Queen City Municipal Airport

Final Airport Master Plan Update Report

May 2021

Prepared by

C&S COMPANIES®

Queen City Municipal Airport

Allentown, Pennsylvania

Master Plan Update

Prepared by:
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Final Report
May 2021

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Queen City Municipal Airport (XLL) is a General Aviation (GA) public-use airport located on approximately 200 acres in Allentown, Lehigh County, Pennsylvania, with convenient access to the Interstate 78 on-ramp/off-ramp access. Since the mid 1940's, the Airport has served a number of purposes such as aircraft production during World War II and Air National Guard flight training. The Airport has been owned and operated by the Lehigh-Northampton Airport Authority (LNAA) since 2000.

According to the *National Plan of Integrated Airport Systems 2017 – 2021* (NPIAS), XLL is classified as a local, general aviation airport with a development estimate of approximately $3.3 million through 2021. XLL is designated as an intermediate facility in the Commonwealth of Pennsylvania Department of Transportation (PennDOT) Bureau of Aviation's *State Aviation System Plan* (SASP).

XLL consists of two runways. Runway 7-25, the primary runway, is 3,949 feet long by 75 feet wide. It consists of grooved asphalt with non-precision runway markings and medium intensity runway lighting. Each runway end has runway end identifier lights (REILs) and 4-box precision approach path indicators (PAPIs). Runway 15-33 is 3,159 feet long by 75 feet wide. It consists of asphalt pavement, non-precision runway markings, and medium intensity runway lighting.

The table below presents a summary of XLL's aviation activity forecast including peak period operations as approved by the Federal Aviation Administration (FAA). After an evaluation of various forecast scenarios, the preferred based aircraft forecast is the FAA Terminal Area Forecast (TAF) based aircraft forecast with an average annual growth rate of 1.11% and the preferred operations forecast is the Lehigh County Population Forecast average with an annual growth rate of 0.7%.

Queen City Municipal Airport Demand Forecast Summary with Peak Period Operations

	2017	2018	2023	2028	2033	2038
Based Aircraft	82	83	88	93	98	103
Operations	21,248	21,397	22,156	22,943	23,757	24,600
Itinerant	*2,125*	*2,140*	*2,216*	*2,294*	*2,376*	*2,460*
Local	*19,123*	*19,257*	*19,940*	*20,649*	*21,381*	*22,140*
Peak Month	2,337	2,354	2,437	2,524	2,613	2,706
Average Day Peak Month	78	78	81	84	87	90
Design Hour	10	10	10	11	11	11

Source: C&S Engineers, Inc., LNAA

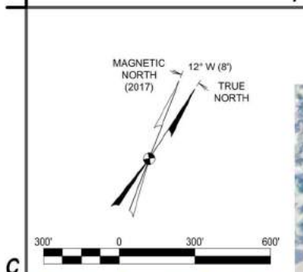
After an analysis of the facility requirements necessary to accommodate the forecast demand and an evaluation of potential development options, the LNAA hosted a public open house at the Airport so users could provide feedback on the future development of the Airport.

The future airport development plan is presented in the following three planning periods: Phase 1 (short-term 0-5 years), Phase 2 (intermediate-term 6-10 years), and Phase 3 (long-term 11-20 years.) The update focuses on the short-term period, as it is used to justify near-term development projects and support the development of the Airport Capital Improvement Program (ACIP). The preferred development project phasing is shown on the table and figure on the following pages.

Preferred Development Projects

Project #	Year	Project Description	Cost Estimate	NEPA Doc	CATEX Source
	Phase 1				
1-1	2020	Obstruction Removal	$1,000,000	EA	
1-2	2020-2023	Rehabilitate Runway 15-33 w/Taxiway B	$7,371,000	CATEX	5-6.4e
1-3	2021-2023	Runway 15-33 Lighting & Electrical Vault	$1,998,000	CATEX	5-6.3b
1-4	2022	SRE Building	$737,000	CATEX	5-6.4f
1-5	2022	Aviation Fuel Farm	$2,055,000	EA	
1-6	2022	Taxiway A Feasibility Study	$100,000	CATEX	5-6.4e
1-7	2023	Taxiway A Rehabilitation	$3,462,000	CATEX	5-6.4e
1-8	2023-2025	Hangar Development 1	$7,401,000	CATEX	5-6.4f
1-9	2024-2025	Hangar Development 2	$13,094,000	CATEX	5-6.4f
1-10	2024-2025	Proposed Avigation Easements (RPZ)	$762,000	CATEX	5-6.4bb
		Phase 1 Total Cost Estimate :	**$37,980,000**		
	Phase 2				
2-1	2026	VIP Ramp (Markings)	$12,000	CATEX	5-6.4e
2-2	2026-2027	Taxiway C Realignment	$3,624,000	EA	
2-3	2027-2028	Terminal Improvements & Expansion	$2,638,000	EA	
2-4	2029	T-Hangar 9 Renovations	$1,874,000	CATEX	5-6.4f
2-5	2029	Transient Parking Expansion with Helipads	$1,694,000	CATEX	5-6.4f
2-6	2030	Taxiway Connectors	$998,000	CATEX	5-6.4e
		Phase 2 Total Cost Estimate :	**$10,840,000**		
	Phase 3				
3-1	2029 - 2030	T-Hangar & Single Unit Hangar Development	$26,955,000	CATEX	5-6.4b; 5-6.4r
3-2	2031	Single Unit Hangar Development	$2,792,000	CATEX	5-6.4f
3-3	2032	Bulk Hangar & Parking Apron	$9,143,000	EA	
		Phase 3 Total Cost Estimate :	**$38,890,000**		
		Total Cost Estimate :	**$90,710,000**		

Source: C&S Engineers, Inc.
EA = environmental assessment
CATEX = categorical exclusion



Notes:
1. Lowercase italicized text indicates an existing condition while uppercase non-italicized indicates a future condition.
2. Road elevations were not determined. An obstruction survey was not conducted for this ALP update.

PREFERRED TERMINAL AREA DEVELOPMENT

FACILITY	REUSE OF EXISTING	NEW CONSTRUCTION	TOTAL UNITS	NOTES
Sm. Tiedowns	10	61	71	Typ. Aircraft: 20 Katana
Lg. Tiedowns	6	15	21	Typ. Aircraft: King Air 300
Helipads	0	6	6	2 Dedicated "Transient"
Sm. Conventional Hangars	10	14	24	Typ. Aircraft: 20 Katana
T-Hangars	51	29	80	Typ. Aircraft: 20 Katana
Lg. Conventional Hangars	4	5	9	Typ. Aircraft: King Air 300
Bulk Hangar	0	1	1	14,175 Sq. Ft.
SRE Building	0	1	1	Pre-Engineered
Terminal Expansion	0	1	1	8,000 Sq. Ft.
Aviation Fuel Farm	0	1	1	2 X 12,000 Gal.

PROPOSED PROJECT LEGEND

EXISTING	SHORT-TERM (0-5 YEARS)	INTERMEDIATE-TERM (6-10 YEARS)	LONG-TERM (11-20 YEARS)	DESCRIPTION
				Buildings
				Pavement
		N/A	N/A	Easements

PROPOSED PROJECT TABLE

ID	FACILITY DESCRIPTION	ESTIMATED TOP ELEV. (MSL)
	PHASE I SHORT-TERM DEVELOPMENT (0 to 5 YEARS)	
1-1	Obstruction Removal	N/A
1-2	Rehabilitate Runway 15-33 w/Taxiway B	N/A
1-3	Runway 15-33 Lighting and Electrical Vault	N/A
1-4	SRE Building	N/A
1-5	Aviation Fuel Farm	N/A
1-6	Taxiway A Feasibility Study (re-align/rehabilitate)	N/A
1-7	Taxiway A Rehabilitation	N/A
1-8	Hangar Development 1	N/A
1-9	Hangar Development 2	N/A
1-10	Proposed Avigation Easements (RPZ)	N/A
	PHASE II INTERMEDIATE-TERM DEVELOPMENT (6 to 10 YEARS)	
2-1	VIP Ramp Markings & Taxilane Re-alignment	N/A
2-2	Taxiway C Realignment	N/A
2-3	Terminal Improvements & Expansion	409.4'±
2-4	T-Hangar 9 Renovations	387.8'±
2-5	Transient Parking Expansion with Helipads	N/A
2-6	Taxiway Connectors	N/A
	PHASE III LONG-TERM DEVELOPMENT (11 to 20 YEARS)	
3-1	T-Hangar & Single Unit Hangar Development	N/A
3-2	Single Unit Hangar Development	N/A
3-3	Bulk Hangar & Parking Apron	N/A

LEGEND

EXISTING	DESCRIPTION
	Buildings
	Off Airport Property Buildings
	Airfield Pavement
	Roads/Parking Lot Pavement
	Fence (7 FT) / Wildlife Fence (10 FT)
	Airport Property
	Avigation Easement
	Non-Aeronautical Development
RSA	Runway Safety Area (RSA)
ROFA	Runway Object Free Area (ROFA)
ROFZ	Runway Obstacle Free Zone (ROFZ)
RVZ	Runway Visibility Zone (RVZ)
TSA	Taxiway Safety Area (TSA)
TOFA	Taxiway Object Free Area (TOFA)
	Runway Protection Zone (RPZ)
	Part 77 Approach Surface
PAPI	PAPI OCS Surface
	Threshold Siting Surface (TSS) OCS
BRL	Building Restriction Line (BRL 25')
	Edge of Water
	Tree Stand Area
ARP	Airport Reference Point
	Survey Monument
	Navigational Aid (NAVAID)
	Railroad Tracks
	To Be Removed

EXISTING FACILITIES TABLE

ID	Facility Description	Top Elevation (MSL)	Obstruction Marking/ Lighting
1	T-Hangar	408.2'	
2	T-Hangar	398.8'	
3	T-Hangar	398.6'	
4	T-Hangar	397.1'	
5	Terminal	401.0'	
6	Hangar	409.4'	
7	Shop	409.5'	
8	Hangar	403.3'	
9	T-Hangar	387.8'	
10	City Garage	419.9'	
11	City Storage Shed	405.7'	
12	Sand Storage Facility	418.5'	
13	Storage Building	408.5'	

LEHIGH - NORTHAMPTON AIRPORT AUTHORITY

SUBMITTED BY: _____ Thomas R. Stoudt, Executive Director

SIGNATURE: _____

DATE: _____

FEDERAL AVIATION ADMINISTRATION
Harrisburg Airports District Office

CONDITIONALLY APPROVED: _____ Manager, HAR-ADO

DATE: _____

SUBJECT TO Comments in Letter Dated: _____

Airspace Study Number: 2021-AEA-764-NRA

The contents of this plan do not necessarily reflect the official views or policy of the FAA. Acceptance of this document by the FAA does not in any way constitute a commitment on the part of the United States to participate in any development depicted herein nor does it indicate that the proposed development is environmentally acceptable in accordance with appropriate public laws.

FAA's approval of this Airport Layout Plan (ALP) represents acceptance of the general location of future facilities depicted. During the preliminary design phase, the airport owner is required to resubmit for approval the final locations, heights and exterior finish of structures. FAA's concern is obstructions, impact on electronic aids or adverse effects on controller view of aircraft approach and ground movement areas which could adversely affect the safety, efficiency or utility of the airport.

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LEHIGH - NORTHAMPTON AIRPORT AUTHORITY LNAA

AIRPORT LAYOUT PLAN UPDATE
QUEEN CITY MUNICIPAL AIRPORT (XLL)
ALLENTOWN, PENNSYLVANIA

MARK	DATE	REVISIONS DESCRIPTION

FAA AIP NO.:	3-42-0002-022-2017
DATE:	MAY 2021
DRAWN BY:	G.M. BUTLER
DESIGNED BY:	G.M. BUTLER
CHECKED BY:	J.J. SHURER

AIRPORT LAYOUT PLAN DRAWING

3

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Section 1—Introduction

Queen City Municipal Airport (XLL) is a General Aviation (GA) public-use airport located on approximately 200 acres in Allentown, Lehigh County, Pennsylvania with convenient access to the Interstate 78 on-ramp/off-ramp access, as shown in **Figure 1.1** and **Figure 1.2**. The Airport's geographic location is 399 feet above mean sea level at the coordinates of 40°34' 13.00" North and 75°29' 17.90 West. This is approximately 1.6 miles south-west of the Allentown Central Business District.

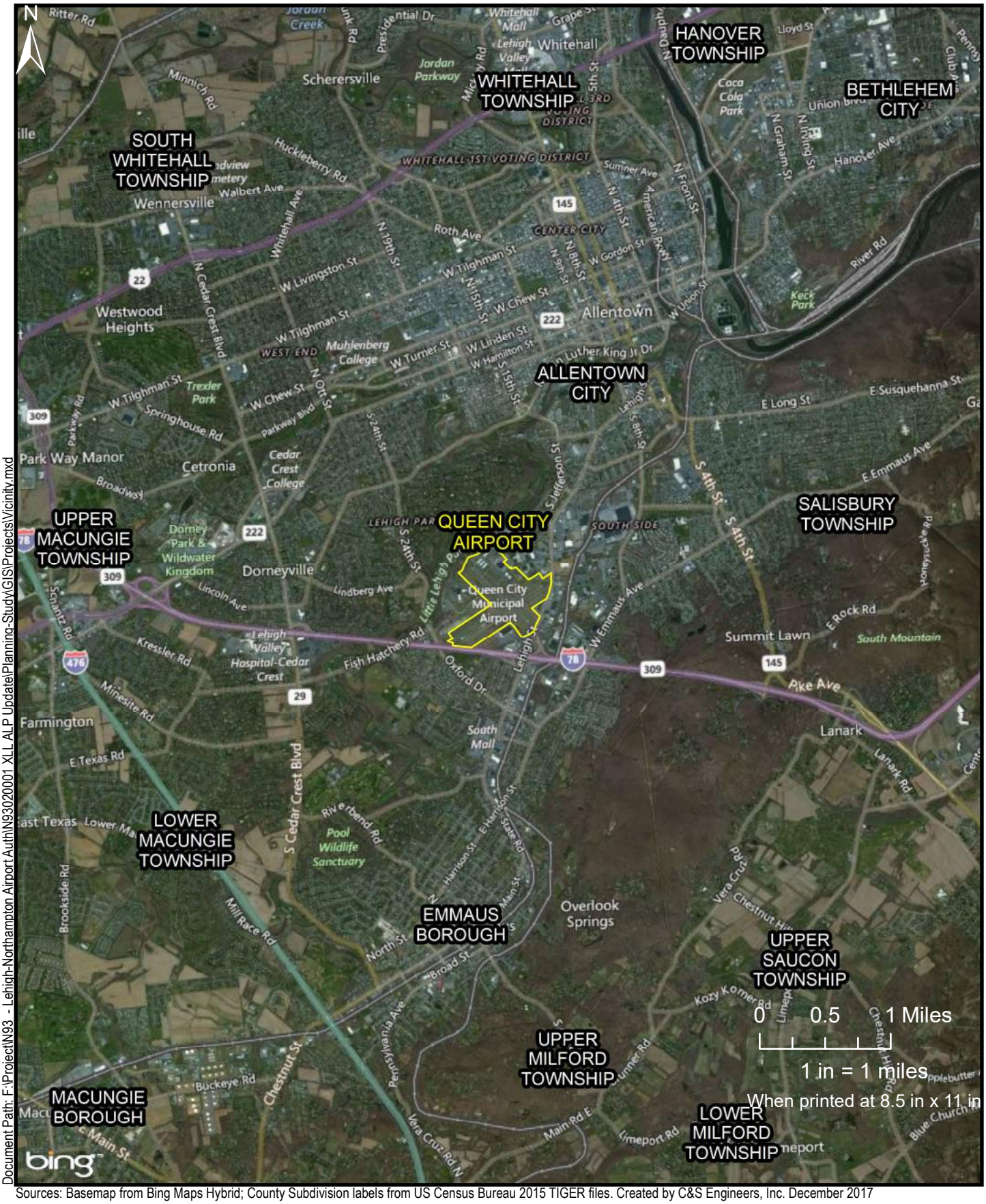
Since the mid 1940's, the Airport has served a number of purposes such as aircraft production during World War II and Air National Guard flight training. The Airport has been owned and operated by the Lehigh-Northampton Airport Authority (LNAA) since 2000.

