7,433,465</td>
<td>$4,855,545,239</td>
<td>519,028</td>
</tr>
<tr>
<td>2010</td>
<td>7,396,628</td>
<td>$4,940,983,369</td>
<td>522,146</td>
</tr>
<tr>
<td>2011</td>
<td>7,354,043</td>
<td>$5,164,897,905</td>
<td>525,420</td>
</tr>
<tr>
<td>2012</td>
<td>7,431,808</td>
<td>$5,414,255,995</td>
<td>537,839</td>
</tr>
<tr>
<td>2013</td>
<td>7,488,353</td>
<td>$5,621,697,325</td>
<td>547,190</td>
</tr>
<tr>
<td>2014</td>
<td>7,563,084</td>
<td>$5,940,186,911</td>
<td>557,721</td>
</tr>
<tr>
<td>2015</td>
<td>7,663,938</td>
<td>$6,253,488,252</td>
<td>569,091</td>
</tr>
<tr>
<td>2016</td>
<td>7,757,807</td>
<td>$6,435,142,055</td>
<td>579,168</td>
</tr>
<tr>
<td>AAGR</td>
<td>0.31%</td>
<td>3.96%</td>
<td>1.49%</td>
</tr>
</tbody>
</table>

Source: US Census – County Business Patterns Survey

Both tables show significant and steady growth in job numbers, number of establishments (e.g. places of employment), and annual payroll. Again, Hays and Caldwell counties (combined) show the highest rate of growth in every category closely followed by the Austin-Round Rock MSA and the San Antonio-New Braunfels MSA. This information indicates that the economy of the region where the San Marcos Regional Airport is located has grown rapidly in recent years.

While historic employment data can provide an indication of recent economic growth within a region, it is important to evaluate future projections of employment growth to identify whether those trends are expected to continue in the future. Employment growth projections within the State of Texas are developed by the Texas Workforce Commission (TWC) for various Workforce Development Areas ( WDAs). WDAs are composed of multiple counties with close economic ties. Table 3-5 shows forecasted employment growth in the following WDAs:

- **Rural Capital WDA** – Composed of the counties surrounding Travis County including Hays and Caldwell County
- **Alamo WDA** – Composed of counties in the San Antonio-New Braunfels Area
Once more, the growth rate of the area encompassing Hays and Caldwell counties is the highest of all areas measured.

All the employment data reviewed as part of this master plan project indicates that the economy in the region the San Marcos Regional Airport is located in has grown and is expected to continue to grow rapidly. This is expected to be a positive influence on aeronautical activity at the airport.

**Median Household Income**

In addition to general employment data, household income data provides insight into the local economy. While a location’s economy can be growing, it is possible for it to grow in a manner that has a limited impact on aeronautical activity (e.g. lower income jobs, businesses with little correlation to aeronautical activity, etc.).

Historically, higher levels of income have been associated with higher aeronautical activity levels. **Tables 3-6 and 3-7** show historic and projected household incomes for Hays and Caldwell counties (combined). Trends similar to these are expected in the Austin-Round Rock MSA and the San Antonio-New Braunfels MSA.

Socioeconomic studies similar to the one completed for this master plan have shown the median household income within the City of San Marcos to be lower than the figures shown in Tables 3-6 and 3-7. Since the area the San Marcos
Regional Airport serves is much wider than just the immediate City of San Marcos area, income figures for Hays and Caldwell County combined were used for this analysis and compared to similar data for the Austin-Round Rock MSA and the San Antonio – New Braunfels MSA.

### Table 3-6
**HISTORICAL HOUSEHOLD INCOMES**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of Household with Income $75,000 - $99,999</td>
<td>12.45%</td>
<td>12.79%</td>
<td>12.29%</td>
<td>12.25%</td>
<td>12.53%</td>
<td>12.61%</td>
<td>13.57%</td>
<td>14.34%</td>
</tr>
<tr>
<td>Percentage of Household with Income $100,000 - $149,999</td>
<td>14.43%</td>
<td>14.49%</td>
<td>14.60%</td>
<td>13.96%</td>
<td>13.97%</td>
<td>14.53%</td>
<td>14.49%</td>
<td>14.72%</td>
</tr>
<tr>
<td>Percentage of Household with Income $150,000 - $199,999</td>
<td>4.66%</td>
<td>5.35%</td>
<td>5.29%</td>
<td>5.85%</td>
<td>5.66%</td>
<td>5.35%</td>
<td>5.51%</td>
<td>6.01%</td>
</tr>
<tr>
<td>Percentage of Household with Income $200,000+</td>
<td>3.46%</td>
<td>3.73%</td>
<td>4.36%</td>
<td>4.46%</td>
<td>4.71%</td>
<td>4.46%</td>
<td>4.86%</td>
<td>5.21%</td>
</tr>
</tbody>
</table>

**Total Percentage of Households with Income Above $75,000**

| 35.00% | 36.36% | 36.54% | 36.53% | 36.86% | 36.94% | 38.43% | 40.28% |

Source: U.S. Census - American Community Survey (ACS)
Together, the tables indicate that the percentage of households earning more than $75,000 annually increased between 2010 and 2017 and is expected to continue to increase in the future. This growth is expected to be a positive influence on aeronautical activity at the San Marcos Regional Airport in the future.

It must be noted that the historic and projected household income information comes from two different sources. As such, there is a drop in percentages between the 2017 historic numbers (Table 3-6) and the 2018 projected numbers (Table 3-7). This difference is due to the different forecasting models used by each data source and because the data source used in Table 3-8 uses 2009 monetary values.

**Socioeconomic Summary**

In general, the analysis of the socioeconomic factors for the region the San Marcos Regional Airport serves show that the regional economy is growing and is expected to continue to grow at a fast pace during the forecast period. This growth will support the growth of aeronautical activity at the airport.
SUMMARY OF AIRPORT HISTORIC OPERATIONS

Since San Marcos is a towered airport, traffic count data collected by the Air Traffic Control Tower (ATCT) was used to compile historic operations data. The San Marcos ATCT is open 7 days a week from 7 AM to 7 PM.

Table 3-8 summarizes the available historic annual operations data (IFR, VFR and Local) at HYI since Fiscal Year (FY) 2012 as recorded by the ATCT. For the purposes of this data, a fiscal year as defined as October – September.

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>IFR</th>
<th>VFR</th>
<th>LOCAL</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 2012</td>
<td>8,796</td>
<td>22,727</td>
<td>29,048</td>
<td>60,571</td>
</tr>
<tr>
<td>FY 2013</td>
<td>9,953</td>
<td>19,717</td>
<td>23,069</td>
<td>52,739</td>
</tr>
<tr>
<td>FY 2014</td>
<td>11,032</td>
<td>22,161</td>
<td>20,009</td>
<td>53,202</td>
</tr>
<tr>
<td>FY 2015</td>
<td>7,994</td>
<td>17,057</td>
<td>19,872</td>
<td>44,923</td>
</tr>
<tr>
<td>FY 2016</td>
<td>6,787</td>
<td>18,004</td>
<td>20,138</td>
<td>44,929</td>
</tr>
<tr>
<td>FY 2017</td>
<td>11,754</td>
<td>23,720</td>
<td>25,310</td>
<td>60,784</td>
</tr>
<tr>
<td>FY 2018</td>
<td>15,855</td>
<td>23,780</td>
<td>21,956</td>
<td>61,591</td>
</tr>
</tbody>
</table>

Source: HYI Air Traffic Control Tower Traffic Counts

The ATCT data shows fluctuations in total activity during the 7 year period, with significant growth in IFR operations but a similar decline in local traffic. Overall VFR traffic grew slightly over the cumulative period.

Based on information obtained from airport tenants, it is estimated that approximately 6,000 additional operations occur annually (500 per month) from 7 PM to 7 AM when the ATCT is closed. These additional operations are not reflected in the table above.

NATIONAL GENERAL AVIATION TRENDS

An understanding of recent and anticipated trends within the General Aviation (GA) industry is important when assessing aviation demand for the San Marcos Regional Airport. Some trends may affect aviation demand in the study area while others will have little or no appreciable impact on local/regional aviation demands.
Various data sources were examined and used to support the analysis of national GA trends. Those sources include:

- Federal Aviation Administration, FAA Aerospace Forecasts, Fiscal Years 2018 – 2038
- National Business Aircraft Association (NBAA), NBAA Business Aviation Fact Book (current edition)
- General Aviation Manufacturers Association (GAMA), 2016 General Aviation Statistical Databook and 2017 Industry Outlook

**GENERAL AVIATION AIRPORT OVERVIEW**

GA aircraft are defined as all aircraft not flown by commercial airlines or the military. In the FAA’s General Aviation Airports: A National Asset report, dated May 2012, the FAA stated that general aviation serves 5 primary functions:

- Emergency Preparedness and Response
- Critical Community Access
- Commercial, Industrial, and Economic Activities
- Destination and Special Events
- Other Aviation Specific Function (e.g. self-piloted business flights, corporate, flight instruction, personal flying, etc.)

According to the current National Plan of Integrated Airport System (NPIAS), there are 19,627 public and private airports located throughout the United States, and 5,099 of these are open to public use. **Figure 3-1** displays the breakdown of airports as described in the FAA’s 2019 -2023 National Plan of Integrated Airport System (NPIAS). The number and distribution of public-use airports available to GA users provides a valuable transportation and economic resource to local communities, businesses, and individuals throughout the region, state, and nation.
San Marcos Regional Airport is considered a “Reliever” airport for both San Antonio International Airport and Austin-Bergstrom International Airport.

**SUMMARY OF NATIONAL GENERAL AVIATION TRENDS**

According to the FAA’s 2018 – 2038 Aerospace Forecast, the overall number of active GA aircraft is expected to remain flat between 2018 and 2038 and the number of hours flown is forecasted to grow at a rate of 0.8 percent annually during that same period. Slight declines are expected in the hours flown and number of active single engine piston and multi-engine piston aircraft. Slight growth is expected in the Light Sport Aircraft (LSA), rotorcraft, jet, turboprop, and experimental aircraft categories. Figure 3-2 and Figure 3-3 depict these forecasted trends.

Additionally, the total number of pilots (excluding student pilots) is expected to remain flat during the same period. Declines are expected in the recreational, private, and commercial pilot categories. Increases are expected in the sport pilot and Airline Transport Pilot (ATP) categories.
FIGURE 3-2
FAA AEROSPACE FORECAST

Active General Aviation Aircraft

Source: FAA Aerospace Forecast, 2018 – 2038

FIGURE 3-3
FAA AEROSPACE FORECAST

General Aviation Hours Flown (in thousands)

Source: FAA Aerospace Forecast, 2018 – 2038
FAA Terminal Area Forecast

The Terminal Area Forecast (TAF) is a FAA forecast-planning database produced each year covering airports in the NPIAS. The TAF is prepared to assist the FAA in meeting its planning, budgeting, and staffing requirements. The TAF forecasts are made at the individual airport level and are based in part on the national FAA Aerospace Forecasts. The TAF contains historic and forecast data for enplanements, airport operations, instrument operations, and based aircraft. TAF data is developed for 264 FAA towered airport, 253 contract-towered airports, 31 terminal radar approach control facilities, and 2,814 non-towered airports as of 2017. Data in the TAF is presented on a U.S. Governmental fiscal year basis, which runs from October through September.

As its primary input, the TAF uses the FAA Aerospace Forecasts from the specific year. Aviation activity forecasts for FAA-towered and federal contract-towered airports are developed using historical relationships between airport passenger demand and/or activity measures and local and national factors that influence aviation activity. At airports similar to the San Marcos Regional Airport, the TAF data is generated from historical data reported by the airport air traffic control tower.

The TAF forecast for the San Marcos Regional Airport, presented in Figure 3-4, reflects a slow but steady growth rate through 2039. TAF forecasts showing slow and steady growth are common at towered airports.
The TAF also depicts a steady growth rate for based aircraft at San Marcos. **Figure 3-5** shows the TAF based aircraft forecast.
Based on information obtained in the inventory analysis, the socioeconomic data presented, and national aviation trends, the following factors and assumptions have been incorporated into the forecasts of based aircraft and annual operations for the San Marcos Regional Airport:

- Future airport facilities will continue to accommodate a broad array of aircraft including business-type aircraft and helicopters.
- Changes in aeronautical activity levels and based aircraft will likely be tied to the regional economy and population changes as well as the growth of the San Antonio and Austin areas.
An “unconstrained” forecast of aviation demand assumes facility improvements will occur as demand increases.

Greater aircraft utilization resulting from airfield and terminal area improvements can be both directly and indirectly be linked to economic development activity.

**Forecast Methodologies**

The development of an aviation activity forecast involves analytical and judgmental assumptions to realize the highest level of forecast confidence. The aircraft operations and based aircraft forecasts are developed in accordance with national and regional trends, and in context with the inventory findings and socioeconomic trends. The forecasts developed here begin with baseline information from 2018 with 2019 as the first forecast year. National trends and forecasts are provided by the *FAA Aerospace Forecasts, Fiscal Years 2018-2038*.

Various forecast techniques can be used to develop baseline forecasts including:

- **Trend Analysis** – Trend analysis is the simplest and most familiar form of forecasting and is also one of the most widely used. This forecasting technique uses historic data as a basis to develop a forecast for the future. An assumption of this forecast method is that historic levels of aviation demands will continue and influence similar linear progressions in the future. Though this assumption seems broad in its application, it can serve as a reliable benchmark against other forecast methods.

- **Regression Analysis** – In a regression model, the forecast of aviation demand (the dependent variable) is projected on the basis of one or more external indicators (the independent variables). Historic values for both the dependent and independent variables are analyzed to determine their relationship. Once defined, this relationship is used to project the dependent variable with a forecast or projection of the independent variable(s). In aviation forecasting, an example of the dependent variable is based aircraft. Population or median household income levels are commonly used independent variables that aid in the projection of aviation growth.
→ Forecast Utilizing National or Regional Projections – The FAA produces an annual aerospace forecast that includes its projections regarding the growth of aviation throughout the United States. The FAA utilizes a variety of data sources to help formulate its forecast including aircraft sales/delivery data, the number of active pilots, economic growth protections, etc. The annual growth rates provided by the FAA may be utilized to formulate growth forecast for an airport. Additionally, many of these national forecasts are further segmented into regional and state level forecasts. These forecasts can also be used to formulate a growth forecast for an airport.

→ Market Analysis – This forecast method typically uses an easily identifiable independent variable such as population or income, which has a high correlation or an indirect cause-and-effect relationship within certain segments of the GA industry. The market analysis technique often employs a static and dynamic variable relationship between community factors and GA trends that aids in predicting aviation growth based on forecast community indicators such as population.

The application of these forecasting techniques for based aircraft and aircraft operations at the San Marcos Regional Airport are discussed below.

**Forecast of Based Aircraft**

Determining the number and type of aircraft anticipated to be based at an airport is a vital component in creating a development plan. Depending on the potential market and forecast, the airport should tailor the development plan to the unique characteristics of the anticipated demand.

The number and type of aircraft that can be expected to base at an airport is dependent on several factors, such as available facilities, airport operator services, airport proximity and accessibility, and the local/regional economy. Many aircraft operators are particularly sensitive to both the quality and location of their basing facilities, with proximity of home and work often identified as the primary consideration in the selection of an aircraft-basing location.

In 2018, a based aircraft count was conducted at the airport. Currently, the San Marcos Regional Airport has 200 total based aircraft (160 single-engine piston
aircraft, 16 multi-engine aircraft, 9 turboprop aircraft, 14 jets and one helicopter). Consequently, 200-based aircraft was the figure used for the base year (2018) of the based aircraft forecast.

One factor that should be considered to gauge the immediate potential for based aircraft growth is whether the airport has an active hangar waiting list. Currently, the airport's hangars are 100% full and a hangar waiting list exists for available hangar space. Currently, there are 109 unique aircraft owners/operators on the hangar waiting list for the San Marcos Regional Airport. Additionally, one of the FBOs at the San Marcos Regional Airport has indicated that they receive multiple inquires each year from larger aircraft operators (e.g. turboprops, jets, etc.) seeking hangar space at the airport.

Numerous forecast methods were used to predict based aircraft growth for the San Marcos Regional Airport. Seven are presented here:

- FAA Terminal Area Forecast Growth Rate for Based Aircraft (3.03%)
- FAA Terminal Area Forecast Growth Rate for Based Aircraft with Flight School Adjustment
- FAA Terminal Area Forecast – Texas State-Wide Based Aircraft Growth Rate (1.13%)
- FAA Terminal Area Forecast – Southwest Region Based Aircraft Growth Rate (1.04%)
- Growth Rate Based on Projected Employment Growth Rate (2.12%)
- Combined Population Growth Rate for Austin-Round Rock and San Antonio-New Braunfels MSAs
- Average of All Forecasts excluding FAA TAF

Table 3-9 and Figure 3-6 provide a summary of the forecast models for based aircraft anticipated at the airport over the 20-year planning period.
**TABLE 3-9**  
**SUMMARY OF BASED AIRCRAFT FORECASTS, 2019-2039**  
**SAN MARCOS REGIONAL AIRPORT**

<table>
<thead>
<tr>
<th>Year</th>
<th>FAA Terminal Area Forecast (TAF)</th>
<th>HYI TAF - Growth Rate for Based Aircraft (3.03%)</th>
<th>HYI TAF - Growth Rate for BA w/Flight School Adjustment</th>
<th>FAA TAF - Texas State-Wide Based Aircraft Growth Rate (1.13%)</th>
<th>FAA TAF - Southwest Region Based Aircraft Growth Rate (1.04%)</th>
<th>Growth Rate Based on Projected Employment Growth Rate (2.12%)</th>
<th>Combined Population Growth Rate for Austin-Round Rock and San Antonio-New Braunfels MSAs (2.91%)</th>
<th>Average (PREFERRED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018 Base Year</td>
<td>134</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>2019 PAL 1</td>
<td>138</td>
<td>206</td>
<td>205</td>
<td>202</td>
<td>202</td>
<td>204</td>
<td>206</td>
<td>206</td>
</tr>
<tr>
<td>2024 PAL 2</td>
<td>158</td>
<td>239</td>
<td>231</td>
<td>214</td>
<td>213</td>
<td>227</td>
<td>238</td>
<td>238</td>
</tr>
<tr>
<td>2029 PAL 3</td>
<td>178</td>
<td>278</td>
<td>262</td>
<td>226</td>
<td>224</td>
<td>252</td>
<td>274</td>
<td>274</td>
</tr>
<tr>
<td>2034 PAL 4</td>
<td>198</td>
<td>322</td>
<td>298</td>
<td>239</td>
<td>236</td>
<td>280</td>
<td>317</td>
<td>317</td>
</tr>
<tr>
<td>2039 PAL 5</td>
<td>218</td>
<td>374</td>
<td>339</td>
<td>253</td>
<td>249</td>
<td>311</td>
<td>366</td>
<td>366</td>
</tr>
</tbody>
</table>

**Source:** Garver Forecast Data for HYI, 2019 and FAA Aerospace Forecasts, Fiscal Years 2018 - 2038.
The current FAA TAF shows the number of based aircraft at the San Marcos Regional Airport in 2018 to be significantly lower than the actual number determined through the 2018 aircraft count (134 based aircraft vs. 200 based aircraft). As a result, the TAF was deemed unreliable as a forecast of future based aircraft activity. Additionally, several regression and trend analysis forecasts were run but were deemed to be statistically unreliable and, as a result, were excluded.
Due to the population and economic growth expected to occur within the region and many of the airports closer to downtown Austin reaching their based aircraft capacity, it is expected that based aircraft will grow at a strong pace during the forecast period. Consequently, the “Average” forecast was selected as the preferred forecast for based aircraft growth at the airport. This forecast is aggressive but realistic for the San Marcos Regional Airport and will facilitate proper planning for the future.

**Forecast of Aircraft Mix for Based Aircraft**

While establishing a baseline forecast of based aircraft growth is critical to facilitate good planning, it is also important to identify the mix of aircraft (e.g. single-engine piston, multi-engine piston, turboprop, jet, helicopter) that are expected at the airport during the planning period, as this can greatly influence the types of facilities expected to be needed at an airport. The proposed aircraft mix at a given airport is typically highly dependent on the local economy and the type of aeronautical traffic it stimulates. National trends in the aircraft fleet can also play a significant role.

The mix of based aircraft for incremental periods throughout the planning period is illustrated in Table 3-10 and Figure 3-7. Consistent with the FAA’s current Aerospace Forecast, the number of single-engine piston aircraft is forecasted to stay flat with most gains of the increases expected in the turbo-prop, helicopter, experimental, and light-sport aircraft categories.
### TABLE 3-10
**BASED AIRCRAFT FLEET MIX, 2019-2039**
**SAN MARCOS REGIONAL AIRPORT**

<table>
<thead>
<tr>
<th>Year</th>
<th>2018 Base Year</th>
<th>2019 PAL 1</th>
<th>2024 PAL 2</th>
<th>2029 PAL 3</th>
<th>2034 PAL 4</th>
<th>2039 PAL 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Engine Piston</td>
<td>160</td>
<td>162</td>
<td>168</td>
<td>178</td>
<td>186</td>
<td>195</td>
</tr>
<tr>
<td>Multi-Engine Piston</td>
<td>16</td>
<td>16</td>
<td>20</td>
<td>24</td>
<td>28</td>
<td>32</td>
</tr>
<tr>
<td>Turbo-Prop</td>
<td>9</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>27</td>
<td>35</td>
</tr>
<tr>
<td>Jet</td>
<td>14</td>
<td>15</td>
<td>21</td>
<td>27</td>
<td>35</td>
<td>45</td>
</tr>
<tr>
<td>Helicopter</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>204</td>
<td>227</td>
<td>253</td>
<td>282</td>
<td>315</td>
</tr>
</tbody>
</table>

**Source:** Garver Forecast Data for HYI, 2019

### FIGURE 3-7
**BASED AIRCRAFT FLEET MIX, 2019-2039**
**SAN MARCOS REGIONAL AIRPORT**

**Source:** Garver Forecast Data for HYI, 2019
AIRCRAFT OPERATIONS FORECASTS

Determining the projected number and mix of future aircraft operations at an airport is a vital component in developing future infrastructure plans. Aeronautical activity at an airport is typically closely linked to the number of aircraft based at the airport and the aeronautical needs of businesses, organizations, and individuals within the surrounding area.

Numerous forecast methods were used to predict aircraft operations growth for San Marcos Regional Airport. Six are presented here:

- FAA Aerospace Forecast - Active GA and Air Taxi Fleet Hours Flown Growth Rate (0.8%)
- FAA Aerospace Forecast - Total Fuel Consumption Growth Rate (1.4%)
- Growth Rate Based on Projected Employment Growth Rate (2.12%)
- Combined Population Growth Rate for Austin-Round Rock and San Antonio-New Braunfels MSAs (2.91%)
- Growth Rate Based on Austin-Round Rock MSA Population Growth Rate (3.53%)
- Trendline Forecast Based on 2012-2018 Tower Operations Data

Table 3-11 and Figure 3-8 provide a summary of the forecast models for aircraft operations anticipated at the airport over the 20-year planning period.
<table>
<thead>
<tr>
<th>Year</th>
<th>FAA Terminal Area Forecast (TAF)</th>
<th>FAA Aerospace Forecast - Active GA &amp; Air Taxi Fleet Hours Flown Growth Rate (.8%)</th>
<th>FAA Aerospace Forecast - Total Fuel Consumption Growth Rate (1.4%)</th>
<th>Growth Rate Based on Projected Employment Growth Rate (2.12%)</th>
<th>Trend Line Forecast Based on 2012-2018 Tower Ops Data (PREFERRED)</th>
<th>Combined Population Growth Rate for Austin-Round Rock and San Antonio-New Braunfels MSAs (2.91%)</th>
<th>Growth Rate Based on Austin-Round Rock MSA Population Growth Rate (3.53%)</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>62,719</td>
<td>68,132</td>
<td>69,024</td>
<td>61,659</td>
<td>69,558</td>
<td>68,537</td>
<td>70,901</td>
<td>68,537</td>
</tr>
<tr>
<td>2024</td>
<td>63,675</td>
<td>70,901</td>
<td>73,471</td>
<td>76,657</td>
<td>80,285</td>
<td>83,231</td>
<td>80,285</td>
<td>80,285</td>
</tr>
<tr>
<td>2029</td>
<td>64,656</td>
<td>73,783</td>
<td>78,760</td>
<td>85,135</td>
<td>92,666</td>
<td>98,996</td>
<td>92,666</td>
<td>92,666</td>
</tr>
<tr>
<td>2034</td>
<td>65,661</td>
<td>76,782</td>
<td>84,430</td>
<td>94,550</td>
<td>106,957</td>
<td>117,747</td>
<td>106,957</td>
<td>106,957</td>
</tr>
<tr>
<td>2039</td>
<td>66,691</td>
<td>79,902</td>
<td>90,508</td>
<td>105,006</td>
<td>123,452</td>
<td>140,049</td>
<td>123,452</td>
<td>123,452</td>
</tr>
</tbody>
</table>

Source: Garver Forecast Data for HYI, 2019 and FAA Aerospace Forecasts, Fiscal Years 2018-2038.
The San Marcos Regional Airport is expected to see a short-term decline in aircraft operations due to a reduced number of flight school operations. However, operations are expected to increase steadily in the long run due to economic and population increases in the region. Consequently, the trend line forecast was selected as the preferred aircraft operations forecast for the San Marcos Regional Airport as it shows a decline in operations in the short term but long term gains.
AIRCRAFT OPERATIONS FLEET MIX FORECAST

In addition to forecasting the total number of annual operations projected to occur at an airport during the forecast period, it is also critical to project the types of aircraft that will likely be operating at the airport.

An examination of historic Instrument Flight Rules (IFR) aircraft operations data at the San Marcos Regional Airport provides some guidance towards developing an accurate fleet mix forecast. Historic IFR flight data for an airport can be pulled from the FAA’s Traffic Flow Management System Counts (TFMSC) database. While IFR flight records account for only a fraction of the total operations that occur at an airport, they do provide an indicator of the type of aircraft that use the airfield and the frequency. It can also be assumed that most aircraft not operating under IFR flight rules at the airport are smaller single engine and light-twin engine aircraft that typically fall in the A-I and B-I aircraft classifications.

IFR flight data from 2013 through 2018 was used to analyze the current mix of aircraft using the San Marcos Regional Airport. Based on this data, discussions with airport stakeholders, and the airport’s current mix of based aircraft, the following aircraft operations fleet mix ratios were established for forecasting purposes:

- Single Engine Piston Aircraft – 79.75%
- Multi Engine Piston Aircraft – 8%
- Turbo-Prop Aircraft – 7%
- Jet – 5%
- Helicopter – .25%

For the purposes of these calculations, light sport aircraft and experimental aircraft have been included in the single-engine piston aircraft category. These ratios are expected to change during the forecast period based on national trends and expected changes in the airport’s-based aircraft fleet mix. Consequently, “acceleration” and “deceleration” factors were applied progressively to these baseline ratios during each forecast interval. Acceleration factors were applied to jet, turboprop, and helicopter aircraft. A deceleration factor was applied to single engine piston aircraft.
Table 3-12 and Figure 3-9 display the aircraft operations fleet mix forecast for the San Marcos Regional Airport for each phase throughout the 20-year planning period.

### TABLE 3-12
**SUMMARY OF OPERATIONS BY AIRCRAFT TYPE, 2019-2039**
SAN MARCOS REGIONAL AIRPORT

<table>
<thead>
<tr>
<th>Operations By Type</th>
<th>2018 Base Year</th>
<th>2019 PAL 1</th>
<th>2024 PAL 2</th>
<th>2029 PAL 3</th>
<th>2034 PAL 4</th>
<th>2039 PAL 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Engine</td>
<td>53,905</td>
<td>49,173</td>
<td>57,074</td>
<td>63,796</td>
<td>69,530</td>
<td>74,634</td>
</tr>
<tr>
<td>Multi-Engine</td>
<td>5,407</td>
<td>4,933</td>
<td>5,888</td>
<td>6,773</td>
<td>7,604</td>
<td>8,415</td>
</tr>
<tr>
<td>Turbo-Prop</td>
<td>4,731</td>
<td>4,316</td>
<td>5,888</td>
<td>7,620</td>
<td>9,504</td>
<td>11,570</td>
</tr>
<tr>
<td>Jet</td>
<td>3,379</td>
<td>3,083</td>
<td>4,416</td>
<td>5,927</td>
<td>7,604</td>
<td>9,468</td>
</tr>
<tr>
<td>Helicopter</td>
<td>169</td>
<td>154</td>
<td>331</td>
<td>550</td>
<td>808</td>
<td>1,105</td>
</tr>
<tr>
<td>Total</td>
<td>67,591</td>
<td>61,659</td>
<td>73,597</td>
<td>84,666</td>
<td>95,050</td>
<td>105,192</td>
</tr>
</tbody>
</table>

*Source: Garver Forecast Data for HYI, 2019*

### FIGURE 3-9
**SUMMARY OF OPERATIONS BY AIRCRAFT TYPE, 2019-2039**
SAN MARCOS REGIONAL AIRPORT

*Source: Garver Forecast Data for HYI, 2019*

Aircraft operations can be further broken down into Aircraft Approach Categories (AAC) and Airplane Design Groups (ADG). This helps to better define the types of
aircraft that will operate at the airport in the future. It also allows for better planning of future facilities and airside needs for the airport and the ability to justify such facilities when the market demands such construction. Most turboprop and jet aircraft currently using San Marcos fall into the B-II, C-I or C-II category. Since 2014, San Marcos has had a few operations in the C-III and D-I categories. The C-III activity is related primarily some to some infrequent DC-9 operations at the airport. The D-I activity is related to the utilization of some older Learjet models (e.g. models 35/36) with smaller wing surfaces and, consequently, higher approach speeds.

Based on this information, the following ratios were developed for the forecasted fleet mix:

- **Aircraft Approach Category (AAC):**
  - A – 88.75%
  - B – 10.00%
  - C/D – 1.0%

- **Aircraft Design Group (ADG):**
  - Group I – 90.65%
  - Group II – 9.00%
  - Group III – .10%
  - Group IV – Less than .01%
  - Helicopter – .25%

These ratios are expected to change during the forecast period based on national trends and expected changes in the airport’s-based aircraft fleet mix. Consequently, “acceleration” and “deceleration” factors were applied progressively to these baseline ratios during each forecast interval. Acceleration factors were applied to the AAC B and C/D categories as well as the ADG II, III, and helicopter categories. A deceleration factor was applied to the AAC A and ADG I categories.

Table 3-13 displays this breakdown for the 20-year planning effort.
TABLE 3-13
FLEET MIX OPERATIONS BY DESIGN GROUP, 2019-2039
SAN MARCOS REGIONAL AIRPORT

<table>
<thead>
<tr>
<th>Aircraft Approach Category</th>
<th>2018 Base Year</th>
<th>2019 PAL 1</th>
<th>2024 PAL 2</th>
<th>2029 PAL 3</th>
<th>2034 PAL 4</th>
<th>2039 PAL 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category A (Less Than 91 Knots)</td>
<td>59,987</td>
<td>54,722</td>
<td>63,698</td>
<td>71,416</td>
<td>78,083</td>
<td>84,101</td>
</tr>
<tr>
<td>Category B (92 – 120 Knots)</td>
<td>6,759</td>
<td>6,166</td>
<td>8,685</td>
<td>11,515</td>
<td>14,638</td>
<td>18,093</td>
</tr>
<tr>
<td>Category C/D (121 – 160 Knots)</td>
<td>676</td>
<td>617</td>
<td>883</td>
<td>1185</td>
<td>1521</td>
<td>1893</td>
</tr>
<tr>
<td>Helicopter</td>
<td>169</td>
<td>154</td>
<td>331</td>
<td>550</td>
<td>808</td>
<td>1,105</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Airplane Design Group</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I (Less Than 49 Feet)</td>
<td>61,271</td>
<td>55,894</td>
<td>65,096</td>
<td>73,025</td>
<td>79,320</td>
<td>86,099</td>
</tr>
<tr>
<td>Group II (49 Feet To 78 Feet)</td>
<td>6,083</td>
<td>5,549</td>
<td>7,949</td>
<td>10,668</td>
<td>14,257</td>
<td>17,041</td>
</tr>
<tr>
<td>Group III (79 Feet To 117 Feet)</td>
<td>68</td>
<td>61</td>
<td>218</td>
<td>418</td>
<td>655</td>
<td>935</td>
</tr>
<tr>
<td>Group IV (118 Feet To 170 Feet)</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Helicopter</td>
<td>169</td>
<td>154</td>
<td>331</td>
<td>550</td>
<td>808</td>
<td>1,105</td>
</tr>
<tr>
<td>Total</td>
<td>67,591</td>
<td>61,659</td>
<td>73,597</td>
<td>84,666</td>
<td>95,050</td>
<td>105,192</td>
</tr>
</tbody>
</table>

Source: Garver Forecast Data for HYI, 2019

Aircraft Approach Category is based on 1.3 times the stall speed of the aircraft at the maximum certified landing weight in the landing configuration. Representative of the anticipated operations for each aircraft approach category and airplane design group. Totals may not equal due to rounding.