The previous master plan update and Airport Layout Plan (ALP) were completed in 2010 by L.R. Kimball, A CDI Company. Since then, the Airport has experienced operational changes that require a new look at key issues in the near-term to identify needed changes to the current ALP.

The objective of an ALP Update is to determine the extent, type, and schedule of development needed to accommodate existing needs and future aviation demand at the airport, and then produce a set of updated drawings (ALP drawing set) that depict the proposed development. The ALP drawing set includes an ALP showing the proposed 20-year development plan for the Airport, airport airspace drawings, terminal area development plan, and an Exhibit "A" – Airport Property Map. For the purposes of this update, airspace drawings and analysis will be taken from an analysis completed in May 2017 and the Exhibit "A" will be based on existing available information but updated according to Standard Operating Procedure 3.00, *Standard Procedure for Federal Aviation Administration (FAA) Review of Exhibit "A" Airport Property Inventory Maps*.

In addition to the ALP drawing set, this narrative report summarizes the Airport's existing airport conditions, key issues, forecasts of aviation activity, facility requirements, and financial management and development plan for the next 20 years. It assesses requirements for the airside (runways, taxiways, safety and object free areas, runway protection zones, and navigation aids) and landside (hangars, aircraft parking aprons, terminal/fixed based operator buildings, fuel, and vehicle parking) facilities.

Future airport development is presented in the following three planning periods: short-term (0-5 years), intermediate-term (6-10 years), and long-term (11-20 years). The update focuses on the short-term period, as it is used to justify near-term development projects and support the development of the Airport Capital Improvement Program (ACIP). The ACIP provides an outline on the sequencing and anticipated financial obligation for development projects.



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Sources: Basemap from Bing Maps Hybrid; County Subdivision labels from US Census Bureau 2015 TIGER files. Created by C&S Companies, Inc. December 2017

Vicinity Map

Queen City Municipal Airport
Master Plan Update
Figure 1.1

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Sources: USGS Basemap; States and counties from US Cenus Bureau 2018 TIGER files. Created by: C&S Engineers, Inc. December 2017

Location Map

Queen City Municipal Airport
Master Plan Update
Figure 1.2

Section 2—Airport Inventory

2.1 Airport System Planning Role

At the national level, the Airport is included in the *National Plan of Integrated Airport Systems 2017 – 2021* (NPIAS) produced by the U.S. Department of Transportation (DOT) Federal Aviation Administration (FAA). According to the NPIAS, XLL is classified as a local, general aviation airport with a development estimate of approximately $3.3 million through 2021.

In 2007, the Commonwealth of Pennsylvania Department of Transportation (PennDOT) Bureau of Aviation completed a *State Aviation System Plan* (SASP). The SASP is expected to be updated in 2018, but the full report is not available at this time. XLL is designated as an intermediate facility. The following table identifies the recommended criteria for amenities and services for the classification of an intermediate facility.

Table 2.1|2007 SASP Intermediate Facility Airport Criteria

Amenity/ Service	Criteria	Criteria Met at XLL?
Runway Length	3,800 feet	Yes
Runway Width	Meet ARC B-II[1] - 75 feet	Yes
Runway Strength	12,500 lbs. (single wheel)	Yes
Taxiway	Full length parallel for primary runway	Yes
Navigational Aids	Approach minimums achieved from ground and/or satellite based air navigation, with a published approach with a decision altitude of 600 feet or less and visibility minimum of 1 mile or less	No (800 feet & 1 mile)
Approach Aids	Rotating beacon, lighted wind indicator/segmented circle, REILs[2], VGSIs[3]	Yes
Runway Edge Lighting	MIRL[4]	Yes
Weather	ASOS/AWOS[5]	Yes
Services	Phone, restrooms, fixed base operator, maintenance, jet fuel, ground transportation	Yes
Facilities	Local and itinerant aircraft parking apron and storage, GA terminal, GA auto parking	Yes

1 - ARC = Aircraft Reference Code
2 - Runway End Indicator Lights
3 - Visual Glide Slope Indicators
4 - Medium Intensity Runway Lights
5 - Automated Surface Observing System/Automated Weather Observing System

Source: C&S Engineers, Inc.; Commonwealth of Pennsylvania, Department of Transportation, Bureau of Aviation. PennDOT Multi-Modal Planning & Implementation Services, State Aviation System Plan Update 2007.

As part of the 2011 PennDOT report, *The Economic Impact of Aviation in Pennsylvania*, the Airport contributes a total annual economic output of over $10.5 million and a payroll of over $2.8 million for 80 employees.

2.2 Surrounding Airports

To provide context of the Airport's role within the regional setting, there are 39 privately owned and private-use and 16 public-use airports currently operational within a 25 nautical mile (NM) radius of the Airport, as shown in **Figure 2.1**. Descriptions of the public-use airports are included in **Table 2.2**.

Table 2.2|Nearby Public Use Airports

Airport Name (Location Identifier)	Distance from XLL (NM)	NPIAS Airport Classification	SASP Classification
Beltzville Airport (14N)	17.7	N/A	N/A
Jake Arner Memorial Airport (22N)	19.0	Local	N/A
Flying M Aerodrome Airport (P91)	14.1	N/A	N/A
Slatington Airport (69N)	12.8	N/A	N/A
Lehigh Valley International Airport (KABE)	5.4	Primary	Commercial Service
Braden Airpark (N43)	15.2	N/A	N/A
Alexandria Airport (N85)	21.5	N/A	N/A
Sky Manor Airport (N40)	23.3	N/A	N/A
Vansant Airport (9N1)	18.5	N/A	N/A
Quakertown Airport (KUKT)	9.5	Local	Intermediate
Pennridge Airport (KCKZ)	14.1	N/A	N/A
Doylestown Airport (KDYL)	22.0	Regional	Intermediate
Butter Valley Golf Port Airport (7N8)	10.9	N/A	N/A
Pottstown Municipal Airport (N47)	20.4	Local	Intermediate
Heritage Field Airport (KPTW)	20.1	Regional	N/A
Perkiomen Valley Airport (N10)	22.1	N/A	Intermediate

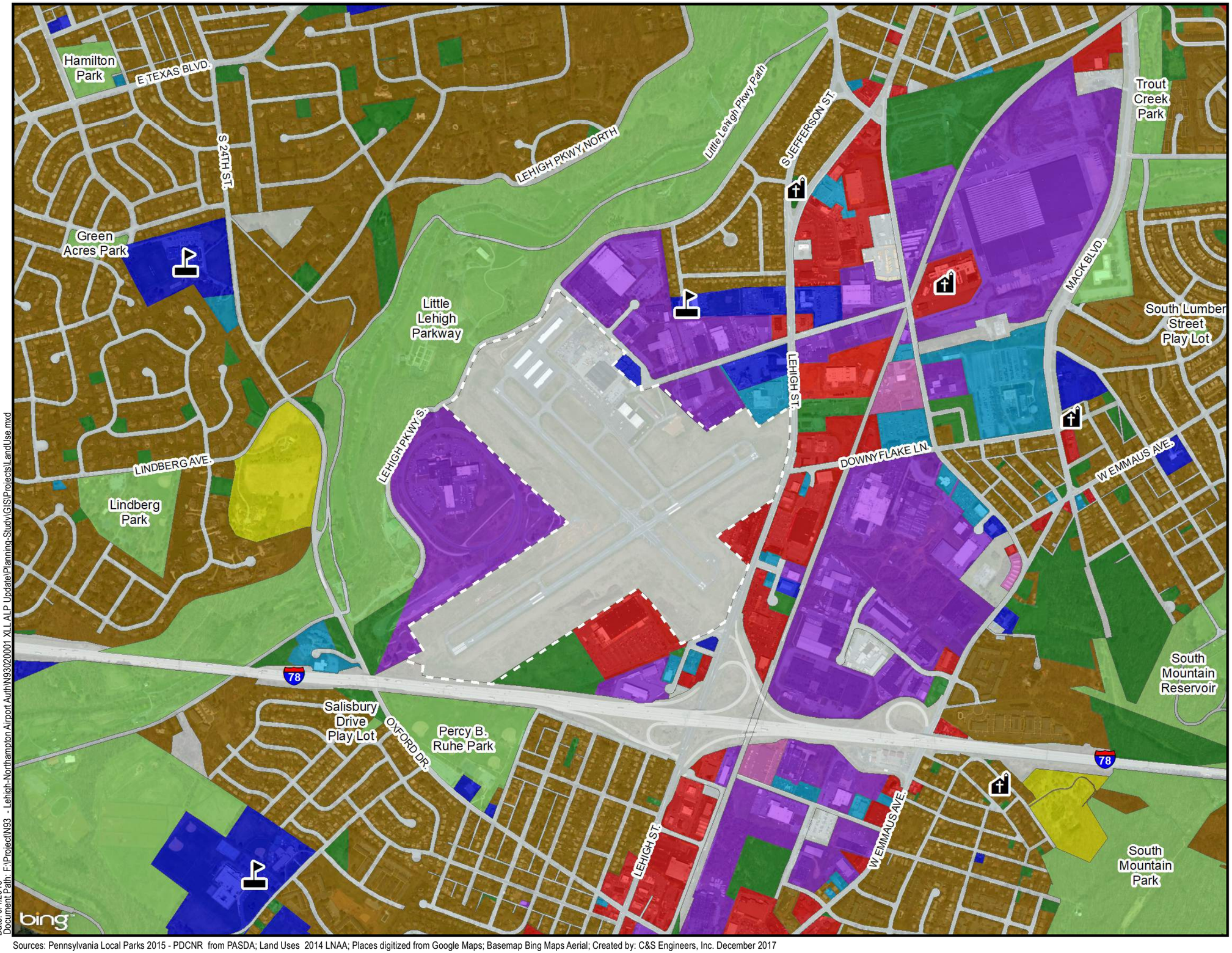
Source: C&S Engineers, Inc.; Data obtained from SkyVector, January 2018. NPIAS categories from Appendix A: All Existing NPIAS Airports (2017-2021). SASP categories from PennDOT 2007 Statewide Airport System Plan – Chapter 1 – Airport System Classification

2.3 Socioeconomic Data

According to FAA AC 150/5070-6B, *Change 2 to Airport Master Plans*, the purpose of gathering socioeconomic data is to determine the nature of the community and market in which the Airport services and to allow for the adequate preparation of aviation demand forecasts.[1] This section provides an overview of the existing socioeconomic conditions in and near the project area and identifies low-income and minority populations.

A socioeconomic analysis evaluates how elements of the human environment such as population, employment, housing, and public services might be affected by the proposed project and alternative(s).

[1] "FAA AC 150/5070-6B – Change 2 to Airport Master Plans," Accessed 12/28/17. Accessible at: https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5070-6B-Change-2-Consolidated.pdf



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Sources: Pennsylvania Local Parks 2015 - PDCNR from PASDA; Land Uses 2014 LNAA; Places digitized from Google Maps; Basemap Bing Maps Aerial; Created by: C&S Engineers, Inc. December 2017

Legend

- Airport Property Line
- Hospital
- School
- Place of Worship

Land Use

- Agriculture & Vacant
- Manufacturing & Industrial
- Office & Business
- Parks, Recreation & Open Space
- Public & Quasi-Public
- Residential
- Retail & Commercial
- Rural Residential
- Warehousing & Distribution
- Transportation, Communication & Utilities, and Right-of-Way

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Queen City Municipal Airport
Master Plan Update

Land Use

Figure 2.2

Socioeconomic changes may occur when a project directly or indirectly changes any of these elements. **Table 2.3** presents an overview of the socioeconomic conditions for the communities located within the vicinity of the Airport (the City of Allentown and Salisbury Township) and provides a comparison to Lehigh County and the Commonwealth of Pennsylvania.

Table 2.3| Socioeconomic Conditions

	Pennsylvania	Lehigh County	City of Allentown	Salisbury Township
Population, total	12,783,977	358,792	119,624	13,697
Families whose income is below the poverty level	9.1%	9.6%	22.7%	4.4%
Population, 18 years and over	10,079,709	276,736	87,988	11,244
Race Statistics:				
White[1]	81.4%	78.7%	58.8%	88.3%
African American[1]	11.0%	6.7%	14.0%	4.6%
Native American[1]	0.2%	0.2%	0.3%	0.1%
Asian[1]	3.1%	3.3%	2.1%	2.1%
Pacific Islander[1]	0.0%	0.0%	0.1%	0.0%
Other[1]	2.0%	8.2%	20.1%	3.3%
Hispanic[2]	6.6%	21.8%	49.0%	6.7%
Housing Statistics:				
Housing Units	5,592,175	143,538	45,826	5,416
Occupied Housing Units	88.7%	94.3%	90.5%	97.6%
Vacant Housing Units	11.3%	5.7%	9.5%	2.4%
Owner-occupied	69.0%	65.8%	45.0%	86.6%
Renter-occupied	31.0%	34.2%	55.0%	13.4%
Economic and Employment Statistics:				
Median household income	$54,895	$57,685	$37,256	$74,554
Median family income	$69,960	$70,098	$40,420	$86,780
Unemployment rate of civilian labor force	7.2%	7.7%	12.9%	5.9%

Notes:

[1]Includes persons reporting only one race

[2]Hispanics may be of any race, so also are included in applicable race categories

Sources: U.S. Census Bureau, American FactFinder, datasets: "ACS Demographic and Housing Estimates (2012-2016 American Community Survey 5-Year Estimates)," "Selected Housing Characteristics (2012-2016 American Community Survey 5-Year Estimates)," and "Selected Economic Characteristics (2012-2016 American Community Sur vey 5-Year Estimates)".

As indicated by the table above, the poverty level for the City of Allentown is approximately twice as high as that of Lehigh County and the Commonwealth of Pennsylvania. In addition, the City of Allentown has almost 50% of its population identifying as Hispanic, which is much larger than that of Pennsylvania, Lehigh

County, and Salisbury Township. Occupied housing unit percentages are relatively consistent for both Pennsylvania and Lehigh County, with the City of Allentown having a majority of renter-occupied units and Salisbury Township having a majority of owner-occupied housing units. Median household and family incomes are lower in the City of Allentown than that of Pennsylvania and Lehigh County, and has the highest unemployment rate. Salisbury Township has a lower unemployment rate and higher median household and family incomes than that of Pennsylvania and Lehigh County.

2.4 Land Use and Zoning

2.4.1 Land Use

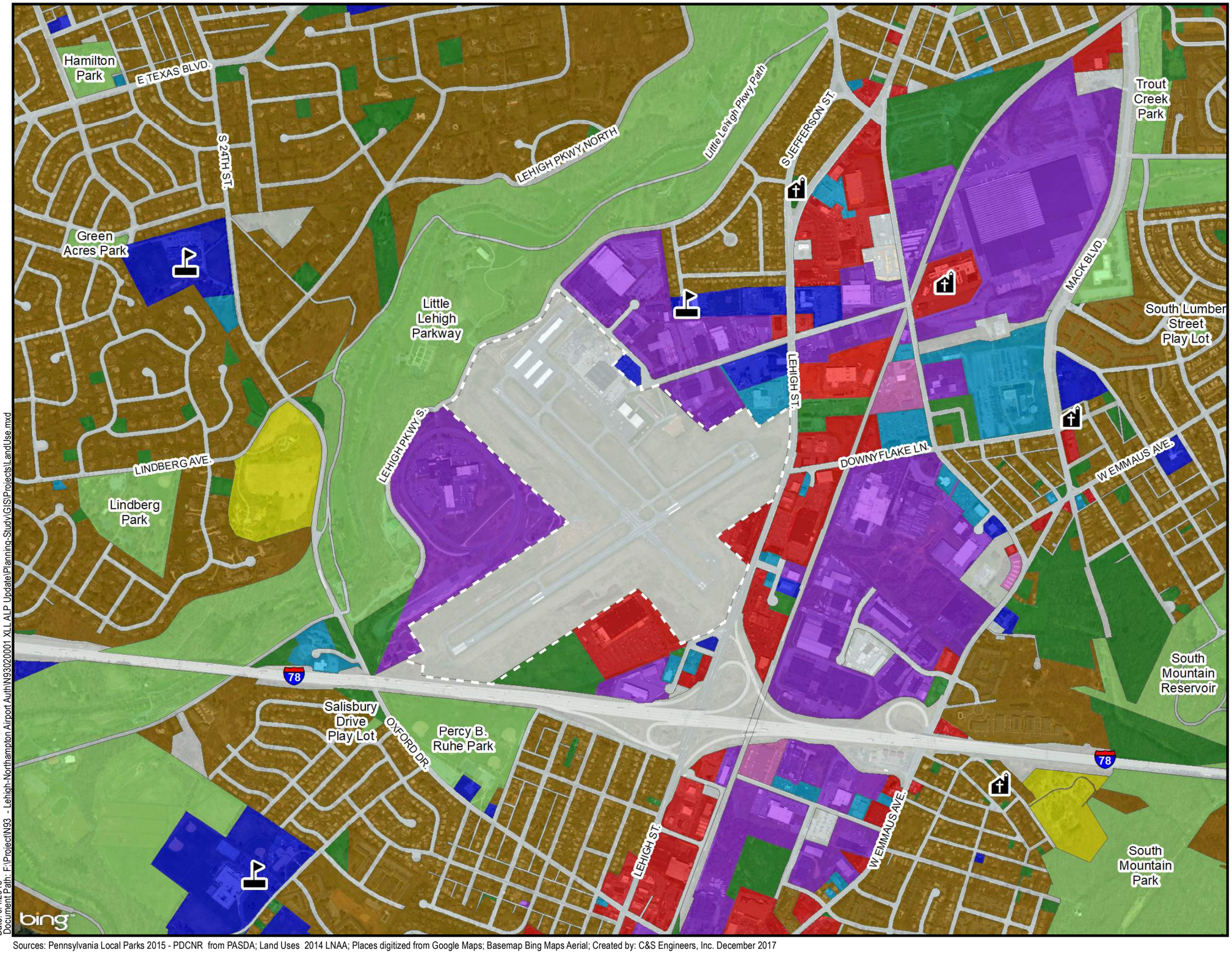
Figure 2.2 presents the variety of land-uses located within the immediate vicinity of the Airport. Land-uses were inventoried to ensure the development of compatible land uses near the Airport through municipal zoning laws. Compatible land uses generally include properties with an industrial and/or commercial land use while incompatible land uses generally include residential areas or areas likely to pose wildlife hazards. Additional common incompatible land uses include public facilities such as schools, hospitals, or places of worship.

The Airport is designated as a "Transportation, Communication, and Utilities" land-use. The majority of the property within the immediate vicinity of the Airport property line is classified as "Parks, Recreation and Open Space," "Manufacturing and Industrial," Office and Business," "Right-of-Way," and "Retail and Commercial."

As indicated by guidance provided in FAA Advisory Circular (AC) 150/5070-6B*, Change 2 to Airport Master Plans*, public facilities within the vicinity of the Airport were identified. Located within one half mile of the Airport is one school, Lehigh Parkway Elementary School, and two places of worship, Parkway Church of Christ and Allentown Victory. Within an additional half mile of this are nine schools, South Mountain Middle School, Salisbury Middle School, Perlis Montessori School, St. Thomas More School, Swain School, Union Terrace Elementary School, Francis D Raub Middle School, William Allen High School, and Jefferson Elementary School. There are also two places of worship, Metaphysical Universal Ministries and Aggadah Ministry. St. Luke's Hospital Allentown Campus and the Lehigh Valley Health Network at Cedar Crest Hospital are also located within one mile of the Airport.

2.4.2 Zoning

The purpose of zoning and its regulations is to guide growth and development of a municipality by ensuring the compatibility of its land uses, building dimensions, parking requirements, and landscaping. **Figure 2.3** presents existing zoning conditions within the Airport vicinity.



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Sources: Pennsylvania Local Parks 2015 - PDCNR from PASDA; Land Uses 2014 LNAA; Places digitized from Google Maps; Basemap Bing Maps Aerial; Created by: C&S Engineers, Inc. December 2017

Legend

- Airport Property Line
- Hospital
- School
- Place of Worship

Land Use

- Agriculture & Vacant
- Manufacturing & Industrial
- Office & Business
- Parks, Recreation & Open Space
- Public & Quasi-Public
- Residential
- Retail & Commercial
- Rural Residential
- Warehousing & Distribution
- Transportation, Communication & Utilities, and Right-of-Way

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0 250 500 1,000 Feet

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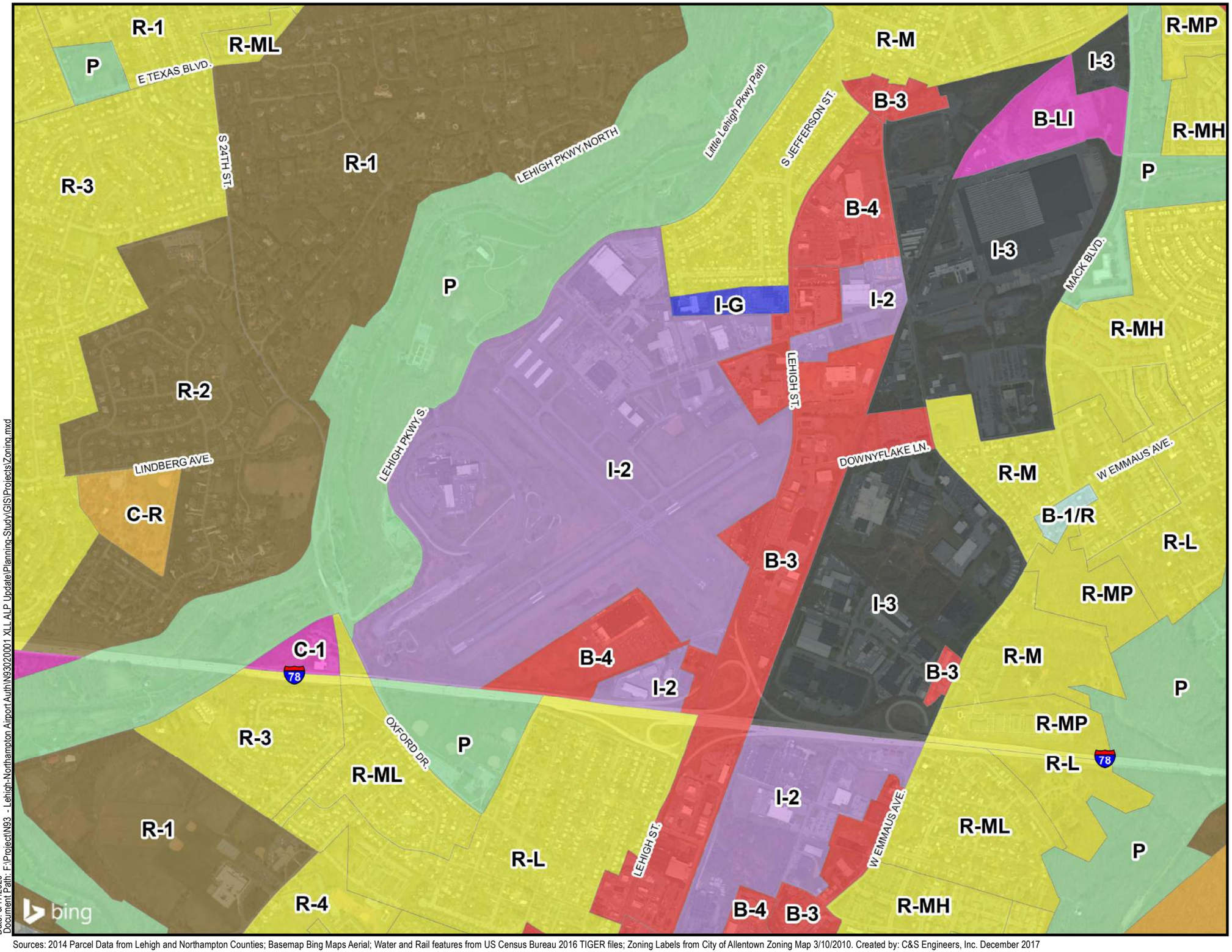
Queen City Municipal Airport
Master Plan Update

Land Use

Figure 2.2



Legend

- Airport Property Line
- Municipal Boundaries
- Ponds/Lakes
- Streams/Rivers
- Railroads

Zoning

- P: Environmental Protection
- I-3: Heavy Industrial
- I-G: Institutional
- I-2: Limited Industrial
- B-1/R: Mixed Uses
- B-LI & C-1: Office/Business
- B-1, B-3 & B-4: Retail Commercial
- C-R: Rural
- R-1 & R-2: Suburban Residential
- R-M, R-MH, R-ML, R-MP, R-L, R-1, R-3 & R-4: Urban Residential

N

0 250 500 1,000 Feet

1 inch = 1,000 feet
When printed at 11 in by 17 in

Queen City Municipal Airport
Master Plan Update

Zoning

Figure 2.3

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Sources: 2014 Parcel Data from Lehigh and Northampton Counties; Basemap Bing Maps Aerial; Water and Rail features from US Census Bureau 2016 TIGER files; Zoning Labels from City of Allentown Zoning Map 3/10/2010. Created by: C&S Engineers, Inc. December 2017

The Airport is zoned under the authority of the City of Allentown. It is zoned as I-2, a "limited industrial district," a type of light industrial zoning.[2] According to the Codified Ordinances of the City of Allentown, the purpose of an I-2 district is to provide for a range of light industrial and related businesses in a manner that is compatible with the Airport and adjacent neighborhoods and parks. The purpose of this zoning is to provide a transition between industrial and other uses and to protect residential property values. Uses located within an I-2 district are subject to strict dimensional requirements regardless of whether or not they are residential in nature. Zoning restrictions are as follows:

- Minimum Lot Area = 10,000 SF
- Minimum Lot Width = 80 FT (except 100 FT for a corner lot)
- Minimum Front Yard = 20 FT
- Minimum Rear Yard = 10 FT
- Minimum Width of Each of Two Side Yards = 8 FT
- Maximum Height = 50 FT
- Maximum Percent of Building Coverage = 70%

Within the ordinance, commercial communication towers and antenna are also subjected to FAA regulations. According to the ordinance, towers less than 200 FT in height must meet all requirements of 14 Code of Federal Regulations Par 77.13 and documentation of FAA approval for those exceeding 200 FT must be provided. However, the ordinance also sets a maximum height for towers at 180 FT in I-2 and I-3 districts. In addition, no tower or antenna can only be artificially lighted except when required and approved by PennDOT Bureau of Aviation.[3]

The properties surrounding the Airport are mostly zoned as Retail Commercial (B-4 and B-3) and Environmental Protection (P). Additional surrounding uses are Medium Low Density Residential (R-ML) Limited Industrial (I-2), General Industrial (I-3).

2.5 Climatological Data & Wind Analysis

FAA guidance provided in *FAA AC 150/5300-13A Change 2, Airport Design*, indicates that maximal operational conditions for airport operations are dictated by the crosswind components for the airport's design aircraft/group. Crosswind components are determined by the airport's Runway Design Code (RDC) with allowable crosswind components for each RDC summarized in **Table 2.4**. The RDC, analogous to the Airport Reference Code, signifies the design standards to which a runway is built.

[2] City of Allentown Zoning Map, Draft – Produced 3/10/2010. Accessed 1/11/18. Accessible at: http://www.allentownpa.gov/portals/0/files/planning_zoning/proposed-zoning-ordinance-06-02.pdf

[3] City of Allentown Zoning Ordinance, Ordinance No. 14835 Exhibit A. November 2015 Edition. Accessed 1/11/18. Accessible at: https://www.allentownpa.gov/Portals/0/files/Legislative/Ordinances/2015/ZoningOrdNov2015.pdf

Table 2.4| Allowable Crosswind Components per RDC

Allowable Crosswind Component (knots)	RDC
10.5	A-I and B-I*
13	A-II and B-II
16	A-III and B-III
	C-I through D-III
	D-I through D-III
20	A-IV through B-IV
	C-IV through C-VI
	D-IV through D-VI
	E-I through E-VI

*Includes A-I and B-I small aircraft
Source: FAA AC 150/5300-13A

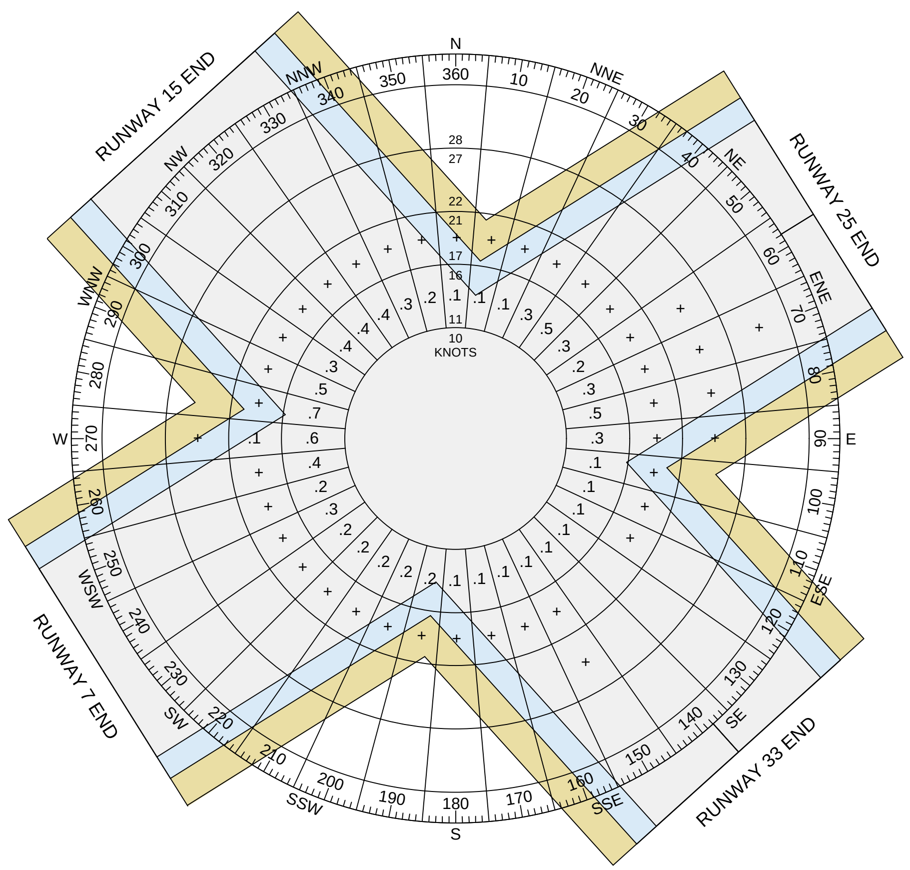
An existing wind analysis was undertaken using historical wind data. Observations for this analysis were taken from January 1, 2008 through December 31, 2013 using data provided by the FAA Windrose Generator and from observations taken from January 1, 2014 through January 31, 2018 using the onsite AWOS owned by DBT Transportation Services, LLC. Percent wind coverage results are summarized in **Figure 2.4** for All-Weather, VFR (Visual Flight Rule), and IFR (Instrument Flight Rule).