**LOCAL AND ITINERANT OPERATIONS FORECAST**

According to FAA Order JO 7210.3AA, *Facility Operation and Administration, September 12, 2017*, a local operation is any operation performed by an aircraft that remains in the local traffic pattern, performs a simulated instrument approach, or operates to or from the Airport and a practice area within a 20-mile radius of the airport or tower. An itinerant operation is any operation that is not considered local. Based on historic operations data from the tower and discussions with airport stakeholders, on average it is estimated that 42.1% of the operations conducted at the airport are local and 57.9% percent are itinerant. These percentages are expected to remain at or near these same levels throughout the forecast period.

*Table 3-14 and Figure 3-10* provides a summary of this information.
### Table 3-14
**Summary of Local and Itinerant Operations, 2019-2039**
**San Marcos Regional Airport**

<table>
<thead>
<tr>
<th>Year</th>
<th>2018 Base Year</th>
<th>2019 PAL 1</th>
<th>2024 PAL 2</th>
<th>2029 PAL 3</th>
<th>2034 PAL 4</th>
<th>2039 PAL 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Local Operations</strong></td>
<td>28,447</td>
<td>25,951</td>
<td>30,975</td>
<td>35,634</td>
<td>40,005</td>
<td>44,273</td>
</tr>
<tr>
<td><strong>Itinerant Operations</strong></td>
<td>39,144</td>
<td>35,708</td>
<td>42,622</td>
<td>49,032</td>
<td>55,045</td>
<td>60,919</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>67,591</td>
<td>61,659</td>
<td>73,597</td>
<td>84,666</td>
<td>95,050</td>
<td>105,192</td>
</tr>
</tbody>
</table>

*Source: Garver Forecast Data for HYI, 2019*

### Figure 3-10
**Summary of Local and Itinerant Operations, 2019-2039**
**San Marcos Regional Airport**

*Source: Garver Forecast Data for HYI, 2019*

### Annual Instrument Approach Forecast

The forecast of Annual Instrument Approaches (AIAs) provides further guidance in determining requirements for the type, extent, and timing of future navigational aid (NAVAID) equipment.
The forecast for instrument approach procedures is based on the IFR flight plan filings for the last five-year period. During the last five year period there has been an average of 9,637 IFR operations (takeoffs/landings) at the airport each year. Dividing this number in half provides an estimate on the number of IFR approaches annually.

The number of instrument approaches conducted at the airport is expected to increase during the forecast period as a result of changes in aircraft fleet mix (e.g. more jet, turboprop, etc.). Jet and turboprop aircraft typically operate on IFR flight plans. Consequently, as the number of jet and turboprop aircraft using the airport increase, the number of instrument approaches to the airport are also expected to increase.

**Table 3-15** summarizes the forecast of annual instrument approaches at the Airport throughout the planning period.

<table>
<thead>
<tr>
<th>Category</th>
<th>2018 Base Year</th>
<th>2019 PAL 1</th>
<th>2024 PAL 2</th>
<th>2029 PAL 3</th>
<th>2034 PAL 4</th>
<th>2039 PAL 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Operations</td>
<td>67,591</td>
<td>61,659</td>
<td>73,597</td>
<td>84,666</td>
<td>95,050</td>
<td>105,192</td>
</tr>
<tr>
<td>Forecasted Number of Approaches</td>
<td>6,440</td>
<td>5,875</td>
<td>7,748</td>
<td>9,760</td>
<td>11,908</td>
<td>14,230</td>
</tr>
</tbody>
</table>

**Source:** Garver Forecast Data for HYI, 2019

**CRITICAL AIRCRAFT**

The “critical” aircraft at an airport is the largest and most demanding aircraft or category of aircraft conducting at least 500 operations per year. Determining the critical aircraft is important for assessing airport design and layout and the structural and equipment needs for both the airfield and terminal area. It is evaluated with respect to aircraft size, speed, and weight. The aircraft operating at San Marcos vary from small piston aircraft, to business jets, to cargo aircraft.

Based on the types of aircraft utilizing the airport, the existing “critical” aircraft at the airport is in the Runway Design Code (RDC) C-II category. Based on forecasting analysis shown in this chapter, the airport’s future critical aircraft could move into the C-III category.
Table 3-16 shows the most common aircraft operating at San Marcos that define its current critical aircraft category. The chart below shows the characteristics and operational frequency of some of the larger aircraft that operated at San Marcos during 2018 according to the FAA's Traffic Flow Management System (TFMSC) database.

<table>
<thead>
<tr>
<th>Aircraft Type and ARC</th>
<th>Wingspan</th>
<th>Height</th>
<th>Max Gross Takeoff Weight</th>
<th>Approach Speed</th>
<th># of Operations in 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embraer Brasilia EMB 120 ARC B-II</td>
<td>65.0 ft</td>
<td>21.0 ft</td>
<td>26,433 lbs.</td>
<td>120 kts</td>
<td>818</td>
</tr>
<tr>
<td>Beech 200 Super King (BE20) ARC B-II</td>
<td>54.50 ft.</td>
<td>17.21 ft.</td>
<td>20,000 lbs.</td>
<td>98 kts</td>
<td>325</td>
</tr>
<tr>
<td>Cessna Citation Excel/XLS ARC B-II</td>
<td>56.33 ft</td>
<td>17.17 ft</td>
<td>20,200 lbs</td>
<td>117 kts</td>
<td>242</td>
</tr>
<tr>
<td>Dassault Falcon/Mystère 50 ARC B-II</td>
<td>61.88 ft</td>
<td>22.90 ft</td>
<td>40,780 lbs</td>
<td>113 kts</td>
<td>106</td>
</tr>
<tr>
<td>Bombardier DHC8-200 ARC B-III</td>
<td>85.00 ft</td>
<td>24.58 ft</td>
<td>36,300 lbs</td>
<td>92 kts</td>
<td>41</td>
</tr>
<tr>
<td>Bombardier Challenger 300 ARC B-II</td>
<td>63.83 ft</td>
<td>20.33 ft</td>
<td>38,850 lbs</td>
<td>117 kts</td>
<td>12</td>
</tr>
<tr>
<td>Boeing (Douglas) DC 9-10 C-III</td>
<td>89.40 ft</td>
<td>27.58 ft</td>
<td>90,700 lbs</td>
<td>132 kts</td>
<td>12</td>
</tr>
<tr>
<td>Gulfstream IV/G400 D-II</td>
<td>77.83 ft</td>
<td>24.42 ft</td>
<td>73,200 lbs</td>
<td>150 kts</td>
<td>10</td>
</tr>
</tbody>
</table>

Source: FAA TFMS database, Aircraft Characteristics Database

A key driver of the move from a C-II to a C-III critical aircraft will be the proposed replacement of the Embraer 120 aircraft operating at the airport with the larger and faster Bombardier Q400 aircraft. This aircraft equipment change is being strongly considered by a tenant at the airport.
AIRCRAFT OPERATIONS PEAKING FORECAST

A primary consideration for facility planning should be the peaking characteristics of an airport’s activity level. To the greatest extent possible, airport facilities should be designed to be able to effectively accommodate normal peaks in aircraft traffic. Historic ATCT operational data was utilized to estimate peaks in operational activity.

For the purposes of this study, it was estimated that the peak month would have approximately 10.5% of total annual operations. The Peak Month Average Day (PMAD) forecasts were developed by dividing the peak month forecast levels by 30 days. The Peak Hour operations calculations assume that 15% of the total PMAD traffic would occur during the peak hour.

Table 3-17 depicts the forecasted peaking numbers for San Marcos.

<table>
<thead>
<tr>
<th>TABLE 3-17</th>
<th>AIRCRAFT OPERATIONS PEAKING, 2019-2039</th>
<th>SAN MARCOS REGIONAL AIRPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>2018 Base Year</td>
<td>2019 PAL 1</td>
</tr>
<tr>
<td>Peak Month PMAD Operations</td>
<td>7,097</td>
<td>6,474</td>
</tr>
<tr>
<td>Peak Hour Operations</td>
<td>237</td>
<td>216</td>
</tr>
<tr>
<td>Total Annual Operations</td>
<td>35</td>
<td>32</td>
</tr>
<tr>
<td>Source: Garver Forecast Data for HYI, 2019</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FORECAST SUMMARY

The various forecast elements discussed in this chapter are displayed in Table 3-18. The forecasts, combined with the inventory data, will be used to identify “development objectives” as part of the facility requirements process. The next chapter, Facility Requirements, identifies the types and extent of facilities needed to adequately accommodate the demand levels identified in this chapter.
## TABLE 3-18
### AVIATION FORECAST SUMMARY, 2019-2039
#### SAN MARCOS REGIONAL AIRPORT

**Based Aircraft By Type**

<table>
<thead>
<tr>
<th>Year</th>
<th>2018 Base Year</th>
<th>2019 PAL 1</th>
<th>2024 PAL 2</th>
<th>2029 PAL 3</th>
<th>2034 PAL 4</th>
<th>2039 PAL 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Engine Piston</td>
<td>160</td>
<td>162</td>
<td>168</td>
<td>178</td>
<td>186</td>
<td>195</td>
</tr>
<tr>
<td>Multi-Engine Piston</td>
<td>16</td>
<td>16</td>
<td>20</td>
<td>24</td>
<td>28</td>
<td>32</td>
</tr>
<tr>
<td>Turboprop</td>
<td>9</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>27</td>
<td>35</td>
</tr>
<tr>
<td>Jet</td>
<td>14</td>
<td>15</td>
<td>21</td>
<td>27</td>
<td>35</td>
<td>45</td>
</tr>
<tr>
<td>Helicopter</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td>204</td>
<td>227</td>
<td>253</td>
<td>282</td>
<td>315</td>
</tr>
</tbody>
</table>

**Aircraft Operations by Type**

<table>
<thead>
<tr>
<th>Year</th>
<th>2018 Base Year</th>
<th>2019 PAL 1</th>
<th>2024 PAL 2</th>
<th>2029 PAL 3</th>
<th>2034 PAL 4</th>
<th>2039 PAL 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Engine</td>
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<td>57,074</td>
<td>63,796</td>
<td>69,530</td>
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<td>5,888</td>
<td>6,773</td>
<td>7,604</td>
<td>8,415</td>
</tr>
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<td>Turbo-Prop</td>
<td>4,731</td>
<td>4,316</td>
<td>5,888</td>
<td>7,620</td>
<td>9,504</td>
<td>11,570</td>
</tr>
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<td>Jet</td>
<td>3,379</td>
<td>3,083</td>
<td>4,416</td>
<td>5,927</td>
<td>7,604</td>
<td>9,468</td>
</tr>
<tr>
<td>Helicopter</td>
<td>169</td>
<td>154</td>
<td>331</td>
<td>550</td>
<td>808</td>
<td>1,105</td>
</tr>
<tr>
<td>Local Operations</td>
<td>28,447</td>
<td>25,951</td>
<td>30,975</td>
<td>35,634</td>
<td>40,005</td>
<td>44,273</td>
</tr>
<tr>
<td>Itinerant Operations</td>
<td>39,144</td>
<td>35,708</td>
<td>42,622</td>
<td>49,032</td>
<td>55,045</td>
<td>60,919</td>
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<td>Total</td>
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<td>61,659</td>
<td>73,597</td>
<td>84,666</td>
<td>95,050</td>
<td>105,192</td>
</tr>
</tbody>
</table>

**Source:** Garver Forecast Data for HYI, 2019
**TAF Comparison**

Table 3-19 shows the preferred baseline based aircraft and aircraft operations forecasts in comparison to the current FAA TAF for San Marcos Regional Airport.

<table>
<thead>
<tr>
<th>Year</th>
<th>TAF Forecast</th>
<th>Preferred Forecast</th>
<th>% Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Year +1 (2019)</td>
<td>138</td>
<td>204</td>
<td>47.83%</td>
</tr>
<tr>
<td>Base Year +5 (2024)</td>
<td>158</td>
<td>227</td>
<td>43.67%</td>
</tr>
<tr>
<td>Base Year +10 (2029)</td>
<td>178</td>
<td>253</td>
<td>42.13%</td>
</tr>
<tr>
<td>Base Year +15 (2034)</td>
<td>198</td>
<td>282</td>
<td>42.42%</td>
</tr>
<tr>
<td>Base Year +20 (2039)</td>
<td>218</td>
<td>315</td>
<td>44.50%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>TAF Forecast</th>
<th>Preferred Forecast</th>
<th>% Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Year +1 (2019)</td>
<td>62,719</td>
<td>61,659</td>
<td>-1.69%</td>
</tr>
<tr>
<td>Base Year +5 (2024)</td>
<td>63,675</td>
<td>73,597</td>
<td>15.58%</td>
</tr>
<tr>
<td>Base Year +10 (2029)</td>
<td>64,656</td>
<td>84,666</td>
<td>30.95%</td>
</tr>
<tr>
<td>Base Year +15 (2034)</td>
<td>65,661</td>
<td>95,050</td>
<td>44.76%</td>
</tr>
<tr>
<td>Base Year +20 (2039)</td>
<td>66,691</td>
<td>105,192</td>
<td>57.73%</td>
</tr>
</tbody>
</table>

Source: Garver Forecast Data for HYI, 2019

As discussed earlier in this chapter, the TAF’s forecast of based aircraft for San Marcos is significantly lower than the current based aircraft figures for the airport. This resulted in the preferred based aircraft forecast being significantly higher than the based aircraft figures shown in the TAF. However, it should be noted that the overall average annual growth rate of the preferred based aircraft forecast is actually lower than the average annual growth rate for based aircraft shown in the FAA’s TAF.

The aircraft operations forecast shown in the TAF shows very slow growth during the forecast period compared to the preferred operations forecast. Due to the economic growth in the Austin and San Antonio area, many airports (especially in the Austin area) have seen significant increases in operations over the past 5 to 8 years. If the economic growth expected in the Hays and Caldwell County regions occurs as expected, similar increases in aircraft operations are expected at the San Marcos Regional Airport.
Chapter 4 – Facility Requirements

INTRODUCTION

This chapter evaluates existing airport facilities and identifies the improvements needed to effectively meet the forecasted demand levels discussed in the Forecast Chapter in a manner that complies with FAA standards and best practices. Identification of a needed facility or infrastructure improvement does not necessarily constitute a “requirement” in terms of design standards, but an improvement “option” to accommodate future aviation activity levels. Market demand will ultimately drive facility development at the San Marcos Regional Airport (HYI) and the operational levels defined in the forecast chapter (e.g. enplanements, aircraft operations, based aircraft, etc.) should be used to help guide the timing and need for future developments/improvements.

Airport facilities can be divided into two areas: airside/airspace and terminal/landside. The airside/airspace facilities include an airport’s runways, taxiways, protected surfaces (e.g. safety areas, object free areas, etc.), airspace, navigational aids (NAVAIDs), airfield marking/signage, and lighting. The terminal/landside area components include the airport’s hangars, terminal/FBO facilities, aircraft parking apron, fuel storage and delivery, vehicular parking, and airport vehicle access routes.

Each of these facilities, including their current condition and forecasted demand, will be discussed in the remainder of this chapter. The results of this chapter will be utilized to drive the alternatives developed in Chapter 5.

AIRSIDE/AIRSPACE FACILITIES

RUNWAY ALIGNMENT

An evaluation of runway alignment is based on crosswind coverage and velocity using guidance provided in FAA Advisory Circular 150-5300-13 (current series), Airport Design. In general, the FAA deems a runway to have sufficient wind coverage when the wind coverage is 95% or better for the runway’s allowable crosswind component which is based on the runway’s Runway Design Code (RDC). The term
“crosswind component” refers to the average maximum wind velocity in a direction perpendicular to the runway’s alignment (e.g. wind blowing across the runway) that a particular category of aircraft can safely land in. The higher the RDC for a runway, the higher the allowable crosswind component for the runway will be.

Currently, the established RDC for Runway 8/26 and Runway 17/35 is B-II which has an allowable crosswind component of 13 knots. Runway 13/31 has an established RDC of C-II which has an allowable crosswind component of 16 knots.

Table 4-1, Runway Crosswind Coverage, shows the crosswind coverage percentages for each runway at the San Marcos Regional Airport and the combined runway wind coverage percentage.

<table>
<thead>
<tr>
<th>Runway</th>
<th>All Weather Wind Coverage %</th>
<th>IFR Wind Coverage %</th>
<th>VFR Wind Coverage %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10.5 Knots</td>
<td>13 Knots</td>
<td>16 Knots</td>
</tr>
<tr>
<td>8/26</td>
<td>79.04%</td>
<td>86.87%</td>
<td>95.35%</td>
</tr>
<tr>
<td>13/31</td>
<td>87.36%</td>
<td>93.23%</td>
<td>98.05%</td>
</tr>
<tr>
<td>17/35</td>
<td>97.28%</td>
<td>98.99%</td>
<td>99.77%</td>
</tr>
<tr>
<td>17/35 &amp; 13/31</td>
<td>98.04%</td>
<td>99.40%</td>
<td>99.90%</td>
</tr>
<tr>
<td>17/35 &amp; 8/26</td>
<td>98.93%</td>
<td>99.75%</td>
<td>99.95%</td>
</tr>
<tr>
<td>All</td>
<td>99.20%</td>
<td>99.82%</td>
<td>99.97%</td>
</tr>
</tbody>
</table>


Based on this analysis, Runway 17/35 meets the FAA wind coverage requirement (95% or more) for the RDC B-II crosswind component of 13 knots and Runway 13/31 meets the same requirement for the RDC C-II crosswind component of 16 knots. Runway 8/26 does not meet the wind coverage requirement for a runway with a B-II RDC.

In general, Runway 17/35 has the best wind coverage of the three runways at the San Marcos Regional Airport with over 96.62% wind coverage in all three crosswind component categories (e.g. all-weather, IFR, and VFR). As a result, Runway 17/35
should be a key development focus for the airport moving forward and should be developed as the airport’s primary runway.

Additionally, it should be noted that the additional wind coverage gained by combining Runway 13/31 or Runway 8/26 with the wind coverage provided by Runway 17/35 is incremental and no substantial difference in wind coverage exists between the wind coverage provided by all three runways as opposed to only two of the runways (e.g. Runway 17/35 and either Runway 8/26 or Runway 13/31). As a result, a third runway is not necessary for wind coverage purposes.

**RUNWAY LENGTH**

Runway length requirements for an airport can be evaluated utilizing a number of methodologies. To ensure a thorough and complete analysis regarding the sufficiency of the San Marcos Regional Airport's current runway length, two evaluation methodologies were used for this analysis:

1. Runway Length Evaluation based on AC 150/5325-4B
2. Runway Length Evaluation Utilizing Forecasted Fleet Mix and Airport Planning Manuals (AMP) or Manufacturer Data for Aircraft Expected to Frequently Use San Marcos Regional Airport

**Runway Length Evaluation Based on AC 150/5325-4B**

FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance to help determine the most appropriate recommended runway lengths for an airport. Runway length is typically predicated upon the category of aircraft using or forecasted to use the airport. By design, the primary runway at an airport is typically the longest runway, with the most favorable wind conditions, the highest pavement strength, and the lowest straight-in instrument approach minimums.

A significant factor to consider when analyzing the generalized runway length requirements for an airport is that aircraft takeoff performance is a function of an airport’s elevation, temperature, and the slope of a runway as well as the aircraft’s payload vs. fuel load, stage length, and general performance characteristics. As these factors change, the runway length requirements for an aircraft change accordingly. Consequently, if a runway is designed to accommodate 75% of the fleet at 60% useful load, this does not prevent larger aircraft at certain times and
during specific conditions from utilizing the runway. However, the amount of time such operations can safely occur is limited.

As Table 4-2, Generalized Runway Length Requirements Based on AC 150/5325-4B, indicates all the runways at the San Marcos Regional Airport meet the runway length requirements for small aircraft (less than 12,500 lbs.) and the runway length requirements for 75% of large aircraft (12,500 lbs. to 60,000 lbs.) at 60% of the useful load.

Only Runway 8/26 currently meets the requirements for 100% of large aircraft at 60% useful load. The generalized runway length requirements shown in Table 4-2 were derived from the nomographs contained in AC 150/5325-4B, Runway Length Requirements for Airport Design.
### TABLE 4-2
**GENERALIZED RUNWAY LENGTH REQUIREMENTS BASED ON AC 150/5325-4B**
**SAN MARCOS REGIONAL AIRPORT**

<table>
<thead>
<tr>
<th>Aircraft Category</th>
<th>Runway Designation</th>
<th>Current Runway Length</th>
<th>Runway Length Requirement</th>
<th>Deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Small Aircraft: 12,500 pounds or less:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>95% GA Fleet</td>
<td>13/31</td>
<td>5,601</td>
<td>3,400</td>
<td>2,201</td>
</tr>
<tr>
<td></td>
<td>8/26</td>
<td>6,330</td>
<td></td>
<td>2,930</td>
</tr>
<tr>
<td></td>
<td>17/35</td>
<td>5,214</td>
<td></td>
<td>1,814</td>
</tr>
<tr>
<td>100% GA Fleet</td>
<td>13/31</td>
<td>5,601</td>
<td>4,000</td>
<td>1,601</td>
</tr>
<tr>
<td></td>
<td>8/26</td>
<td>6,330</td>
<td></td>
<td>2,330</td>
</tr>
<tr>
<td></td>
<td>17/35</td>
<td>5,214</td>
<td></td>
<td>1,214</td>
</tr>
<tr>
<td>100% GA Fleet with 10 or more passenger seats</td>
<td>13/31</td>
<td>5,601</td>
<td>4,400</td>
<td>1,201</td>
</tr>
<tr>
<td></td>
<td>8/26</td>
<td>6,330</td>
<td></td>
<td>1,930</td>
</tr>
<tr>
<td></td>
<td>17/35</td>
<td>5,214</td>
<td></td>
<td>814</td>
</tr>
<tr>
<td><strong>Large Aircraft between 12,500 and 60,000 pounds:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75% of fleet at 60% useful load</td>
<td>13/31</td>
<td>5,601</td>
<td>5,047</td>
<td>554</td>
</tr>
<tr>
<td></td>
<td>8/26</td>
<td>6,330</td>
<td>4,928</td>
<td>1,402</td>
</tr>
<tr>
<td></td>
<td>17/35</td>
<td>5,214</td>
<td>5,045</td>
<td>169</td>
</tr>
<tr>
<td>75% of fleet at 90% useful load</td>
<td>13/31</td>
<td>5,601</td>
<td>7,547</td>
<td>-1,946</td>
</tr>
<tr>
<td></td>
<td>8/26</td>
<td>6,330</td>
<td>7,428</td>
<td>-1,098</td>
</tr>
<tr>
<td></td>
<td>17/35</td>
<td>5,214</td>
<td>7,545</td>
<td>-2,331</td>
</tr>
<tr>
<td>100% of fleet at 60% useful load</td>
<td>13/31</td>
<td>5,601</td>
<td>6,147</td>
<td>-546</td>
</tr>
<tr>
<td></td>
<td>8/26</td>
<td>6,330</td>
<td>6,028</td>
<td>302</td>
</tr>
<tr>
<td></td>
<td>17/35</td>
<td>5,214</td>
<td>6,145</td>
<td>-931</td>
</tr>
<tr>
<td>100% of fleet at 90% useful load</td>
<td>13/31</td>
<td>5,601</td>
<td>9,697</td>
<td>-4,096</td>
</tr>
<tr>
<td></td>
<td>8/26</td>
<td>6,330</td>
<td>9,578</td>
<td>-3,248</td>
</tr>
<tr>
<td></td>
<td>17/35</td>
<td>5,214</td>
<td>9,695</td>
<td>-4,481</td>
</tr>
</tbody>
</table>

**Source:** AC 150/5325-4B Figures 2-1, 2-2, 3-1 and 3-2. Generalized length only. Actual lengths should be calculated based on the specific aircraft's operational nomographs. Useful load refers to all usable fuel, passengers, and cargo. Calculations based on 594.7” MSL airport elevation, mean maximum daily temperature of 97˚F. The runway end elevation differences for HYI are as follows: RWY 8/26 – 7.8 feet, RWY 13/31 – 19.7 feet, RWY 17/35 – 19.5 feet. Figures are increased 10 feet for each foot of elevation difference between high and low points of runway centerline.

Based on this analysis, there are likely times during the year when the stage length and/or payload of certain aircraft would be limited when operating from the San Marcos Regional Airport. This is primarily a concern with Runway 17/35 and Runway 13/31 as they are the shorter of the three runways and are the runways used most frequently due to their wind coverage. However, the majority of the large aircraft departing from San Marcos are flying to locations within the continental United States and, consequently, are likely not required to depart the
airport at their Maximum Takeoff Weight (MTOW) with a full load of fuel to reach their destination. As a result, a more detailed analysis utilizing the specific aircraft types expected to use the airport in the future is necessary to determine future runway length requirements. This analysis is included in the section below.

**Runway Length Evaluation Based on Aircraft Planning Manuals and Manufacturer Data**

The sufficiency of a runway's length can also be evaluated by reviewing the performance characteristics of aircraft that currently use or are forecasted to operate from an airport. Information regarding aircraft performance can typically be obtained by reviewing a given aircraft’s Airport Planning Manual (APM) published by the aircraft’s manufacturer or by contacting the aircraft manufacturer directly.

Based on discussions with airport personnel and tenants, the following aircraft makes/models were selected for an in-depth analysis to study the sufficiency of the length of the existing runways at the San Marcos Regional Airport:

- **Large and Mid-Sized Corporate Jets**
  - Gulfstream 450
  - Gulfstream 550
  - Gulfstream 650
  - Bombardier Challenger 650
  - Bombardier Global Express 5000
  - Bombardier Global Express 6000

- **Other Potential Future Aircraft**
  - Bombardier Canadair Regional Jet 200 LR
  - Bombardier Q400
  - Boeing 737-800 (cargo)

The number of aircraft operating at the airport in the large and mid-sized corporate jet category are expected to increase in the future with the continued growth of the local and regional economy and the increase in the number of aircraft in this category that are being manufactured. The aircraft types identified in the “other potential future aircraft” grouping were specifically mentioned by current airport tenants or airport stakeholders during meetings held as part of the master planning effort. The Bombardier Q400 is the expected replacement for the Embraer
120 aircraft that currently operate at the airport on a regular basis. The Bombardier Canadair Regional Jet 200 LR is a potential alternate for the Q400. The Boeing 737-800 is the short to mid-haul cargo aircraft currently being used by Amazon Air.

Table 4-3 through Table 4-5, *Aircraft Range and Maximum Runway Length Analysis*, shows the estimated maximum range that each of the nine selected aircraft can achieve when departing the San Marcos Regional Airport at 97°F utilizing each of airport’s three existing runways. These range calculations assume that each aircraft is operating at 80% of its maximum payload (e.g. cargo/ passengers) and carrying the maximum fuel load possible to maximize range. The table also shows the runway length necessary for the aircraft to achieve its maximum published range (e.g. a departure at the airport’s published Maximum Takeoff Weight – MTOW). The aircraft range and takeoff performance calculations for each of these aircraft were developed using the Airport Planning Manuals (APM) for the aircraft and/or calculations provided by the aircraft manufacturers.

**TABLE 4-3**

**AIRCRAFT RANGE AND MAXIMUM RUNWAY LENGTH ANALYSIS – GULFSTREAM AIRCRAFT**

<table>
<thead>
<tr>
<th>Range (NM)</th>
<th>Gulfstream 450</th>
<th>Gulfstream 550</th>
<th>Gulfstream 650</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range using Existing Runway 8/26 - 6,330 ft. Length</td>
<td>4,080</td>
<td>5,680</td>
<td>5,706</td>
</tr>
<tr>
<td>Range using Existing Runway 13/31 - 5,601 ft. Length</td>
<td>3,543</td>
<td>5,009</td>
<td>4,791</td>
</tr>
<tr>
<td>Range using Existing Runway 17/35 - 5,214 ft. Length</td>
<td>3,199</td>
<td>4,644</td>
<td>4,547</td>
</tr>
<tr>
<td>Runway Length (ft.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Runway Length Necessary to Depart HYI at MTOW (ft.)</td>
<td>6,668</td>
<td>7,577</td>
<td>7,417</td>
</tr>
<tr>
<td>Published Maximum Range (NM)</td>
<td>4,350</td>
<td>6,750</td>
<td>7,000</td>
</tr>
</tbody>
</table>

**Source:** Aircraft Manufacturers – Airport Planning Manuals and Gulfstream
### TABLE 4-4
AIRCRAFT RANGE AND MAXIMUM RUNWAY LENGTH ANALYSIS – BOMBARDIER AIRCRAFT
SAN MARCOS REGIONAL AIRPORT

<table>
<thead>
<tr>
<th>Range (NM)</th>
<th>Challenger 650</th>
<th>Global 5000</th>
<th>Global 6000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range using Existing Runway 8/26 - 6,330 ft. Length</td>
<td>2,521</td>
<td>4,920</td>
<td>4,993</td>
</tr>
<tr>
<td>Range using Existing Runway 13/31 - 5,601 ft. Length</td>
<td>2,000</td>
<td>4,256</td>
<td>4,297</td>
</tr>
<tr>
<td>Range using Existing Runway 17/35 - 5,214 ft. Length</td>
<td>1,640</td>
<td>4,131</td>
<td>4,092</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Runway Length (ft.)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Runway Length Necessary to Depart HYI at MTOW (ft.)</td>
<td>6,715</td>
<td>7,159</td>
<td>9,386</td>
</tr>
<tr>
<td>Published Maximum Range (NM)</td>
<td>4,000</td>
<td>5,200</td>
<td>6,000</td>
</tr>
</tbody>
</table>

**Source:** Aircraft Manufacturer – Airport Planning Manuals and Bombardier

### TABLE 4-5
AIRCRAFT RANGE AND MAXIMUM RUNWAY LENGTH ANALYSIS – OTHER AIRCRAFT
SAN MARCOS REGIONAL AIRPORT

<table>
<thead>
<tr>
<th>Range (NM)</th>
<th>Q400</th>
<th>B-737-800</th>
<th>CRJ 200 LR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range using Existing Runway 8/26 - 6,330 ft. Length</td>
<td>1,506</td>
<td>1,400</td>
<td>823</td>
</tr>
<tr>
<td>Range using Existing Runway 13/31 - 5,601 ft. Length</td>
<td>1,506</td>
<td>700</td>
<td>315</td>
</tr>
<tr>
<td>Range using Existing Runway 17/35 - 5,214 ft. Length</td>
<td>1,285</td>
<td>200</td>
<td>55</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Runway Length (ft.)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Runway Length Necessary to Depart HYI at MTOW (ft.)</td>
<td>5,450</td>
<td>8,300</td>
<td>7,910</td>
</tr>
<tr>
<td>Published Maximum Range (NM)</td>
<td>1,506</td>
<td>4,000</td>
<td>1,585</td>
</tr>
</tbody>
</table>

**Source:** Aircraft Manufacturers – Airport Planning Manuals and Boeing

Of the nine aircraft examined, only the Q400 can depart the San Marcos Regional Airport at its established MTOW at 97°F utilizing the airport’s existing runway lengths. The remaining eight aircraft cannot depart the San Marcos Regional Airport at their established MTOW at 97°F and achieve their maximum range, meaning that a runway extension would enable a range increase for these aircraft. However, since most of the aircraft departing the San Marcos Regional Airport are flying domestic routes or shorter international routes, it is not expected that the existing runway length is a limiting factor for most aircraft operations.

The key driver in determining future runway length requirements at the San Marcos Regional Airport will lie with the potential operation of the Boeing 737-800 and the...
CRJ 200 LR and whether the mid-size to large corporate aircraft using the airport begin flying longer stage lengths. If these operations come to fruition, increases in runway length will likely be necessary.