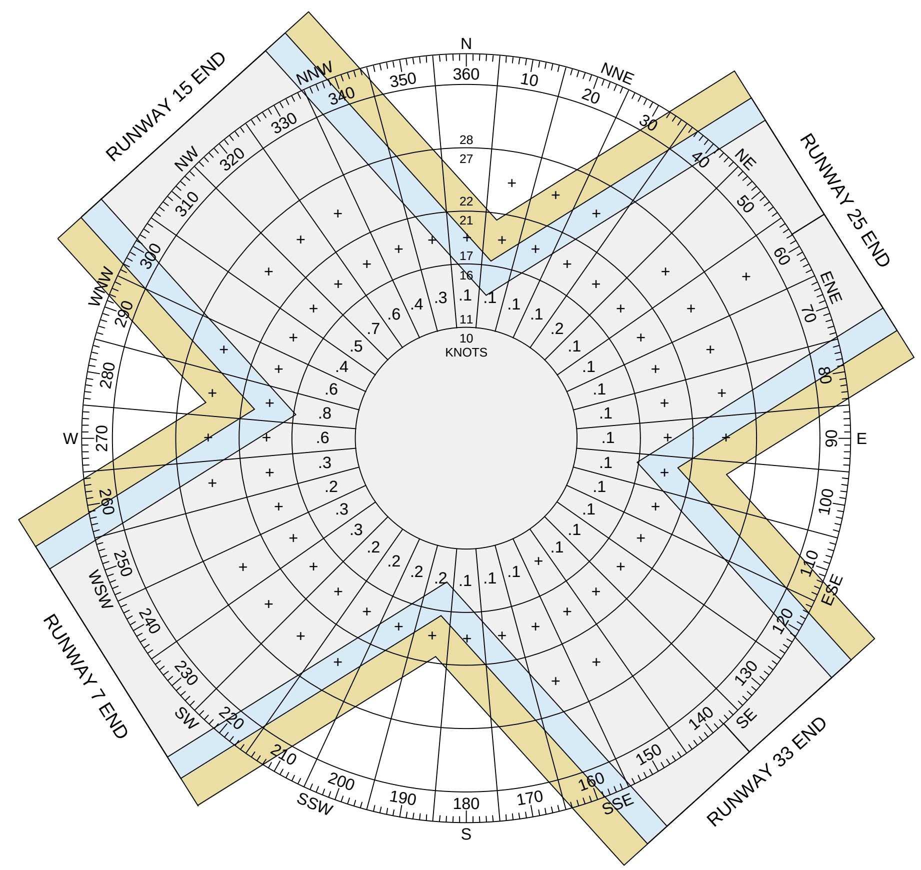
An additional weather analysis was conducted using the data obtained from DBT Transportation Services, LLC to determine the occurrence of weather categories at the Airport. The data was filtered based on weather categories defined in **Table 2.5** and illustrates the percentage of time and number of hours under each category. Flight categories are derived from ceiling and visibility conditions, with ceiling values referring to the height above ground or water of the lowest layer of clouds below 20,000 feet covering more than half the sky and visibility values referring to the distance at which prominent objects or lights can be clearly discerned. As summarized by the table, ceiling and visibility occurrence rates indicate that the Airport is under VFR conditions 92% of the time.

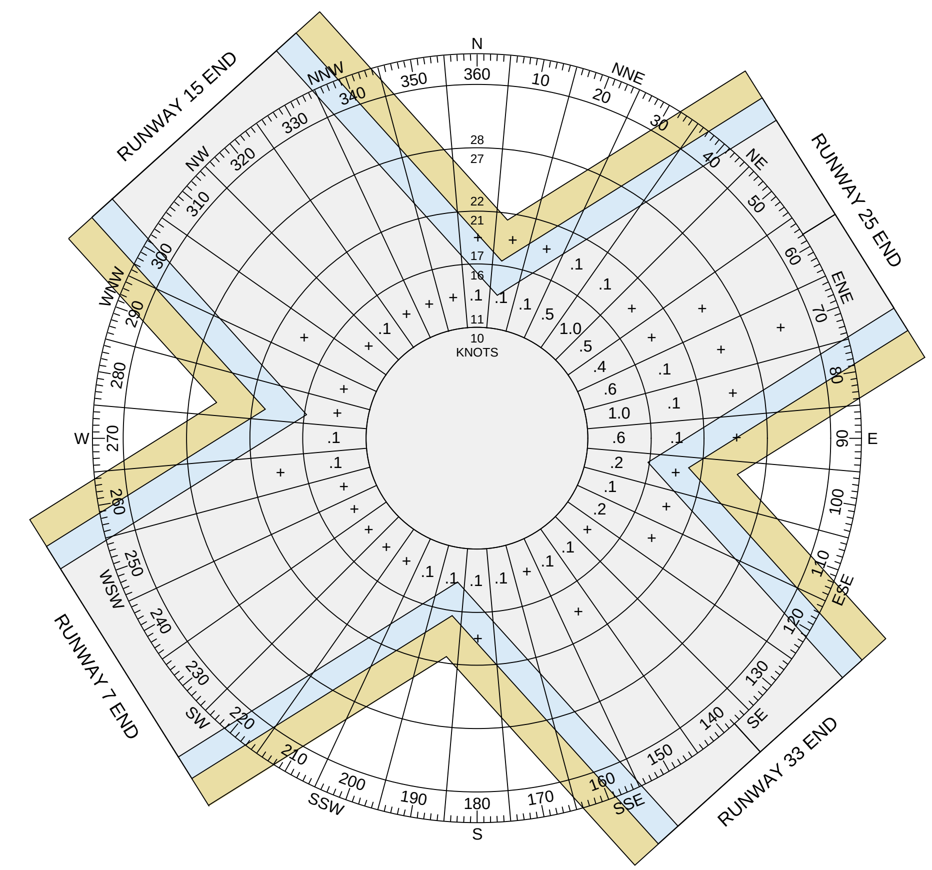
Table 2.5| Occurrence of Weather Categories

Category	Ceiling (in feet)	Ceiling Occurrence %	Visibility (in miles)	Visibility Occurrence %	Ceiling &/OR Visibility	Ceiling & Visibility Occurrence %
VFR	>=1,000		>=3			
	10761	81%	33681	95%	10,451	92%
IFR	<1,000		<3			
	2,565	19%	1,792	5%	905	8%
Total	13,326	100%	35,473	100%	11,356	100%
Not Reported	21,707		22		21,707	

Source: Created by C&S Engineers, Inc. Observations taken at XLL on 1/01/13-1/31/18 by DBT Transportation Services, LLC.







ALL WEATHER WIND COVERAGE			
	PERCENT COVERAGE		
CROSSWIND COMPONENT	RUNWAY 7-25	RUNWAY 15-33	COMBINED
10.5 KNOTS	96.35%	95.48%	99.70%
13 KNOTS	98.20%	97.73%	99.96%
16 KNOTS	99.69%	99.62%	99.99%

VFR WIND COVERAGE			
	PERCENT COVERAGE		
CROSSWIND COMPONENT	RUNWAY 7-25	RUNWAY 15-33	COMBINED
10.5 KNOTS	95.79%	96.91%	99.74%
13 KNOTS	97.90%	98.54%	99.98%
16 KNOTS	99.68%	99.79%	100.00%

IFR WIND COVERAGE			
	PERCENT COVERAGE		
CROSSWIND COMPONENT	RUNWAY 7-25	RUNWAY 15-33	COMBINED
10.5 KNOTS	98.89%	95.09%	99.77%
13 KNOTS	99.51%	97.39%	99.96%
16 KNOTS	99.93%	99.53%	100.00%

Source: C&S Engineers, Inc. May 2018
Observations taken at Queen City Municipal Airport from January 1, 2008 through December 31, 2013 from FAA Windrose Generator Download for "Allentown Queen City Muni".
Observations take at Queen City Municipal Airport from January 1, 2014 through January 31, 2018 from onsite AWOS owned by DBT Transportation Services, LLC.
Percent Wind Coverages calculated using FAA Airport GIS Windrose Generator.

Wind Rose Data

2.6 Airfield Facilities

Airfield design standards applicable for an airport are specified by the runway design code (RDC) and taxiway design codes (TDC). The RDC consists of three components related to the operational demands of aircraft:

- Aircraft approach category (AAC) – approach speed
- Airplane design group (ADG) – wingspan and tail height
- Runway visibility range (RVR) – visibility minimums

The latest XLL ALP Update, November 2010, identified the existing Airport Reference Code (ARC) for the Airport to be a B-II (small aircraft). The small aircraft identifier notes that the standards associated with aircraft with a maximum allowable takeoff weight (MTOW) of less than 12,500 pounds are applicable.

As seen in FAA AC 150/5300-13A Change 2, *Airport Design*, the FAA has renamed the ARC to the Runway Design Code (RDC). For this reason, Section 3 of this report includes the determination of an updated RDC, Taxiway Design Group (TDG), and/or design aircraft, if applicable, for existing and future conditions. For the purposes of Section 2, the RDC is B-II (small aircraft) and the design aircraft is the Beechcraft King Air B200.

2.6.1 Airfield Pavement

Runways

Runway 7-25, the primary runway, is 3,949 feet long by 75 feet wide. It consists of grooved asphalt with non-precision runway markings and medium intensity runway lighting. Each runway end has runway end identifier lights (REILs) and 4-box precision approach path indicators (PAPIs).

Runway 15-33 is 3,159 feet long by 75 feet wide. It consists of asphalt pavement, non-precision runway markings, and medium intensity runway lighting. **Table 2.6** summarizes the runway system characteristics for the Airport. More information on the pavement condition is discussed in the Pavement Condition section below.

Table 2.6| Runway System Characteristics

Characteristics	Runway 7-25	Runway 15-33
Use	Primary	Crosswind
Length (feet)	3,949	3,159
Displaced Threshold (feet)	0 / 0	0 / 0
Width (feet)	75	75
Condition[1]	Good	Poor
Pavement Condition Index[1]	92	21
Pavement Strength (pounds)		
Single Wheel	12,000	12,000
Composition	Asphalt/grooved	Asphalt
Wind Coverage (AW)		
10.5 knots	96.35%	95.48%
13 knots	98.20%	97.73%
16 knots	99.69%	99.62%
Markings	Non-Precision	Non-Precision
Edge Lighting	MIRL	MIRL
Approach Lighting	REILs	-

Source: FAA Airport Master Record Form 5010 (9/14/17) (see Appendix A); C&S Engineers, Inc.

1 - Based on 2016 PennDOT APMS (see Figure 2.5)

AW - All-weather conditions

MIRL - medium intensity runway lighting

REIL - runway end indicator lighting

Taxiways

Each runway is served by a full-length parallel taxiway. The airfield is also developed with a network of connector taxiways, outlined in **Table 2.7** on the following page. Information on taxiway pavement condition is discussed in the Pavement Condition section below.

Table 2.7| Runway System Characteristics

Taxiway		Serves	Width (feet)
A		Parallel to RW 7-25	40
	A1	Access from TW A to RW 7 end	40
	A2	Access from TW A to RW 25 end	35
	A3	Access from TW A to RW 25 end	42
B		Parallel to RW 15-33	35
	B1	Access from TW B to parking apron	35
	B1	Access from TW B to RW 15 end	40
	B2	Access from TW B to Parking apron	35
C		Access to TW A/RW 7-25 from parking apron	40
G		Connector from TW B to parking apron	40

Source: C&S Engineers, Inc.

There is a non-standard condition/feature for the separation between Taxiway A and Runway 7-25 indicated by the current ALP.

Apron and Aircraft Parking Areas

The Airport has approximately 21 parking spaces adjacent to the FBO building, conventional hangars, and the hangar leased by the City of Allentown Public Works Department's Street Department (referred to as the Vultee Hangar). There are also 18 tie-down spaces available in grass areas between Taxiway C and the parking apron, and along both sides of the taxilane to the old T-hangar building. Based on data provided by the FBO, 18 of the 21 paved tie-downs and 3 of 18 grass tie-downs are currently leased. See the following section for apron pavement condition information.

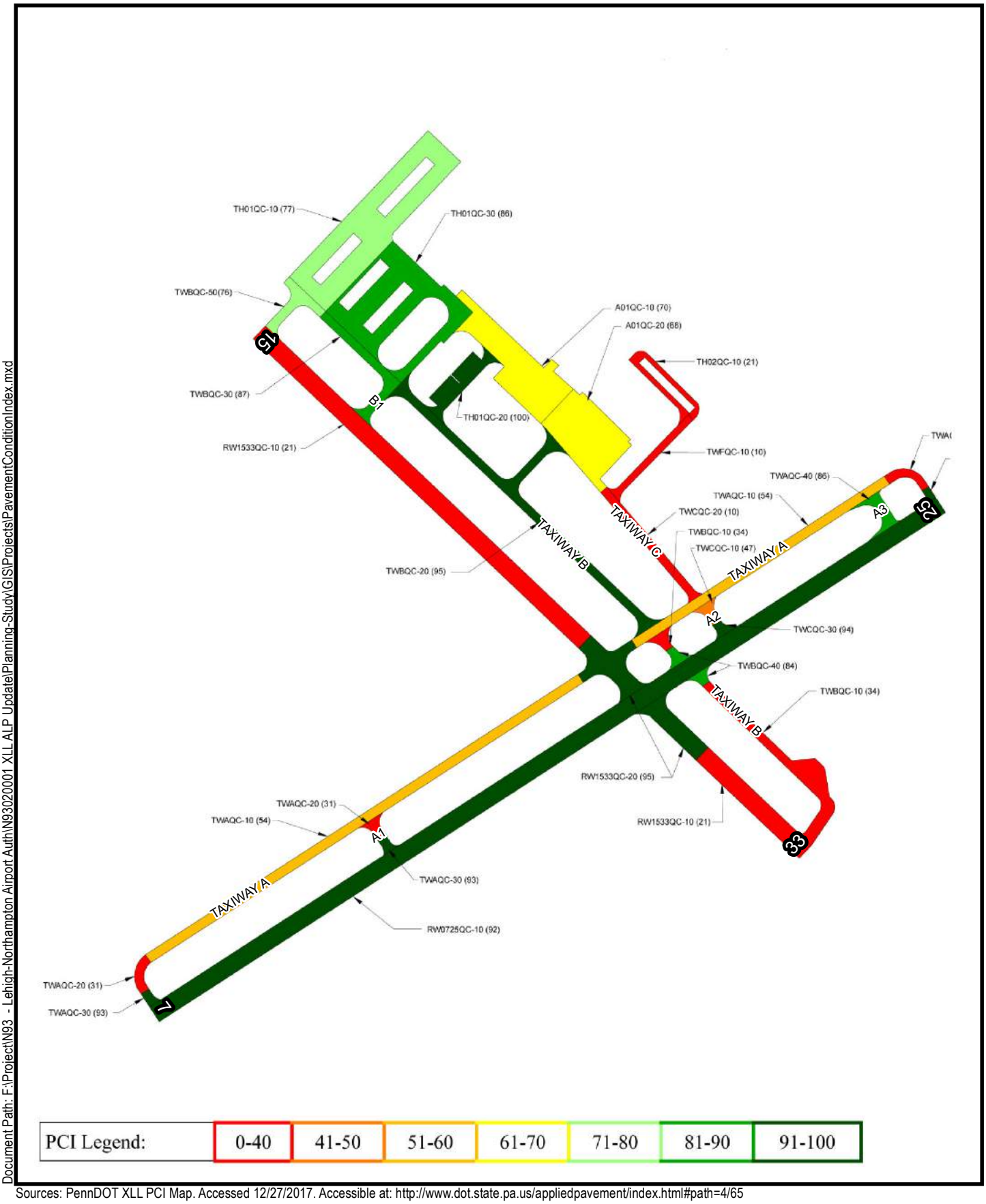
Pavement Condition

In 2016, PennDOT updated the Bureau of Aviation's Airport Pavement Management System (APMS). The APMS data for the Airport includes a map summarizing the pavement condition index (PCI) for all airfield pavements, detailed inspection comments, and a pavement work plan for maintenance and rehabilitation. The PCI for a pavement section corresponds to an appropriate repair type recommendation[4]:

- PCI 100-71 = Preventative Maintenance
- PCI 70-41 = Major Rehabilitation
- PCI 40-0 = Reconstruction

As shown in **Figure 2.5**, most of Runway 15-33, Taxiway C, the portion of Taxiway B near the Runway 33 end, and sections of pavement connecting Taxiway A to Runway 7-25 have PCI ratings below 40, indicating

[4] http://www.dot.state.pa.us/appliedpavement/index.html#path=5



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Sources: PennDOT XLL PCI Map. Accessed 12/27/2017. Accessible at: http://www.dot.state.pa.us/appliedpavement/index.html#path=4/65

Pavement Condition Index Map

Queen City Municipal Airport
Master Plan Update
Figure 2.5

the need for reconstruction. Taxiway A and the apron around the conventional hangars have PCI's between 41 and 70, indicating the need for major rehabilitation, while the rest of the pavement on the airfield is in good condition and requires only routine preventative maintenance at this time. This information, along with the PennDOT recommended pavement plan, will be taken into consideration for the Airport's 20-year development plan. See **Appendix A** for more information from the PennDOT APMS.

2.6.2 Safety & Object Free Areas

Runways and taxiways are surrounded by rectangular areas known as 'safety areas'. These areas have slopes ranging from 1 percent to 5 percent and should be graded and free of obstructions to enhance the safety of aircraft should they undershoot, overrun, or veer off a runway or taxiway. The purpose of the safety areas is to minimize the probability of serious bodily injury or damage to aircraft accidentally entering the area, and to provide greater accessibility for firefighting and rescue equipment during such incidents.

The approved June 2010 ALP identified the existing ARC for both runways as B-II. Based on this ARC as applied to the new RDC, the applicable Runway Safety Area (RSA) dimensions for both runways is 300 feet beyond the departure end, 300 feet prior to the threshold, and at a width of 150 feet. The RDC and these surfaces will be further evaluated in the facility requirements based on the forecasts of aviation demand.

Object Free Areas (OFAs) also surround runways and taxiways. These areas require clearing of objects except for any objects whose location is fixed by function. The purpose of the OFAs is to provide safe and efficient operations at the Airport. The existing Runway Object Free Area (ROFA) for both runways has a length of 300 feet beyond the departure end, 300 feet prior to the threshold, and at a width of 500 feet. There are currently two non-standard features/conditions for the ROFA noted on the current ALP. These are:

- There is 173 feet of a fence along Lehigh Street located within the ROFA for Runway 7.
- There is 222 feet of fence along Lehigh Street located within the ROFA for Runway 15.

The fence within the Runway 15 end ROFA is not along Lehigh Street but along Grammes Road and the fence within the Runway 7 end is along Interstate 78. There is fence within the ROFAs at the Runway 25 and 33 ends along Lehigh Street that is not noted on the current ALP.

The Taxiway Safety Area (TSA) is a defined surface alongside the taxiway that is suitable for reducing the risk of damage to an aircraft deviating from the taxiway. The TSA for a B-II ADG is 79 feet wide, centered on the taxiway centerline. The Taxiway Object Free Area is 131 feet wide and the Taxilane Object Free Area is 115 feet wide.

2.6.3 Runway Protection Zones

The function of the Runway Protection Zone (RPZ) is to enhance the protection of people and property on the ground. This is best achieved by Airport acquisition of property located within the RPZ and clearing it of incompatible land uses and obstructions. The RPZ is a trapezoidal shape centered on and extending out from the runway centerline, and contains a Central Portion and a Controlled Activity Area. The Central Portion of the RPZ is equal in width to the ROFA. The Controlled Activity Area is the remaining area of the RPZ on either side of the Central Portion of the RPZ.

The dimensions of an RPZ are determined by the ADG as well as the approach visibility minimums for each runway end. Dimensions for the Approach and Departure RPZs for each runway end are summarized in **Table 2.8**.

Table 2.8 | Approach and Departure RPZ Dimensions by Runway

	Runway			
	7	**25**	**15**	**33**
Approach Visibility Minimum	**1 mile**	**Visual**	**Visual**	**Visual**
		Approach RPZ		
Length (FT)	1,000	1,000	1,000	1,000
Inner Width (FT)	250	250	250	250
Outer Width (FT)	450	450	450	450
Area (acres)	8.035	8.035	8.035	8.035
		Departure RPZ		
Length (FT)	1,000	1,000	1,000	1,000
Inner Width (FT)	250	250	250	250
Outer Width (FT)	450	450	450	450
Area (acres)	8.035	8.035	8.035	8.035

Source: Visibility Minimums from Approach Plates acquired from AirNav; RPZ dimensions from FAA AC 150/5300-13A (Change 1) for an ADG of B-II small. C&S Engineers, Inc. January 2018.

2.6.4 Navigational Aids

Lighting/Visual NAVAIDS

Visual aids to navigation are particularly important under Visual Meteorological Conditions (VMC). However, operations can also occur in VMC on an IFR flight plan. The visual aids at the Airport include:

- **Airport Beacon** – The airport beacon serves as an indicator for the Airport's location for pilots at night or in low-light conditions including overcast skies. It is mounted to the top of a towering structure and rotates at a constant speed, producing flashes at regular intervals of two alternating colors (180° green and white). Queen City Municipal Airport's beacon operates from sunset to sunrise (and other times as needed) and is located on top of Hangar 6.

Figure 2.6—Wind Sock, Runway 15-33

Source: C&S Engineers, Inc.

- **Wind Socks** – A wind sock is a conical textile tube that provides a visual indication of wind direction and velocity. There is one lighted wind sock at the Airport located north of the intersection of Runway 15-33 and 7-25.

The Airport also has several lighting systems to facilitate operations during the nighttime and periods of low visibility. The types of lighting systems located at the Airport are as follows and indicated by **Table 2.9**:

- **Runway Edge Lighting** – Both runways have pilot-activated medium intensity runway lighting (ACTVT MIRL).
- **Runway End Identifier Lights (REIL)** – Runway 7-25 has REILs located at each runway end. They provide rapid and positive identification of the approach end and consist of a pair of synchronized flashing lights located laterally on each side of the runway threshold.
- **Precision Approach Path Indicators (PAPI)** – PAPIs provide visual approach slope guidance to pilots during landing operations. The PAPIs at Queen City Municipal Airport consist of two 4-light units and are located left of the runway edge perpendicular to the runway centerline. The Runway 7 PAPI oriented at a 3.00-degree glide path, and the Runway 25 PAPI oriented at a 3.50-degree glide path, provide descent guidance to pilots the location of the optimum touchdown point on the runway.
- **Taxiway Lighting** – All taxiways at the Airport have Medium Intensity Taxiway Lighting (MITL).

Additional visual aids to navigation include:

- **Runway Markings** – Runway 7 has non-precision runway markings. Runways 25, 15, and 33 have basic runway markings. All runways have unlighted touchdown points.

Table 2.9 | Runway Lighting

Lighting	Runway			
	7	25	15	33
ACTVT MIRL	✓	✓	✓	✓
REIL	✓	✓		
PAPI	✓	✓		

Source: Airport Master Record Form 5010 (01/17/18), AirNav (01/17/18), C&S Engineers, Inc. January 2018.

Electronic Aids to Navigation

Electronic NAVAIDs provide non-visual support for navigation to pilots. Electronic NAVAIDs are generally classified by the approach procedures they support. Electronic NAVAIDs and the approaches they support at Queen City Municipal Airport include:

- **RNAV (GPS)** – Runway 7 contains an RNAV (GPS) approach. GPS uses a network of satellites to create reference points that allows users with GPS receivers to determine their latitude, longitude, and altitude. RNAV describes an aircraft's ability to navigate using performance standards and enable

aircraft to navigate using a combination of GPS and ground based navigational aids as a network of navigation beacons.

- **Very High Frequency Omnidirectional Range (VOR)** – This is a radio navigation system enabling aircraft to determine their position and stay on course by receiving radio signals transmitted by a network of fixed ground radio beacons. The Airport has a VOR-B circling approach.

Support Equipment

There is a privately owned weather station located at the Airport. This Automated Weather Observation Station (AWOS) is owned by DBT Transportation Services, LLC (after recently acquiring assets from Vaisala Inc.) and broadcasts real-time airport weather conditions via radio broadcast at a frequency of 127.875.[5] It is not operated or maintained by the Airport, but it is located on Airport property and FAA certified.

2.6.5 Airspace Protection

An obstruction study, *AGIS Mapping Upload and Obstruction Analysis*, was completed for the Airport in June of 2017 by C&S Engineers, Inc. to analyze the Part 77 airspace as defined in Title 14 Code of Federal Regulations (CFR), the Runway End Siting Surfaces (RESS) for each runway, and the Precision Approach Path Indicator (PAPI) System obstacle clearance surfaces for Runways 7 and 25. All obstruction data presented below was provided from this study.

Part 77 Surfaces

The Part 77 surfaces analyzed as part of this study consisted of:

- Primary Surface – Defined as an area longitudinally centered on the runway for a width dependent on the type of runway, and extending 200 feet beyond each end of the landing threshold. At Queen City Municipal Airport, Runway 7-25 is a non-precision runway, corresponding to a primary surface width of 500 feet and Runway 15-33 is a visual runway, corresponding to a primary surface with of 250 feet.
- Approach Surface – An area longitudinally centered on the extended runway centerline, extending upwards and outwards from each end of the primary surface. The slope and configuration of each runway approach surface is varied as a function of the runway type and availability of instrument approaches.
    - Runway 7-25 consists of an approach surface with an inner width of 500 feet, starting 200 feet from the runway end and extending outward and upward at a slope of 20 feet horizontal to 1 foot vertical for a distance of 5,000 feet or until the elevation intersects the horizontal surface elevation.
    - Runway 15-33 has a an approach surface consisting of an inner width of 250 feet, extending outward and upward at a slope of 20 feet horizontal to one foot vertical for a distance of 5,000 feet or until the elevation intersects the horizontal surface elevation.

[5] Federal Aviation Administration, "Surface Weather Observation Stations, ASOS/AWOS" Accessed 2/15/18. Accessible at: https://www.faa.gov/air_traffic/weather/asos/?state=PA

- Transitional Surface – Extends outward and upward from the runway primary surfaces and each of the runway approach surfaces, to the airport horizontal surface, at right angles to the runway centerline at a slope of 7 feet horizontal to 1 foot vertical.
- Horizontal and Conical Surface – A horizontal plane 150 feet above the established airport elevation. The outer perimeter of the horizontal surface is delineated by arcs with a radius of 10,000 feet from the center of each end of the primary surface of each runway end. Adjacent arcs from each runway are connected by lines tangent to these arcs. The conical surface extends upwards and outwards from the limits of the horizontal surface for a distance of 4,000 feet at a slope of 20 feet horizontal to 1 foot vertical.

The analysis of these surfaces revealed numerous obstructions located in the last 1,200 feet of the horizontal and conical surfaces with the approach of Runway 33. The majority of these obstructions (trees and terrain) are located within the South Mountain Preserve and Robert Rodale Reserve. Due to these locations serving unique natural importance to the Lehigh Valley Region, it has been determined that it is not feasible to remove these obstructions.

Obstructions to the Part 77 Surfaces, in order of removal priority are as follows:

- On-Airport trees located within the Approach and Transitional to the Approach Surfaces of Runways 7, 25, 15, and 33.
- On-Airport obstructions to the Primary and Transitional to the Primary Surfaces of Runway 7-25.
- Off-Airport trees located with the Approach Surfaces of Runway 7, 25, 15, and 33.
- Off-Airport obstructions to the Primary and Transitional to the Primary Surfaces of Runway 7-25.

Threshold Siting Surface (TSS)

The TSS shape, dimensions, and slope are related to each runway end. The TSS category for Runway 7-25 is a "Non Precision Instrument Runway" Type 4 Siting Surface. This surface starts 200 feet beyond the runway end of pavement elevation and slopes upward at a slope of 20 feet horizontal to 1 foot vertical for a distance of 10,000 feet. The inner width of the surface is 400 feet and the outer width is 3,800 feet centered on the runway centerline.

Runway 15-33 is a "Visual Runway" Type 2 Siting Surface. The TSS surface for this runway starts at the runway end of pavement elevation and slopes upward at a slope of 20 feet horizontal to 1 foot vertical for a distance of 2,250 feet. The inner width of the surface is 250 feet and the outer width is 700 feet centered on the runway centerline.

Obstruction removal priority for the TSS are those located on-airport within the Approach Surface of Runway 15 (with a displacement of 130 FT for Runway 15) and then the off-airport obstructions located within the Approach Surface of Runway 7.

Precision Approach Path Indicator (PAPI) System Surfaces

The PAPI obstacle clearance surface (OCS) provides the pilot with a minimum clearance over obstacles during the approach. The PAPI surface begins 300 feet in front of the PAPI system and proceeds outward

into the approach zone at an angle 1 degree less than the aiming angle of the four-light unit assembly from the runway. The surface extends 10 degrees on either side of the extended runway centerline to a point four statute miles from its point of origin.

There were no obstructions observed to the Runway 7 or Runway 25 PAPI surfaces. However, there was one tree observed within one foot of penetrating the Runway 7 PAPI surface.

2.7 Access, Circulation, & Parking

The Airport is accessed via Vultee Street, which connects to I-78 via Lehigh Street. US Route 22 provides east-west access just north of the Airport and I-476 provides north-south access to the southwest, as shown in **Figures 1.1 and 1.2**. Vultee Street is a two-lane city street with limited on-street parking and Lehigh Street is a five-lane county road.

There is no airport wayfinding signage on I-78 or Lehigh Street, but there is a brand new sign located at the intersection of Vultee and Lehigh Street indicating the location of the Airport and neighboring industrial park. There is another sign with the LNAA logo and listing of tenants as you approach airport property at the end of Vultee Street.