**Runway Length Analysis Conclusions**

Based on the results of this runway length analysis, a runway extension should be planned for to ensure that property and airspace are protected for a future runway extension. The primary runway that should be protected for this purpose is Runway 17/35 due to its wind coverage. As a result, it is recommended that the alternatives process evaluate the feasibility of extending Runway 17/35 to 7,000 ft.

**Runway Strength**

FAA AC 150/5320-6E, *Airport Pavement Design and Evaluation*, provides guidance on the structural design of airport pavements. The FAA requires the use of the pavement design program, FAARFIELD, to determine the pavement section that will support the various aircraft gear loadings the pavement is expected to support. The design is based on a 20-year pavement life cycle. To establish the required pavement section, FAARFIELD analyzes the damage to the pavement done by each aircraft and determines the final pavement thickness/structure based on the total cumulative damage of all aircraft.

The runway pavement strength for each of the runways at the San Marcos Regional Airport is shown in Table 4-6, *Existing Runway Weight Bearing Capacity*.

<table>
<thead>
<tr>
<th>Weight Bearing Capacity (pounds)</th>
<th>Runway 8/26</th>
<th>Runway 13/31</th>
<th>Runway 17/35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Wheel Gear (SWG)</td>
<td>38,500</td>
<td>23,000</td>
<td>28,000</td>
</tr>
<tr>
<td>Double Wheel Gear (DWG)</td>
<td>56,500</td>
<td>-</td>
<td>43,500</td>
</tr>
<tr>
<td>Dual Tandem Wheel (DTW)</td>
<td>106,000</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Source:* Pavement strength numbers shown above are from a memo from Fugro USA Land, Inc. to KSA Engineers, Inc. dated February 7, 2019 discussing the structural capacity of the runways. Fugro USA Land, Inc. performed a pavement structural capacity evaluation for the airport in 2015. The pavement strength figures shown in the report differ from the figures currently shown in the current FAA Form 5010 and on the previous Airport Layout Plan.
Table 4-7, *Current and Historic Fleet Mix MTOW and Gear Configurations*, shows the landing gear configuration and MTOW of the larger aircraft that are currently operating at the airport.

**TABLE 4-7**

CURRENT AND HISTORIC FLEET MIX MTOW AND GEAR CONFIGURATIONS

<table>
<thead>
<tr>
<th>Aircraft</th>
<th>Gear Configuration</th>
<th>MTOW (Lbs)</th>
<th># of OPS (5 years)</th>
<th># of OPS (2018)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boeing (Douglas) DC-9-10</td>
<td>Double Wheel</td>
<td>90,700</td>
<td>37</td>
<td>12</td>
</tr>
<tr>
<td>Dassault Falcon/Mystère 50 (FA50)</td>
<td>Double Wheel</td>
<td>40,780</td>
<td>398</td>
<td>106</td>
</tr>
<tr>
<td>Bombardier DHC8-200/100</td>
<td>Double Wheel</td>
<td>36,300</td>
<td>110</td>
<td>41</td>
</tr>
<tr>
<td>Cessna Citation X C750</td>
<td>Double Wheel</td>
<td>36,100</td>
<td>105</td>
<td>21</td>
</tr>
<tr>
<td>Dornier 328 (D328)</td>
<td>Double Wheel</td>
<td>30,843</td>
<td>62</td>
<td>0</td>
</tr>
<tr>
<td>BAe HS 125/700-800/Hawker 800 (H25B)</td>
<td>Double Wheel</td>
<td>28,000</td>
<td>102</td>
<td>20</td>
</tr>
<tr>
<td>Embraer Brasilia E120</td>
<td>Double Wheel</td>
<td>26,433</td>
<td>2,499</td>
<td>818</td>
</tr>
<tr>
<td>Cessna Excel/XLS (C56X)</td>
<td>Single Wheel</td>
<td>20,200</td>
<td>957</td>
<td>242</td>
</tr>
<tr>
<td>Beech Super King Air 350 (B350)</td>
<td>Double Wheel</td>
<td>16,500</td>
<td>274</td>
<td>54</td>
</tr>
<tr>
<td>Cessna Citation Cj3 (C25B)</td>
<td>Single Wheel</td>
<td>13,870</td>
<td>694</td>
<td>188</td>
</tr>
<tr>
<td>Fairchild Swearingen Merlin (SW3)</td>
<td>Single Wheel</td>
<td>13,230</td>
<td>276</td>
<td>37</td>
</tr>
<tr>
<td>Beech 200 Super King (BE20)</td>
<td>Double Wheel</td>
<td>12,500</td>
<td>1,084</td>
<td>325</td>
</tr>
<tr>
<td>Dehaviland Twin Otter (DHC6)</td>
<td>Single Wheel</td>
<td>11,566</td>
<td>307</td>
<td>126</td>
</tr>
<tr>
<td>Cessna CitationJet/CJ1 (C525)</td>
<td>Single Wheel</td>
<td>10,600</td>
<td>911</td>
<td>170</td>
</tr>
<tr>
<td>HondaJet (HDJT)</td>
<td>Single Wheel</td>
<td>10,600</td>
<td>212</td>
<td>89</td>
</tr>
<tr>
<td>Pilatus PC12</td>
<td>Single Wheel</td>
<td>10,450</td>
<td>1,428</td>
<td>686</td>
</tr>
<tr>
<td>Beech King Air 90 (BE9L)</td>
<td>Single Wheel</td>
<td>9,300</td>
<td>2,738</td>
<td>129</td>
</tr>
<tr>
<td>Cessna Citation Mustang (C510)</td>
<td>Single Wheel</td>
<td>8,645</td>
<td>1,560</td>
<td>187</td>
</tr>
<tr>
<td>Piper Seminole PA44</td>
<td>Single Wheel</td>
<td>3,800</td>
<td>1,384</td>
<td>686</td>
</tr>
<tr>
<td>Cessna Skyhawk (C172)</td>
<td>Single Wheel</td>
<td>2,550</td>
<td>13,420</td>
<td>4,870</td>
</tr>
</tbody>
</table>

Source: Aircraft manufacturer websites, FAA Aircraft Database.

Of the aircraft shown in the current and historic fleet mix data, only the DC-9 has a higher MTOW than the current weight bearing capacity of Runway 8/26 and Runway 17/35. Based on information provided by airport tenants, the DC-9’s operating at the airport typically arrive and depart with very light loads (payload and fuel) and, consequently, do not operate at a weight close to the aircraft’s published MTOW.

Table 4-8, *Future Fleet Mix MTOW and Gear Configurations*, shows the landing gear configuration and MTOW of the larger aircraft that may operate at the airport in the future based on information provided by tenants and stakeholders.
TABLE 4-8
FUTURE FLEET MIX MTOW AND GEAR CONFIGURATIONS
SAN MARCOS REGIONAL AIRPORT

<table>
<thead>
<tr>
<th>Aircraft</th>
<th>Gear Configuration</th>
<th>MTOW (Lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boeing 737-800</td>
<td>Double Wheel</td>
<td>174,200</td>
</tr>
<tr>
<td>Bombardier Q400</td>
<td>Double Wheel</td>
<td>65,200</td>
</tr>
<tr>
<td>CRJ 200</td>
<td>Double Wheel</td>
<td>53,000</td>
</tr>
</tbody>
</table>

Source: Aircraft manufacturer websites, FAA Aircraft Database.

The key driver of future runway weight bearing capacity requirements for the San Marcos Regional Airport will be the operation of the Bombardier Q400 and Boeing 737-800 aircraft at the airport. Both of these aircraft’s gear configurations and MTOWs exceed the current runway weight bearing capacity limits of the existing runways. As a result, runway pavement strengthening should be a consideration in the future development of the runways. A priority for runway strengthening should be Runway 17/35 and Runway 13/31 as both of these runways are the most frequently utilized at the airport because they have the best wind coverage but have the lowest weight bearing capacity.

**Instrument Approach Procedures**

Instrument Approach Procedures (IAPs) are critical to ensuring the usability of an airport during poor weather conditions. IAPs provide guidance to pilots via land-based equipment or GPS satellites that aid them in executing an approach to land on a runway when a visual approach to the runway is not possible. The types of IAPs vary widely, however, they can generally be segmented into three primary categories: precision, non-precision, and circling approaches. Precision instrument approaches are approaches where a pilot is provided with both vertical and horizontal guidance and the visibility minimums for the approach are below ¾ of a mile. Non-precision instrument approaches are any straight-in instrument approaches with visibility minimums not lower than ¾ of a mile. Circling approaches are instrument approaches that do not provide an aircraft with a straight-in approach to a runway.

The San Marcos Regional Airport currently has a precision instrument approach to Runway 13 and non-precision approaches to all other runways. The precision instrument approach to Runway 13 utilizes an Instrument Landing System (ILS) and the runway is equipped with a Medium Intensity Approach Lighting System with Sequenced Flashers (MALSR) to enable visibility minimums of ½ mile. RNAV/GPS
approaches exist to all other runway ends at the airport. There is also an NDB approach to Runway 13.

All the RNAV/GPS approaches at the airport have three-quarter mile visibility minimum with the exception of the RNAV/GPS approach for Runway 17 which has 1 1/8-mile visibility minimums and the RNAV/GPS approach for Runway 31 which has 7/8-mile visibility minimums. **Table 4-9** shows the IFR wind coverage for each runway end at the San Marcos Regional Airport.

### Table 4-9

<table>
<thead>
<tr>
<th>RWY</th>
<th>13 kts</th>
<th>16 kts</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>65.84%</td>
<td>66.19%</td>
</tr>
<tr>
<td>35</td>
<td>46.73%</td>
<td>47.36%</td>
</tr>
<tr>
<td>13</td>
<td>68.09%</td>
<td>69.37%</td>
</tr>
<tr>
<td>31</td>
<td>46.46%</td>
<td>43.13%</td>
</tr>
<tr>
<td>8</td>
<td>63.06%</td>
<td>66.32%</td>
</tr>
<tr>
<td>26</td>
<td>43.96%</td>
<td>45.40%</td>
</tr>
</tbody>
</table>

**Source:** FAA Airports – GIS Wind Analysis Tool using HYI wind data as generated by the FAA's GIS tool. Completed 5/3/19.

A key finding of this analysis is that Runway 17 is the runway end with the second highest IFR wind coverage (second only to Runway 13 which has an ILS) but has the worst visibility minimums of all the RNAV/GPS approaches for the airport. As a result, a key priority for the alternatives process should be establishing lower visibility minimums (3/4 mile) for the RNAV/GPS approach for Runway 17. Since Runway 13 has the highest IFR wind coverage, the ILS approach and MALSR system currently serving that runway should remain.

**Magnetic Declination**

The current magnetic variation at San Marcos Regional Airport as shown on the FAA published airfield diagram is 4.2° East with a 0.1° West annual change as of January 2015. The current, established magnetic heading for each runway is shown below:

- Runway 8/26 – 083.6° and 263.7°
- Runway 13/31 – 128.7° and 308.7°
- Runway 17/35 – 173.7° and 353.7°
Based on the established annual rate of change, runway designation changes may be needed for Runway 8/26 and/or Runway 17/35 during the long range portion (10+ years) of the planning horizon. Runway 13/31’s designation was recently updated and is not anticipated to require further change during the planning period.

AIRPORT DESIGN CONSIDERATIONS

Compliance with airport design standards is vitally important because compliance with these standards aids an airport in maintaining a minimum level of operational safety. The major airport design elements are established by FAA AC 150/5300-13 (current series). Ideally, airports should conform with all established FAA airport design standards without requiring a Modification to Standards (MOS). Frequently this is not possible as many airports have infrastructure that was designed before the current design standards were established. In these cases, airport operators are generally required to improve the facilities to the new design standards if they accept FAA grant funds to rehabilitate or improve that particular facility.

Table 4-10, Current Runway Design, provides an overview of the FAA Design Standards and the current runway facilities at the San Marcos Regional Airport.

<table>
<thead>
<tr>
<th>TABLE 4-10</th>
<th>CURRENT RUNWAY DESIGN</th>
<th>SAN MARCOS REGIONAL AIRPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Runway Design:</strong></td>
<td><strong>FAA Design Standard (C-II)</strong></td>
<td><strong>FAA Design Standard (B-II)</strong></td>
</tr>
<tr>
<td>Width (ft)</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>RSA Width (ft)</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>RSA Length beyond R/W end (ft)</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>OFA Width (ft)</td>
<td>800</td>
<td>800</td>
</tr>
<tr>
<td>OFA Length beyond R/W end (ft)</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>ROFZ Width (ft)</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>ROFZ Length beyond R/W end (ft)</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td><strong>Runway Setbacks - Runway Centerline to:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parallel Taxiway Centerline (ft)</td>
<td>400</td>
<td>630</td>
</tr>
<tr>
<td>Holdline (ft)</td>
<td>250</td>
<td>250-290</td>
</tr>
<tr>
<td>Aircraft Parking Area (ft)</td>
<td>500</td>
<td>705</td>
</tr>
</tbody>
</table>


Currently, the San Marcos Regional Airport has no deficiencies related to its current runway width, Runway Safety Areas (RSA), Runway Object Free Areas (ROFA), Runway Obstacle Free Zones (ROFZ), runway to parallel taxiway separation, runway hold position marking location, and aircraft parking area separation standards.
related to the current RDC for each runway. Each of these aspects of runway design are discussed in more depth in the subsections below.

Additionally, since the Forecast chapter identified the potential for the critical aircraft to move into the C-III category, an analysis was completed to determine the impacts of each of the three runways moving into the C-III category and the ability for each runway to meet C-III design standards. *Table 4-11, Future Runway Design*, identifies the potential limitations/constraints of shifting the critical aircraft for each runway into the C-III category.

### TABLE 4-11
**FUTURE RUNWAY DESIGN**
SAN MARCOS REGIONAL AIRPORT

<table>
<thead>
<tr>
<th>Runway Design:</th>
<th>FAA Design Standard (C-III)</th>
<th>Runway 13/31</th>
<th>Runway 17/35</th>
<th>Runway 8/26</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width (ft)</td>
<td>150</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>RSA Width (ft)</td>
<td>500</td>
<td>500</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>RSA Length beyond R/W end (ft)</td>
<td>1000</td>
<td>1000</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>OFA Width (ft)</td>
<td>800</td>
<td>800</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>OFA Length beyond R/W end (ft)</td>
<td>1000</td>
<td>1000</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>ROFZ Width (ft)</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>ROFZ Length beyond R/W end (ft)</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Runway Setbacks - Runway Centerline to:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parallel Taxiway Centerline (ft)</td>
<td>400</td>
<td>630</td>
<td>N/A</td>
<td>630</td>
</tr>
<tr>
<td>Holdline (ft)</td>
<td>250</td>
<td>250 - 290</td>
<td>200</td>
<td>250 - 290</td>
</tr>
<tr>
<td>Aircraft Parking Area (ft)</td>
<td>500</td>
<td>705</td>
<td>N/A</td>
<td>710</td>
</tr>
</tbody>
</table>


The areas where the existing infrastructure or a protected surface would have to be modified are shown in red text. The cells highlighted in yellow notate items where a potential limiting factor exists that could hamper a move to C-III standards. Each of these areas are discussed in more detail in the subsections below. An analysis of the Runway Protection Zones (RPZs) is also provided later in this chapter.

**Runway Width**

FAA AC 150/5300-13 (current series) delineates the requirements for runway width. At present, all runways at the San Marcos Regional Airport are 100 feet wide. This width meets the minimum runway width recommended in AC 150/5300-13 for runways with a C-II RDC (Runway 13/31) and exceeds the B-II RDC standard (Runway 8/26 and Runway 17/35) of 75 feet.
If the San Marcos Regional Airport's critical aircraft moves into the C-III category during the forecast period, the width of the runways primarily used by C-III aircraft would need to be expanded to 150 feet. Since the runways were all previously 150 feet wide, there are no known factors that would limit the ability to expand the runways back to 150 feet in width.

**Runway Safety Area**

The Runway Safety Area (RSA) is a two-dimensional area surrounding a runway that is centered along the runway centerline and extends beyond the edges of the useable runway pavement. RSA's are provided to reduce the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway pavement. RSAs must be free of objects, except those required for air navigation, and be graded to transverse and longitudinal standards to prevent water accumulation. Objects located in the RSA that are over 3 inches above grade must be constructed, to the extent practical, on frangible mounted structures with the frangible point no higher than 3 inches above grade. Under dry conditions, the RSA must support Aircraft Rescue and Fire Fighting (ARFF) equipment (if applicable), snow removal equipment, and the occasional passage of aircraft without causing damage to the aircraft.

The FAA recommends airports own the entire RSA in “fee simple” title. Based on RDC B-II design standards, the RSAs for Runways 8/26 and 17/35 should extend beyond the end of the runway for 300 feet and be 150 feet wide (75 feet each side of the runway centerline) with a grade not steeper than 3%. These standards are met on both runways. Runway 13/31 has a C-II RDC. Consequently, the required RSA for Runway 13/31 is 1,000 feet beyond the runway ends and 500 feet wide (250 feet on each side of the runway centerline) with a grade not steeper than 3%. These standards are met on Runway 13/31.

Since the Forecast Chapter identified that the San Marcos Regional Airport is expected to move to the C-III RDC during the 20-year planning horizon, improvements to the RSAs of one or more of the runways may be required. Currently, the RSA dimensional standards for a runway with a C-III RDC are identical to the standards for a Runway with a C-II RDC. Consequently, if Runway 13/31 is moved from a C-II RDC to a C-III RDC, no improvements to the existing RSA for the runway would be necessary. However, the RSA dimensional standards for a runway with a B-II RDC (e.g. Runway 17/35 and Runway 8/26) are significantly smaller than a
runway with a C-III RDC. As a result, some significant improvements would be required to accommodate RSA standards if Runway 17/35 or Runway 8/26 move into the C-III RDC category. **Figure 4-1 and 4-2** identify the impacts of expanding the Runway RSA and ROFA dimensions (i.e. ROFA dimension impacts are discussed in the next section) for Runway 8/26.

As **Figure 4-1** shows, the RSA and ROFA associated with the approach end of Runway 8 would extend over the existing location of Airport Drive. Consequently, Airport Drive would need to be relocated outside the RSA and ROFA or the threshold of Runway 8 would need to be relocated approximately 300 feet to the east if the runway was moved to a C-III RDC. Additionally, it should be noted that the ROFA for Runway 8/26 will extend into the ramp area for the Taxiway Kilo Development Area. Since the ROFA clearing standard precludes parked aircraft, a small portion of the ramp will not be usable for aircraft parking.

**Figure 4-2** shows that a similar issue exists at the approach end of Runway 26 where the airport perimeter road passes through the C-III RSA and ROFA. In this case, the roadway would need to be closed or relocated outside of the RSA/ROFA or the threshold of Runway 26 would need to be relocated approximately 295 feet to the west. If the roadway is not close or relocated, it would be necessary to protect the RSA and ROFA from vehicle encroachment using vehicle “Stop” signs and informational signs directing vehicle desiring to cross through the RSA/ROFA to contact ATCT for permission.

These issues would make it difficult to move Runway 8/26 to C-III standards without making significant infrastructure modifications.
FIGURE 4-1
RSA AND ROFA IMPACTS AT APPROACH OF RUNWAY 8
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019.
Runway Object Free Area

The Runway Object Free Area (ROFA) is a two-dimensional area surrounding a runway that is centered along the runway centerline. The ROFA must be clear of objects except those used for air navigation or aircraft ground maneuvering purposes and be clear of above-ground objects protruding higher than the elevation of the RSA at the closest adjacent point. An object is considered any terrain, structure, navigational aid, person, piece of equipment, or parked aircraft. The FAA recommends that an airport own the entire ROFA in "fee simple" title.
Currently, FAA Airport Design criteria for an RDC-B-II runway requires the ROFA to be 500 feet wide and extend 300 feet beyond each runway end. Runways 8/26 and 17/35 meet these requirements. FAA Airport Design criteria for an RDC C-II runway requires the ROFA to be 800 feet wide (400 feet each side of the runway centerline) and extend 1,000 feet beyond each runway end. Runway 13/31 meets this requirement.

Since the critical aircraft for the San Marcos Regional Airport is expected to move into the C-III category an analysis was completed to determine the impacts of moving each runway from its current ROFA dimensions to the ROFA dimensions required under C-III standards. In addition to the RSA and ROFA impacts discussed in the RSA section (see Figures 4-1 and 4-2), Figure 4-3 depicts a ROFA only impact at the approach end of Runway 35. A small portion of the airport perimeter road passes through the proposed C-III ROFA at the approach end of Runway 35. This portion of the roadway would need to be realigned to move the roadway outside the proposed C-III ROFA.
Obstacle Free Zone

The Obstacle Free Zone (OFZ) is a volume of airspace above and centered along the runway centerline. The OFZ precludes taxiing and parked airplanes and object penetrations except for objects required to be located in the OFZ due to their function. OFZs can have a number of different components including a Runway Obstacle Free Zone (ROFZ), inner-transitional OFZ, inner approach OFZ, and a Precision Obstacle Free Zone (POFZ). The ROFZ applies to all the runways at the San Marcos Regional Airport. The inner-transitional OFZ, inner-approach OFZ, and POFZ
only apply to Runway 13 because it is the only runway with a precision instrument approach and an approach lighting system. The status of all four OFZ surfaces are discussed below.

**Runway Obstacle Free Zone (ROFZ)**

The length of a ROFZ is fixed at 200 feet beyond the associated runway end but the width is dependent upon the size of the aircraft using the runway (small – less than 12,500 lbs. or large – greater than 12,500 lbs.) and the visibility minimums for the lowest instrument approach to the runway. The ROFZ width for all three runways at the airport is 400 feet (200 feet each side of the runway centerline). The elevation of the ROFZ is equal to the closest point along the runway centerline. All runways at the airport meet the established ROFZ requirements. Since the dimensions of the ROFZ are not based on the RDC of a runway, no ROFZ impacts will occur if any of the runways are moved to a C-III RDC.

**Inner Approach OFZ**

Runway 13 has a MALSR approach lighting system. Consequently, an inner approach OFZ is applicable. The inner approach OFZ begins at the end of the ROFZ (200 feet beyond the runway end) and extends to a point 200 feet beyond the last lighting unit of the MALSR system (2,600 feet beyond the runway end). Consequently, the total inner approach OFZ is 2,400 feet in length. Additionally, the inner approach OFZ rises at a 50:1 slope from the edge of the ROFZ and remains the same width as the ROFZ (400 feet). The current inner-approach OFZ for Runway 13 meets the established FAA standards. Since the dimensions of the inner approach OFZ are not based on the RDC of a runway, no inner approach OFZ impacts will occur if Runway 13 is moved to a C-III RDC.

**Inner Transitional OFZ**

The inner transitional OFZ is a defined volume of airspace along the sides of the ROFZ and inner approach OFZ. It applies only to runways with lower than ¾ statute mile approach visibility minimums.

Runway 13 has an ILS approach with visibility minimums of ½ mile. Since these visibility minimums are below ¾ mile an inner-transitional OFZ is applicable.
Figure 4-4, Runway 13 Inner Transitional OFZ, displays the inner transitional OFZ configuration for Runway 13 and its relationship to the ROFZ.

**FIGURE 4-4**

**RUNWAY 13 INNER TRANSITIONAL OFZ**

For Category 1 ILS runways, the inner transitional OFZ begins at the edges of the ROFZ and inner-approach OFZ and then rises vertically to a height ("H") which is calculated using the following formula:

\[
H = 61 - 0.094(S) - 0.003(E)
\]

“S” is equal to the most demanding wingspan of the RDC of the runways which is 118 feet (C-III standard). “E” is equal to the runway threshold elevation above sea level which is 593.1 feet. MSL. Based on this formula, “H” equals 51.69 feet for Runway 13.

After rising to a height of “H”, the inner transitional OFZ then slopes outward at a 6:1 slope until reaching 150 feet above the established airport elevation (594.7 feet MSL).

The inner transitional OFZ for Runway 13 currently meets all established FAA standards. No inner transitional OFZ impacts will occur if Runway 13 is moved to a C-III RDC.
Precision OFZ (POFZ)

The final OFZ surface that applies to Runway 13 is the Precision Obstacle Free Zone (POFZ). The POFZ is a defined volume of airspace above an area beginning at the threshold of the runway that extends to 200 feet beyond the end of the runway and is 800 feet wide, centered along the extended runway centerline. The volume of airspace begins at the threshold elevation for the applicable runway end. The wing of an aircraft may penetrate the POFZ but penetrations involving an aircraft fuselage or tail are not permitted.

Runway 13 is the only runway at the San Marcos Regional Airport that requires a POFZ. The POFZ begins at the runway threshold elevation for Runway 13 which is 593.1 feet MSL. The POFZ for Runway 13 meets all established FAA standards. Since the dimensions of the POFZ are not based on the RDC of a runway, no POFZ impacts will occur if Runway 13 is moved to a C-III RDC.

Runway Hold Position Markings

The runway hold position markings (or holdlines) denote the entrance to the runway from a taxiway and the location where aircraft are supposed to stop when approaching the runway. Their location is prescribed by FAA AC 150/5300-13 (current edition). They are generally located across the centerline of a given taxiway within 10 feet of an associated runway hold position sign. According to FAA standards, the holdlines for Runways 8/26 and 17/35 (e.g. the B-II RDC runways) should be located at least 200 feet from the runway centerline. All of the runway hold position markings associated with Runways 8/26 and 17/35 are located at least 200 feet from the runway centerline.

The runway hold position markings for Runway 13/31 (e.g. the C-II RDC runway) should be located at least 250 feet from the runway centerline. All the runway hold position markings associated with Runway 13/31 meet or exceed this standard.

If any of the runways are moved from their existing RDC to a C-III RDC, the runway hold position markings would be required to be located 250 feet from the runway centerline. Based on the layout of the airfield, all runways should be able to meet this standard if necessary.
Runway to Parallel Taxiway Separation Standards

According for AC 150/5300-13 (current edition) the minimum necessary runway centerline to parallel taxiway centerline separation for a runway with an RDC of C-II is 400 feet. Currently, 630 feet of separation exists between Runway 13/31 and Taxiway Charlie, the parallel taxiway for Runway 13/31. Consequently, Runway 13/31 and Taxiway Charlie exceed the minimum centerline-to-centerline separation standard by 230 feet.

Minimum separation for a runway with an RDC of B-II is 240 feet from the runway centerline to the parallel taxiway centerline. Currently, 630 feet of separation exists between Runway 8/26 and Taxiway Alpha, the partial parallel taxiway for Runway 8/26, which exceeds the minimum required separation distance by 390 feet. No parallel taxiway exists for Runway 17/35. The minimum runway centerline to parallel taxiway centerline separation standard for a runway with a C-III RDC is 400 feet according to current FAA standards. All the runways at the San Marcos Regional Airport should be able to meet this standard without requiring any modifications.

Building Restriction Line

According to AC 150/5300-13 (current edition) the Building Restriction Line (BRL) represents the boundary where it is generally suitable or unsuitable to develop buildings such as hangars, terminals, or other facilities. The BRL is established based on an airport’s FAR Part 77 imaginary surfaces, Runway Protection Zones (RPZs), Obstacle Free Zones (OFZ), Object Free Areas (OFA), runway visibility zones, NAVAID critical areas, and approach surfaces. Based on existing instrument approach procedures, the primary surface for all the runways at the San Marcos Regional Airport are 1,000 feet wide (500 feet each side of the runway centerline) and extend 200 feet beyond each runway end.

The transitional surface slopes up at a 7:1 ratio from the edge of the primary surface to the horizontal surface which is 150 feet above airport elevation (airport elevation is 594.7 feet MSL). Buildings should not penetrate the transitional surface at any point. Based on the dimensions of the primary surface and transitional surface, the 35.0-foot BRL for all the runways at the airport are 745 feet from runway centerline.
Currently, the two Berry hangar facilities located at the approach end of Runway 8 are located within the BRL 35 feet. However, according to survey data provided by TXDOT and the FAA, neither of the facilities penetrate the transitional surface for Runway 8/26.

The new hangar being constructed in the Taxiway Kilo development area will also be located within the BRL 35 feet and is expected to penetrate both the primary surface and the transitional surface associated with Runway 8/26.

All future developments should be located outside of the BRL. Placing buildings inside the BRL is possible if the height of a building is minimized. Locating buildings inside the BRL may hamper the options for expanding the San Marcos Regional Airport in the future.

**Runway Line-Of-Sight**

To ensure the safety of aircraft operations at an airport it is imperative that proper lines of sight exist along a single runway and amongst intersecting runways. Proper lines of sight facilitate coordination amongst aircraft and vehicles operating on runway(s) by allowing them to identify the position of other aircraft or vehicles operating on the same runway or on an intersecting runway.

On a single runway without a parallel taxiway, an acceptable runway profile permits any two points, generally each runway end, 5 feet above the runway centerline, to be mutually visible for the entire runway length. If the runway offers a full-length parallel taxiway, an unobstructed line of sight should exist from any point 5 feet above the runway centerline to any other point 5 feet above the runway centerline for one-half the runway length. There are no single runway line of sight issues for the runways at the San Marcos Regional Airport.

On intersecting runways, an acceptable runway profile permits visibility between established points on each intersecting runway so aircraft operators and vehicle operators can see other aircraft or vehicles operating on the intersecting runway. Runway 8/26 currently intersects Runway 13/31 and Runway 17/35. There are no intersecting runway line of sight issues at the San Marcos Regional Airport.
Runway Protection Zone

The purpose of a Runway Protection Zone (RPZ) is to enhance the protection of people and property on the ground, and to prevent developments that are incompatible with aircraft operations. The FAA recommends that airports own the entire RPZ in "fee simple" title and that the RPZ be clear of any non-aeronautical structure or object that would interfere with the arrival and departure of aircraft. If "fee simple" interest is unachievable, the next option is controlling the heights of objects and keeping the area clear of any facilities that would support an incompatible activity (e.g., places of public assembly, etc.) via an avigation easement. An avigation easement is an agreement between the airport sponsor and a landowner that grants the airport sponsor various privileges related to the landowner's property and limits the potential impact to aircraft operations.

The RPZ is a two-dimensional trapezoidal area that normally begins 200 feet beyond the paved runway end and extends along the runway centerline. When a displaced landing threshold is present there is a need for separate approach and departure RPZs. The approach RPZ begins 200 feet from the runway threshold. The departure RPZ begins 200 feet beyond the end of runway pavement or 200 feet from the end of the Takeoff Runway Available (TORA), if established.

An FAA Interim Guidance Letter (IGL) published in September 2012 addressed acceptable property uses within an RPZ. The IGL was released to specify and emphasize existing use standards and indicates that if any of the following parameters are met then the RPZ ownership must be reevaluated:

- An airfield project (e.g., a runway extension, runway shift)
- A change in the critical design aircraft that increases the RPZ size
- A new or revised instrument approach procedure that increases the RPZ dimensions
- A local development proposal in the RPZ (either new or reconfigured)

Land uses within an RPZ that require specific and direct coordination with the FAA include:

- Buildings and structures
- Recreational land uses
- Transportation facilities
RPZ dimensions are determined by the type/size of aircraft expected to operate at an airport and the type of approach, existing or planned, for each runway end (visual, precision, or non-precision). The recommended visibility minimums for the runway ends are determined with respect to published instrument approach procedures, the ultimate runway RDC, airfield design standards, instrument meteorological conditions, wind conditions, and physical constraints (approach slope clearance) along the extended runway centerline beyond the runway end.

**Table 4-12, Runway Protection Zone Dimensions**, delineates the current RPZ requirements at the San Marcos Regional Airport.

**TABLE 4-12**

<table>
<thead>
<tr>
<th>Runway End</th>
<th>Approach Visibility Minimums</th>
<th>Facilities Expected to Serve (AAC - ADG)</th>
<th>Length (ft)</th>
<th>Inner Width (ft)</th>
<th>Outer Width (ft)</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway 13</td>
<td>Lower than 3/4 mile</td>
<td>C-II</td>
<td>2,500</td>
<td>1,000</td>
<td>1,750</td>
<td>78.914</td>
</tr>
<tr>
<td>Runway 31</td>
<td>Not lower than 3/4 mile</td>
<td>C-II</td>
<td>1,700</td>
<td>1,000</td>
<td>1,510</td>
<td>48.978</td>
</tr>
<tr>
<td>Runway 17</td>
<td>Not lower than 1 mile</td>
<td>B-II</td>
<td>1,000</td>
<td>500</td>
<td>700</td>
<td>13,770</td>
</tr>
<tr>
<td>Runway 35</td>
<td>Not lower than 3/4 mile</td>
<td>B-II</td>
<td>1,700</td>
<td>1,000</td>
<td>1,510</td>
<td>48.978</td>
</tr>
<tr>
<td>Runway 8</td>
<td>Not lower than 3/4 mile</td>
<td>B-II</td>
<td>1,700</td>
<td>1,000</td>
<td>1,510</td>
<td>48.978</td>
</tr>
<tr>
<td>Runway 26</td>
<td>Not lower than 3/4 mile</td>
<td>B-II</td>
<td>1,700</td>
<td>1,000</td>
<td>1,510</td>
<td>48.978</td>
</tr>
</tbody>
</table>

**Source:** FAA Advisory Circular 150/5300-13 (current series).
Currently, the RPZs at the approach ends of Runways 8, 13, 31, and 35 all extend beyond the San Marcos Regional Airport’s established property line. Based on the research performed as part of this master plan, it appears that an avigation easement exists on the property north of Highway 21 that is within the RPZ associated with the approach to Runway 13. RPZs that extend outside of the airport’s existing property line and that are not controlled via an avigation easement will be a key consideration in the alternatives analysis.

**Figures 4-5, 4-6, 4-7, and 4-8** depict the existing RPZs and highlights the portions outside of airport property.
FIGURE 4-5
RUNWAY 13 RPZ
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019
FIGURE 4-6
RUNWAY 31 RPZ
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019
Figure 4-7
RUNWAY 8 RPZ
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019.
Note: The RPZ at the approach end of Runway 8 will be reduced to 500’ x 700’ x 1,000’ when FM110 is constructed.
FIGURE 4-8
RUNWAY 35 RPZ
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019.
**Turf Runway**

Historically, the operators of tail-dragger aircraft sometimes prefer to utilize turf runways for their takeoff and landing operations. Since the San Marcos Regional Airport already has three paved runways with differing orientations the addition of a turf runway would further complicate the airspace and movement of aircraft on the ground. For these reasons, it is not recommended that a turf runway be considered as part of the alternatives analysis process.

**Airfield Capacity Analysis**

The FAA's standard method for determining airport capacity and delay for long-range planning purposes can be found in Advisory Circular (AC) 150/5060-5 (current edition), Airport Capacity and Delay. For this portion of the facility requirements analysis, generalized airfield capacity was calculated in terms of the airport’s current percentage of its maximum Annual Service Volume (ASV). An airport’s maximum ASV is the peak number of aircraft operations an airport could handle in a given year before significant delays begin to occur.

These capacity metrics are calculated based the following factors:

- Runway Configuration
- Taxiway Configuration
- Aircraft Mix Index
- Operational Characteristics
- Meteorological Conditions

When analyzed collectively, the above elements provide the basis for establishing the generalized operational capacity of an airport as expressed by Annual Service Volume. Utilizing the methodology described in AC 150/5060-5 (current edition) for long-range planning purposes, the maximum ASV possible at the San Marcos Regional Airport is between 230,000 and 260,000 annual operations depending on the runway configuration utilized for the analysis. In the Forecast Chapter, the peak of total annual operations is expected to be 105,192 operations. This places the San Marcos Regional Airport at approximately 46% of its maximum ASV. Based on the results of this analysis no capacity enhancements are expected to be needed during the 20-year planning period.
**Runway Facility Requirements Summary**

When reviewing the results of the runway facility requirements analysis in its totality, three key findings were identified:

- **Upgrade to C-III Standards**: Runway 17/35 and Runway 13/31 are the runways that are in the best position to be upgraded to C-III standards if the critical aircraft for the San Marcos Regional Airport moves into the C-III category. While Runway 8/26 could potentially be upgraded to C-III standards it would require a significant amount of infrastructure relocation or require the runway to be shortened.

- **Primary Runway**: Runway 17/35 should be treated as the primary runway as it is the runway with the best wind coverage and has the best opportunity for future expansion. Currently, Runway 17/35 is the shortest runway at the San Marcos Regional Airport and has the highest approach minimums. Lengthening, strengthen, and reducing the IAP visibility minimums for Runway 17 should all be a key consideration in the alternatives analysis.

- **Need for Tertiary Runway**: Based on results of this facility requirements analysis, there is no substantial benefit to having a tertiary runway at the San Marcos Regional Airport. Runway 17/35 and Runway 13/31 together provide the optimal blend of wind coverage and airfield capacity and can be upgraded to C-III standards with less infrastructure impacts. As a result, the alternatives analysis will evaluate the potential decommissioning of Runway 8/26.

These three points will be a key consideration in the alternatives analysis.

**Taxiway Facility Requirements**

The following section discusses facility requirements related to the taxiways at the San Marcos Regional Airport.
**Taxiway Design Standards**

In general, taxiway design can be segmented into two general categories:

1. Taxiway Pavement Design
2. Taxiway Layout Based on the Taxiway’s Established Aircraft Design Group (ADG)

Each of these design categories play a critical role in evaluating the sufficiency of taxiway pavements at an airport both now and in the future.

**Taxiway Pavement Design**

Taxiway pavement design is complex because it is based on landing gear configurations which vary widely amongst different aircraft types. The FAA has classified the numerous variations of landing gear configurations into various Taxiway Design Groups (TDG) that now guide taxiway pavement design.

Additionally, taxiway pavement design standards have changed significantly over the past 10 years. Prior to 2012, taxiway pavement design was based on a taxiway’s Aircraft Design Group (ADG), which categorizes aircraft based on wingspan and tail height. In 2012, when TDG based standards came into effect, taxiway pavement design and fillet dimensions changed significantly. The most significant change was that the size of taxiway fillets increased significantly. These new TDG based standards went through another minor revision in 2014.

Consequently, at many airports, any taxiway pavements that were designed prior to 2012 do not meet the current TDG based standards. As a result, as these taxiway pavements are re-constructed, they need to be re-designed to current TDG standards.

The taxiways at the San Marcos Regional Airport are no different. The taxiways at the San Marcos Regional Airport are designed to older ADG based pavement design standards that were in effect prior to the new TDG standards being instituted. Consequently, the taxiway fillets at the airport do not meet the existing TDG standards and practices.
Existing and Forecasted TDG

**Table 4-13, Existing Fleet Mix MTOW and Gear Configurations,** shows the TDG of some of the larger aircraft that have operated at the San Marcos Regional Airport over the past five years and in 2018 alone:

<table>
<thead>
<tr>
<th>Aircraft</th>
<th>TDG</th>
<th># of OPS (5 years)</th>
<th># of OPS (2018)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embraer Brasilia E120</td>
<td>3</td>
<td>2,499</td>
<td>818</td>
</tr>
<tr>
<td>Bombardier DHC8-200/100</td>
<td>3</td>
<td>110</td>
<td>41</td>
</tr>
<tr>
<td>Beech 200 Super King (BE20)</td>
<td>2</td>
<td>1,084</td>
<td>325</td>
</tr>
<tr>
<td>Cessna Citation CJ3 (C25B)</td>
<td>2</td>
<td>694</td>
<td>188</td>
</tr>
<tr>
<td>Beech Super King Air 350 (B350)</td>
<td>2</td>
<td>274</td>
<td>54</td>
</tr>
<tr>
<td>Boeing (Douglas) DC-9-10</td>
<td>2</td>
<td>37</td>
<td>12</td>
</tr>
<tr>
<td>Fairchild Swearingen Merlin (SW3)</td>
<td>2</td>
<td>276</td>
<td>37</td>
</tr>
<tr>
<td>Cessna Excel/XLS (C56X)</td>
<td>1B</td>
<td>957</td>
<td>242</td>
</tr>
<tr>
<td>Dassault Falcon/Mystère 50 (FA50)</td>
<td>1B</td>
<td>398</td>
<td>106</td>
</tr>
<tr>
<td>Cessna Citation X (C750)</td>
<td>1B</td>
<td>105</td>
<td>21</td>
</tr>
<tr>
<td>BAe HS 125/700-800/Hawker 800 (H25B)</td>
<td>1B</td>
<td>102</td>
<td>20</td>
</tr>
</tbody>
</table>

*Source: Aircraft manufacturer websites, FAA TFMSC database.*

The majority of the large aircraft operations that occurred at the San Marcos Regional Airport during the aforementioned time periods fall into the TDG-2 and TDG-3 categories. However, the airport had over 850 operations in the TDG-3 category in 2018 alone. As a result, the taxiways at the San Marcos Regional Airport should be designed to TDG-3 pavement design standards based on the airport's current fleet mix. According to current TDG-3 pavement design standards, the width of the taxiways at the San Marcos Regional Airport should be 50 feet. **Table 4-14** depicts the existing width of the existing taxiways at the airport and the TDG category each pavement is most closely aligned to.
As Table 4-14 shows, Taxiways Bravo, Charlie (north of Taxiway Alpha), Echo, and Kilo do not have sufficient width to meet TDG-3 standards and should be widened as part of future pavement rehabilitation projects.

Additionally, the potential change from the Embraer Brasilia E120 to the Bombardier Q400 should be closely monitored as this change will have a significant impact on taxiway design. The Bombardier Q400 is a TDG-5 aircraft. Current TDG-5 taxiway design standards require a 75-foot-wide taxiway as opposed to the 50 foot width requirement necessary to meet TDG-3 standards. If the move to the Q400 occurs, taxiway routes that will be commonly utilized by the aircraft should be upgraded to TDG-5 taxiway pavement design standards.

### Taxiway Layout Design Standards Based on Aircraft Design Group (ADG)

While taxiway pavement design is based on an aircraft’s TDG, a taxiway's Taxiway Safety Area (TSA), Taxiway Object Free Area (TOFAs), and separation standards are based on the Aircraft Design Group (ADG) of the critical aircraft for the taxiway. These ADG based standards are based on the aircraft wingspan and tail height of the critical aircraft.

Based on the Forecast Chapter, the current critical aircraft for the San Marcos Regional Airport is in the ADG II category but there is the potential for the critical aircraft to move into the ADG III category.
Table 4-15, *Current Taxiway Standards Based on Aircraft Design Group*, below provides an overview of the ADG II taxiway design standards and the application of those standards to the San Marcos Regional Airport.

<table>
<thead>
<tr>
<th>Taxiway</th>
<th>Applicable Taxiway ADG</th>
<th>Current TSA (feet)</th>
<th>TOFA (feet)</th>
<th>Standard Met (Y/N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>II</td>
<td>79</td>
<td>131</td>
<td>Y</td>
</tr>
<tr>
<td>B</td>
<td>II</td>
<td>79</td>
<td>131</td>
<td>Y</td>
</tr>
<tr>
<td>C</td>
<td>II</td>
<td>79</td>
<td>131</td>
<td>Y</td>
</tr>
<tr>
<td>E</td>
<td>II</td>
<td>79</td>
<td>131</td>
<td>Y</td>
</tr>
<tr>
<td>F</td>
<td>II</td>
<td>79</td>
<td>131</td>
<td>Y</td>
</tr>
<tr>
<td>J</td>
<td>II</td>
<td>79</td>
<td>131</td>
<td>Y</td>
</tr>
<tr>
<td>K</td>
<td>II</td>
<td>79</td>
<td>131</td>
<td>Y</td>
</tr>
</tbody>
</table>

*Source: Garver, 2019*

As the table indicates, all the existing taxiways at the San Marcos Regional Airport meet the current ADG II taxiway design standards.

Table 4-16, *Future Taxiway Standards Based on Aircraft Design Group*, provides an overview of the potential impacts of applying ADG III standards to the existing taxiways at the San Marcos Regional Airport.

<table>
<thead>
<tr>
<th>Taxiway</th>
<th>Applicable Taxiway ADG</th>
<th>Current TSA (feet)</th>
<th>TOFA (feet)</th>
<th>ADG III Compliant</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>III</td>
<td>79</td>
<td>131</td>
<td>Y</td>
</tr>
<tr>
<td>B</td>
<td>III</td>
<td>79</td>
<td>131</td>
<td>Y</td>
</tr>
<tr>
<td>C</td>
<td>III</td>
<td>79</td>
<td>131</td>
<td>Y</td>
</tr>
<tr>
<td>E</td>
<td>III</td>
<td>79</td>
<td>131</td>
<td>Y</td>
</tr>
<tr>
<td>F</td>
<td>III</td>
<td>79</td>
<td>131</td>
<td>Y</td>
</tr>
<tr>
<td>J</td>
<td>III</td>
<td>79</td>
<td>131</td>
<td>Y</td>
</tr>
<tr>
<td>K</td>
<td>III</td>
<td>79</td>
<td>131</td>
<td>Y</td>
</tr>
</tbody>
</table>

*Source: Garver, 2019*
As **Table 4-16** indicates, all the taxiways at the San Marcos Regional Airport currently have TSA and TOFA’s that are dimensionally smaller than the ones required based on ADG III standards. An analysis was completed to determine if the existing taxiways at the airport could meeting ADG III TSA and TOFA standards without any substantial improvements/modifications. The results of the analysis showed that the San Marcos Regional Airport will not need to make any TSA or TOFA improvements to meet ADG III dimensional standards if the critical aircraft for the airport moves into the ADG III category.

**Taxiway Weight Bearing Capacity**

As discussed in the Runway Strength section, the MTOW of the aircraft using the Airport is expected to increase during the forecast period, so improvements to taxiway pavement strength may need to be considered as well.

**Taxiway Configuration Review**

Based on research, the FAA has identified a number of taxiway configurations that have been shown to cause pilot confusion, which can lead to safety issues such as runway incursions and incorrect runway departures.

Currently, the San Marcos Regional Airport has seven existing taxiway configurations that are not recommended by the FAA. Each of the seven areas and the configuration concern are identified later in this section.

Additionally, the intersection of Taxiway Foxtrot and the approach end of Runway 31 and Runway 35, as well as the intersection of Runway 8/26 and Runway 17/35, are considered a “hot spots” by the FAA, meaning there is an increased likelihood of runway incursions based on historical information.

- **Location #1** - Taxiway Alpha intersection with Runway 8 approach end
  - Direct access from apron to runway without a turn
  - Runway/taxiway intersection is not at a 90-degree angle
  - Shown in **Figure 4-9**
- **Location #2** - Taxiway Bravo intersection with Runway 8/26
  - Direct access from apron to runway without a turn
  - High energy intersection (middle 1/3 of runway)
- Shown in **Figure 4-10**
  - **Location #3 - Taxiway Charlie intersection with Runway 8/26**
    - Runway/taxiway intersection is not at a 90-degree angle
    - High energy intersection (middle 1/3 of runway)
    - Shown in **Figure 4-11**
  - **Location #4 - Taxiway Juliet intersection with Runway 8 approach end**
    - Runway/taxiway intersection is not at a 90-degree angle
    - Shown in **Figure 4-12**
  - **Location #5 - Taxiway Echo intersection with Runway 13/31**
    - Direct access from apron to runway without a turn
    - Shown in **Figure 4-13**
  - **Location #6 - Taxiway Foxtrot intersection with Runway 31 approach end**
    - Runway/taxiway intersection is not at a 90-degree angle
    - Single taxiway accesses two runway ends
    - Designated FAA Hot Spot
    - Shown in **Figure 4-14**
  - **Location #7 - Runway 17/35 intersection with approach end Runway 26**
    - Runway 17/35 is used as a taxiway for access to and from approach end of Runway 26
    - Designated FAA Hot Spot
    - Shown in **Figure 4-15**
FIGURE 4-9
TAXIWAY ALPHA INTERSECTION WITH RUNWAY 8 APPROACH END
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019
FIGURE 4-10
TAXIWAY BRAVO INTERSECTION WITH RUNWAY 8 APPROACH END
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019
FIGURE 4-11
TAXIWAY CHARLIE INTERSECTION WITH RUNWAY 8/26
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019

FIGURE 4-12
TAXIWAY JULIET INTERSECTION WITH RUNWAY 8 APPROACH END
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019
FIGURE 4-13
TAXIWAY ECHO INTERSECTION WITH RUNWAY 13/31
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019
FIGURE 4-14
TAXIWAY FOXTROT INTERSECTION WITH RUNWAY 13/31
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019

FIGURE 4-15
RUNWAY 13/31 INTERSECTION WITH RUNWAY 8/26
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019

Each of these configuration concerns will be addressed as part of the alternatives effort.
Engine Run-Up Areas

A concerned voiced by airport stakeholders in the stakeholder survey completed at the beginning of this master plan project was the lack of aircraft engine run-up areas available close to the ends of Runway 17 and Runway 31 and 35. These general areas are shown in Figure 4-16.

Since engine run-up areas are not present in these locations, aircraft congestion impacts frequently occur. Additionally, for departures on Runway 31 and Runway 35, engine run-ups are frequently completed on the ramp which presents a number of safety issues. Creation of run-up areas in these locations will be a consideration in the Alternatives Chapter.
**Taxi Routes/Times**

Another issue identified during stakeholder interviews and the stakeholder survey was the length of time and distance required to taxi from the main ramp area to the approach end of Runway 17 for departure. Runway 17 is the runway end that is most frequently used, yet it has the longest taxi time and distance. The taxi time is further increased because no direct taxiway route exists to the end of the runway. This will be a key consideration in the Alternatives Chapter.

**Airfield Lighting, Marking, and Signage Requirements**

Sufficient and accurate airfield marking, lighting and signage is essential to maintaining a high level of safety in an airport’s daily operation. In this section the existing airfield lighting, marking, and signage will be reviewed in light of the established activity forecast to determine where improvements need to be made.

**Runway Lighting, Marking, and Signage**

Runway marking and lighting requirements vary based on the utilization characteristics of a runway including each runway’s critical aircraft and instrument approaches.

**Runway Lighting**

All three runways at the San Marcos Regional Airport have Medium Intensity Runway Lighting (MIRLs) and all are in good condition. The airport also has Precision Approach Path Indicator (PAPI) light systems that are located on the approach ends of Runway 13, 17, and 31. The addition of PAPIs for Runway 35 should be a consideration in the future development of the airport. Runway 8/26 is equipped with Runway End Identifier Lights (REILs) on each runway end. The REIL systems are not operational and will be further evaluated as part of the alternatives analysis to determine whether they should be repaired or decommissioned.

Runway Centerline Lights and Touchdown Zone Lights (TDZ) are required on runways with Category (CAT) II or III Instrument Landing System (ILS) operations or any CAT I ILS runways with operations below 2,400 feet visibility. The lowest IAP minimum at the San Marcos Regional Airport is currently 2,400 feet visibility for the CAT I ILS approach to Runway 13. Based on the forecast it is not anticipated that
lower IAP minimums will be needed during the forecast period. As a result, it is not anticipated that the San Marcos Regional Airport will need to add runway centerline lights or touchdown zone lights during the forecast period.

Runway Markings

Runway 13/31 has precision instrument runway markings that are in good condition. Runway 8/26 and Runway 17/35 have non-precision instrument markings that were recently repainted and are in good condition. Based on an evaluation of future instrument approach needs at the airport it is not expected that the existing runway marking schemes (e.g. precision, non-precision, etc.) for any of the runways will need to be changed during the forecast period.

However, a marking deficiency was noted as part of the facility requirements analysis. Since Runway 17/35 is used as a taxiway to reach the approach end of Runway 26, painted runway hold position markings should be installed on Runway 17/35 to protect aircraft using Runway 8/26. This will be a consideration in the alternatives analysis.

Runway Signage

In general, the existing runway signage for the San Marcos Regional Airport is sufficient. However, Runway 17/35 has a single mandatory runway hold position sign on each side of its intersection with Runway 8/26. Since Runway 17/35 is used as a taxiway to taxi to/from the approach end of Runway 26, there should be two mandatory runway hold position signs on each side of Runway 17/35’s intersection with Runway 8/26. This will be a consideration as part of the alternatives analysis.

Taxiway Lighting, Marking, and Signage

All taxiways at San Marcos Regional Airport have taxiway centerline markings. The markings are generally in good to fair condition. Additionally, all taxiways at the Airport have Medium Intensity Taxiway Lights (MITLs) that are in good condition. Airfield signage related to the taxiway system is generally sufficient and provides accurate wayfinding to pilots.

However, through stakeholder feedback, it was noted that additional markings and/or signage may be needed at Taxiway Alpha and Charlie intersection adjacent
to the apron, as unfamiliar pilots sometimes miss the turn to Taxiway Alpha when taxiing northwest on Taxiway Charlie. Solutions to this issue will be considered in the alternatives chapter.

**Approach Lighting Systems**

An Approach Lighting System (ALS) provides the basic means to transition from instrument flight to visual flight for landing. An ALS is a configuration of signal lights starting at the landing threshold and extending into the approach area for a distance of 2400-3000 feet for precision instrument runways and 1400-1500 feet for non-precision instrument runways. Some systems include sequenced flashing lights that appear to the pilot as a ball of light traveling towards the runway at high speed.

Operational requirements dictate the sophistication and configuration of the ALS for a runway. Depending on the type of approach, certain ALS are required to aide pilots in the identification of the airport environment during instrument meteorological conditions. These requirements are found in FAA AC 150/5300-13 (current edition). It should be noted that ALS systems are required for runways with precision instrument approaches.

As part of the ILS, Runway 13 has a Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR). The Runway Alignment Indicator Lights (RAILs) are currently out of service, but a project to repair them is planned. The FAA owns and maintains the MALSR.

Future consideration for a new ALS will be predicated on user needs, instrument approach minimum requirements, and the restrictions of surrounding property and land use. Based on the forecast of future aeronautical activity and an analysis for future IAP needs at the airport, the MALSR for Runway 13 is expected to be sufficient during the forecast period and no additional ALS systems are expected to be needed.

**Wind Cone/Segmented Circle/Airport Beacon**

There are five total windsocks at the San Marcos Regional Airport. The primary windsock is located approximately 385 feet north of Runway 8/26 centerline and approximately 2,150 feet east of the threshold for Runway 8. The windsock is
lighted and is in good condition. The segmented circle associated with the windsock is in good condition.

There are four supplemental windsocks at the San Marcos Regional Airport at the following locations:

- **Supplemental Windsock #1** - Located close to the approach end of Runway 13, approximately 380 feet southwest of Runway 13/31 centerline and 925 feet from Runway 13 threshold.
- **Supplemental Windsock #2** - Located southeast of the intersection of Runway 8/26 and Runway 13/31. Approximately 410 feet from each runway's respective centerline.
- **Supplemental Windsock #3** - Located approximately 410 feet south of Runway 8/26 centerline and 790 feet from Runway 8 threshold.
- **Supplemental Windsock #4** - Located approximately 400 feet west of Runway 17/35 centerline and 1,020 feet from Runway 17 threshold.

All four supplemental windsocks are in good condition, but they are not lighted. As part of the alternatives analysis, consideration will be given to lighting the windsocks close to runway ends to improve visibility.

The primary airport beacon is located on top of the Air Traffic Control Tower and is in good condition. There is also a backup beacon located on top of the old air traffic control tower building, known as the Graham Tower. No changes to the airport beacon are expected to be needed during the forecast period.

**NAVAIDs**

Airport Navigation Aids (NAVAIDs) are installed on or near an airport to increase the Airport's reliability during night and inclement weather conditions and to provide electronic guidance and visual references for executing an approach to the Airport or runway.

FAA Order 7031.2C, *Airport Planning Standard Number One - Terminal Air Navigation Facilities and Air Traffic Control Services*, specifies minimum activity levels to qualify for instrument approach equipment and approach procedures. As forecast in the previous chapter, approximately 28,460 instrument operations (approaches and
takeoffs) will be conducted annually under IFR flight rules by the end of the 20-year planning period. The following describes the status of existing and new NAVAIDs used at general aviation airports.

**Very High Frequency Omni-Directional Radio Range**

The Very High Frequency Omni-Directional Radio Range (VOR/VORTAC) system emits a very high frequency radio signal utilized for both enroute navigation and non-precision approaches. It provides an instrument rated pilot with 360 degrees of azimuth information oriented to magnetic north. Due to the recent development of more precise navigational systems it is planned to be phased-out by the FAA.

The San Marcos Regional Airport is served by the Randolph VORTAC, located 31.4 nautical miles southeast of the Airport, and the Centex VORTAC, located 33.9 nautical miles north of the Airport. The Centex VOR is utilized for the Runway 13 ILS approach to identify the outer marker. With the FAA’s migration toward GPS based approaches and enroute navigation, it is not expected that any additional VORs will be needed in the area.

**Global Positioning System**

The Global Positioning System (GPS) is a highly accurate worldwide satellite navigational system that is unaffected by weather and provides point-to-point navigation by encoding transmissions from multiple satellites and ground-based data-link stations using an airborne receiver. GPS is presently FAA-certified for enroute and instrument approaches into numerous airports. The current program provides for GPS stand-alone and overlay approaches where GPS fixes are overlaid on top of an existing approaches (typically NDB or VOR approaches).

The Wide Area Augmentation System (WAAS) is being installed at or near airports to provide a signal correction enabling GPS precision approaches (commonly called GPS approaches with LPV minimums). As discussed earlier in this chapter, Runway 17 should be evaluated for a GPS approach with ¾ mile visibility minimums.

**Non-DIRECTIONAL Beacons (NDBs)**

NDBs are an older ground based navigational technology that are still used in some places to provide redundant navigational capabilities at airports. NDBs emit a signal
that aircraft can fly to when they are in close proximity to the NDB station. Currently, NDBs are used as a basis for instrument approach procedures and for marker locations (e.g. typically the outer marker) associated with ILS approaches. The San Marcos Regional Airport currently has an NDB located approximately 5.5 nautical miles northwest of the Airport directly under the flight path for Runway 13. The NDB is used as the basis for the NDB approach to Runway 13 and as the outer marker associated with the ILS approach for Runway 13. It is expected that the NDB will eventually be decommissioned as the FAA plans to phase out NDB systems nationwide.

**Instrument Landing System (ILS)**

Instrument Landing Systems (ILS) are a ground-based navigation system, composed of a localizer and glideslope that provide vertical and horizontal guidance to pilots when conducting an instrument approach to a runway during inclement weather. Today, ILS systems are still the primary instrument approach system utilized at commercial service airports across the United States. However, with the FAA’s migration to GPS based approaches and enroute navigation, the need for ILS systems is expected to decrease in the future.

Currently, San Marcos Regional Airport only has an ILS approach to Runway 13. Based on the IFR wind coverage analysis previously shown in Table 4-9, Runway 13 has the best IFR wind coverage of all the individual runway ends at the San Marcos Regional Airport and, consequently, is the ideal runway end to be equipped with an ILS system. The ILS system is in good condition and is maintained by the FAA. Due to the FAA’s migration to GPS based instrument approach procedures, it is not expected that an additional ILS system will be needed at the San Marcos Regional Airport.

**Weather Reporting System**

Automated Weather Observation Systems (AWOS) and Automated Surface Observation Systems (ASOS) consist of various types of sensors, a processor, a computer-generated voice subsystem, and a transmitter to broadcast minute-by-minute weather data from a fixed location directly to the pilot. The information is transmitted over the voice portion of a local NAVAID (VOR or DME), or a discrete VHF radio frequency. The transmission is broadcast in 20-30 second messages in
standard format and can be received within 25 nautical miles of the automated weather site.

At airports with instrument procedures, an AWOS/ASOS weather report eliminates the remote altimeter setting penalty, thereby permitting lower minimum descent altitudes (lower approach minimums). These systems should be sited within 500 to 1,000 feet of the primary runway centerline. FAA Order 6560.20B, *Siting Criteria for Automated Weather Observing Systems*, assists in the site planning for AWOS/ASOS systems.

The San Marcos Regional Airport is equipped with an AWOS-3 system that is owned and operated by the FAA. The AWOS is in good condition.

**AIRSPACE**

The term “airspace” is frequently used when discussing the areas surrounding an airport. There are a number of different categories/types of airspace that must be considered as part of the Airport master planning process. These include:

- Airspace Classification for Aeronautical Operators (e.g. Class B, C, D, etc.)
- FAR Part 77 – Imaginary Surfaces

**Airspace Classification for Aeronautical Operators**

The current airspace surrounding the San Marcos Regional Airport is classified as Class D airspace during times when the ATCT facility at the airport is operational (7 AM to 7 PM). When the ATCT facility is not in operation, the airspace around the airport reverts to Class E airspace.

As aircraft operations levels are not expected to change significantly during the forecast period, it is not expected that the current airspace classification will need to be changed during the 20-year planning horizon.

**FAR Part 77 – Imaginary Surfaces**

14 CFR Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*, provides standards and procedures to protect the continued safe and efficient use of airspace. 14 CFR Part 77.19, *Civil Airport Imaginary Surfaces*, defines the five civil
imaginary surfaces related to airports. To ensure the continued safe and efficient use of the airspace surrounding an airport, it is important that the five civil airport imaginary surfaces remain clear of any obstructions that could pose a hazard to air navigation. It should be noted that some objects may be located within an airport’s imaginary surfaces as long as they have been properly marked/lighted and an airspace review has been completed and determined that the object will not adversely affect the safe and efficient use of the local airspace.

The five civil airport imaginary surfaces described in 14 CFR Part 77.19 are defined below:

- **Primary Surface** – A surface longitudinally centered on a runway. When the runway has a specially prepared hard surface, the primary surface extends 200 feet beyond each end of that runway; but when the runway has no specially prepared hard surface, the primary surface ends at each end of that runway. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline.

- **Approach Surface** – A surface longitudinally centered on the extended runway centerline and extending outward and upward from each end of the primary surface. An approach surface is applied to each end of each runway based upon the type of approach available or planned for that runway end.

- **Horizontal Surface** – A horizontal plane 150 feet above the established airport elevation, the perimeter of which is constructed by swinging arcs of a specified radii from the center of each end of the primary surface of each runway of the airport and connecting the adjacent arcs by lines tangent to those arcs.

- **Conical Surface** – A surface extending outward and upward from the periphery of the horizontal surface at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

- **Transitional Surface** – These surfaces extend outward and upward at right angles to the runway centerline and the runway centerline extended at a slope of 7 to 1 from the sides of the primary surface and approach surfaces. Transitional surfaces for those portions of the precision approach surface which project through and beyond the limits of the conical surface, extend a
distance of 5,000 feet measured horizontally from the edge of the approach surface and at right angles to the runway centerline.

Based on the criteria described in 14 CFR Part 77.19, the five civil imaginary surfaces for the San Marcos Regional Airport are described below:

- **Runway 8/26**
  - Primary Surface - 1,000 feet wide x 200 feet past each runway end.
  - Approach Surface Runway 8 and Runway 26 - 34:1 slope for 10,000 feet. Inner width of the approach surface is 1,000 feet wide and expands to 4,000 feet wide.

- **Runway 13/31**
  - Primary Surface - 1,000 feet wide x 200 feet past each runway end.
  - Approach Surface Runway 13 - 50:1 slope first 10,000 feet, then 40:1 for 40,000 feet. Inner width of the approach surface is 1,000 feet wide and expands to 16,000 feet wide.
  - Approach Surface Runway 31 - 34:1 slope for 10,000 feet. Inner width of the approach surface is 1,000 feet wide and expands to 3,500 feet wide.

- **Runway 17/35**
  - Primary Surface - 1,000 feet wide x 200 feet past each runway end.
  - Approach Surface Runway 17 - 34:1 slope for 10,000 feet. Inner width of the approach surface is 1,000 feet wide and expands to 3,500 feet wide.
  - Approach Surface Runway 35 - 34:1 slope for both runway ends for 10,000 feet. Inner width of the approach surface is 1,000 feet wide and expands to 4,000 feet.

- **Non-Runway Specific Surfaces**
  - Horizontal Surface - Flat surface established at an elevation 744.7 feet (150 feet above field elevation). Perimeter is based on 10,000 feet arcs swung from all runway ends.
  - Conical Surface - Extends from the edges of the Horizontal Surface for a horizontal distance of 4,000 feet at a 20:1 slope.
- **Transitional Surface** - Extends from the edges of the primary surface until it reaches the horizontal surface and from the edges of the approach surfaces until it reaches the horizontal surface or for a horizontal distance of 5,000 feet at a 7:1 slope.