Figure 2.7—Airport Entrance Sign

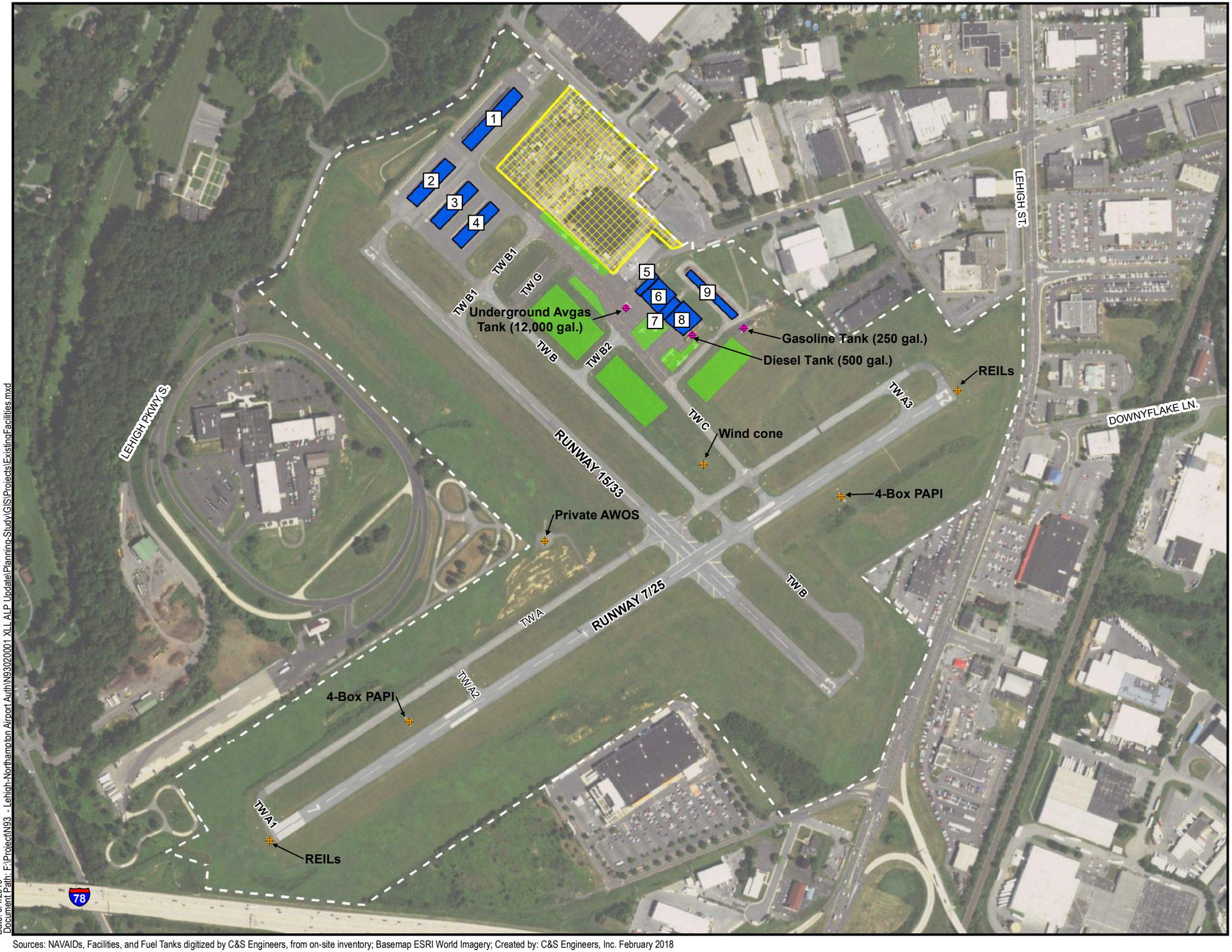
Source: LNAA

There are no airport circulation roadways. The FBO terminal and main vehicle parking are located off the end of Vultee Street and there is some vehicular parking for T-hangars located just off Grammes Road. City streets are used to travel between the two areas. There are approximately 60 parking spaces near the FBO terminal and another 24 near the T-hangars.

Enterprise rental car services are available (office at the intersection of Lehigh and Vultee streets) and a complimentary shuttle provides service when reserved. The Airport is not currently served by LANta bus service directly, but there are routes along Lehigh Street.

2.8 General Aviation Facilities

General Aviation (GA) refers to all civil aviation operations at an airport other than scheduled commercial air transportation (including cargo). GA facilities are documented in **Figure 2.8**.



Legend

- Airport Property Line
- Land Lease
- Facilities
- Tie-Down Areas
- Fuel Tanks
- NAVAIDs
- 1 T-Hangar
- 2 T-Hangar
- 3 T-Hangar
- 4 T-Hangar
- 5 Terminal
- 6 Hangar/Building 6
- 7 Maintenance Shop
- 8 Hangar/Building 8
- 9 Building 9/Old T-Hangars

N

0 110 220 440 Feet

1 inch = 450 feet
When printed at 11 in by 17 in

Queen City Municipal Airport
Master Plan Update

Existing Facilities

Figure 2.8

Date: 6/4/2019
Document Path: F:\Project\N93 - Lehigh-Northampton Airport Auth\N93020001 XLL ALP Update\Planning-Study\GIS\Projects\ExistingFacilities.mxd

Sources: NAVAIDs, Facilities, and Fuel Tanks digitized by C&S Engineers, from on-site inventory; Basemap ESRI World Imagery; Created by: C&S Engineers, Inc. February 2018

2.8.1 Fixed Base Operators

A Fixed Base Operator (FBO) is an organization that provides services such as fueling, hangaring, tie-downs and parking, aircraft rentals, aircraft maintenance, flight training, etc. At Queen City Municipal Airport, Lehigh Valley Aviation Services is the FBO and located in Hangar 6. Line services provided include: aircraft oil, full-service fueling (100LL and Jet-A) provided via World Fuel Services), ground power units, heated hangars, and tie-downs.

The Terminal (Building 5) is located adjacent to Hangar 6 and has an area of 4,886 square-feet. Pilot services offered include: an Automated Weather Observation Service (AWOS), access to faxing and copying services, access to a flight planning computer, a pilot lobby, and pilot supplies sold by Gateway Aviation. Passenger services include: ATM, baggage assistance, complimentary shuttle service, enterprise rental car drop-off, hotel reservations, and a passenger lounge.

Gateway Aviation provides services regarding aircraft charters, aircraft sales, air tours, a flight school, and a pilot shop.

2.8.2 Hangars

Conventional/Bulk Hangars

There are three bulk hangars at the Airport. Two are utilized for aircraft storage and the third is used as an aircraft maintenance shop. The bulk hangars at Queen City Municipal Airport are summarized in **Table 2.10**.

Table 2.10 | Hangars

Number	Elevation (FT)	Size (SF)	Description
6	409.4	12,580	Hangar 6
7	409.5	4,922	Maintenance Shop
8	403.3	11,517	Hangar 8

Source: Numbering, description, elevation, and SF based on 2010 Existing Facilities Plan. Compiled by C&S Engineers, Inc. January 2018.

There is a fourth hangar, referred to as the Vultee Hangar, that is included as part of a lease to the City of Allentown that began in November 2000. As shown in Figure 2.8, the City leases approximately 8 acres of land for use by the Public Works Department's Street Department. The Authority has the right to reduce the leased land area as needed and collects a monthly fee from the City based on an annual lease rate. Between 2013 and 2017 that annual rate increased from $77,977.81 to $124,764.50 based on the latest available amendment to the lease agreement.

T-Hangars

The Airport has five T-hangar buildings containing 52 units. T-hangar buildings 1 through 4 (containing units 1-43) are located east of Runway 15 at the northernmost part of Airport property. These T-hangars also

contain storage units (A through H) of approximately 550 square feet each. For FY 2015 (starting November 1st), three storage units were rented, generating approximately $5,300 in profit.

Building 9, the older T-Hangars, is located northwest of Hangar 8 and Hangar 6. All nine units in this building are currently leased except for one unit, which is unusable.

T-Hangars generated approximately $18,500 in monthly revenue for the Airport in FY 2015, with rents averaging approximately $443 per month. Interviews with the Airport have indicated that there is currently a waiting list for aircraft storage, with a preference for T-Hangars. Existing T-Hangars, their elevations, size, total units, and unit occupancy are documented in **Table 2.11.**

Table 2.11 | T-Hangars

Number	Elevation (FT)	Size (SF)	Unit Numbers	# of Units	Storage Units	Units Occupied
1	408.2	19,834	1-11	11	2 (A/B)	11
2	398.8	14,514	12-21	10	2 (H/G)	10
3	396.6	14,230	22-32	11	2 (C/D)	11
4	397.1	14,460	33-43	11	2 (E/F)	11
9	387.8	10,033	N/A	9	N/A	9

Source: Numbering, description, elevation, and SF based on 2010 Existing Facilities Plan. Occupancy/units from LNAA based on FY 2015 data (starting November 1st). Compiled by C&S Engineers, Inc. January 2018.

See **Appendix A** for more hangar information.

2.8.3 Tie-downs

Queen City Municipal Airport has both paved and grass tie-downs. Eighteen grass tie-downs are located adjacent to Taxiway C. For FY 2015, three spaces were occupied at rate of $63.35 per month, generating approximately $2,300 in revenue. There are 21 paved tie-downs at the Airport, located south of Hangars 7 and 8, and the Vultee Hangar. For FY 2015, paved tie-downs generate approximately $19,000 in revenue, at a rate of $88.67 per month with 18 units rented.

2.8.4 Fuel Farm

There is not a consolidated fuel farm at the Airport. Adjacent to the terminal there is one underground 12,000-gallon Avgas fuel tank. Self-fueling is not permitted but is performed by the FBO, which uses a fuel truck with a 1,000-gallon capacity.

Jet-A fuel is available at the Airport; however, the Airport currently does not have a fixed, on-site Jet-A storage tank. Jet-A fuel is provided via a 5,000-gallon truck that the Airport purchases between 3,000 to 4,500 gallons at a time from the supplier to fill.

Monthly distribution averages for Avgas and Jet-A are summarized in **Tables 2.12** and **2.13**, with a summary of total fuel sales in **Table 2.14**.

Table 2.12 | Avgas Monthly Distributions (2014 -2017) in Gallons

Month	2014	2015	2016	2017	Average	Monthly Distribution (Average)
Jan	2,942	2,992	3,557	2,592	3,021	5%
Feb	2,608	3,232	4,545	3,668	3,513	6%
Mar	3,639	4,024	4,129	3,188	3,745	6%
Apr	4,791	3,687	5,029	5,048	4,639	8%
May	5,488	5,484	4,908	4,394	5,069	8%
Jun	5,919	5,385	6,016	5,648	5,742	10%
Jul	7,245	6,820	5,858	4,560	6,121	10%
Aug	6,612	7,090	5,568	4,760	6,008	10%
Sept	6,144	5,827	6,114	5,732	5,954	10%
Oct	6,394	6,168	5,364	4,018	5,486	9%
Nov	4,765	5,092	5,754	3,855	4,867	8%
Dec	3,769	3,751	3,297	3,026	3,461	6%
Total	**60,316**	**59,552**	**60,139**	**50,489**	**60,002**	
Revenue[1]	**$229,804**	**$226,893**	**$229,130**	**$192,363**	**$228,609**	

[1]Revenue assuming fuel sold at $3.81/gal.

Source: C&S Engineers, Inc.

Table 2.13 | Jet-A Monthly Distributions (2014 -2017) in Gallons

Month	2014	2015	2016	2017	Average	Monthly Distribution (Average)
Jan	1,109	1,464	4,467	2,795	2,459	4%
Feb	1,674	3,098	4,706	2,983	3,115	6%
Mar	2,973	1,330	3,138	3,954	2,849	5%
Apr	3,079	4,150	5,012	5,986	4,557	8%
May	3,514	5,930	6,064	4,351	4,965	9%
Jun	5,114	7,305	6,294	7,509	6,556	12%
Jul	3,270	5,826	8,978	3,234	5,327	9%
Aug	2,061	6,633	6,084	4,738	4,879	9%
Sept	4,134	4,881	6,537	7,804	5,839	10%
Oct	4,642	5,457	5,662	5,892	5,413	10%
Nov	4,102	6,969	7,965	6,376	6,353	11%
Dec	5,253	4,139	6,131	5,886	5,352	9%
Total	**40,925**	**57,182**	**71,038**	**61,508**	**56,382**	
Revenue[1]	**$88,807**	**$124,085**	**$154,152**	$133,472	$122,348	

[1]Revenue assuming fuel sold at $2.17/gal.

Source: C&S Engineers, Inc.

Table 2.14 | Total Monthly Fuel Sales (2014 -2017) in Gallons

Month	2014	2015	2016	2017	Average	Monthly Distribution (Average)	Ranking
Jan	4,051	4,456	8,024	5,387	5,510	4.73%	12
Feb	4,282	6,330	9,251	6,651	6,621	5.69%	10
Mar	6,612	5,354	7,267	7,142	6,411	5.51%	11
Apr	7,870	7,837	10,041	11,034	8,583	7.37%	9
May	9,002	11,414	10,972	8,745	10,463	8.99%	7
Jun	11,033	12,690	12,310	13,157	12,011	10.32%	2
Jul	10,515	12,646	14,836	7,794	12,666	10.88%	1
Aug	8,673	13,723	11,652	9,498	11,349	9.75%	4
Sept	10,278	10,708	12,651	13,536	11,212	9.63%	6
Oct	11,036	11,625	11,026	9,910	11,229	9.65%	5
Nov	8,867	12,061	13,719	10,231	11,549	9.92%	3
Dec	9,022	7,890	9,428	8,912	8,780	7.54%	8
Total	101,241	116,734	131,177	111,997	116,384		
Revenue[1]	$318,611	$350,978	$383,282	$325,835	$344,677		

Source: C&S Engineers, Inc.

There is a 500-gallon diesel tank adjacent to Hangar 8, which has been in place since 1995. There is also a 250-gallon tank that provides gasoline for maintenance vehicles adjacent to the old hangars. See **Appendix A** for more fuel information.

2.9 Environmental

A Short Environmental Assessment Form based on guidance provided by FAA Order 1050.1F was conducted by C&S Engineers for On and Off-Airport Obstruction Mitigation in early 2018. Key environmental findings from this analysis are as follows and documented in **Appendix A**:

- The Airport is located in a marginal nonattainment for 8-hour ozone (2008) area and in moderate nonattainment for PM-2.5 (2006) area.
- There are six federally listed protected or endangered species known in the vicinity of the Airport: the Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), bog turtle (*Clemmys muhlenbergii*), northeastern bulrush (*Scirpus ancistrochaetus*), bald eagle (*Haliaeetus leucocephalus*), and the golden eagle (*Aquila chrysaetos*).
- There are 14 species of birds protected under the Migratory Bird Act located in the Airport vicinity: Bald Eagle, Black-billed cuckoo, Bobolink, Cerulean warbler, Eastern whip-poor-whil, Golden-winged warbler, Henslow's sparrow, Kentucky warbler, Prairie warbler, Red-headed woodpecker, Wood thrush, and the Yellow-bellied sapsucker.