These surfaces are depicted in the Airspace Drawing that is included as part of the Airport Layout Plan. A small hill is located approximately 4,500 feet north of the existing Runway 17 threshold in close alignment with the Runway 17/35 centerline. This hill is expected to be key consideration in the future development of Runway 17/35 in the alternatives process.

**Airfield/Airspace Facility Requirements Summary**

Based on airfield/airspace facility requirements defined previously in this document, the following airfield/airspace development objectives have been created to guide the alternatives development process:

**Runways/Approaches/Airspace:**

- Runway 17/35 needs to be developed as the primary runway.
- Runway 17/35 should be protected for an extension up to 7,000 feet.
- Runway strengthening will likely be necessary for Runway 13/31 and Runway 17/35.
- Runway 17/35 and Runway 13/31 should be considered for upgrades to C-III standards as they are the most suitable for improvement.
- Runway 17 should be evaluated for lower approach minimums (¾ mile).
- Evaluate need to repair or replace Runway 8/26 REILs.
- Consider the closure of Runway 8/26 as it provides no substantial wind coverage or capacity benefits and would be difficult to upgrade to C-III runway design standards.
- Add lighted windsocks to runway ends.
- Add PAPI system to Runway 35.
- Acquire property or establish avigation easements necessary to protect the RPZs for Runway 8, 31, and 35.
Add additional mandatory hold position signage on Runway 17/35 at the intersection of Runway 8/26 to fully conform to FAA safety standards. Painted runway hold position markings should also be installed.

Update runway designations for Runway 17/35 and Runway 8/26 during the latter portion of the forecast period due to magnetic variation changes.

**Taxiways**

- Improve taxiways to TDG-3 standards as they are rehabilitated and monitor for potential fleet mix shift to Bombardier Q400 aircraft (a TDG-5 aircraft). Improve to TDG-5 standards if this fleet mix shift occurs.
- Resolve the seven identified taxiway layout configuration issues.
- Improve airfield marking and signage related to the Taxiway Alpha/Charlie intersection.
- Establish aircraft run-up areas at the approach end of Runway 17, 31 and 35.
- Improve taxiway access to the approach end of Runway 17 to reduce taxi times.
- Improve taxiway weight bearing capacity.
Terminal Area/Landside Facility Requirements

Terminal area and landside area facilities play an important role in enabling the transition of pilots, passengers, and goods to and from the airside facilities at the airport. Terminal and landside area facilities include FBO/Terminal building facilities, hangars, apron space, vehicle parking areas, and roadway access.

FBO/Terminal Building Requirements

FBO/Terminal buildings serve both a functional and social capacity central to the operation, promotion, and visible identity of any airport. Key FBO/terminal area facility requirements are developed in consideration of the following general design concepts:

- Future terminal area development for general aviation airports serving utility and larger than utility aircraft should be centralized
- Planned development should allow for incremental linear expansion of facilities and services in a modular fashion along an established flightline
- Major design considerations involve minimizing earthwork/grading, avoiding flood-prone areas and integrating existing paved areas to reduce pavement (taxilane) costs
- Future terminal expansion should allow sufficient maneuverability and accessibility for appropriate types (mix) of aircraft within secured access areas
- Future terminal area development should enhance safety, visibility, and be aesthetically pleasing

The San Marcos Regional Airport currently has two FBO/Terminal buildings. The FBO/terminal building operated by Berry Aviation is approximately 3,600 square feet. The FBO/terminal building operated by Redbird Skyport provides approximately 17,850 square feet of FBO/terminal space. The total amount of FBO/terminal building space is approximately 21,450 square feet.

An estimate of future building/space needs based on forecasted demand is outlined in Table 4-17. Public space is allocated for lounge/waiting area, flight planning, restrooms, meeting rooms, and concession. The FBO space could
accommodate FBO office space, employee breakroom, and a utility/equipment room.

### TABLE 4-17
**TERMINAL BUILDING SPACE REQUIREMENTS**
**SAN MARCOS REGIONAL AIRPORT**

<table>
<thead>
<tr>
<th>Facility</th>
<th>2018</th>
<th>PAL 1</th>
<th>PAL 2</th>
<th>PAL 3</th>
<th>PAL 4</th>
<th>PAL 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Formula Factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Peak Hour Operations</td>
<td>35</td>
<td>32</td>
<td>39</td>
<td>44</td>
<td>50</td>
<td>55</td>
</tr>
<tr>
<td>- % of Aircraft Using FBO Terminal Facilities</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>- Average # of Pilots/Passengers</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>- Sq. Ft. Allotment Per Person</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td><strong>Terminal Sq. Ft. Requirement for Passengers/Pilots</strong></td>
<td>6,653</td>
<td>6,070</td>
<td>7,245</td>
<td>8,334</td>
<td>9,356</td>
<td>10,355</td>
</tr>
<tr>
<td>- Office/Support Space (25%)</td>
<td>1,663</td>
<td>1,517</td>
<td>1,811</td>
<td>2,084</td>
<td>2,339</td>
<td>2,589</td>
</tr>
<tr>
<td><strong>Total Terminal Sq. Ft. Requirement</strong></td>
<td>8,317</td>
<td>7,587</td>
<td>9,056</td>
<td>10,418</td>
<td>11,696</td>
<td>12,944</td>
</tr>
<tr>
<td><strong>Current Terminal Sq. Ft.</strong></td>
<td>21,450</td>
<td>21,450</td>
<td>21,450</td>
<td>21,450</td>
<td>21,450</td>
<td>21,450</td>
</tr>
<tr>
<td><strong>Surplus/Deficiency (Sq. Ft.)</strong></td>
<td>13,133</td>
<td>13,863</td>
<td>12,394</td>
<td>11,032</td>
<td>9,754</td>
<td>8,506</td>
</tr>
</tbody>
</table>

*Source: ACRP Guidebook for GA Facility Planning and Garver, 2019*

Based on this analysis it is not expected that additional FBO/terminal building facilities will be needed in the future.

**AIRCRAFT STORAGE**

Future hangar areas should achieve a balance between maintaining an unobstructed expansion area, minimizing pavement development, and allowing convenient airside and landside access. Typically, single-engine piston aircraft demand 1,250 square feet, twin-propeller aircraft require 3,500 square feet, business turboprop/jet aircraft require approximately 3,000 to 5,000 square feet, and helicopters typically require approximately 1,500 square feet. General hangar design considerations include the following:

- Construction of aircraft hangars should be beyond an established Building Restriction Line (BRL) surrounding the runway and taxiway areas, the runway OFZ, runway and taxiway OFAs, and remain clear of the FAR Part 77 Surfaces and Threshold Siting Surfaces.
Maintaining the minimum recommended clearance between T-hangars of 79 feet for one-way traffic, and 143 feet for two-way traffic. Taxilanes supporting T-hangars should be no less than 25 feet wide. Individual paved approaches to each hangar stall are typically less costly, but not preferred to paving the entire T-hangar access/ramp area.

Interior and exterior lighting and electrical connections on new hangar construction. Enclosed hangar storage with bi-fold doors is recommended.

Adequate drainage with minimal slope differential between the hangar door and taxilane. A hard-surfaced hangar floor is recommended, with less than one percent downward slope to the taxilane/ramp.

Segregate hangar development based on the hangar type and function. From a planning standpoint, hangars should be centralized in terms of auto access, and located along the established flight line to minimize costs associated with access, drainage, utilities and auto parking expansion.

Today, the San Marcos Regional Airport has box and T-hangar storage totaling 469,150 square feet and has 200 based aircraft on the field. Currently, the hangars at the airport are at capacity and a waiting list for hangar space exists. As of May 2019, 109 individuals are on the waiting list for box hangar space, T-hangar space, or T-shelter space. Based on the forecast for based aircraft, it is expected that the need for hangar space at the San Marcos Regional Airport will need to grow as described in Table 4-18 to accommodate both current and future demand.
### TABLE 4-18
**HANGAR SPACE REQUIREMENTS**
**SAN MARCOS REGIONAL AIRPORT**

<table>
<thead>
<tr>
<th>Facility</th>
<th>2018</th>
<th>PAL 1</th>
<th>PAL 2</th>
<th>PAL 3</th>
<th>PAL 4</th>
<th>PAL 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Based Aircraft - Single Engine Piston</td>
<td>160</td>
<td>162</td>
<td>168</td>
<td>178</td>
<td>186</td>
<td>195</td>
</tr>
<tr>
<td>% of Based SE Aircraft Utilizing Hangar</td>
<td>75%</td>
<td>75%</td>
<td>75%</td>
<td>75%</td>
<td>75%</td>
<td>75%</td>
</tr>
<tr>
<td>Total Based SE Aircraft Placed in Hangar</td>
<td>120</td>
<td>122</td>
<td>126</td>
<td>134</td>
<td>140</td>
<td>146</td>
</tr>
<tr>
<td>Estimated Hangar Space per Aircraft</td>
<td>1,250</td>
<td>1,250</td>
<td>1,250</td>
<td>1,250</td>
<td>1,250</td>
<td>1,250</td>
</tr>
<tr>
<td>Total Hangar Space Required (sq. ft.)</td>
<td>150,000</td>
<td>151,875</td>
<td>157,500</td>
<td>166,875</td>
<td>174,375</td>
<td>182,813</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Facility</th>
<th>2018</th>
<th>PAL 1</th>
<th>PAL 2</th>
<th>PAL 3</th>
<th>PAL 4</th>
<th>PAL 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Based Aircraft - Multi-Engine/Turboprop</td>
<td>25</td>
<td>26</td>
<td>35</td>
<td>44</td>
<td>55</td>
<td>67</td>
</tr>
<tr>
<td>% of Based ME/TP Aircraft Utilizing</td>
<td>95%</td>
<td>95%</td>
<td>95%</td>
<td>95%</td>
<td>95%</td>
<td>95%</td>
</tr>
<tr>
<td>Total Based ME/TP Aircraft Placed in</td>
<td>24</td>
<td>25</td>
<td>33</td>
<td>42</td>
<td>52</td>
<td>64</td>
</tr>
<tr>
<td>Estimated Hangar Space per Aircraft</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
</tr>
<tr>
<td>Total Hangar Space Required (sq. ft.)</td>
<td>71,250</td>
<td>74,100</td>
<td>99,750</td>
<td>125,400</td>
<td>156,750</td>
<td>190,950</td>
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</table>

<table>
<thead>
<tr>
<th>Facility</th>
<th>2018</th>
<th>PAL 1</th>
<th>PAL 2</th>
<th>PAL 3</th>
<th>PAL 4</th>
<th>PAL 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Based Aircraft - Helicopters</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Estimated Hangar Space per Aircraft</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
</tr>
<tr>
<td>Total Hangar Space Required (sq. ft.)</td>
<td>1,500</td>
<td>1,500</td>
<td>4,500</td>
<td>6,000</td>
<td>9,000</td>
<td>12,000</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Facility</th>
<th>2018</th>
<th>PAL 1</th>
<th>PAL 2</th>
<th>PAL 3</th>
<th>PAL 4</th>
<th>PAL 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Based Aircraft - Jet</td>
<td>14</td>
<td>15</td>
<td>21</td>
<td>27</td>
<td>35</td>
<td>45</td>
</tr>
<tr>
<td>Estimated Hangar Space per Aircraft</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Total Hangar Space Required (sq. ft.)</td>
<td>70,000</td>
<td>75,000</td>
<td>105,000</td>
<td>135,000</td>
<td>175,000</td>
<td>225,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Facility</th>
<th>2018</th>
<th>PAL 1</th>
<th>PAL 2</th>
<th>PAL 3</th>
<th>PAL 4</th>
<th>PAL 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Itinerant Aircraft Operations</td>
<td>39,144</td>
<td>35,708</td>
<td>42,622</td>
<td>49,032</td>
<td>55,045</td>
<td>60,919</td>
</tr>
<tr>
<td>Maintenance/Transient Hangar Area Demand (ft²)</td>
<td>78,287</td>
<td>71,417</td>
<td>85,243</td>
<td>98,064</td>
<td>110,091</td>
<td>121,838</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Facility</th>
<th>2018</th>
<th>PAL 1</th>
<th>PAL 2</th>
<th>PAL 3</th>
<th>PAL 4</th>
<th>PAL 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Unmet Demand (e.g. Hangar)</td>
<td>60,875</td>
<td>60,875</td>
<td>45,000</td>
<td>32,500</td>
<td>20,000</td>
<td>12,500</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Facility</th>
<th>2018</th>
<th>PAL 1</th>
<th>PAL 2</th>
<th>PAL 3</th>
<th>PAL 4</th>
<th>PAL 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Based Aircraft</td>
<td>200</td>
<td>204</td>
<td>227</td>
<td>253</td>
<td>282</td>
<td>315</td>
</tr>
<tr>
<td>Total Hangar Space Required (sq. ft.)</td>
<td>431,912</td>
<td>434,767</td>
<td>496,993</td>
<td>563,839</td>
<td>645,216</td>
<td>745,101</td>
</tr>
</tbody>
</table>

Source: Garver, 2019

**Note:** An average of 1,250 square feet per aircraft was utilized for the T-hangar area demand calculations. An average of 3,000 square feet per aircraft was utilized for based turboprop/multi-engine box hangar calculations. An average of 1,500 square feet per helicopter was utilized for based helicopter hangar demand calculations.

With the expected growth of based single-engine piston, multi-engine, turboprop and jet aircraft at the Airport it is expected that both T-hangar and box hangar space will be needed in the future. However, box hangar space is expected to be in
higher demand. This will likely need to include larger hangars with taller doors to accommodate larger Group III aircraft.

**AUTO PARKING, CIRCULATION, AND ACCESS REQUIREMENTS**

**Vehicle Parking**

Airports are unique facilities with regard to vehicle parking requirements because they are used by a number of aeronautical and non-aeronautical users and for a variety of purposes. Consequently, a calculation on the number of required parking spaces was completed using the best practices established in Airport Cooperative Research Program’s (ACRP) *Guidebook for General Aviation Facility Planning*.

Under the best practices established in that document a total of 2.5 spaces should be allocated for each aircraft operating during peak hour activity levels and an additional 1 space for every 1,000 square feet of hangar space to account for employees and others.

**Table 4-19** shows the number of required parking spaces utilizing this methodology.
### Table 4-19
**VEHICLE PARKING SPACE REQUIREMENTS**
**SAN MARCOS REGIONAL AIRPORT**

<table>
<thead>
<tr>
<th>Facility</th>
<th>2018</th>
<th>PAL 1</th>
<th>PAL 2</th>
<th>PAL 3</th>
<th>PAL 4</th>
<th>PAL 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FBO Terminal Parking</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Peak Hour Operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- % of Aircraft Using FBO Terminal Facilities</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>- Peak Hour Multiplier</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>Parking Space Need for Passenger/Pilot</strong></td>
<td>44</td>
<td>40</td>
<td>48</td>
<td>56</td>
<td>62</td>
<td>69</td>
</tr>
<tr>
<td><strong>Hangar Space Parking</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Hangar Space Requirement</td>
<td>371,037</td>
<td>373,892</td>
<td>451,993</td>
<td>531,339</td>
<td>625,216</td>
<td>732,601</td>
</tr>
<tr>
<td>- Parking Allotment Based on Hangar Space (1 space per 1,000 sf)</td>
<td>371</td>
<td>374</td>
<td>452</td>
<td>531</td>
<td>625</td>
<td>733</td>
</tr>
<tr>
<td>- Reduction for Parking Inside Hangar or Unmarked Area</td>
<td>75.00%</td>
<td>75.00%</td>
<td>75.00%</td>
<td>75.00%</td>
<td>75.00%</td>
<td>75.00%</td>
</tr>
<tr>
<td><strong>Total Parking Needed for Hangar Space</strong></td>
<td>93</td>
<td>93</td>
<td>113</td>
<td>133</td>
<td>156</td>
<td>183</td>
</tr>
<tr>
<td><strong>Tie-Down Space Parking</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Tie-Down Space Requirements</td>
<td>41</td>
<td>42</td>
<td>44</td>
<td>47</td>
<td>49</td>
<td>52</td>
</tr>
<tr>
<td>- % of A/C in Use at One-Time</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Total Parking Needed for Tie-Down Space</strong></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td><strong>Flight School Parking Space</strong></td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total # of Spaces Currently</strong></td>
<td>234</td>
<td>234</td>
<td>234</td>
<td>234</td>
<td>234</td>
<td>184</td>
</tr>
<tr>
<td><strong>Total Number of Parking Spaces Needed</strong></td>
<td>191</td>
<td>188</td>
<td>216</td>
<td>243</td>
<td>274</td>
<td>307</td>
</tr>
<tr>
<td><strong>Total Deficiency/Surplus</strong></td>
<td>43</td>
<td>46</td>
<td>18</td>
<td>-9</td>
<td>-40</td>
<td>-123</td>
</tr>
</tbody>
</table>

*Source: Garver, 2019*

While this analysis shows that San Marcos Regional Airport will not need additional vehicle parking spaces until PAL 3 is reached it should be noted that vehicle parking is currently lacking in specific areas of the Airport while other portions of the Airport have excess vehicle parking capacity. Consequently, short-term parking improvements will be needed in specific areas to meeting current demand. This will be a consideration in the alternatives analysis.

### Vehicle Access

Current vehicle access to the Airport is via Airport Drive, which connects to Highway TX-21. The road is paved and is in good condition. However, stakeholder feedback has indicated a desire to straighten the roadway and improve its aesthetics. The close proximity between airport development areas and the Gary Job Corps. property line provide a limited area to improve the roadway without modifying...
other facilities. Improving the alignment and aesthetics of Airport Drive will be a consideration during the alternatives analysis.

Additionally, while it is not expected that vehicle congestion will be an issue during the forecast period, a secondary access route to the ramp side development area should be considered to improve vehicle access and flow. A secondary access route will be a consideration in the alternatives analysis.

In addition, adding a right turn lane from TX-21 to Airport Drive in order to improve traffic flow and safety will also be considered.

**Aircraft Apron Storage**

**Composition, Layout, and Condition**

Aircraft apron areas are provided for aircraft maneuvering and parking. Typically, aprons utilized for aircraft parking have a blend of based aircraft utilizing the apron as a permanent parking location and itinerant aircraft that are using the apron as a temporary parking location. Currently, the apron at San Marcos Regional Airport is used for a combination of transient and based aircraft parking. The apron is concrete and is in fair to poor condition. Stakeholders have expressed concern regarding the condition of the apron. Consequently, in addition to the ramp space requirements based on the calculations found later in this section, ramp condition and utilization will be considerations in the alternatives analysis.

**Apron Space Requirements**

Since both based and transient aircraft utilize the apron at the San Marcos Regional Airport, space requirements have been calculated to account for both, along with the space needed for general aircraft movement. For the purposes of this analysis it is assumed that aircraft will primarily be in a single row configuration, wing-to-wing, with pull-through or push-back parking as is common with itinerant aircraft.

To begin the analysis, a weighted average for the number of square feet of pavement needed to park an aircraft was calculated. Additionally, for these calculations, considerations were made for the fleet mix at the San Marcos Regional Airport, the movement of the aircraft into and out of the parking area, and the movement of other aircraft around the parked aircraft. Required clearances on all
sides of the aircraft were also taken into the consideration. **Table 4-20** shows the results of this analysis and provides a weighted average apron space requirement per aircraft.

**TABLE 4-20**

**VEHICLE PARKING SPACE REQUIREMENTS**

**SAN MARCOS REGIONAL AIRPORT**

<table>
<thead>
<tr>
<th>ADG</th>
<th>Average Length (ft)</th>
<th>Average Wingspan (ft)</th>
<th>Additional Clearance (ft)</th>
<th>TOFA Clearance (ft)</th>
<th>Average Parking Area Required (ft²)</th>
<th>Fleet Mix</th>
<th>Weighted Average Parking Area (ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>26</td>
<td>35</td>
<td>7.50</td>
<td>79</td>
<td>6,000</td>
<td>81.85%</td>
<td>4,911</td>
</tr>
<tr>
<td>II</td>
<td>55</td>
<td>60</td>
<td>9.00</td>
<td>115</td>
<td>14,664</td>
<td>16.20%</td>
<td>2,376</td>
</tr>
<tr>
<td>III</td>
<td>100</td>
<td>100</td>
<td>11.00</td>
<td>162</td>
<td>34,648</td>
<td>0.89%</td>
<td>308</td>
</tr>
<tr>
<td>IV</td>
<td>155</td>
<td>140</td>
<td>13.5</td>
<td>225</td>
<td>67,969</td>
<td>0.01%</td>
<td>7</td>
</tr>
<tr>
<td>Helicopter</td>
<td>35</td>
<td>30</td>
<td>12.00</td>
<td>0</td>
<td>3,186</td>
<td>1.05%</td>
<td>33</td>
</tr>
</tbody>
</table>

**Weighted Average:** 7,635

**Source:** Garver, 2019

**Note:** These calculations take into account the TOFA required for another aircraft to pass by the parked aircraft. The average parking area required was calculated by multiplying the average aircraft length plus 2 times the additional clearance margin by the average aircraft wingspan plus 2 times the additional clearance margin and then adding that number to the TOFA plus the aircraft’s average wingspan plus 2 times the additional clearance margin.

Based on these calculations and the San Marcos Regional Airport peaking characteristics described in the Forecast Chapter, **Table 4-21** shows the estimated amount of apron space that will be required at the airport during the forecast period.
## APRON SPACE REQUIREMENTS

### Table 4-21

<table>
<thead>
<tr>
<th>Year</th>
<th>Peak Month Average Day (PMAD)</th>
<th>Estimated Percentage OPS on Apron at Same Time</th>
<th>Estimated Average Aircraft Parking Area (ft²)</th>
<th>Estimated Parking Apron Area (ft²)</th>
<th>Aircraft Circulation Factor</th>
<th>Long-Term Tie-Down Aircraft</th>
<th>Total Apron Area Required (ft²)</th>
<th>Current Apron Area (ft²)</th>
<th>Surplus/Deficiency Based on Current Apron Size (ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>237</td>
<td>50.00%</td>
<td>6,805</td>
<td>806,393</td>
<td>483,836</td>
<td>82,500</td>
<td>1,372,728</td>
<td>2,498,300</td>
<td>1,125,572</td>
</tr>
<tr>
<td>PAL 1</td>
<td>216</td>
<td>50.00%</td>
<td>6,805</td>
<td>734,940</td>
<td>440,964</td>
<td>83,600</td>
<td>1,259,504</td>
<td>2,498,300</td>
<td>1,238,796</td>
</tr>
<tr>
<td>PAL 2</td>
<td>258</td>
<td>50.00%</td>
<td>7,012</td>
<td>904,548</td>
<td>542,729</td>
<td>87,500</td>
<td>1,534,777</td>
<td>2,498,300</td>
<td>963,523</td>
</tr>
<tr>
<td>PAL 3</td>
<td>296</td>
<td>50.00%</td>
<td>7,220</td>
<td>1,068,560</td>
<td>641,136</td>
<td>93,400</td>
<td>1,803,096</td>
<td>2,498,300</td>
<td>695,204</td>
</tr>
<tr>
<td>PAL 4</td>
<td>333</td>
<td>50.00%</td>
<td>7,480</td>
<td>1,245,420</td>
<td>747,252</td>
<td>98,500</td>
<td>2,091,172</td>
<td>2,498,300</td>
<td>407,128</td>
</tr>
<tr>
<td>PAL 5</td>
<td>368</td>
<td>50.00%</td>
<td>7,635</td>
<td>1,404,840</td>
<td>842,904</td>
<td>104,200</td>
<td>2,351,944</td>
<td>2,498,300</td>
<td>146,356</td>
</tr>
</tbody>
</table>

Source: Garver, 2019

**Note:** An assumption was made that no more than 50% of the total number of estimated itinerant operations during the PMAD would be on the ramp at the same time. The estimated parking apron required was calculated by multiplying the PMAD by the forecasted percentage of itinerant operations, then multiplying that result by the estimated percentage of itinerant operations on the apron at the same time, and then multiplying that result by the weighted average aircraft parking area. A factor of .6 was added to the apron space calculation to account for general aircraft circulation and movement.

These calculations show that the existing apron space will be sufficient for the duration of the planning period. Since pavement condition is a significant concern regarding the ramp, the alternatives analysis will identify portions of the main ramp that could potentially be temporarily closed in an effort to reduce the amount of pavement that has to be maintained.

### Apron Lighting

Based on feedback from airport stakeholders, the main ramp area is too dark at night. Additional lighting will be a consideration in the alternatives analysis process. Light pollution from the Gary Job Corps facility contributes to this issue.

### Fuel Storage Requirements

Fuel storage requirements are based on the forecast of annual operations, aircraft utilization, average fuel consumption rates, and the forecast mix of GA aircraft anticipated at the San Marcos Regional Airport. On average, the typical single-engine airplane consumes 12.0 gallons of fuel per hour and flies approximately 100 nautical miles (1.0 to 1.5 hours) per flight. Turbine aircraft generally will fly greater
distances averaging 300 nautical miles and approximately 1.5 – 2.0 hours. Market conditions will determine the ultimate need for fuel tanks and their size. The following guidelines should be implemented when planning future airport fuel facilities:

- Aircraft fueling facilities should remain open continually (24-hour access), remain visible and be within close proximity to the terminal building or FBO to enhance security and convenience.
- Fuel storage capacity should be sufficient for average peak-hour month activity.
- Fueling systems should permit adequate wing-tip clearance to other structures, designated aircraft parking areas (tie-downs), maneuvering areas, and OFAs associated with taxilane and taxiway centerlines.
- Locating the fuel facilities beyond the RSA and BRL.
- Equipping all fuel storage tanks with monitors to meet current state and federal environmental regulations, and be sited in accordance with local fire codes.
- Have a dedicated fuel truck for Jet-A delivery to minimize the liability associated with towing and maneuvering expensive aircraft up to and in the vicinity of fueling facilities.
- Maintaining adequate truck transport access to the fuel storage tanks for fuel delivery.

As reported in the Inventory Chapter, both FBOs have fuel farms with storage tanks for both 100LL and Jet-A fuel. Redbird Skyport has two Above-Ground Storage Tanks (ASTs), one for Jet-A and one for 100LL. Both tanks are 12,000 gallons and are in good condition. Berry Aviation has two ASTs, one for Jet-A and one for 100LL. Both tanks are 10,000 gallons and are in good condition. Berry also has an additional 1,000 gallon tank of 100LL fuel used for self-service. Based on forecasted demand, it is not expected that a fuel farm expansion will be needed.

**US Customs and Border Protection Facility**

During the initiation of this Master Planning process, multiple stakeholders mentioned the need for a US Customs and Border Protection (CBP) User Fee facility at the airport. The establishment of US CBP User Fee facility requires the
construction of a Federal Inspection Station (FIS) to allow processing of international flights/passengers. The development of similar facilities at other airports in the recent past have cost between $4 and $5 million dollars.

As part of this master plan study, efforts were made to determine if a measurable demand for a CBP FIS at the San Marcos Regional Airport exists. Based on available data, no clear demand driver was identified. While it is assumed that international visitors to the San Marcos outlet malls may use a CBP FIS located at the San Marcos Regional Airport, no available data shows a link to a demand for the facility.

Consequently, the future location for a US CBP FIS facility will be considered as part of the alternatives analysis, but the facility should only be developed when a clear demand driver has been established.

**Utilities**

The primary utility need identified as part of this facility requirements analysis is the need for fiber to tenants along Airport Drive. Additionally, utility access will also be necessary to support development along TX-21. This will be a consideration in the alternatives chapter. Utility improvements along TX-21 are currently in the City of San Marcos Capital Improvement Program (CIP) for the near future.

**Terminal Area/Landside Facility Requirements Summary**

Based on the terminal area/landside requirements analysis, the following development objectives have been established for the HYI alternatives development process.

- A significant amount of additional box hangar space is expected to be needed. This will include larger hangars with bigger doors that can accommodate larger aircraft.
- A smaller amount of additional T-hangar space will be needed.
- Portions of the existing main ramp should be closed to reduce pavement that must be maintained. Portions of the ramp that are not closed will need to be rehabilitated as necessary.
- Additional vehicle parking spaces need to be added in key areas to meet existing demand.
➤ Improve apron area lighting.
➤ Identify location for a future CBP FIS facility.
➤ Improved fiber access along Airport Drive.
➤ Improve utility access along TX-21.
➤ Add a secondary access route into airport.
➤ Straighten and improve aesthetics of Airport Drive.

**FACILITY REQUIREMENTS – SUMMARY**

Based on the analysis completed in this chapter, the primary drivers for the Alternatives Chapter are the items defined below:

**RUNWAYS/APPROACHES/AIRSPACE**

➤ Runway 17/35 needs to be developed as the primary runway.
➤ Runway 17/35 should be protected for an extension up to 7,000 feet.
➤ Runway strengthening will likely be necessary for Runway 13/31 and Runway 17/35.
➤ Runway 17/35 and Runway 13/31 should be considered for updates to C-III standards as they are the most suitable for improvement.
➤ Runway 17 should be evaluated for lower approach minimums (¾ mile)
➤ Evaluate need to repair or replace Runway 8/26 REILs.
➤ Consider the closure of Runway 8/26 as it provides no substantial wind coverage or capacity benefits and would be difficult to upgrade to C-III runway design standards.
➤ Add lighted windsocks to runway ends.
➤ Add PAPI system to Runway 35.
➤ Acquire property or establish avigation easements necessary to protect the RPZs for Runway 8, 31, and 35
➤ Add additional mandatory hold position signage on Runway 17/35 at the intersection of Runway 8/26 to fully conform to FAA safety standards.
➤ Update runway designations for Runway 17/35 and Runway 8/26 during the latter portion of the forecast period due to magnetic variation changes.
Taxiways

- Improve taxiways to TDG-3 standards as they are rehabilitated and monitor for potential fleet mix shift to Bombardier Q400 aircraft (a TDG-5 aircraft). Improve to TDG-5 standards if this fleet mix shift occurs.
- Resolve the seven identified taxiway layout configuration issues.
- Improve airfield marking and signage related to the Taxiway Alpha/Charlie intersection.
- Establish aircraft run-up areas at the approach end of Runway 17, 31 and 35.
- Improve taxiway access to the approach end of Runway 17 to reduce taxi times.
- Improve taxiway weight bearing capacity.

Terminal/Landside

- A significant amount of additional box hangar space is expected to be needed. This will include larger hangars with bigger doors that can accommodate larger aircraft.
- A smaller amount of additional T-hangar space will be needed.
- Portions of the existing main ramp should be closed to reduce pavement that must be maintained. Portions of the ramp that are not closed will need to be rehabilitated as necessary.
- Additional vehicle parking spaces need to be added in key areas to meet existing demand.
- Improve apron area lighting.
- Identify location for a future CBP FIS facility.
- Improved fiber access along Airport Drive.
- Improve utility access along TX-21.
- Add a secondary access route into airport.
- Straighten and improve aesthetics of Airport Drive.
CHAPTER 5

Alternatives
CHAPTER 5: ALTERNATIVES

INTRODUCTION

This chapter describes the various runway/approach, taxiway, land-use, and ramp re-development alternatives that were created based on the needs defined in the Facility Requirements Chapter. This chapter also:

- Discusses the evaluation process used to select the preferred development alternative for each area;
- Reviews the results of the evaluation process; and,
- Provides an overview of the anticipated environmental impacts of the consolidated preferred development alternatives.

ALTERNATIVES DEVELOPMENT AND EVALUATION PROCESS

The various alternatives described in this chapter were created by reviewing the facility requirements defined in Chapter 4 and devising numerous development options that could potentially satisfy those requirements. These preliminary development alternatives were then consolidated into:

- 3 – Runway/Approach Alternatives
- 3 – Taxiway Alternatives
- 4 – Land-Use Alternatives
- 3 – Ramp Re-Development Alternatives

These alternatives were then formally evaluated using the processes described in the remainder of this chapter.

Runways are the cornerstone of an airport's infrastructure system. Typically, the location and development of all other infrastructure at an airport (e.g. taxiways, ramps, hangars, etc.) is based on the layout of the runways. As a result, the alternatives were reviewed and evaluated in the order described below with a
preferred alternative in each higher order area being identified prior to the evaluation of the alternatives in a lower order area:

- **1st Order – Runway/Approach Alternatives**
- **2nd Order – Taxiway Alternatives**
- **3rd Order – Land-Use Alternatives**
- **4th Order – Ramp Re-Development Alternatives**

The evaluation of the alternatives within each alternative area (e.g. runway/approach, taxiway, land-use, etc.) is a complex task that requires unique considerations related to the area being evaluated. For example, the criteria utilized to evaluate runway/approach alternatives is different than the criteria utilized to evaluate taxiway, land-use, or ramp re-development alternatives. The formal evaluation criteria utilized to evaluate the alternatives within each area are discussed in the remainder of this chapter.

**RUNWAY/APPRAOCH ALTERNATIVES**

The following development objectives were established related to the runway/approach alternatives at the San Marcos Regional Airport:

- Runway 17/35 needs to be developed as the primary runway.
- Runway 17/35 must be protected for an extension up to 7,000 feet.
- Runway strengthening will be necessary for Runway 13/31 and Runway 17/35.
- Runway 17/35 and Runway 13/31 should be considered for upgrades to C-III standards as they are the most suitable for improvement.
- Runway 17 should be evaluated for lower approach minimums (¾ mile).
- Evaluate the need to repair or replace the Runway 8/26 REILs.
- Consider the closure of Runway 8/26 as it provides no substantial wind coverage or capacity benefits and would be difficult to upgrade to C-III runway design standards.
- Add lighted windsocks to runway ends.
- Add PAPI system to Runway 35.
AIRPORT MASTER PLAN

- Acquire property or establish avigation easements necessary to protect the RPZs for Runway 31.
- Add additional mandatory hold position signage on Runway 17/35 at the intersection of Runway 8/26 to fully conform to FAA safety standards.
- Update runway designations for Runway 17/35 and Runway 8/26 during the latter portion of the forecast period due to magnetic variation changes.

These development objectives were utilized as the basis for developing each of the three runway/approach alternatives for the San Marcos Regional Airport. It should be noted that the development objectives not related to the layout of the runways and approaches (e.g. adding lighted windsocks, adding PAPIs, additional runways signage, and updating the runway designations) are not depicted in the alternative drawings for clarity. However, these items will be incorporated, as appropriate, into the Airport Layout Plan (ALP) developed based on the preferred alternative.

The three runway/approach alternatives are described in the subsections below.

**Runway/Approach Alternative #1**

A key development objective identified during the facility requirements process was the need to develop Runway 17/35 into a more suitable primary runway for the San Marcos Regional Airport. As a result, the first runway/approach alternative focused on extending Runway 17/35 to the maximum length possible without requiring the relocation of any significant infrastructure (e.g. TX 21, railroad tracks, etc.). Specifically, this alternative included:

- Runway 17 was extended 500 feet to the north where the northwest corner of the Runway Protection Zone (RPZ) stops just short of TX 21; and,
- Runway 35 was extended 600 feet to the south where the southwest corner of the RPZ stops just short of a small dirt road associated with the Gary Job Corps facility.

The runway was not extended further south toward the existing railroad track to allow space for a future paved roadway that would ultimately connect the Airport with the SMART Terminal facility. In total, this alternative extends Runway 17/35 to 6,314 feet in length. This was determined to be the maximum length that could be achieved for Runway 17/35 without requiring the relocation of significant
infrastructure. It should be noted that the northeast corner of the RPZ associated with Runway 17 does protrude slightly over William Pettus Rd.

This alternative also includes the establishment of a RNAV/GPS approach with ¾ mile visibility minimums for Runway 17. To evaluate the feasibility of lowering the approach minimums to ¾ mile with the northerly runway extension, an airspace analysis was completed to determine whether the rising terrain north of the TX 21 would impact the feasibility of the approach. The analysis determined that the terrain itself would not prevent the establishment of the lower approach minimums but that many of the trees and utility poles in the area would likely need to be removed or modified. The results of the analysis are shown in Figure 5-1. The blue lines represent LIDAR data ground elevation contours. The numbers shown indicate the vertical distance between the ground and the non-precision FAR Part 77 approach surface associated with the runway. At its closest point, the ground elevation is expected to be approximately 20 feet from the bottom of the FAR Part 77 non-precision approach surface. The visibility minimums for Runway 35 are expected to remain at ¾ mile.

It should be noted that the FAA completed a separate airspace analysis to determine the feasibility of lowering the approach minimums for Runway 17 to ¾ mile at the runway's current length. The analysis identified that there was a single utility pole that would need to be lowered by 1 foot to improve the existing approach minimums to ¾ mile. The airport has held discussions with the landowner regarding making this change.
FIGURE 5-1
RUNWAY 17 AIRSPACE ANALYSIS
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019
This alternative also includes the ultimate widening of Runway 17/35 to meeting C-III runway design standards and the establishment of new taxiways to each runway end. Runway 8/26 is shown as ultimately being decommissioned in this alternative since it is the airport’s tertiary runway.

In summary, this alternative includes the following improvements:

- Lengthens Runway 17/35 to 6,314 feet in length and establishes new taxiways to reach each end of the new runway.
- Upgrades Runway 17/35 to C-III-4000 runway design standards.
- Adds a RNAV/GPS approach with ¾ mile visibility minimums for Runway 17.
- Maintains a RNAV/GPS approach with ¾ mile visibility minimums for Runway 35 and 31.
- Widens Runway 17/35 to 150 feet in width.
- Provides for the ultimate strengthening of Runway 17/35 to 175,000 double wheel (DW).
- Adds PAPIs at the approach end of Runway 35.
- Maintains ILS approach and RNAV/GPS approach with ½ mile visibility minimums and MALSR system for Runway 13.
- Adds lighted windsocks to all runway ends.
- Provides for the ultimate decommissioning of Runway 8/26 and the REILs system associated with the runway.
- Adds additional mandatory hold position signage on Runway 17/35 at the intersection of Runway 8/26 to fully conform to FAA safety standards.
- Ultimately updates runway designations for Runway 17/35 during the latter portion of the forecast period due to magnetic variation changes.

Runway/Approach Alternative #1 is shown in Figure 5-2.

**Runway/Approach Alternative #2**

Runway/Approach Alternative #2 shows the extension of Runway 17/35 to its maximum feasible length and the ultimate decommissioning of Runway 8/26 as described in Runway/Approach Alternative #1. This alternative focuses on the feasibility of shortening Runway 13/31 to physically decouple it from the pavement.
associated with Runway 17/35. Physically decoupling the runways will resolve the existing significant safety issue of Runway 31 and 35 sharing a single taxiway associated with each runway end. In this alternative, Runway 31 is shortened by 450 feet to place the eastern edge of the runway outside of the Runway Safety Area (RSA) for Runway 17/35. The ultimate length of Runway 13/31 under this alternative would be 5,151 feet. This reconfiguration enables Runway 31 to be utilized for departures independently of arrivals and departures on Runway 17/35. Additionally, shortening Runway 31 by 450 feet brings the RPZ associated with the runway end entirely onto airport property, eliminating that need to purchase additional land.

In summary, this alternative includes the following improvements:

- Lengthens Runway 17/35 to 6,314 feet in length and establishes new taxiways to reach each end of the new runway.
- Shortens Runway 13/31 to 5,151 feet in length and establishes a new taxiway to the approach end of Runway 31.
- Upgrades Runway 17/35 to C-III-4000 runway design standards.
- Upgrades Runway 13/31 to C-III-2400 runway design standards.
- Adds a RNAV/GPS approach with ¾ mile visibility minimums for Runway 17.
- Maintains a RNAV/GPS approach with ¾ mile visibility minimums for Runway 35 and 31.
- Maintains ILS approach and RNAV/GPS approach with ½ mile visibility minimums and MALSR system for Runway 13.
- Widens Runway 17/35 and Runway 13/31 to 150 feet in width.
- Provides for the ultimate strengthening of Runway 17/35 and Runway 13/31 to 175,000 DW.
- Adds PAPIs at the approach end of Runway 35.
- Adds lighted windsocks to all runway ends.
- Provides for the ultimate decommissioning of Runway 8/26 and the REILs system associated with the runway.
- Adds additional mandatory hold position signage on Runway 17/35 at the intersection of Runway 8/26 to fully conform to FAA safety standards.
- Ultimately updates runway designations for Runway 17/35 during the latter portion of the forecast period due to magnetic variation changes.
Runway/Approach Alternative #2 is shown in **Figure 5-3**.

**RUNWAY/APPROACH ALTERNATIVE #3**

Runway/Approach Alternative #3 shows the extension of Runway 17/35 to its maximum feasible length and the ultimate decommissioning of Runway 8/26 as described in Runway/Approach Alternative #1. This alternative focuses on the feasibility of extending Runway 13/31 to eliminate the single taxiway leading to the ends of Runway 31 and Runway 35. In this alternative, Runway 31 is extended 800 feet to the southeast past the eastern edge of the Runway Object Free Area (ROFA) associated with Runway 17/35. This extension brings the ultimate length for Runway 13/31 to 6,401 feet. This alternative pushes the RPZ associated with Runway 31 further off airport property and into the residential development southeast of the airfield.

In summary, this alternative includes the following improvements:

- Lengthens Runway 17/35 to 6,314 feet in length and establishes new taxiways to reach each end of the new runway.
- Lengthens Runway 13/31 to 6,401 feet in length and establishes a new taxiway to the approach end of Runway 31.
- Upgrades Runway 17/35 to C-III-4000 runway design standards.
- Upgrades Runway 13/31 to C-III-2400 runway design standards.
- Adds a RNAV/GPS approach with ¾ mile visibility minimums for Runway 17.
- Maintains a RNAV/GPS approach with ¾ mile visibility minimums for Runway 35 and 31.
- Maintains ILS approach and RNAV/GPS approach with ½ mile visibility minimums and MALSR system for Runway 13.
- Widens Runway 17/35 and Runway 13/31 to 150 feet in width.
- Provides for the ultimate strengthening of Runway 17/35 and Runway 13/31 to 175,000 DW.
- Adds PAPIs at the approach end of Runway 35.
- Adds lighted windsocks to all runway ends.
- Provides for the ultimate decommissioning of Runway 8/26 and the REILs system associated with the runway.
» Adds additional mandatory hold position signage on Runway 17/35 at the intersection of Runway 8/26 to fully conform to FAA safety standards.

» Ultimately updates runway designations for Runway 17/35 during the latter portion of the forecast period due to magnetic variation changes.

Runway/Approach Alternative #3 is shown in Figure 5-4.
FIGURE 5-3
RUNWAY/APPROACH ALTERNATIVE #2
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019
FIGURE 5-4
RUNWAY/APPRAOCH ALTERNATIVE #3
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019
RUNWAY/APPROACH ALTERNATIVES EVALUATION

Once the runway/approach alternatives were established, they were analyzed through an evaluation process to determine which alternative provided the best future development concept. To facilitate this analysis, evaluation criteria were established, and an evaluation matrix was developed showing how each runway/approach alternative compared based on the evaluation criteria. The evaluation criteria are discussed below.

The following criteria are rated on a high (red), moderate (yellow), or low (green) level of impact scale:

- **Ability to Satisfy Established Facility Requirements** – Does the alternative meet the facility requirements established based on the forecast of future aeronautical activity? Ideally, the preferred alternatives should enable the airport to meet all established facility requirements.

- **Resolves Safety/Non-Compliant Conditions** – Does the alternative resolve existing safety issues and configuration deficiencies? Ideally, the preferred alternative should resolve any existing safety issues or configuration deficiencies in a realistic and fiscally responsible manner.

- **Environmental Impacts** – What impacts will the proposed runway/approach alternative have on the environment and how might these impacts influence the feasibility of future development? Environmental factors that should be evaluated for impacts include farmland, wetlands, floodplains, soil, wildlife, noise, and cultural environmental factors as well as any others applicable to the Airport. Ideally, the preferred alternative should minimize environmental impacts to the greatest extent practical while still meeting the Airport’s future development needs.

- **Residential and/or Business Impacts** – Will the proposed runway/approach alternative have any known impacts on residential or business areas? Will it require their relocation? Ideally, the preferred alternative should minimize the impact to existing residences or businesses to the greatest extent practical while still meeting the Airport’s future development needs.
Road Relocation, Power Line, and Utility Impacts – Will any roadways, power lines, or utilities be impacted by the development of the alternative? Ideally, the preferred alternative should minimize the impact to existing roadways, power lines, and utilities to the greatest extent practical while still meeting the Airport’s future development needs.

Geographic Constraints – Are there property or topographical challenges that are constraints for this alternative? Property lines, topographical features, and bodies of water are key considerations.

Development Cost/Ease of Implementation – What is the significance of the development costs associated with the alternative and how challenging will it be to implement? Anticipated cost, funding eligibility, and funding availability are considerations. Ideally, the preferred alternative should limit development costs to the extent practical.

These criteria were utilized to evaluate the alternatives as discussed in the section below.

**Runway/Approach Alternatives Evaluation Results**

Utilizing the evaluation criteria defined above, each runway/approach alternative was reviewed and assigned high (red), moderate (yellow), and low (green) ratings for each criterion. In general, the alternative with the most low (green) ratings and the least moderate (yellow) and high (red) ratings is the alternative that is deemed to be the preferred alternative based on the evaluation criteria.

Table 5-1 contains a matrix depicting the results of the evaluation process. A discussion regarding the rationale behind the ratings provided for each alternative is discussed in the following sub-sections.
## TABLE 5-1
### RUNWAY/APPROACH ALTERNATIVE EVALUATION
#### SAN MARCOS REGIONAL AIRPORT

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Runway/Approach Alternative #</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td><strong>2</strong></td>
</tr>
<tr>
<td>Ability to Satisfy Facility Requirements</td>
<td>Green</td>
</tr>
<tr>
<td>Resolves Safety/Non-Compliant Conditions</td>
<td>Red</td>
</tr>
<tr>
<td>Environmental Impacts</td>
<td>Green</td>
</tr>
<tr>
<td>Residential and/or Business Impacts</td>
<td>Red</td>
</tr>
<tr>
<td>Road Relocation, Power Line, and Utility Impacts</td>
<td>Yellow</td>
</tr>
<tr>
<td>Geographical Constraints</td>
<td>Green</td>
</tr>
<tr>
<td>Development Cost/Ease of Implementation</td>
<td>Green</td>
</tr>
</tbody>
</table>

- **Green**: Low Impact or Meets Requirements
- **Yellow**: Moderate Impact or Fails to Meet Some Requirements
- **Red**: High Impact or Fails to Meet Most Requirements

**Source:** Garver, 2019

### Evaluation Commentary for Runway/Approach Alternative #1

Runway/Approach Alternative #1 received “green” ratings for its ability to satisfy facility requirements, low environmental impact, and low impact on existing residences and businesses. These ratings were given because the alternative does not require the purchase of any additional property and it develops Runway 17/35 into a suitable primary runway for the Airport.

“Yellow” ratings were given to this alternative related to its impact on utility infrastructure, geographic constraints, and development cost. These ratings were given due to the alternatives impact related to the trees and utility poles located at the approach end of Runway 17 that will likely need to be trimmed and/or relocated which increases development costs.
A “red” rating was given to this alternative related to resolving safety/non-compliant conditions. This rating was given because the end of Runway 31 would still intersect with Runway 17/35 which increases the potential for a wrong-runway departure when taxing to Runway 31 for departure.

**Evaluation Commentary for Runway/Approach Alternative #2**

This alternative received “green” ratings related to its ability to satisfy facility requirements, resolve safety/non-compliant conditions, low environmental impacts, and low residential/business impacts. These ratings were given because the alternative minimizes impacts related to surrounding properties, develops Runway 17/35 into a suitable primary runway, and decouples Runway 13/31 and Runway 17/35. Similar to Runway/Approach Alternative #1, this alternative received “yellow” ratings related to utility impacts, geographic constraints, and development cost. No “red” ratings were received.

**Evaluation Commentary for Runway/Approach Alternative #3**

Runway/Approach Alternative #3 received “green” ratings related to its ability to satisfy facility requirements and for its low environmental impact. These ratings were given because it supports the development of Runway 17/35 into a suitable primary runway and there are no expected environmental concerns related to the extension of Runway 31 by 800 feet to the southeast.

Runway/Approach Alternative #3 received “yellow” ratings related to resolving safety/non-compliant conditions and geographic constraints. These ratings were provided because while the alternative separates the ends of Runway 31 and Runway 35, the runways are not decoupled in this alternative.

This alternative received “red” ratings related to residential/business impacts, roadway/utility impacts, and development costs. These ratings were given due to the alternative’s impact on the residential community southeast of the airfield.

**Preferred Runway/Approach Alternative**

Alternative #2 obtained the best overall rating in the runway/approach alternative’s evaluation analysis. Based on the evaluation analysis and discussions with the City of San Marcos, Texas Aviation Partners, TxDOT Aviation, and members of the Master Plan Advisory Committee (MPAC), Runway/Approach Alternative #2 was
selected as the preferred alternative for the San Marcos Regional Airport. The preferred runway/approach alternative is shown in Figure 5-5.
FIGURE 5-5
PREFERRED RUNWAY/APPROACH ALTERNATIVE
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019
**Taxiway Alternatives**

Various layouts for the taxiway system were considered once the preferred runway/approach alternative was selected. The primary purpose of the taxiway system at an airport is:

- Provide for the safe and efficient movement of aircraft to/from the runways to various aircraft parking locations on the airfield (e.g. ramps, hangars, etc.).
- Minimize Runway Occupancy Time (ROT) to improve runway capacity.

The taxiway system at the San Marcos Regional Airport was analyzed extensively to identify potential changes needed during the forecast period. The taxiway development objectives established as a result of the facility requirements analysis include:

- Improve taxiways to TDG-3 standards as they are rehabilitated and monitor for potential fleet mix shift to Bombardier Q400 aircraft (a TDG-5 aircraft). Improve to TDG-5 standards if this fleet mix shift occurs.
- Resolve the seven identified taxiway layout configuration issues.
- Improve airfield marking and signage related to the Taxiway Alpha/Charlie intersection.
- Establish aircraft run-up areas at the approach end of Runway 17, 31 and 35.
- Improve taxiway access to the approach end of Runway 17 to reduce taxi times.
- Improve taxiway weight bearing capacity.

These development objectives were utilized as the basis for developing each of the three taxiway alternatives for the San Marcos Regional Airport. It should be noted that the development objectives not related to the layout of the taxiways (e.g. marking and lighting at the Taxiway Alpha/Charlie, aircraft run-up areas, and taxiway weight bearing capacity) are not depicted in the alternative drawings to reduce clutter. However, these items will be incorporated, as appropriate, into the Airport Layout Plan (ALP) developed based on the preferred taxiway alternative.

The three taxiway alternatives are described in the subsections below.
GA

Airports Guide

Alternatives Chapter

OCTOBER 2020

AIRPORT MASTER PLAN

San Marcos Regional Airport

Taxiway Alternative #1

Taxiway Alternative #1 focused on establishing a partial parallel taxiway for Runway 17/35 since it is being developed as the primary runway for the San Marcos Regional Airport and the existing taxiway infrastructure associated with the runway is minimal. Due to the decommissioning of Runway 8/26, it was identified that Taxiway Alpha and Juliet at the approach end of Runway 8 could be closed to open additional area for aeronautical development between Taxiway Juliet and Taxiway Alpha. The closure of Runway 8/26 also resolves a number of non-compliant taxiway configuration conditions identified in the Facility Requirements Chapter.

A significant objective in the development of all taxiway alternatives was to reduce taxi times to/from the approach end of Runway 17. As a result, a taxi distance analysis was completed to determine how Taxiway Alternative #1 would impact taxi distances for aircraft located at various points along the main ramp. It should be noted that the taxi distance analysis for alternatives #1 and #2 are identical. The results of the analysis are shown in Table 5-2.

Table 5-2
TAXI DISTANCE ANALYSIS – TAXIWAY ALTERNATIVES #1 AND #2
SAN MARCOS REGIONAL AIRPORT

<table>
<thead>
<tr>
<th>Taxi Distance to Runway 17 Approach</th>
<th>Berry FBO (Western Portion of Main Ramp) in Linear ft.</th>
<th>ATCT Area (Central Portion of Main Ramp) in Linear ft.</th>
<th>CAF Area (Southeast Portion of Main Ramp) in Linear ft.</th>
<th>Total Taxi Distance from All Areas in Linear ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>Future</td>
<td>Diff</td>
<td>Current</td>
<td>Future</td>
</tr>
<tr>
<td>Alternative 1 and 2</td>
<td>8,800</td>
<td>10,400</td>
<td>-1,600</td>
<td>8,500</td>
</tr>
</tbody>
</table>

Source: Garver, 2019

In general, the results of the analysis show that the alternative will reduce the taxi distances for aircraft located on the central and southeastern portions of the main ramp. Taxi distances for aircraft located on the western portion of the main ramp will increase.

In summary, this alternative includes the following improvements:

- Establishment of a partial parallel taxiway for Runway 17/35 to reduce ROT and reduce taxi distances to the approach end of Runway 17.
The northeastern extension of Taxiway Echo to connect with the new partial parallel taxiway for Runway 17/35.

A new crossing point for Runway 13/31 to reach the partial parallel taxiway system for Runway 17/35 (identified as Taxiway Foxtrot).

A new taxiway exit for aircraft landing on Runway 31 (identified as Taxiway November).

Closure of Taxiway Alpha and Juliet at the approach end of Runway 8.

Resolves all non-compliant taxiway configuration issues with the exception of the direct ramp to runway access related to Taxiways Echo and Foxtrot which will be resolved with surface painted no-taxi islands as part of the ramp redevelopment alternatives.

Provides for the ultimate strengthening of the taxiway system to 175,000 pounds DW.

Upgrade of taxiway system to meet TDG 3 standards and ultimately TDG 5 standards.

Includes the installation of surface painted taxiway location and directional signs related to the Taxiway Alpha and Charlie intersections where pilots have missed the turn-off from Taxiway Alpha when taxing northbound on Taxiway Charlie.

Includes the development of engine run-up areas at the approach end of Runway 17, 31 and 35.

Taxiway Alternative #1 is shown in Figure 5-6. Green arrows have been added to the diagram to show the flow of outbound aircraft traffic to Runway 17. Red arrows depict the proposed route of in-bound traffic landing on Runway 17.

**Taxiway Alternative #2**

Taxiway Alternative #2 is identical to Taxiway Alternative #1 except Taxiway Alternative #2 includes an eastern full-length parallel taxiway for Runway 17/35 to serve aeronautical developments located east of the runway. As discussed before, the taxi distance analysis for Taxiway Alternative #2 is identical to Taxiway Alternative #1 and the results of the analysis are shown in Table 5-2.

In summary, this alternative includes the following improvements:
The establishment of a full-length east side parallel taxiway for Runway 17/35.

Establishment of a partial parallel taxiway for Runway 17/35 to reduce ROT and reduce taxi distances to the approach end of Runway 17.

The northeastern extension of Taxiway Echo to connect with the new partial parallel taxiway for Runway 17/35.

A new crossing point for Runway 13/31 to reach the partial parallel taxiway system for Runway 17/35 (identified as Taxiway Foxtrot).

A new taxiway exit for aircraft landing on Runway 31 (identified as Taxiway November).

Closure of Taxiway Alpha and Juliet at the approach end of Runway 8.

Resolves all non-compliant taxiway configuration issues with the exception of the direct ramp to runway access related to Taxiways Echo and Foxtrot which will be resolved with surface painted no-taxi islands as part of the ramp redevelopment alternatives.

Provides for the ultimate strengthening of the taxiway system to 175,000 pounds DW.

Upgrade of taxiway system to meet TDG 3 standards and ultimately TDG 5 standards.

Includes the installation of surface painted taxiway location and directional signs related to the Taxiway Alpha and Charlie intersections where pilots have missed the turn-off from Taxiway Alpha when taxing northbound on Taxiway Charlie.

Includes the development of engine run-up areas at the approach end of Runway 17, 31 and 35.

Taxiway Alternative #2 is shown in Figure 5-7.

**Taxiway Alternative #3**

Taxiway Alternative #3 is identical to Taxiway Alternative #2 with the exception of two changes:
The establishment of a full-length east side parallel taxiway for Runway 17/35.

Establishment of a partial parallel taxiway for Runway 17/35 reduce ROT on Runway 17/35 and reduce taxi distances to the approach end of Runway 17. This includes the establishment of Taxiway Mike as a high-speed exit from Runway 17.

The northeastern extension of Taxiway Echo to connect with the new partial parallel taxiway for Runway 17/35.

A new crossing point for Runway 13/31 to reach the partial parallel taxiway system for Runway 17/35 (identified as Taxiway Foxtrot).

A new taxiway exit for aircraft landing on Runway 31 (identified as Taxiway November).
- Upgrade of taxiway system to meet TDG 3 standards and ultimately TDG 5 standards.
- Closure of Taxiway Alpha and Juliet at the approach end of Runway 8.
- Realignment of Taxiway Juliet between the approach end of Runway 13 and Taxiway Delta to open up additional development space north of the taxiway.
- Resolves all non-compliant taxiway configuration issues with the exception of the direct ramp to runway access related to Taxiways Echo and Foxtrot which will be resolved with surface painted no-taxi islands as part of the ramp redevelopment alternatives.
- Provides for the ultimate strengthening of the taxiway system to 175,000 pounds DW.
- Includes the installation of surface painted taxiway location and directional signs related to the Taxiway Alpha and Charlie intersections where pilots have missed the turn-off from Taxiway Alpha when taxing northbound on Taxiway Charlie.
- Includes the development of engine run-up areas at the approach end of Runway 17, 31 and 35.

Taxiway Alternative #3 is shown in Figure 5-8.
FIGURE 5-6
TAXIWAY ALTERNATIVE #1
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019
FIGURE 5-7
TAXIWAY ALTERNATIVE #2
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019
FIGURE 5-8
TAXIWAY ALTERNATIVE #3
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019
**Taxiway Alternatives Evaluation and Preferred Alternative**

Since all three taxiway alternatives are very similar, a rating matrix was not established to determine which should be selected as the preferred taxiway alternative. Instead, the evaluation criteria below were identified and utilized to determine the preferred development alternative through discussions with airport stakeholders:

- **Taxi Flow** – Does the taxiway alternative provide for a safe and efficient flow of aircraft throughout the airfield? Ideally, the preferred taxiway alternative should minimize potential conflicts between arriving and departing traffic and provide direct routing to the runway ends most commonly used.

- **Supports Additional Land Development** – Does the alternative support the development of land holdings throughout the airport? Ideally, the preferred taxiway alternative should support the development of undeveloped and developed land surrounding the airfield.

Since all three alternatives provided a similar taxi flow and distances, the determining factor for selecting the preferred taxiway alternative was the ability of the alternative to support additional land development. As a result, **Taxiway Alternative #3 was selected as the preferred alternative.** This alternative realigns Taxiway Juliet to provide additional development space for the Airport. The preferred taxiway development alternative is shown as Figure 5-9.

It should be noted that the potential for developing a direct taxi route between the western portion of the main ramp and the approach end of Runway 17 was reviewed as part of the development and evaluation of the taxiway alternatives. Ultimately, it was determined that the establishment of a direct taxi route between the two areas was not recommended as it would likely impact the potential for redeveloping portions of Runway 8/26, would require the relocation of the glide slope and AWOS, and would have limited use compared to the cost for development.
FIGURE 5-9
PREFERRED TAXIWAY ALTERNATIVE
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019
**LAND-USE ALTERNATIVES**

The focus of the land-use alternatives process was to identify the highest and best use of the land surrounding the Airport including the type of development best suited for each parcel. For this effort, land-use at the San Marcos Regional Airport was segmented into the following categories:

- **Commercial Aeronautical** – Commercial aeronautical development includes aeronautical businesses that provide a wide array of services to the aviation industry. This land-use category includes Maintenance Repair and Overhaul (MRO) businesses, avionics shops, flight schools, commercial charter operations, aircraft salvage, etc.
- **FBO Development** – FBO development includes the establishment of a Fixed Based Operator (FBO), associated hangar development, and service facilities (e.g., maintenance, aircraft washing, fueling, U.S. Customs and Border Protection Federal Inspection Station facility, etc.). This could include the relocation of the existing FBO to this area.
- **Cargo Development** – Cargo development includes the establishment of air cargo facilities and the facilities needed to transition air cargo to/from other means of transportation (e.g., trucking, rail, etc.).
- **GA/Corporate Development** – General Aviation (GA)/corporate development includes the development of private box hangars and T-hangars for aircraft storage.
- **Non-Aeronautical Development** – Non-aeronautical development includes the establishment of non-aeronautical facilities (e.g., gas stations, shops, storage, restaurants, industrial, etc.).

Each land-use category defined above typically has unique needs/preferences that influence whether a particular parcel of land would be well suited for that type of development. For example, commercial aeronautical businesses typically prefer better roadway access to support commercial deliveries and customer access to their facility. Conversely, many corporate hangar operators typically prefer to be located in lower profile areas that are more removed from the public eye. As a result, the following land-use needs/preferences were considered related to each land-use type in developing the four alternatives:
Commercial Aeronautical – Commercial aeronautical businesses typically prefer to have excellent roadway access to support commercial deliveries and customer access to their facilities. Additionally, depending on the type of commercial aeronautical business, these operators typically prefer to have centralized airfield access to minimize taxi times.

FBO Development – FBOs are similar to commercial aeronautical businesses in that they prefer to have good roadway access and a centralized location on the airfield. If the Airport only has one FBO, another key consideration is the ability for the FBO to deliver fuel to various locations throughout the Airport.

Cargo Development – Cargo operators typically require excellent roadway access but prefer to be located separately from other operators as cargo operations typically involve larger aircraft and occur at night.

GA/Corporate Development – GA/corporate developments typically prefer a more private location on the airfield. Additionally, roadway access to support commercial deliveries or customer access is not as important.

Non-Aeronautical Development – The needs/preferences for non-aeronautical businesses varies significantly based on the type of business. However, in accordance with FAA policies, non-aeronautical developments should only be considered for areas not reasonably expected to be used for aeronautical developments. As a result, non-aeronautical development locations were only considered in areas where aeronautical development is not reasonably expected to be seen.

In addition to the land-use needs/preferences described above, the following development objectives from the Facility Requirements Chapter were also utilized as a basis for developing the four land-use alternatives:

- A significant amount of additional box hangar space is expected to be needed. This will include larger hangars with bigger doors that can accommodate larger aircraft.
- A lesser amount of additional T-hangar space will be needed.
- Additional vehicle parking spaces need to be added in key areas to meet existing demand.
→ Identify location for a future CBP FIS facility.
→ Improve fiber access along Airport Drive.
→ Improve utility access along TX 21.
→ Add a secondary access route into airport.
→ Straighten and improve aesthetics of Airport Drive.

It should be noted that the development objectives related to utilities, fiber access along Airport Drive, and additional parking spaces are not specifically shown in the land-use alternatives to simplify the drawings. However, it is assumed that each of these development objectives are incorporated into each land-use alternative. Additionally, it is assumed that the potential U.S. Customs and Border Protection (CBP) Federal Inspection Station (FIS) will be located in the FBO Development area in each alternative. Proposed box hangar and T-hangar layouts are not shown within each development area to ensure flexibility related to future development.

Each of the four land-use alternatives are discussed in the subsections below.

**Land-Use Alternative #1**

The land-use patterns shown in Alternative #1 are described below:

→ **Commercial Aeronautical Development** – Since commercial aeronautical developments typically require excellent roadway access for commercial deliveries and customer access, the existing parcels of airport property located along TX 21 were identified for commercial aeronautical developments.

→ **FBO Development** – The centralized development area located between Taxiways Alpha, Bravo, Charlie, and Juliet was identified as the future FBO development area. This location would provide excellent public access to the facility and centralized access to the airfield. It would also provide good access for fuel delivery to other development areas at the airport.

→ **Cargo Development** – Cargo development is shown east of Runway 17/35 adjacent to William Pettus Rd. Locating the cargo facility in this area will provide roadway access to the SMART Terminal facility as well as TX 21 via Williams Pettus Rd.
GA/Corporate Development – GA/corporate development is shown adjacent to the proposed FBO area to improve access to fuel and other aircraft services provided by the FBO. An additional GA/corporate development area is shown at the southern end of the airfield close to the approach end of Runway 35 and Runway 31.

Non-Aeronautical Development – Non-aeronautical development areas are shown west of Airport Drive, north of TX 21, and immediately adjacent to William Pettus Road. A small triangle of non-aeronautical property is also shown at Airport Drive’s intersection with TX 21. Due to the location and layout of this property, it is better suited for non-aeronautical use.