- There are no critical habitats, national wildlife refuge lands, or fish hatcheries located within the Airport vicinity.
- The Airport is not located within the Pennsylvania Coastal Zone Management Plan or within the Coastal Barrier Resources System.
- There are no Section 4(f) resources located on Airport property. Section 4(f) resources located within 0.5 miles of the Airport include three parks: Salisbury Drive Playlot, Perce Ruhe Park, and Little Lehigh Parkway; two recreation areas: Western Salisbury Elementary School (sports complex) and Lehigh Parkway Schools (sports complex); and one historic site: the Bogert Covered Bridge
- There are no actively farmed (cropland or pastureland) areas within or immediately adjacent to the Airport
- In regard to hazardous materials, solid waste, and pollution prevention, the Airport is listed one time in the Leaking Underground Storage Tank (LUST) database and four times in the Recovered Government Archive (RGA) LUST database. However, information provided for the one LUST designation indicates that cleanup was completed. The Spirax Sarco site is located off-airport to the west of the southern end of Runway 15-33. It is listed in the Leaky Aboveground Storage Tank (LAST), Unregulated Leaky Tanks, Voluntary Cleanup Program (VCP), Institutional Controls, and Activity and Use Limitations (AUL) databases. The AUL database indicates that this site was entered into the PADEP Land Recycling and Cleanup Program in 2000 as a "Complete Site"
- There are no National Historic Landmarks located within the immediate vicinity of the Airport.
- There are no federal wetlands, state wetlands, surface waters, designated wild and scenic rivers, 100-year floodplains, or sole source aquifers located on Airport property.

A more detailed environmental review will occur as the alternatives are developed, as necessary.

Section 3—Forecasts of Demand

3.1 Forecast Overview

Forecasts of aviation demand are an essential element to the airport planning process that require FAA review and approval (at airports with over 100,000 operations or 100-based aircraft). Demand forecasts, based upon desires and needs within the service area, as well as national and regional trends, provide a basis for determining the type, size, and timing of aviation facilities development. As the operation and construction of future airport facilities require FAA and local investment, accurate forecasts are essential for effective airport planning and decision-making and influence all subsequent steps of the planning process. As stated in FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS), dated December 4, 2000, forecasts should:

- Be realistic,
- Be based on the latest available data,
- Reflect current conditions at the airport,
- Be supported by information in the study, and
- Provide adequate justification for the airport planning and development.

Forecasts of the Airport's future aviation activity were developed for the planning period extending through 2038 using various data sources provided by the FAA, Woods & Poole Economics, Inc., and Lehigh Northampton Airport Authority (LNAA). The forecast is based on the best practice standards as defined in FAA Advisory Circular (AC) 150-5070-6B, *Airport Master Plans*. Consistent with the report *Forecasting Aviation Activity by Airport*, prepared for the FAA in July 2001 by GRA, Incorporated, this forecasting effort was broken into the following steps:

- Identification of Aviation Demand Elements
- Data Sources
- Historical and Existing Aviation Activity
- Review of Aviation Forecasts
- Collection of Data
- Development of the Forecast Framework
- Development of the Forecast
- Demand Forecast Summary
- Comparison with FAA Terminal Area Forecast (TAF)

Additional information specific to XLL and pertinent to future planning is also included.

3.2 Identification of Aviation Demand Elements

Forecasts of aviation demand are developed for a number of elements or parameters. The key demand elements for XLL include General Aviation (GA) activity and based aircraft. Aviation demand forecasts were therefore developed for the following:

- Number of Based Aircraft and Associated Fleet Mix

- Annual General Aviation Operations (Includes Air Taxi/Commuter)

Military Operations

Military operations at XLL (published in the FAA TAF records) have fluctuated over the last 10-years from a low of 135 combined local and itinerant operations in recent years to a high of 600 in 2008 and do not make up a significant percentage of the Airport's operations. According to FAA TFMSC published data (IFR operations only), 81 military operations occurred at XLL from 2013 to 2017. The FAA TAF indicates forecasted annual military operations of 135 every year looking forward throughout the forecast period. Given the overall low percentage of military operations, combined with minor historical fluctuations, forecasted military operations were forecast to remain at current levels published in the FAA TAF (135 annual operations) through the XLL 20-year planning period.

3.3 Data Sources

Information factored into the forecasting effort included FAA GA fleet trends, anticipated changes in the aircraft fleet mix operating at XLL, and local and regional socioeconomic trends. The data and assumptions used to define baseline conditions and future activity trends were derived from several data sources. The following provides a brief description of these data sources:

- **LNAA:** The Authority provided historical documentation prepared for the Airport and included existing based aircraft, average monthly fuel sales, and aviation forecasts such as the Airport Layout Plan Update and Narrative Report preferred forecast that was prepared in 2010.

- **FAA Terminal Area Forecast (TAF):** The TAF is the official FAA forecast of aviation activity for U.S. airports. Activity estimates are derived from national estimates of aviation activity that are then assigned to individual airports based upon multiple market and forecast factors. The FAA looks at local and national economic conditions, as well as trends within the aviation industry, to develop each forecast. The latest TAF was published in January 2018.

- **FAA Traffic Flow Management System County (TFMSC):** TFMSC contains data provided from the FAA's Air Traffic Airspace Lab's Traffic Flow Management System. The data provides historical records of aircraft operations that can be reviewed and filtered to provide specific information on the aircraft types operating at XLL during a defined period of time.

- **Flightwise.com:** Flightwise.com is an aviation website with detailed information on airports, runways, and services available. Flightwise allows users to retrieve information on flights for a particular flight/aircraft, for past flights.

- **Patriot Technologies, Inc.:** Contracted to provide Traffic Counting Services at XLL utilizing Patriot's Airport Traffic Counting System (PATC™). The data from the Patriot counts will be used to compare operations with other sources for the existing baseline of the forecast.

- **Pennsylvania Statewide Airport System Plan Update 2016 (PA SASP 2016):** The PA SASP 2016 is an update to the previous 2007 State Aviation System Plan (SASP) Update and provides a statewide framework for prioritizing investments to improve performance of Pennsylvania's air transportation system, and is used to estimate projected statewide aviation activity. While the

complete document is not yet available, the PennDOT provided information regarding statewide forecasts.

- **Airport Cooperative Research Program (ACRP) Report 129 – *Evaluating Methods for Counting Aircraft Operations at Non-Towered Airports*:** The Transportation Research Board's ACRP Report 129 provides a review of techniques for estimating operations at airports without air traffic control towers. Methodologies provided in this report will be used for comparison with existing data provided by other sources.

- **Woods & Poole Economics, Inc.:** Woods & Poole is an independent firm that specializes in developing long-term economic and demographic projections. Their database includes every state, Metropolitan Statistical Area (MSA), and county in the U.S. and contains historical data and projections through 2050 utilizing more than 900 economic and demographic variables.

3.4 Historical Aviation Activity

Historical aviation activity at the Airport was gathered using a number of the sources noted above. General Aviation makes up the majority of aircraft activity at 98 percent of the total 2017 traffic, while military and air taxi operations combined make up just under 2 percent. The different types of activity are described below:

- **General Aviation:** All operations not including air carrier, air taxi and commuter, scheduled commercial cargo, and military. These operations are generally conducted under Federal Aviation Regulations (FAR) Part 91 (General Operating and Flight Rules). GA represents the largest percentage of civil aircraft in the U.S. and accounts for the majority of operations handled by towered and non-towered airports, as well as the majority of certificated pilots. Its activities include flight training, sightseeing, aerial photography, light cargo, recreational, law enforcement, and medical flights, as well as personal travel via air taxi charter, business, and corporate operations. GA aircraft encompass a broad range of types, from single-engine piston aircraft to large jets, as well as rotorcraft, gliders, and amateur-built aircraft.

- **Military:** Operations conducted by the nation's military forces.

- **Air Taxi and Commuter:** Carriers that operate aircraft with 60 or fewer seats or have a cargo payload capacity of less than 18,000 pounds, and carry passengers on an on-demand basis only (non-scheduled charter service) and/or carries cargo or mail on either a scheduled or charter basis. Commuter operators provide scheduled passenger service (five or more round trips per week on at least one route according to published flight schedules) while utilizing aircraft of 60 or fewer seats. Air taxi and commuter carriers are governed under FAR Part 135 (Commuter and On Demand Operations).

Airport operations are classified as local and itinerant. Local operations are those operations performed by aircraft that operates from the airport, remains within the specified radius, and does not land at another airport. Itinerant operations are aircraft that land at an airport, arriving from outside the airport area, or depart an airport and leave the airport area.

Terminal Area Forecast (TAF)

The data published in the FAA TAF for the past 10 years shows a negative 2.4 percent average annual growth rate (AAGR) in operations and based aircraft, and positive annual average growth rates in operations and based aircraft over the past five years – 4.6 percent and 1.6 percent respectively (see **Table 3.1**).

Table 3.1 | FAA TAF Historical and Existing Aircraft Operations and Based Aircraft at XLL

Year	Air Taxi & Commuter	Itinerant GA	Itinerant Military	Local GA	Local Military	Total Operations	Total Based Aircraft
2007	1,348	2,616	330	51,679	0	**55,973**	**106**
2008	1,300	2,520	600	49,800	0	**54,220**	**95**
2009	1,306	2,532	330	50,034	0	**54,202**	**95**
2010	1,312	2,544	330	50,269	0	**54,455**	**104**
2011	1,318	2,556	330	50,505	0	**54,709**	**76**
2012	423	1,688	135	27,933	0	**30,179**	**73**
2013	423	2,100	135	32,000	0	**34,658**	**83**
2014	423	2,100	135	32,000	0	**34,658**	**83**
2015	423	2,100	135	32,000	0	**34,658**	**86**
2016	444	3,150	135	33,600	0	**37,329**	**77**
2017	446	3,166	135	33,758	0	**37,505**	**78**

	Operations	Based Aircraft
AAGR 10-yr trend (2007-2017)	**-2.4%**	**-2.4%**
AAGR 5-yr trend (2013-2017)	**4.6%**	**1.6%**

Source: FAA TAF, January 2018
AAGR: Average Annual Growth Rate, used when data is available for consecutive years

3.5 Existing Aviation Activity

Detailed information from LNAA is reflected below with both existing based aircraft and fuel sales for the base and prior years. The operations counts performed for October 1, 2017 through December 30, 2017 by Patriot Technologies, Inc. is also included (see **Appendix B**). Flightwise operations data for 2017 and TFMSC operations data for 2017 are used as a comparison with existing activity at XLL. Through reviewing each data source, a baseline is established for the forecasts.

Based Aircraft

As shown in **Table 3.2**, based on data provided by the LNAA, there are currently 82-based aircraft at XLL, with over 75 percent being single engine aircraft. Most of them are stored in the various T-hangars on airport with 26 in conventional hangars, four on ramp tie-down spaces, and two tied-down in the grass area. **Appendix C** includes the list of based aircraft at XLL.

Table 3.2 | Existing Based Aircraft at XLL

Aircraft Type	Based Aircraft
Single Engine	63
Multi Engine	13
Jet	0
Helicopter	6
Total Based Aircraft	**82**

Source: LNAA

Fuel Sales

Section 2.8.4 provides detailed fuel sales information for 2014 through 2017. Through 2016, Avgas sales remained constant, while the quantity of Jet A fuel sales has steadily increased. Sales for both types of fuel decreased by approximately 10,000 gallons each in 2017 compared to 2016. The third quarter was the busiest of the year in terms of fuel sales for 2014, 2015, and 2016 but the second quarter saw the most sales in 2017. The first quarter was the lowest each year, as shown in **Table 3.3**. Fuel sales increased by 15 percent from 2014 to 2015, increased another 12 percent from 2015 to 2016, and then decreased 15 percent from 2016 to 2017.

Table 3.3 | Historical Fuel Sales* at XLL

2014	Gallons per Quarter	2015	Gallons per Quarter	2016	Gallons per Quarter	2017	Gallons per Quarter
Q1	14,945	Q1	16,140	Q1	24,542	Q1	19,180
Q2	27,905	Q2	31,941	Q2	33,323	Q2	32,936
Q3	29,466	Q3	37,077	Q3	39,139	Q3	30,798
Q4	28,925	Q4	31,576	Q4	34,173	Q4	29,053
Total 2014	**101,241**	**Total 2015**	**116,734**	**Total 2016**	**131,177**	**Total 2017**	**111,967**

Source: LNAA

*Combined sales of Avgas and Jet A

Operations Counts

Patriot Technologies, Inc. conducted detailed traffic counts at XLL from October 1, 2017 through December 30, 2017. **Table 3.4** summarizes the information collected. The data also provides a breakdown of operations per runway and aircraft design group.

Table 3.4 | Operations during October, November and December 2017 – Patriot Technologies

		Runway						Aircraft Design Group				
	Total Operations	7	25	15	33	N/A	Unk.	I	II	III	Heli.	Unk.
Oct	1,731	128	1,245	28	143	179	8	1,641	51	0	28	11
Nov	1,912	438	944	36	279	212	3	1,828	37	0	47	0
Dec	1,244	163	839	19	102	120	1	1,185	47	0	12	0
Total	**4,887**	**729**	**3,028**	**83**	**524**	**511**	**12**	**4,654**	**135**	**0**	**87**	**11**

Source: Patriot Technologies, Inc., C&S Engineers, Inc.
N/A – helicopter operation
Unk. - Unknown

Calculation of Annual Operations

In order to project the count data to a year's worth of operations, a number of methodologies were considered. Correlations between operations published by TFMSC and flightwise, fuel sales throughout the year, based aircraft, and instrument operations were all calculated, as well as an annual estimate of operations based on a seasonal adjustment factor as noted in ACRP Report 129. ACRP Report 129 provides monthly and quarterly seasonal adjustment factors to apply to count data to estimate annual operations for the different regions of the country. Applying the 0.23 adjustment factor for the fall quarter (October through December) to the operations numbers observed at XLL (northeast region), the annual operations for 2017 is estimated to be 21,248. The results for all the methodologies were comparable, ranging from the lowest at 18,023 operations based on fuel sales to the 21,248 operations based on the ACRP method. The annual operations estimate based on the ACRP method was determined to be the preferred methodology (see **Table 3.5**). Therefore, the annual the number of operations for 2017 to be used is 21,248 operations. See **Appendix C** for the detailed calculations associated with all the above-mentioned methodologies and summary in Table 3.5.

Table 3.5 | 2017 Estimated Annual Operations Summary

2017 Data	Annual Operations
Based on Fuel Sales (Oct-Dec = 27% of total gas sold)	18,023
Based on Flightwise Data (Oct-Dec = 24% of data)	20,302
Based on TFMSC Data (Oct-Dec = 25% of data)	19,792
Based on operations per based aircraft (82)	19,680
ACRP Report 129 using seasonal adjustment factor	21,248

Source: Patriot Technologies, Inc., flightwise.com, FAA TFMSC, LNAA, ACRP Report 129, C&S Engineers, Inc.

3.6 Review of Previous Aviation Forecasts

Historical aviation activity forecasts were reviewed to evaluate forecasting trends and methodologies and determine their applicability for preparing a new forecast.