In addition to these land-use patterns, this alternative also extends Airport Drive and provides a secondary access route to the existing ramp area.

Land-Use Alternative #1 is shown as Figure 5-10.

Land-Use Alternative #2

The land-use patterns shown in Alternative #2 are described below:

Commercial Aeronautical Development – Commercial aeronautical development is moved to a consolidated site on the east side of the Airport adjacent to Williams Pettus Road.

FBO Development – The FBO development is moved to the property located immediately northeast of the Taxiway Kilo development area. This will provide improved public access to this facility from TX 21.

Cargo Development – Cargo development is moved to the larger parcel of property located along TX 21. This will provide improved roadway access for cargo development but does not provide a direct connection to the SMART Terminal facility to the south.

GA/Corporate Development – GA/corporate development is shown as occupying the entire mid-field development area created by the decommissioning of Runway 8/26. An additional GA/corporate development area is shown at the southern end of the airfield close to the approach end of Runway 35 and Runway 31.
Non-Aeronautical Development – The non-aeronautical developments are largely unchanged from the areas identified in Alternative #1. However, a small piece of property located adjacent to the access road between FM 110 and Airport Drive has been converted to non-aeronautical use. This parcel of property is expected to have limited aeronautical development potential due to its location far away from the runways.

In addition to these land-use patterns, this alternative also straightens Airport Drive and provides a secondary access route to the existing ramp area.

Land-Use Alternative #2 is shown as **Figure 5-11**.

**Land-Use Alternative #3**

The land-use patterns shown in Alternative #3 are described below:

- Commercial Aeronautical Development – Commercial aeronautical development is moved to the large development area located adjacent to TX 21.
- FBO Development – The FBO development is shown in the same location as it was shown in Alternative #1.
- Cargo Development – Cargo development is shown in the same location as it was shown in Alternative #1.
- GA/Corporate Development – GA/corporate development is shown in the same location as it was shown in Alternative #1. However, the parcel of land located northeast of the existing Taxiway Kilo development area is shown for GA/corporate use.
- Non-Aeronautical Development – Non-aeronautical development is shown in the same location as it was shown in Alternative #2.

In addition to these land-use patterns, this alternative also straightens Airport Drive and provides a secondary access route to the existing ramp area.

Land-Use Alternative #3 is shown as **Figure 5-12**.
Land-Use Alternative #4

The land-use patterns shown in Alternative #4 are described below:

- **Commercial Aeronautical Development** – Commercial aeronautical development is shown in the large development area located adjacent to TX 21.
- **FBO Development** – The FBO development is shown in the same location as it was shown in Alternative #1 and #3.
- **Cargo Development** – Cargo development is shown in the same location as it was shown in Alternative #1 and #3.
- **GA/Corporate Development** – GA/corporate development is shown in the same location as it was shown in Alternative #1.
- **Non-Aeronautical Development** – Non-aeronautical development is shown in the same location as it was shown in Alternative #2 and #3. However, additional non-aeronautical development spaces are shown located adjacent to TX 21.
- **Mix-Used Development** – The land northeast of the Taxiway Kilo development area is shown as a mixed development for both GA/corporate development and commercial aeronautical businesses.

In addition to these land-use patterns, this alternative also straightens Airport Drive and provides a secondary access route to the existing ramp area.

Land-Use Alternative #4 is shown as **Figure 5-13**.
FIGURE 5-10
LAND-USE ALTERNATIVE #1
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019
FIGURE 5-12
LAND-USE ALTERNATIVE #3
SAN MARCOS REGIONAL AIRPORT

Source: Garver, 2019
FIGURE 5-13
LAND-USE ALTERNATIVE #4
SAN MARCOS REGIONAL AIRPORT

HYI Land-Use Alternative #4

Source: Garver, 2019
LAND-USE ALTERNATIVES EVALUATION AND PREFERRED ALTERNATIVE

The land-use alternatives were analyzed through an evaluation process to determine which alternative provided the best land-use plan for future development. To facilitate this analysis, evaluation criteria were established related to each land-use category based on the development needs/preferences associated with each land-use type and other development considerations (e.g. environmental, timing, etc.). The evaluation criteria utilized for each land-use type were not the same. The general evaluation criteria used within the analysis are discussed below.

The following criteria are rated on a high (red), moderate (yellow), or low (green) level of impact scale:

- **Proximity to Major Roadway Access** – Would facilities located in the area have the roadway access they need? Some land-use types require good roadway access to support their operation. This includes commercial aeronautical businesses and cargo operators.
- **Utility Access** – Would facilities located in the area have the utility access they need? Access to utilities such as electric, sewer, water, fiber, and other telecommunication utilities are key considerations in future development. Commercial businesses typically have more stringent requirements.
- **Compatibility with Existing Developments** – Will the proposed land-use cause any potential compatibility issues with existing developments (e.g. mixing small and large aircraft, etc.)? Ideally the preferred land-use plan should minimize the potential for conflicts.
- **Proximity to Primary Runway** – Would facilities located in the area have the runway access they need? Proximity to the runway is very important for cargo operators that typically operate on a very strict timetable.
- **Centralized Airfield Access** – Does the facility have the airfield access it needs to serve airport users and tenants? Centralized airfield access is very important for FBOs who regularly service users at multiple locations on the airfield.
Privacy – Does the area provide privacy to tenants who value a lower profile? Some airport users, especially corporate tenants, usually prefer to locate in areas less accessible to the public.

Proximity to FBO – Will the area provide convenient access to the FBO? Typically, many of the users of an airport require one or more of the services provided by the FBO (e.g. fuel, aircraft washing/cleaning, lavatory servicing, etc.). As a result, it is important that some operators (especially GA and corporate operators) have good access to the FBO.

Timing – Is land going to be available for the development in the time frame the development is expected to occur? This evaluation point includes three criteria:

- Estimated Timeline for Development – Is the development expected to occur in the near, mid, or long term? Ideally, developments expected to be in the near and mid-term should not be dependent on the closure of Runway 8/26 or require significant land purchases.
- Dependency of Runway 8/26 Closure – Is the development contingent on the closure of Runway 8/26?
- Amount of Land Purchase Required – Will the development require the purchase of land the Airport currently does not own? If so, how much land?

Environmental – Are there known environmental factors that should be considered related to development in a specific area? Ideally, near and mid-term developments should have no significant environmental impediments.

These criteria were utilized to evaluate the alternatives as discussed below.

**LAND-USE ALTERNATIVES EVALUATION RESULTS**

Utilizing the evaluation criteria defined above, each land-use alternative was reviewed and assigned high (red), moderate (yellow), and low (green) ratings for each criterion. In general, the alternative with the most low (green) ratings and the lease moderate (yellow) and high (red) ratings is the alternative that is deemed to be the preferred alternative based on the evaluation criteria.
Table 5-4 contains a matrix depicting the results of the evaluation process. A discussion regarding the rationale behind the ratings provided for each alternative is discussed in the following sub-sections.
<table>
<thead>
<tr>
<th>Land-Use Category</th>
<th>Evaluation Criteria</th>
<th>Alternative #1 Ratings</th>
<th>Alternative #2 Ratings</th>
<th>Alternative #3 Ratings</th>
<th>Alternative #4 Ratings</th>
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<tr>
<td>Commercial Aeronautical Development</td>
<td>Proximity to Major Roadway Access</td>
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<tr>
<td></td>
<td>Compatibility with Existing Developments</td>
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<td>Environmental</td>
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<tr>
<td></td>
<td>Dependency on Runway 8/26 Closure</td>
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<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Est. Timeline for Development</td>
<td>Near</td>
<td>Near</td>
<td>Near</td>
<td>Near</td>
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<tr>
<td></td>
<td>Amount of Land Purchase Required</td>
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<td>None</td>
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<tr>
<td>FBO Development</td>
<td>Centralized Airfield Access</td>
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<td>Compatibility with Existing Developments</td>
<td></td>
<td></td>
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<td></td>
<td>Environmental</td>
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</tr>
<tr>
<td></td>
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<tr>
<td></td>
<td>Est. Timeline for Development</td>
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<td>Near/Mid</td>
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<td>Amount of Land Purchase Required</td>
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<td>None</td>
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<tr>
<td>Cargo Development</td>
<td>Proximity to Primary Runway</td>
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<tr>
<td></td>
<td>Proximity to Major Roadway Access</td>
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<td>Compatibility with Existing Developments</td>
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<td>Environmental</td>
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<tr>
<td></td>
<td>Dependency on Runway 8/26 Closure</td>
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<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Est. Timeline for Development</td>
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<td>Mid/Long</td>
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<td>Mid/Long</td>
<td>Significant</td>
<td>Mid/Long</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>Proximity to FBO</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Proximity to Primary Runway</td>
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<tr>
<td></td>
<td>Utility Access</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compatibility with Existing Developments</td>
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<td>Environmental</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Dependency on Runway 8/26 Closure</td>
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<td>Yes</td>
<td>Partial - Less Available</td>
<td>Partial - More Available</td>
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<td>Small (South Side Extension)</td>
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<td>Near</td>
</tr>
<tr>
<td></td>
<td>Amount of Land Purchase Required</td>
<td>Small (South Side Extension)</td>
<td>Small (South Side Extension)</td>
<td>Small (South Side Extension)</td>
<td>Small (South Side Extension)</td>
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<tr>
<td>Non-Aeronautical Development</td>
<td>Roadway Access</td>
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<td></td>
<td>Compatibility with Existing Development</td>
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<tr>
<td></td>
<td>Environmental</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Source: Garver, 2019
Evaluation Commentary for Land-Use Alternative #1

In general, Land-Use Alternative #1 received “green” ratings associated with the evaluation criteria for multiple land-use categories. However, “yellow” ratings were provided related to the timing aspect of the GA/corporate development as most of the GA/corporate development shown in the alternative is contingent upon the closure of Runway 8/26. Additionally, a “yellow” rating was provided for the timing of the FBO development for the same reason. A “red” rating was provided related to utility access for the cargo development area because of the limited utilities present on Williams Pettus Road.

Evaluation Commentary for Land-Use Alternative #2

Land-Use Alternative #2 received the highest number of “red” ratings compared to all the other alternatives. A “red” rating was given regarding the timing of the cargo development because the need for a cargo development is not expected until later in the planning horizon but space that is readily available for immediate development has been allocated for it in this alternative. Similarly, a “red” rating was also given related to the timing of the commercial aeronautical development area as it is expected to be needed in the near term but the land dedicated to it in this alternative is not currently owned by the Airport and is contingent on the closure of Runway 8/26.

Evaluation Commentary for Land-Use Alternative #3

Land-Use Alternative #3 received very similar ratings to Land-Use Alternative #1. The only differences between the ratings of Alternative #1 and #3 is that Alternative #3 has a lower privacy rating and a higher utility access rating since a portion of the GA/corporate development is located along TX 21.

Evaluation Commentary for Land-Use Alternative #4

In general, Land-Use Alternative #4 received the most “green” ratings. The ratings generally follow the same ratings given to Alternative #3 but a higher rating was given related to the timing of the GA/corporate developments due to the “mixed development” area established along TX 21 that includes both GA/corporate and commercial aeronautical businesses developments.
**Preferred Land-Use Alternative**

Land-Use Alternative #4 received the best overall ratings in the alternative’s evaluation analysis. Based on the evaluation analysis and discussions with the City of San Marcos, Texas Aviation Partners, TxDOT Aviation, and members of the Master Plan Advisory Committee (MPAC), Land-Use Alternative #4 was selected as the preferred alternative for the San Marcos Regional Airport. The preferred land-use alternative is shown in Figure 5-14.

As shown in the Land-Use Alternatives, a new Gary Job Corp. entrance is proposed along Airport Drive as well as an access road from FM 110 to Airport Drive. Both of these improvements are expected to occur in the next two to three years. As part of these improvements, Airport Drive will likely be realigned to improve the flow of traffic through the area. A separate planning and conceptual design analysis was completed to identify potential alternative alignments.

**Non-Aeronautical Development Strategy**

As part of this Master Plan, Paragon Project Resources Inc. (Paragon) competed a preliminary analysis to determine the types of non-aeronautical development that should be pursued at the San Marcos Regional Airport.

- **Industrial/Warehousing** – As discussed in the Inventory Chapter, approximately 40 acres of airport property close to FM 110 has been designated as a Foreign Trade Zone (FTZ). Due to this designation, an industrial or warehouse operation should be considered for this area that capitalizes on the FTZ. FTZ’s can involve production, manufacturing, assembly, repackaging, repair, and storage of goods and equipment.

- **Storage Units** – An alternative development that could be considered in the 40 acres adjacent to FM 110 is the establishment of personnel storage units.

- **Food Kiosk** – For the non-aeronautical properties close to the intersection of FM 110, Airport Drive, and TX 21, a small food establishment should be considered. An important aspect in the development of these types of facilities is vehicle counts on the roadways leading to the facility. With
increased traffic from FM 110 the development of this type of establishment should be considered.

In general, Paragon believes an industrial development related to the FTZ has the highest likelihood of success.
RAMP RE-DEVELOPMENT ALTERNATIVES

The final step in the alternatives development and evaluation process was the creation and review of various ramp redevelopment alternatives. The primary focus of these alternatives was to:

- Create a tool to aid in the re-development of the various hangar areas along the main ramp.
- Identify area on the main ramp that could be temporarily closed, re-developed, or used for a different purpose to minimize the amount of ramp space that needs to be maintained.

In developing the ramp re-development alternatives a number of factors were considered including:

- Whether AIP funding was used to rehabilitate portions of the ramp and are therefore subject to grant assurances that could impact how the ramp is used
- Pavement condition
- Providing proper separation between aircraft/vehicle access
- Tenant activity levels and type of aircraft utilized
- Existing and ultimate taxiway and runway layout
- Protected surfaces related to the runway and taxiway system (e.g., safety areas, object free areas, etc.)

For each ramp re-development alternative, the current leased areas were color-coded green, yellow, or red based on the remaining length of the existing lease agreements within each area. The time frames represented by each color should be utilized as a tool to evaluate whether each area should be considered for re-development based on when the leases in the area will be expiring. The color-coding of these areas is identical in all three ramp re-development alternatives. As a result, the primary difference between each alternative is the portions of the ramp that are expected to be closed or re-developed. These differences will be the focus of the discussion in the remainder of this section.
**Ramp Re-Development Alternative #1**

Ramp Re-Development Alternative #1 focused on the closure of approximately 11 acres of existing ramp space primarily along Taxiways Alpha and Charlie. The goal of these closures was to close ramp space associated with the Taxiway Object Free Area (TOFA) associated with Taxiways Alpha and Charlie and contiguous portions of pavement that are not extensively utilized for aircraft parking. Additionally, approximately 4.7 acres of ramp space located immediately adjacent to the tower was considered for re-development as it is largely unused, and an access road is provided to the area. However, portions of this part of the ramp were replaced utilizing Airport Improvement Program (AIP) funds which makes the area subject to FAA grant assurances. As a result, portions of the ramp in this area could not be leased for re-development until the grant assurances associated with it expire.

Ramp Re-Development Alternative #1 is shown as **Figure 5-15**.

**Ramp Re-Development Alternative #2**

Ramp Re-Development Alternative #2 includes the closure of approximately 11.1 acres of existing ramp space utilizing a similar approach to the one discussed in Alternative #1. However, a larger closure was proposed adjacent to the former Redbird terminal facility since it is no longer being utilized as an FBO. Additionally, a 1.1-acre re-development area was proposed adjacent to the new Berry Maintenance hangar located southeast of the existing ATCT. The 4.7-acre ramp area located adjacent to the ATCT is proposed as a new common-use aircraft parking area since much of the ramp is in good condition and common-use aircraft parking is compatible with the FAA grant assurances associated with the pavement.

Ramp Re-Development Alternative #2 is shown as **Figure 5-16**.

**Ramp Re-Development Alternative #3**

Ramp Re-Development Alternative #3 includes the closure of approximately 7.6 acres of existing ramp space. Smaller closures are proposed along the west end of the ramp where the majority of aircraft activity currently occurs. Larger closures are proposed along the southeast end of the ramp where the pavement condition is the worst and less aircraft activity occurs. Additionally, a total of 2.02 acres of re-development space is proposed along the ramp.
Ramp Re-Development Alternative #3 is shown as **Figure 5-17**.
FIGURE 5-15
RAMP RE-DEVELOPMENT ALTERNATIVE #1
SAN MARCOS REGIONAL AIRPORT

Legend
- No Taxi Island
- Ramp Areas to be Redeveloped
- Common Use Aircraft Parking
- Leases with More than 15 Years Left
- Leases >5 and <15 Years Left
- Leases with Less than 5 Years Left

Source: Garver, 2019
FIGURE 5-17
RAMP RE-DEVELOPMENT ALTERNATIVE #3
SAN MARCOS REGIONAL AIRPORT

Legend
- No Taxi Island
- Ramp Areas to be Redeveloped
- Common Use Aircraft Parking
- Leases with More than 15 Years Left
- Leases >5 and <15 Years Left
- Leases with Less than 5 Years Left

Source: Garver, 2019
RAMP RE-DEVELOPMENT ALTERNATIVES EVALUATION AND PREFERRED ALTERNATIVE

To evaluate the ramp re-development alternatives, the following evaluation criteria were established, and an evaluation matrix was created:

- **Potential for Conflicts with Grant Assurances** – Will the proposed re-development of the ramp create any potential conflicts with FAA grant assurances (e.g. leasing, non-exclusive use, etc.)?
- **Potential for Creating ATCT Line-of-Sight Issues** – Will the proposed re-development of the ramp create any potential line-of-sight issues from the existing ATCT?
- **Congruence with Current Pavement Conditions** – Does the alternative maximize the amount of pavement in poor condition that is closed?
- **Revenue Development Potential** – Does the alternative provide opportunities to increase revenue through the re-development of the ramp?
- **Ability to Support Existing Tenant Operations** – Will the alternative create any negative impacts on existing tenant operations?
- **Separation of Vehicle/Aircraft** – Does the alternative provide for the separation of vehicle and aircraft traffic? Ideally, the preferred alternative should minimize the need for vehicles to traverse the ramp.
- **Amount of Pavement Closed (Acres)** – How much pavement does the alternatives close?
- **Amount of Pavement Used for Hangar Development (Acres)** – How much pavement does the alternative re-develop into additional hangar space?

The rating matrix showing the results of the evaluation process is shown in Table 5-5.
### TABLE 5-5
RAMP RE-DEVELOPMENT ALTERNATIVE EVALUATION
SAN MARCOS REGIONAL AIRPORT

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Alternative #1</th>
<th>Alternative #2</th>
<th>Alternative #3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential for Conflicts with Grant Assurances</td>
<td>Yellow</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Potential for Creating ATCT Line-of-Sight Issues</td>
<td>Yellow</td>
<td>Green</td>
<td>Yellow</td>
</tr>
<tr>
<td>Congruence with Current Pavement Condition</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Green</td>
</tr>
<tr>
<td>Revenue Development Potential</td>
<td>Green</td>
<td>Yellow</td>
<td>Yellow</td>
</tr>
<tr>
<td>Ability to Support Existing Tenant Operations</td>
<td>Yellow</td>
<td>Green</td>
<td>Yellow</td>
</tr>
<tr>
<td>Separation of Vehicle/Aircraft</td>
<td>Green</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Amount of Pavement Closed (Acres)</td>
<td>11</td>
<td>11.1</td>
<td>7.6</td>
</tr>
<tr>
<td>Amount of Pavement Used for Hangar Development (Acres)</td>
<td>4.7</td>
<td>1.1</td>
<td>2.02</td>
</tr>
</tbody>
</table>

*Source: Garver, 2019*

**Evaluation Commentary for Ramp Re-Development Alternative #1**

Ramp Re-Development Alternative #1 was the lowest rated of the three alternatives. It received “yellow” ratings related to its potential for conflicts with grant assurances and for its potential to create a line of sight issue with the ATCT. Additionally, the alternative received “yellow” rating related to its ability to support existing tenant operations due to the amount of space closed in close proximity to the Berry FBO. The alternative also received a “yellow” rating related to its congruence with existing pavement conditions since the portions of the ramp that are in the worst condition are not closed in this alternative.

**Evaluation Commentary for Ramp Re-Development Alternative #2**

Ramp Re-Development Alternative #2 received similar ratings to Alternative #1. The alternative received “yellow” ratings related to its congruence with the ramp’s current pavement condition, revenue development potential, and ability to support existing tenant operations. This alternative received a “yellow” rating related to its...
revenue development potential because only 1.1 acres of existing apron space is proposed to be used for hangar development.

**Evaluation Commentary for Ramp Re-Development Alternative #3**

Ramp Re-Development Alternative #3 received the highest ratings of the 3 ramp re-development alternatives. While this alternative closes the least amount of pavement, it does so in congruence with the existing pavement condition while minimizing the impact on existing tenant operations. It also dedicates approximately 2.02 acres of apron space for re-development.

**Preferred Land-Use Alternative**

Ramp Re-Development Alternative #3 obtained the best overall ratings in the alternative’s evaluation analysis. Based on the evaluation analysis and discussions with the City of San Marcos, Texas Aviation Partners, TxDOT Aviation, and members of the Master Plan Advisory Committee (MPAC), Ramp Re-Development Alternative #3 was selected as the preferred alternative for the San Marcos Regional Airport. The preferred ramp re-development alternative is shown in **Figure 5-18**.
FIGURE 5-18
PREFERRED RAMP RE-DEVELOPMENT ALTERNATIVE
SAN MARCOS REGIONAL AIRPORT

Legend
- No Taxi Island
- Ramp Areas to be Redeveloped
- Common Use Aircraft Parking
- Leases with More than 15 Years Left
- Leases >5 and <15 Years Left
- Leases with Less than 5 Years Left

Source: Garver, 2019
PREFERRED DEVELOPMENT PLAN – ENVIRONMENTAL OVERVIEW

The preferred development alternatives depicted in Figures 5-5 (Runway/Approach), 5-9 (Taxiway), 5-14 (Land-Use), and 5-18 (Ramp Re-Development) were reviewed to identify potential environmental impacts that will be a consideration during the execution of the programs/projects described in the Capital Improvement Program Chapter. The environmental review factors set forth in FAA Standard Operating Procedure (SOP) 5.1 – CATEX Determinations were utilized as the framework for this analysis.

The environmental factors evaluated are grouped into the following three categories: 1) No Impact or Minor/Temporary Impact, 2) Moderate Impacts, and 3) Moderate/High Impact potential.

No Impact or Minor/Temporary

- **Air Quality** – Minimal impacts to air quality are anticipated as a result of the preferred development alternatives.
- **Coastal Resources** – The coast is approximately 139 miles from the Airport; therefore these resources are not affected.
- **Department of Transportation Act, Section 4(f), Recreational Areas** – A sports complex (baseball fields) is currently located approximately 1 mile southwest of the threshold of Runway 8. Since Runway 8/26 is expected to be decommissioned during the planning horizon, improvements at the Airport are not expected to have an adverse impact on the facility.
- **Historic Facilities** – There are no expected impacts to any state or federal historic sites. However, the City of San Marcos has its own Historic Preservation Commission that has designated the Commemorative Air Force Hangar and the Graham Air Traffic Control Tower as local historic sites. Any changes/modifications to these facilities will require close coordination with the City’s Historic Preservation Commission.
Federally Listed Endangered and Threatened Species – There are no known protected species at the Airport. However, future coordination may be required with the U.S. Fish and Wildlife Service (USFWS) and the Texas Parks and Wildlife Department (TPWD) to confirm this as part of future projects.

Energy Supplies, Natural Resources and Sustainable Design – Future development plans are anticipated to have no impacts on areas of natural resources or energy supplies.

Light Emissions and Visual Effects – The future development of the San Marcos Regional Airport is not expected to have an impact on light emissions or visual effects in the area.

Wild and Scenic Rivers – There are no wild and scenic rivers in the immediate area.

Environmental Justice – No residences are expected to be relocated as part of the future development plan. Consequently, there should be no impacts related to minority or low-income populations.

Floodplains – None of the development shown in the preferred alternatives is expected to impact the 100-year flood plain.

Water Quality – Water quality is not expected to be impacted by future development. However, a more in-depth review may be necessary as part of a program/project's design.

Wetlands – None of the areas impacted by the preferred development alternative are considered “wetlands”.

Compatible Land Use – None of the areas impacted by the preferred development alternative are expected to have any land use compatibility issues.

Farmland – Much of the area the Airport is located on is considered prime farmland. However, a minimal amount of undeveloped property is expected to be purchased during the planning horizon and none of it is used as farmland. As a result, there are minimal impacts expected to prime farmland.

Disruption of Establish Community – No impacts to an established community are expected as part of the preferred development plan.

Surface Transportation – The preferred development alternatives are expected to have a minimal impact on surrounding surface transportation.
**Moderate Probability for Impact**

- **Noise** – The extension of Runway 17/35 could have a nominal noise impact on the surrounding community. There are a few residences north of TX 21 that could be see increased noise levels due to the extension. Additionally, the existing residential development located at the approach end of Runway 31 could see increased noise exposure.

- **Solid Waste** – As discussed in the Inventory Chapter, a landfill exists east of Runway 17/35 in the area ultimately shown for cargo development. It is unclear what materials have been buried in the landfill. As a result, this area will require a more detailed site investigation before any development can take place.

- **Hazardous Materials** – The preferred development plan includes the acquisition of some land south of 9th Street that is currently owned by Gary Job Corps. Based on information obtained during the development of this Master Plan, some decommissioned underground storage tanks may be buried in the area to be acquired. A more detailed site investigation will be needed before purchasing the property.

**Moderate to High Potential for Impact**

- None anticipated.
CHAPTER 6

Capital Improvement Program and Financial Plan
CHAPTER 6 – CAPITAL IMPROVEMENT PROGRAM AND FINANCIAL PLAN

INTRODUCTION

This chapter provides a detailed summary of the Capital Improvement Program (CIP) and Financial Plan for the San Marcos Regional Airport. The CIP describes the near, mid, and long-term capital improvements necessary to migrate from the airport’s existing infrastructure (described in the Inventory Chapter) to the future development plan set forth in the Alternatives Chapter. The Financial Plan describes the proposed funding plan for the programs/projects identified in the CIP.

CIP PROGRAM STRUCTURE AND TRIGGER MECHANISMS

The San Marcos Regional Airport CIP has been structured into fourteen improvement programs that each contain a series of projects focused on a common goal/improvement. For example, the capital projects necessary to extend Runway 17/35 to 6,314 feet and de-couple Runway 17/35 from Runway 13/31 are set forth in the “Runway 17/35 and 13/31 Physical Decoupling and Runway 17 Extension Program.” This program then describes the individual projects needed to complete the program and discusses project phasing and financing.

As a general rule, programs within the CIP should be implemented based on “demonstrated demand” and not based solely on the proposed timing of the program as shown in the CIP. To aid in this effort, trigger mechanisms have been established for each program contained in the CIP. These trigger mechanisms identify the demand drivers behind each program and specify a demand threshold that, if eclipsed, should trigger the implementation of the program. It is recommended that the trigger mechanisms for each program be reviewed on an annual basis to determine which programs should be prioritized for implementation.

It should be noted that not all programs in the CIP have an activity-based trigger such as increases in based aircraft or aircraft operations. Many times, programs
have compliance or safety-based triggers when an existing piece of infrastructure creates a safety issue or does not comply with current airport design standards and needs to be corrected. An example of this is the decoupling of Runway 17/35 and Runway 13/31. Current FAA design standards identify that a single taxiway leading to the approach end of two runways has been shown to lead to wrong runway departures. As a result, the trigger for enacting the CIP program related to decoupling Runway 17/35 and 13/31 is based on improving safety at the Airport and not an activity threshold.

The programs set forth in the CIP have been organized into two general time frames:

- **Short/Mid-Term Programs** – 0 – 10 Years
- **Long-Term Programs** – 11+ Years

The CIP programs and trigger mechanisms were reviewed with Texas Aviation Partners (TAP) and the City of San Marcos to identify which programs should be included in the short/mid-term phase and the long-term phase. The Short/Mid-Term Program and Long-Term Program sections of this chapter describe the results of this effort and provides a detailed summary of the programs contained in each timeframe.

**CIP Cost Estimates**

Cost estimates for programs and individual projects within the CIP are in current year dollars and are based on Garver’s conceptual understanding of the project and preliminary development considerations (e.g. environmental impacts, etc.). Since the cost estimates are based on current year dollars and are conceptual in nature, they are intended for planning purposes only and should not be used or construed as construction cost estimates. Formalized opinions of probable costs should be developed as a part of each project’s scoping process during the design and engineering phase.
FUNDING PLAN OVERVIEW

The traditional source of funding utilized by most general aviation airports to finance capital projects is the FAA Airport Improvement Program (AIP). However, over the past 20 years the annual amount of funds authorized for the AIP program has remained relatively unchanged while construction costs have steadily increased. As a result, it has become increasingly challenging for airports to solely rely on AIP funds to meet their capital improvement needs. Non-aviation related grants (e.g. economic development, education, etc.), private financing, local funding, bonds, and other forms of debt have become necessary to develop and maintain airport infrastructure. Additionally, given the magnitude of many airport capital development programs, funding from a combination of sources is frequently required.

The sections below provide an overview of the FAA AIP program and other non-AIP funding sources that can be utilized to finance airport capital improvement programs.

A proposed funding plan, that leverages one or more of the funding sources described below, is provided for each of the fourteen capital improvement programs defined in this Master Plan for the San Marcos Regional Airport.

FAA AIRPORT IMPROVEMENT PROGRAM OVERVIEW

The FAA AIP Program has been providing federal grant funds for airport development and planning projects since the passage of the Airport and Airway Improvement Act of 1982. AIP funds are drawn from the Airport and Airway Trust Fund (AATF), which is supported by a variety of user fees and fuel taxes. The FAA Reauthorization Act of 2018 provided annual AIP funding in the amount of $3.35 billion from the AATF for five years (from 2019-2023). Commercial service and general aviation airports that are part of the FAA’s National Plan of Integrated Airport Systems (NPIAS) are eligible for AIP funds. According to the Financing Airport Improvements Report authored by the Congressional Research Service in March 2019, approximately 75% of AIP funds are allocated to commercial service airports on an annual basis.
The methodology utilized for allocating AIP funds to airports is a complex process. It is based on a combination of formula grants (also referred to as apportionments or entitlements) and discretionary funds. Each year, the entitlements funds are apportioned by formula to specific airports or types of airports. In general, larger airports with more activity are generally allocated more entitlement funds. These funds are provided individually to airports to aid them in completing eligible capital projects.

Once the entitlement allocation requirements are satisfied, the remaining funds are defined as discretionary funds. Airports apply for and compete against other airports to obtain discretionary funds for their projects. The FAA utilizes a prioritization system to rate proposed projects to allocate discretionary funding to specific projects on an annual basis. The vast majority of AIP funding is allocated for entitlement grants (typically close to 90%). In FY2018, only 9.4% of the total amount of authorized AIP funds were allocated to discretionary grants.

AIP funds can generally be used for projects that support aircraft operations such as runways, taxiways, aprons, noise abatement, land acquisition, and safety or emergency equipment. Revenue producing facilities (e.g. aircraft hangars and maintenance shops) are generally not eligible for AIP funding.

**INTEGRATION OF AIP FUNDS WITHIN THE CIP FUNDING PLAN**

The funding plans for many airfield improvement programs discussed in this chapter are anticipated to be supported with AIP funding. As a general practice, programs eligible for grant funding under the FAA’s AIP program are shown as being grant funded at a 90/10 split with the FAA/TxDOT Aviation funding 90% of the project’s estimated cost and the City of San Marcos funding the remaining 10%. Texas is a block grant state under the FAA’s AIP program. As a block grant state, TxDOT Aviation is responsible for administering AIP grants to general aviation airports within the State of Texas.

General aviation airports receive a limited allotment of entitlement funds through the FAA AIP Program on an annual basis. Currently, the San Marcos Regional Airport receives $150,000 in Non-Primary Entitlement (NPE) funds annually through the FAA AIP Program. These funds can be banked for up to 4 years and require a 10% match by the sponsor. Any additional funding received through the AIP
program is discretionary funding which TxDOT Aviation and the FAA allocate to various airport projects throughout the State of Texas based on a project prioritization and rating system, as previously discussed.

Due to the limited amount of AIP grant funds available, the ability to implement a program within the CIP can be significantly influenced by the availability of the AIP funds necessary to enact the program. As a result, local funding (e.g. non-airport funds, general obligation bonds, etc.), TxDOT Aviation non-AIP grants, and other non-AIP funding sources (e.g. third party funds, economic development grants, etc.) can play an important role in executing projects that are necessary and are not likely to be funded with AIP discretionary grants. Consequently, the funding plan for the CIP identifies programs that are AIP eligible but may need to be funded using non-AIP money to ensure the program can be implemented when needed. An in-depth discussion on non-AIP funding mechanisms is provided in the next section.

It is important to note that this financial plan does not represent an obligation of local, state, or federal funds for any of the programs/projects discussed in this document. The obligation and allocation of funds to support the programs/projects included in this CIP are expected to be a function of the normal budgeting and grant administration cycles of the City of San Marcos, TxDOT Aviation, and the FAA.

**Non-AIP Capital Funding Sources**

As mentioned previously, it has become increasingly important for airports to utilize non-AIP funding sources to meet their financial needs for capital improvements. These funding sources include but are not limited to:

- Non-AIP Grants (e.g. economic development, education, etc.)
- Local Funding
- Private Investment
- Bonds

Each of these non-AIP funding sources are discussed in the subsections below.
**Non-AIP Grants**

Many times, national, state, or regional grants are available for economic development activities and related capital improvements. Historically, these grant programs have successfully been leveraged to finance airport capital improvements. These grants can be particularly helpful to airports seeking to develop revenue producing facilities that are not eligible for AIP funding (e.g. hangars). However, economic development grant programs are typically competitive in nature which means proposed airport related projects must compete with a broad array of other projects for funding.

In addition to economic development grants, education centric grants have been utilized to help fund the development of education related facilities at airports including flight school, aircraft maintenance schools, and other aviation related activities.

**Local Funding**

The most common source of non-AIP funding typically utilized to finance capital programs at an airport is local funding provided by municipalities such as city and county governments. With rising construction costs limiting the availability of AIP funding, local funding is being increasingly utilized to fund airport improvement programs that are AIP eligible but are unlikely to receive an AIP discretionary grant. As a result, it is essential that city and county governments provide funding support to their local airports to ensure necessary capital improvement programs can be implemented. Depending on the financial position of the municipality, these funds can come from a variety of sources including dedicated taxes to provide revenue to the airport, general fund revenues, and municipal debt (e.g. bonds). In general, general fund revenues and municipal debt are the most common local funding sources utilized to support airport capital improvement programs.

**Private Investment**

Private investment is typically leveraged at airports to develop revenue producing facilities such as hangars or commercial businesses. As a result, most private investment at general aviation airports occurs in the form of a developer/tenant constructing building improvements on airport land subject to a long-term ground
lease. Ground leases are unique real estate investments that present sophisticated challenges for both the developer/tenant and landlord. When the airport creates a ground lease, it grants the tenant the right to use, possess, and improve the land subject to terms and conditions outlined in the lease agreement for a specified duration. The airport, as landlord, retains all other ownership rights plus the right to regain possession when the lease expires, which is often referred to as its “right of reversion.” With long-term leases covering land only, the tenant is generally expected to construct building improvements on the site or replace/redevelop those already in existence. Rent for long-term leases are generally “net” to the airport, with the tenant obligated to pay all construction costs, taxes and insurance, maintenance, and operating costs over the term of the lease. At the end of the lease term, in absence of any arrangement to the contrary, the improvements made to the land revert to the landlord.

**Bonds**

Airports will frequently turn to debt financing (bonds) to bridge their capital requirements for major capital programs or for those that are not eligible for AIP grants. Airports of all sizes are major and regular participants in the municipal bond markets. According to *Bond Buyer*, a trade publication, airports raised $17.4 billion in 84 separate bond issues in 2018.

There are three basic types of bonds available for funding airport capital development:

- General Obligation (GO) bonds supported by the overall tax base of the issuing entity (typically a local municipality).
- General Airport Revenue Bonds (GARBs) secured by the revenues of the airport and other revenues as may be defined in the bond indenture.
- Special facility bonds backed solely by revenues from a facility constructed with proceeds of the bond.

In general, GO bonds are the most common bonds leveraged by GA airports where limited opportunity exists to utilize GARBs and special facility bonds. GO bonds can be especially helpful to finance capital programs with a high cost and are unlikely to be funded with AIP grants.
INTEGRATION OF NON-AIP FUNDS WITHIN THE CIP FUNDING PLAN

Where appropriate, the various non-AIP financial options are incorporated in the funding plan sections for each CIP Program.

SHORT/MID-TERM CIP PROGRAMS AND FUNDING PLAN

This section discusses the CIP programs identified for inclusion in the short/mid-term planning horizon (e.g. years 0 – 10) including each program’s proposed funding plan, trigger mechanism, and a year-by-year implementation strategy. The CIP programs included in the short/mid-term planning horizon are:

- **Program #1** – Runway 17/35 and 13/31 Physical Decoupling and Runway 17 Extension
- **Program #2** – Taxiway A and C Reconstruction
- **Program #3** – Apron Reconstruction and Improvement
- **Program #4** – Taxiway Rehabilitation and Standards Upgrade
- **Program #5** – Runway Weight Bearing Capacity Evaluation

Each of these CIP programs are discussed in the subsections below.

**Program #1 – Runway 17/35 and 13/31 Physical Decoupling and Runway 17 Extension**

This program includes the physical decoupling of Runway 17/35 and Runway 13/31 and the northerly extension of Runway 17/35 by 500 feet as shown in Figure 5-4 of the Alternatives Chapter. As part of the decoupling, Runway 17/35 will be extended an additional 600 feet to the south and Runway 13/31 will be shortened by 450 feet at the approach end of Runway 31. Once the program is complete, the ultimate length of Runway 17/35 will be 6,314 feet and the ultimate length of Runway 13/31 would 5,151 feet. A new Instrument Approach Procedure (IAP) with ¾ mile visibility minimums would also be established for Runway 17 as part of this program. The program also includes the design and construction of taxiways to the new ends of the runways and new run-up pads.
**Program Trigger Mechanism**

Currently, there is a single taxiway (Taxiway Foxtrot) that leads to the approach end of Runway 31 and Runway 35. The presence of a single taxiway leading to two runway ends in close proximity to each other has been shown to be a contributing factor to wrong runway departures and the configuration should be corrected wherever it exists. As a result, the trigger mechanism for this program is the need to resolve the existing non-compliant configuration to improve operational safety at the San Marcos Regional Airport.

**Program – Projects and Phasing**

**Table 6-1** provides an overview of the projects and proposed phasing for the program. The program begins with a detailed planning and environmental review effort to prepare for the design and construction of the decoupling. Once design is complete, the first phase of construction will be the extension of Runway 17/35 by 600 feet to the south followed by the shortening of Runway 13/31 by 450 feet. The next phases of the program include the planning/environmental, design, and construction of the 500 feet extension of Runway 17 to the north.
<table>
<thead>
<tr>
<th>Program #</th>
<th>Program Title</th>
<th>Project #</th>
<th>Project Title</th>
<th>Project Description</th>
<th>Year</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Runway 17/35 and 13/31 Physical Decoupling and Runway 17 Extension</td>
<td>1</td>
<td>PLANNING/ENVIRONMENTAL - Runway 17/35 and Runway 13/31 Decoupling - Planning and Environmental</td>
<td>Detailed phasing development and environmental clearance (e.g, EA assumed) for Runway 17/35 and Runway 13/31 decoupling.</td>
<td>2024</td>
<td>$500,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>DESIGN - Runway 17/35 and Runway 13/31 Decoupling</td>
<td>Design of the Runway 17/35 and Runway 13/31 Decoupling including Taxiway F and Q to the new approach ends of Runway 31 and Runway 35. New run-up pad for Runway 17/35. Mill and overlay of existing runway.</td>
<td>2025</td>
<td>$1,004,800</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>CONSTRUCTION - Runway 17/35 and Runway 13/31 Decoupling (Extension of Runway 35 by 600 ft.)</td>
<td>The construction of the 600 ft. southerly extension of Runway 17/35.</td>
<td>2026</td>
<td>$7,168,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>CONSTRUCTION - Runway 17/35 and Runway 13/31 Decoupling (Shortening of Runway 13/31 by 450 ft.)</td>
<td>The construction of the 450 ft. shortening of Runway 13/31 and the developing of a new run-up pad for the Runway 31 and 35 Runway ends.</td>
<td>2027</td>
<td>$2,880,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>PLANNING/ENVIRONMENTAL - Runway 17/35 - 500 ft. Extension to North</td>
<td>Environmental/planning work related to the extension of Runway 17/35 by 500 ft. to the north.</td>
<td>2028</td>
<td>$500,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>DESIGN - Runway 17/35 - 500 ft. Extension to North</td>
<td>Design of Runway 17/35 500 ft. extension to the north including the design of a new engine run-up pad at the approach end of Runway 17.</td>
<td>2029</td>
<td>$416,200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>CONSTRUCTION - Runway 17/35 - 500 ft. Extension to North</td>
<td>The construction of the 500 ft. northern extension of Runway 17/35.</td>
<td>2030</td>
<td>$4,162,000</td>
</tr>
</tbody>
</table>

**Source:** Garver, 2020

**Funding**

The total estimated cost for this program is $16,631,000. The program is proposed to be funded through FAA AIP discretionary grants. Runway safety related projects rate highly in the discretionary prioritization process which positions this program well for discretionary funding. However, since it is unlikely the San Marcos Regional Airport will be able to obtain $16,631,000 in discretionary funding over a 2- or 3-year period, the program has been broken up to be implemented over 7 years. If necessary, it is feasible to complete the northerly extension of Runway 17/35 as part of a separate program.

**Program #2 – Taxiway A and C Reconstruction**

This program includes the full-depth reconstruction of Taxiways A and C along the main apron. This program has already been designed and is expected to be completed in one phase.
Program Trigger Mechanism

The trigger mechanism for this program is the existing condition of the pavement on Taxiways A and C along the main apron area. Currently, the taxiway pavement is in poor condition and is producing Foreign Object Debris (FOD). As a result, a full-depth reconstruction of the taxiway pavement is necessary to allow aircraft to safely use the taxiways. This program does not include the reconstruction of Taxiway A at the approach end of Runway 8 or the reconstruction of Taxiway C north of Taxiway A.

Program – Projects and Phasing

Table 6-2 provides an overview of the projects and proposed phasing for the program. Currently, the program is shown as being constructed in a single phase in 2022. Airport personnel have been in discussions with TxDOT Aviation and the FAA regarding the appropriation of a discretionary grant for the project.

<table>
<thead>
<tr>
<th>Program #</th>
<th>Program Title</th>
<th>Project #</th>
<th>Project Title</th>
<th>Project Description</th>
<th>Year</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Taxiway A and C</td>
<td>1</td>
<td>CONSTRUCTION - Taxiway A and C</td>
<td>Rehabilitation</td>
<td>2022</td>
<td>$11,678,000</td>
</tr>
<tr>
<td></td>
<td>Reconstruction</td>
<td></td>
<td></td>
<td>Reconstruction of Taxiways A and C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Garver, 2020

Total: $11,678,000

Funding

The total estimated cost for this program is $11,678,000. The program is proposed to be funded through FAA AIP discretionary grants. Taxiway reconstruction projects rate highly in the discretionary prioritization process which positions this program well for discretionary funds.

Program #3 – Apron Reconstruction and Improvement

The reconstruction of the existing apron is expected to be an ongoing effort throughout the short/mid and long-term phases of the master plan. The primary focus of this program is to install “no-taxi” islands to close portions of the apron that are in poor condition and/or are not utilized significantly as shown in Figure 5-18 of the Alternatives Chapter. As part of this effort, minor repairs to the pavement within the no-taxi islands will be completed to prevent the pavement from further
deteriorating. In addition to the installation of the no-taxi islands, this program
includes the reconstruction of approximately 1 acre of apron space that is in very
poor condition located on the eastern portion of the apron and the reconstruction
of approximately .84 acres of apron space close to the ATCT facility. These projects
(e.g. the no-taxi islands and pavement rehabilitation) will address the pavement
areas that are in the worst condition. Additional pavement maintenance (e.g. joint
seal replacement, pavement repairs, etc.) will be needed throughout the planning
horizon.

Program Trigger Mechanism

The trigger mechanism for this program is the existing condition of the apron
pavement. Currently, portions of the apron are in poor/failed condition and
produce FOD, which creates a safety hazard. As a result, portions of the apron that
are in poor condition and not extensively utilized should be closed so they do not
have to be maintained and the portions that are utilized should be rehabilitated.

Program – Projects and Phasing

Table 6-3 provides an overview of the projects and proposed phasing for the
program. The installation of the no-taxi islands and the rehabilitation of the eastern
portion of the apron should be the first priorities (projects 1 and 2). The
rehabilitation of the apron area close to the ATCT should be the next priority
(projects 3 and 4).

<table>
<thead>
<tr>
<th>Program #</th>
<th>Program Title</th>
<th>Project #</th>
<th>Project Title</th>
<th>Project Description</th>
<th>Year</th>
<th>Cost</th>
</tr>
</thead>
</table>
| 3         | Apron
Reconstruction
and Improvement | 1         | DESIGN - Installation of “No-Taxi Islands” and Replacement of 1 Acre of Pavement on Eastern Portion of Ramp | Design of “No-Taxi Islands” to be installed along the apron. Replacement of 1 acre of pavement in poor condition on the eastern side of the ramp. | 2021 | $188,000|
|           |               | 2         | CONSTRUCTION - Installation of “No-Taxi Islands” and Replacement of 1 Acre of Pavement on Eastern Portion of Ramp | Construction of “No-Taxi Islands” to be installed along the apron. Replacement of 1 acre of pavement in poor condition on the eastern side of the ramp. | 2022 | $2,012,000|
| 3         | Apron
Reconstruction
and Improvement | 3         | DESIGN - Apron Reconstruction by ATCT | Design for the reconstruction of .84 acres of apron pavement adjacent to the ATCT facility. | 2023 | $126,000|
| 4         | Apron
Reconstruction
by ATCT | 4         | CONSTRUCTION - Apron Reconstruction by ATCT | Construction of .84 acres of apron pavement adjacent to the ATCT facility. | 2024 | $1,389,000|

Source: Garver, 2020
Funding

The total estimated cost for this program is $3,715,000. While apron rehabilitation projects are eligible for AIP funding, they typically hold a lower priority than the runway and taxiway projects that receive the bulk of the available AIP discretionary funding. While it is recommended that AIP funding be pursued for this program, local funding of the project through a General Obligation Bond (GO Bond) should be considered if AIP funding cannot be obtained.

PROGRAM #4 – TAXIWAY REHABILITATION AND STANDARDS UPGRADE

This program includes the rehabilitation of the remaining taxiways at the San Marcos Regional Airport that will not be rehabilitated as part of the Taxiway A and C Reconstruction program or the Runway 17/35 and 13/31 Physical Decoupling and Runway Extension program. Additionally, any taxiways that currently do not meet TDG 3 design standards will be upgraded to meet the standard as part of this program. Pavement condition information provided by the City of San Marcos was utilized to estimate the extent of the pavement maintenance required (e.g., routine maintenance, mill and overlay, reconstruction, etc.) on each taxiway surface.

Program Trigger Mechanism

The trigger mechanism for this program is the existing condition of the taxiway pavement. Portions of the existing taxiway system are in fair to poor condition and need to be rehabilitated soon while others are in good condition and only require routine maintenance.

Program – Projects and Phasing

Table 6-4 provides an overview of the projects and proposed phasing for the program. Portions of the existing taxiway system that are in fair or poor condition have been prioritized as part of this program.
### TABLE 6-4
**TAXIWAY REHABILITATION AND STANDARDS UPGRADE**
**SAN MARCOS REGIONAL AIRPORT**

<table>
<thead>
<tr>
<th>Program #</th>
<th>Program Title</th>
<th>Project #</th>
<th>Project Title</th>
<th>Project Description</th>
<th>Year</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DESIGN - Reconstruction of Taxiway C North of Taxiway A</td>
<td>1</td>
<td>DESIGN - Reconstruction of Taxiway C North of Taxiway A</td>
<td>Design of the reconstruction of Taxiway C North of Taxiway A and upgrade to TDG 3 standards</td>
<td>2024</td>
<td>$315,000</td>
</tr>
<tr>
<td>2</td>
<td>CONSTRUCTION - Reconstruction of Taxiway C North of Taxiway A</td>
<td>2</td>
<td>CONSTRUCTION - Reconstruction of Taxiway C North of Taxiway A</td>
<td>Construction of the reconstruction of Taxiway C North of Taxiway A and upgrade to TDG 3 standards</td>
<td>2025</td>
<td>$3,360,000</td>
</tr>
<tr>
<td>3</td>
<td>DESIGN - Mill and Overlay of Taxiway B</td>
<td>3</td>
<td>DESIGN - Mill and Overlay of Taxiway B</td>
<td>Design of mill and overlay of Taxiway B and upgrade to TDG 3 standards</td>
<td>2026</td>
<td>$70,000</td>
</tr>
<tr>
<td>4</td>
<td>CONSTRUCTION - Mill and Overlay of Taxiway B</td>
<td>4</td>
<td>CONSTRUCTION - Mill and Overlay of Taxiway B</td>
<td>Construction of mill and overlay of Taxiway B and upgrade to TDG 3 standards</td>
<td>2027</td>
<td>$809,000</td>
</tr>
<tr>
<td>5</td>
<td>DESIGN - Routine Maintenance on Taxiway J</td>
<td>5</td>
<td>DESIGN - Routine Maintenance on Taxiway J</td>
<td>Design of routine pavement maintenance (seal coat) on Taxiway J</td>
<td>2028</td>
<td>$160,000</td>
</tr>
<tr>
<td>6</td>
<td>CONSTRUCTION - Routine Maintenance on Taxiway J</td>
<td>6</td>
<td>CONSTRUCTION - Routine Maintenance on Taxiway J</td>
<td>Construction of routine pavement maintenance (seal coat) on Taxiway J</td>
<td>2029</td>
<td>$1,755,000</td>
</tr>
<tr>
<td>7</td>
<td>DESIGN - Routine Maintenance on Taxiway A at Approach of Runway 8</td>
<td>7</td>
<td>DESIGN - Routine Maintenance on Taxiway A at Approach of Runway 8</td>
<td>Design of routine pavement maintenance (seal coat) on Taxiway A at the approach end of Runway 8 and upgrade to TDG 3 standards</td>
<td>+10 Years Out</td>
<td>$148,000</td>
</tr>
<tr>
<td>8</td>
<td>CONSTRUCTION - Routine Maintenance on Taxiway A at Approach of Runway 8</td>
<td>8</td>
<td>CONSTRUCTION - Routine Maintenance on Taxiway A at Approach of Runway 8</td>
<td>Construction of routine pavement maintenance (seal coat) on Taxiway A at the approach end of Runway 8 and upgrade to TDG 3 standards</td>
<td>+10 Years Out</td>
<td>$1,626,000</td>
</tr>
<tr>
<td>9</td>
<td>DESIGN - Routine Maintenance on Taxiway E Between Taxiway C and Runway 13/31</td>
<td>9</td>
<td>DESIGN - Routine Maintenance on Taxiway E Between Taxiway C and Runway 13/31</td>
<td>Design of routine pavement maintenance (seal coat) on Taxiway E between Taxiway C and Runway 13/31</td>
<td>+10 Years Out</td>
<td>$95,000</td>
</tr>
<tr>
<td>10</td>
<td>CONSTRUCTION - Routine Maintenance on Taxiway E Between Taxiway C and Runway 31/31</td>
<td>10</td>
<td>CONSTRUCTION - Routine Maintenance on Taxiway E Between Taxiway C and Runway 31/31</td>
<td>Construction of routine pavement maintenance (seal coat) on Taxiway E between Taxiway C and Runway 31/31</td>
<td>+10 Years Out</td>
<td>$1,010,000</td>
</tr>
</tbody>
</table>

**Source:** Garver, 2020

#### Funding

The total estimated cost for this program is $9,348,000. It should be noted that projects 7-10 of this program are expected to occur in the long-term portion of the CIP, leaving $6,469,000 to be funded in the short/mid-term portion of the CIP. As previously discussed, taxiway rehabilitation projects compete well for AIP discretionary funding. As a result, AIP discretionary funding is proposed to be used for this program.

**Program #5 – Runway Weight Bearing Capacity Evaluation**

This program includes a single project to determine the existing weight bearing capacity of Runway 17/35 and Runway 13/31.

**Program Trigger Mechanism**

The existing weight bearing capacity of the runway pavement at the San Marcos Regional Airport has not been clearly defined. Therefore, it is a priority to accurately define the existing weight bearing capacity to determine what changes may need to
be made in the future when larger aircraft (Q400 which is a possibility outlined in prior chapters) begin using the Airport on a more frequent basis.

**Program - Projects and Phasing**

**Table 6-5** provides an overview of the only project associated with this program.

<table>
<thead>
<tr>
<th>Program #</th>
<th>Program Title</th>
<th>Project #</th>
<th>Project Title</th>
<th>Project Description</th>
<th>Year</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Runway Weight Bearing Capacity Evaluation</td>
<td>1</td>
<td>DESIGN - Pavement Weight Bearing Capacity Evaluation</td>
<td>This includes a pavement structure evaluation for the existing runway pavements to determine their weight bearing capacity.</td>
<td>2021</td>
<td>$50,000</td>
</tr>
</tbody>
</table>

**Source:** Garver, 2020

**Funding**

The total estimated cost for this program is $50,000. Due to the low cost of this program, it is recommended the TxDOT Aviation RAMP grant program be utilized for funding.

**Short/Mid-Term Phasing Summary**

**Figure 6-1** provides an overview of the proposed phasing for all the projects set forth in the five programs that are part of the short/mid-term phase of the CIP. The colors used in the figure correspond to the colors utilized in Table 6-1 through 6-5. The first number in the “Program/Project” column refers to the program number and the second number refers to the project number shown in the aforementioned tables.
## FIGURE 6-1
SHORT/MID-TERM PHASING SUMMARY
SAN MARCOS REGIONAL AIRPORT

<table>
<thead>
<tr>
<th>Program/Project</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>2026</th>
<th>2027</th>
<th>2028</th>
<th>2029</th>
<th>2030+</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1</td>
<td>$0.5M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-2</td>
<td></td>
<td>$1M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3</td>
<td></td>
<td></td>
<td>$7M</td>
<td></td>
<td></td>
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<td>1-4</td>
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LONG-TERM CIP PROGRAMS AND FUNDING PLAN

This section discusses the CIP programs identified for inclusion in the long-term planning horizon (e.g. years 11+) including each program’s proposed funding plan and implementation trigger. A year-by-year breakdown of the projects and phasing of each program is not included for these programs since they are part of the long-term timeframe. The CIP programs included in the long-term phase are:

- **Program #6** – Western Partial Parallel Taxiway for Runway 17/35 (Proposed Taxiway D, H, P2, L, M, F, and E)
- **Program #7** – Eastern Full-Length Parallel Taxiway for Runway 17/35 (Proposed Taxiway P, P1 – P4)
- **Program #8** – Taxiway Juliet Realignment (Southerly)
- **Program #9** – Taxiway November Connector to Runway 13/31
- **Program #10** – Runway 17/35 Strengthening and Widening
- **Program #11** – Runway 13/31 Strengthening and Widening
- **Program #12** – Decommissioning of Runway 8/26
- **Program #13** – Roadway Improvement Program
- **Program #14** – Utilities and Aesthetic Improvements Program

Each of these CIP programs are discussed in the subsections below. Individual costs for the projects within each of these programs have been provided to the City of San Marcos to support future planning and implementation.

**Program #6 – Western Partial Parallel Taxiway for Runway 17/35 (Proposed Taxiway D, H, P2, L, M, F, and E)**

This program includes the development of the western partial parallel taxiway for Runway 17/35 (proposed to be called Taxiway Delta) including the development of the new Taxiway Foxtrot, Taxiway Echo north of Runway 13/31, and the new high-speed taxiway exit (Taxiway Mike) for aircraft landing on Runway 17.
**Program Trigger Mechanism**

This program should be implemented when taxi times to and from Runway 17/35 begin creating operational delays at the Airport. This is likely to occur as aircraft operations increase closer to 100,000 operations annually as is expected toward the end of the 20-year planning horizon.

**Program – Projects and Phasing**

The parallel taxiway and the new crossing points for Runway 13/31 (e.g. Taxiways Echo and Foxtrot) should be constructed first. Taxiway Mike could be constructed separately as part of a separate phase, if needed.

**Funding**

The total estimated cost for this program is $23,211,100. This program is AIP eligible. However, capacity improvement projects are typically rated lower when competing for discretionary funding. As a result, AIP funding should be pursued but local debt financing of the program may be necessary if the program is needed and AIP funding cannot be obtained.

**Program #7 – Eastern Full-Length Parallel Taxiway for Runway 17/35 (Proposed Taxiway P, P1 – P4)**

This program includes the development of the eastern full-length parallel taxiway for Runway 17/35 (proposed to be called Taxiway Papa) including four stub taxiways connecting the runway to the new parallel taxiway.

**Program Trigger Mechanism**

This program should be implemented if there is demand for development in the cargo development area identified east of Runway 17/35. This area is not expected to be developed until close to the end of the 20-year planning horizon. The ALEERT Center area would likely need to be purchased to support development in this area. It should be purchased if the area becomes available.
**Program – Projects and Phasing**

The parallel taxiway and the new crossing points (e.g. Taxiways P1 and P4) should be constructed first. Taxiway P2 and P3 could be constructed as part of a separate phase, if needed.

**Funding**

The total estimated cost for this program is $23,424,022. This program is AIP eligible. However, capacity improvement projects are typically rated lower when competing for discretionary funding. As a result, AIP funding should be pursued but local debt financing of the program may be necessary if the program is needed and AIP funding cannot be obtained.

**PROGRAM #8 – TAXIWAY JULIET REALIGNMENT (SOUTHERLY)**

This program includes the realignment of Taxiway Juliet to the south to open up additional land for development south of TX 21.

**Program Trigger Mechanism**

This program should be implemented if there is demand for development in the commercial aeronautical business development area south of TX 21 beyond what can be accommodated on the existing land.

**Program – Projects and Phasing**

The project is expected to be completed in a single phase.

**Funding**

The total estimated cost for this program is $7,122,930. This program is AIP eligible. However, since the project is being undertaken to open up additional land for development, obtaining AIP funding is expected to be difficult. If there is demand for additional commercial aeronautical development in the area that requires the realignment of Taxiway Juliet, it is recommended that the realignment project be incorporated as part of the third party development financing used to develop the site.
**Program #9 – Taxiway November Connector to Runway 13/31**

This program includes the addition of a new taxiway exit for Runway 31 identified as Taxiway November.

**Program Trigger Mechanism**

This program should be implemented if the number of aircraft operations increases on Runway 31 and operational delays begin occurring due to Runway Occupancy Time (ROT). This is not expected to occur until late in the 20-year planning horizon.

**Program – Projects and Phasing**

The project is expected to be completed in a single phase.

**Funding**

The total estimated cost for this program is $3,341,000. This program is AIP eligible. However, capacity improvement projects are typically rated lower when competing for discretionary funding. As a result, AIP funding should be pursued but local debt financing of the program may be necessary if the program is needed and AIP funding cannot be obtained.

**Program #10 – Runway 17/35 Strengthening and Widening**

This program includes the widening of Runway 17/35 to 150 feet and the strengthening of the runway to accommodate double wheel (DW) aircraft up to 175,000 pounds.

**Program Trigger Mechanism**

This program would be triggered if there is demand for mid-sized cargo aircraft (e.g., similar to the B-737-800's operated by Amazon) to begin regularly operating at the Airport.

**Program – Projects and Phasing**

The project is expected to be completed in a single phase.
Funding

The total estimated cost for this program is $26,275,700. This program is AIP eligible. It is recommended that AIP discretionary funding be pursued.

**PROGRAM #11 – RUNWAY 13/31 STRENGTHENING AND WIDENING**

This program includes the widening of Runway 13/31 to 150 feet and the strengthening of the runway to accommodate DW aircraft up to 175,000 pounds.

**Program Trigger Mechanism**

This program would be triggered if there is demand for mid-sized cargo aircraft (e.g., similar to the B-737-800's operated by Amazon) to begin regularly operating at the Airport.

**Program – Projects and Phasing**

The project is expected to be completed in a single phase.

Funding

The total estimated cost for this program is $21,623,800. This program is AIP eligible. It is recommended that AIP discretionary funding be pursued.

**PROGRAM #12 – DECOMMISSIONING OF RUNWAY 8/26**

This program includes the decommissioning of Runway 8/26 and the decommissioning of Taxiway Alpha and Juliet at the approach end of Runway 8.

**Program Trigger Mechanism**

This program should be implemented when Runway 17/35 is extended to 6,314 feet or when it becomes infeasible to maintain Runway 8/26.

**Program – Projects and Phasing**

The project is expected to be completed in a single phase.
**Funding**

The total estimated cost for this program is $1,441,000. This program is AIP eligible. It is recommended that AIP discretionary funding be pursued. Since the cost of this program is relatively low compared to other programs, it may be feasible to use AIP discretionary funds to supplement NPE funds for this project.

**PROGRAM #13 – ROADWAY IMPROVEMENT PROGRAM**

This program includes multiple new roadways at different locations around the airport as shown in Figure 5-14 of the Alternatives Chapter. Specifically, it includes new roadways in each of the land-use development areas (e.g. Taxiway K, Taxiway J, and Runway 8/26 re-development area), a new roadway connecting Airport Drive to the SMART Terminal facility, the airport access road from FM 110, and a roadway connection from the SMART Terminal to the proposed cargo development area. All roadways are expected to have a single lane in each direction.

**Program Trigger Mechanism**

The trigger mechanism for each roadway project contained in this program will be tied to the demand for development in the area(s) the roadway serves. As demand for development in a particular area is realized, roadway(s) to serve that development area should be considered. The development of the roadway connecting FM 110 and Airport Drive is expected to occur during the short-term planning horizon due to the potential relocation of the Gary Job Corp. entrance.

**Program – Projects and Phasing**

Each roadway contained in the program is expected to be completed individually.

**Funding**

The total estimated cost for this program is $14,049,000. This program is not AIP eligible. Roadway projects will likely need to be locally funded or funded by third party financing as part of the development of the area the roadway will serve. The development of new roadways will likely occur throughout the planning horizon.
**PROGRAM #14 – UTILITIES AND AESTHETIC IMPROVEMENTS PROGRAM**

This program includes multiple utility and aesthetic improvements at the Airport. Specifically, this program includes:

- The installation of a common-use fiber optic cable along Airport Drive.
- Relocation of all the existing above ground utilities along Airport Drive to underground utilities.
- The replacement of the Gary Job Corp fencing along Airport Drive to a fence type that is more refined in appearance.
- The relocation of the Graham Air Traffic Control Tower and airfield electrical controls vault.

**Program Trigger Mechanism**

The trigger mechanism for each project contained in this program will be different. The installation of common-use fiber optic cable will be important for the continued development of the main apron area and should be implemented when able as existing tenants have identified it as a need. The relocation of the Graham Air Traffic Control Tower and electrical vault will be triggered by demand to develop the area where these facilities are currently located. The relocation of the above ground utilities to an underground location and the replacement of the fence are aesthetic improvements that do not have a specific trigger.

**Program – Projects and Phasing**

Each project contained in the program is expected to be completed individually.

**Funding**

The total estimated cost for this program is $5,295,000. This program is not AIP eligible. All projects are expected to be locally funded with the exception of the common-use fiber. The City of San Marcos should work with local fiber utility providers to install common-use fiber along Airport Drive. These improvements are expected to occur throughout the planning horizon.
CIP PHASING SUMMARY

Figure 6-2 provides an overview of the short/mid and long-term CIP phasing for all the programs shown within the CIP.
### CIP PHASING SUMMARY
SAN MARCOS REGIONAL AIRPORT

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**Notes:**
- Programs 1-1 to 5-1 represent Short/Mid-Term Programs.
- Programs 6 to 14 represent Long Term Programs.
- Expenses are listed in millions of dollars.
- The table presents the budget allocation for each year from 2021 to 2030+.

**Total Expenses:**
- **Short/Mid-Term Programs Total:** $6.83M
- **Long Term Programs Total:** $25.03M
Airport Layout Plan