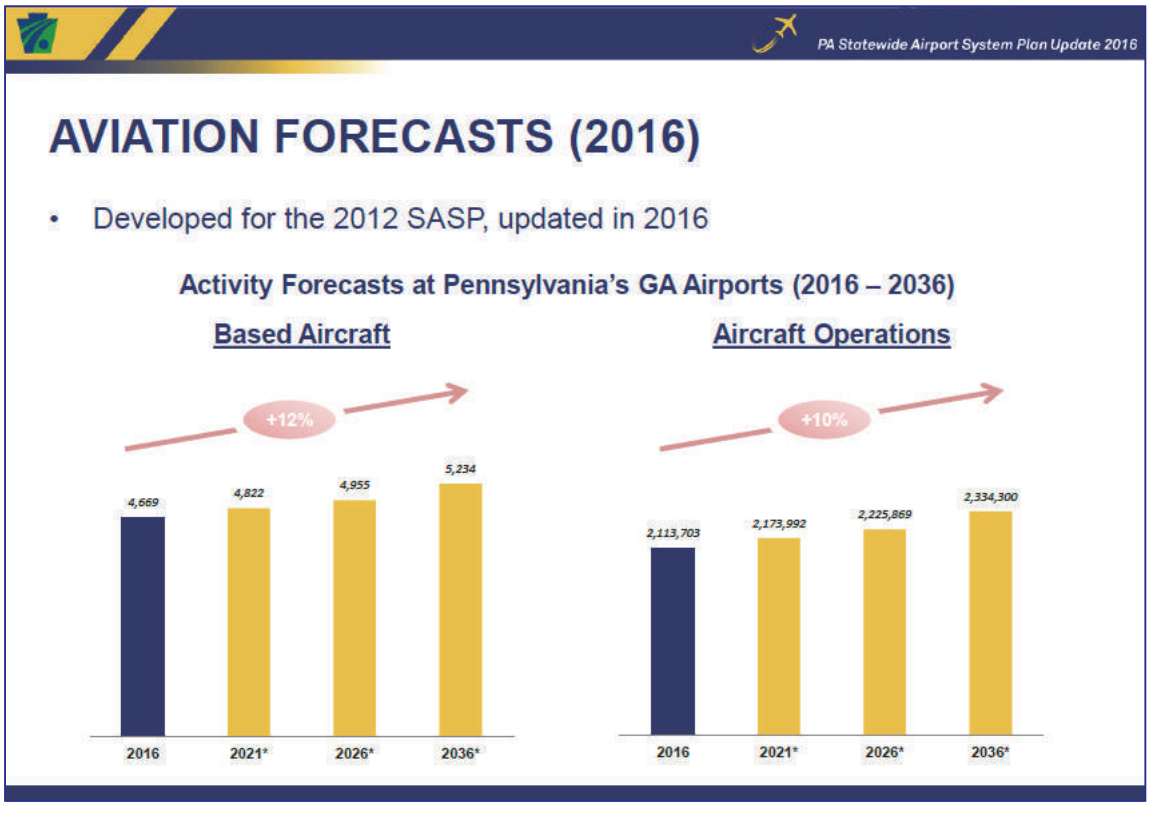
3.6.1 Forecast Data Specific to XLL

Forecast data was reviewed from the 2010 Airport Layout Plan Update (see **Table 3.6**) and the FAA TAF for years 2017 to 2037 (see **Table 3.7**). The forecast data in this section is shown as reported in those documents and has not been adjusted.

Pennsylvania Statewide Airport System Plan Update (2016)

A review of the PennDOT *Statewide Airport System Plan 2007* found no detailed data of forecasts for the state or region. An update to this report is currently under review - *PA Statewide Airport System Plan Update 2016* (SASP 2016) - with an approval/release expected soon. PennDOT provided information regarding forecasts updated for the 2016 update prior to the document's release. **Figure 3.1** below shows results of positive growth in based aircraft and operations from the updated activity forecast at Pennsylvania's GA airports. Using the based aircraft and operations data for GA airports published in the updated SASP 2016, the compound annual growth rates (CAGR) were 0.58 percent for based aircraft and 0.50 percent for operations in Pennsylvania.

Figure 3.1 – Pennsylvania Statewide Airport System Plan Update: Aviation Forecasts (2016)



Source: PennDOT

2010 Airport Layout Plan Update

The 2010 ALP Update and Narrative Report included an evaluation of forecast activity at the Airport. The forecast covered a 20-year planning period with base year beginning of 2007 and the forecast ending in 2027. **Table 3.6** provides a breakdown of the ALP Update Report forecast summarizing based aircraft and operations. Overall, the based aircraft forecast and operations forecast projected a compound annual growth rate (CAGR) of 0.78 percent and 0.27 percent, respectively, through 2027.

Table 3.6 | 2010 Airport Layout Plan Update and Narrative Report–Aviation Forecast Summary

Year	Based Aircraft	Total Operations
2007	106	55,973
2008	95	54,220
2012	110	54,966
2017	114	56,262
2027	123	58,946
CAGR	**0.78%**	**0.27%**

Source: Queen City Municipal Airport Layout Plan Update 2010, Table 2-12, page 2-10
CAGR: Compound Annual Growth Rate, used when data is not available for consecutive years

Terminal Area Forecast (TAF)

The FAA TAF provides forecast data for passenger enplanements, airport operations, Terminal Radar Approach Control Facilities (TRACON) operations, and based aircraft, and is the benchmark against which the FAA compares all airport activity forecasts. The TAF shows 0.47 percent annual average growth at XLL for operations and 1.11 percent annual average growth for based aircraft through the forecast period from 2017 to 2038 as shown in **Table 3.7** on the following page**.**

Table 3.7 | FAA TAF Operations & Based Aircraft Forecast for XLL

Year	Total Operations	Based Aircraft
Existing 2017	37,505	78
2018 (base year)	37,680	79
2023 (5 year)	38,570	83
2028 (10 year)	39,480	88
2033 (15 year)	40,411	93
2038 (20 year)	41,363	98
AAGR Used for TAF	**0.47%**	**1.11%**

Source: FAA TAF, January 2018
Note: FAA TAF data includes forecasts for the interim years. AAGR was calculated based on all years of 20-year forecast.

3.6.2 Aviation Industry Trends

Industry data sources in addition to those described previously were used to identify aviation trends anticipated to influence aircraft activity at XLL over the forecast period (2018 to 2038).

The FAA Aerospace Forecast, Fiscal Years (FY) 2017-2037

The FAA Aerospace Forecast provides an overview of aviation industry trends and expected growth for commercial passenger carrier, cargo carrier, and GA segments. National growth rates in enplanements, operations, fleet growth and fleet mix for commercial fleets and the GA fleet are provided over a 20-year forecast period. With no commercial service at XLL, a closer look at national GA trends was the focus of the review.

Below are several key elements regarding GA activity:

- The active GA fleet is projected to increase over the forecast period by an annual rate of 0.1 percent per year. This fleet includes several types of aircraft, each of which are projected to grow or decline at varying rates over the planning period:
  - The turbine-powered fleet is projected to grow at an average annual growth rate of 1.9 percent a year.
  - The turbojet fleet is projected to increase at a rate of 2.3 percent per year.[6]
  - Fixed-wing piston-powered aircraft are projected to decrease by an average annual growth rate of -0.8 percent.
- The number of GA hours flown is projected to increase by 0.9 percent yearly over the forecast period. [7]
- The number of active GA pilots is projected to decrease by 7,500 (down 0.1 percent annually) through the forecasted period. However, student pilot training is projected to increase at 0.4 percent annually. This, in combination with an increase in the much smaller category of sport pilots, would result in an additional 15,500 pilots over the forecasted period.

Although the largest section of the national GA fleet, fixed-wing piston aircraft are forecast to shrink annually by 0.08 percent over the forecast period. According to the FAA Aerospace Forecast, this decline can be attributed to pilot demographics, increases in cost of aircraft ownership, and the inability of new aircraft deliveries to keep up with the retirement of an aging fleet. However, growth in the U.S. economy's gross domestic product (GDP) and continuous growth of turbine and rotorcraft fleets help to offset the decline (see **Table 3.8** and **Figure 3.2**). Increases in the total number of aircraft that make up the GA fleet are forecasted to increase from 209,905 in 2016 to 213,420 aircraft in 2037, which portrays a 0.1 percent average annual growth rate over the forecast period.

According to the FAA Aerospace Forecast for Fiscal Years (FY) 2017-2037, at airports with FAA or contracted air traffic control service, GA operations are projected to remain stable with a 0.3 percent increase

[6] FAA Aerospace Forecast (FY) 2017-2037, General Aviation, page 22
[7] FAA Aerospace Forecast (FY) 2017-2037, Table 29, page 82

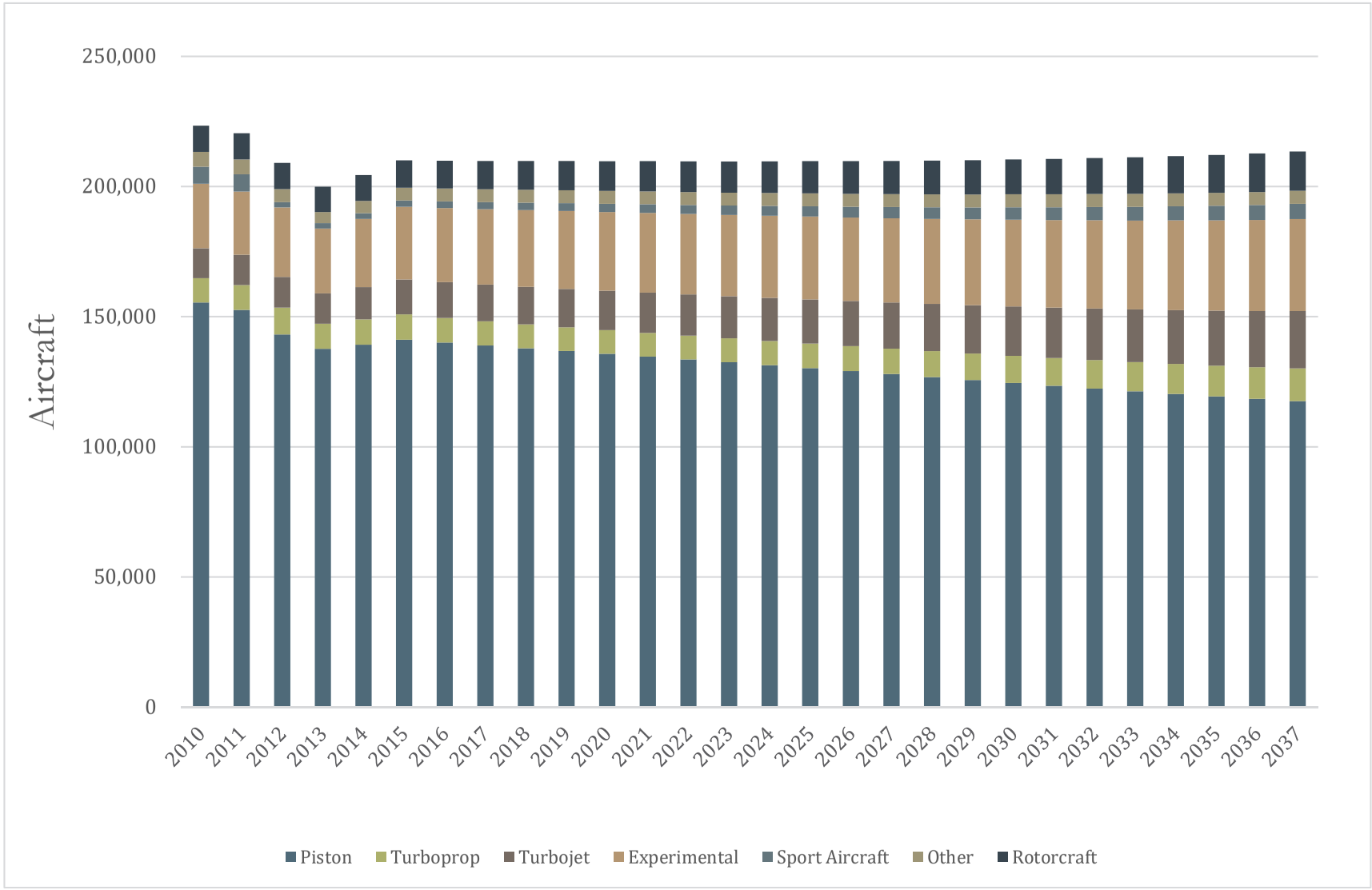
per year over the forecasted period. While this is promising for GA activity, with no air traffic control tower at Queen City Municipal Airport, the best trend for comparison to both based aircraft and operations would be the general GA fleet national trend with an average annual growth rate of 0.1 percent over the forecast period. For clarification throughout this section, this will be referred to as the FAA Aerospace Forecast GA Trends Forecast.

Table 3.8 | Active GA and Air Taxi Aircraft Fleet Growth Rates

	Single-Engine Piston	Multi-Engine Piston	Turboprop	Turbojet	Rotorcraft	Total GA Fleet Growth
AAGR 2010-2016	-1.6%	-3.1%	0.2%	3.1%	1.0%	-
AAGR 2016-2037	-0.9%	-0.5%	1.4%	2.3%	1.6%	**0.1%**

Source: FAA Aerospace Forecast for FY 2017 – 2037, Table 28
AAGR: Average Annual Growth Rate, used when data is available for consecutive years

Figure 3.2 – Active GA and Air Taxi Aircraft Growth



Source: FAA Aerospace Forecast for FY 2017 – 2037, Table 28

3.7 Collection of Other Data

This step involves the gathering of all other applicable and pertinent information/data that may be used in the forecast development.

3.7.1 Socioeconomic Trends Affecting Aviation

Airports are often affected by national and regional trends in population, per capita income, and employment. While socioeconomic activity more directly correlates with airports supporting commercial passenger service, it is still important to review and have a clear understanding of local demographic and economic forces that can influence and provide context for an aviation activity forecast.

Lehigh County Population and Income Trends

Lehigh County is one of three counties included in the Metropolitan Statistical Area (MSA) designated Allentown-Bethlehem-Easton, Pennsylvania. Comparisons in average annual growth rates in historical data and forecast data is depicted below for the County, MSA, State and US. Population growth over the forecast period is projected to increase at 0.7 percent annually for Lehigh County (see **Table 3.9**).This forecasted growth rate is higher than state levels, and equal to the MSA for the broader Lehigh Valley area. Historical trends show growth in the past five years in Lehigh County.

Table 3.9 | Historic and Projected Population Growth Rates

Year	Lehigh County	Allentown-Bethlehem-Easton MSA	Pennsylvania	US
AAGR 2007-2017	1.2%	0.7%	0.4%	1.4%
AAGR 2013-2017	1.5%	0.9%	0.5%	2.0%
AAGR 2018-2038	0.7%	0.7%	0.3%	0.9%

Source: Woods & Poole Economics, Inc. 2017; C&S Engineers, Inc.
AAGR: Average Annual Growth Rate, used when data is available for consecutive years

Lehigh County, the Allentown-Bethlehem-Easton MSA, the state of Pennsylvania, and the United States as a whole saw an employment increase from 2007 to 2017. When looking at data from the past five years, employment in Lehigh County has experienced economic recovery and grown by an average annual rate of 3.6 percent. Annually, Lehigh County employment is predicted to grow 1.3 percent (see **Table 3.10**) between the forecasted years of 2018-2038.

Table 3.10 | Historic and Projected Employment Growth Rates

Year	Lehigh County	Allentown-Bethlehem-Easton MSA	Pennsylvania	US
AAGR 2007-2017	1.9%	1.7%	1.3%	2.0%
AAGR 2013-2017	3.6%	3.3%	2.5%	4.2%
Forecasted AAGR 2018-2038	1.3%	1.2%	0.9%	1.2%

Source: Woods & Poole Economics, Inc. 2017; C&S Engineers, Inc.
AAGR: Average Annual Growth Rate

As employment growth rates forecast an increase in Lehigh County during the 2018 to 2038 period, per capita income forecasts show an increased growth rate of 4.9 percent (see **Table 3.11**) for the same period. Lehigh County is forecasted to have a higher average annual growth rate forecasted than the MSA, State, and US.

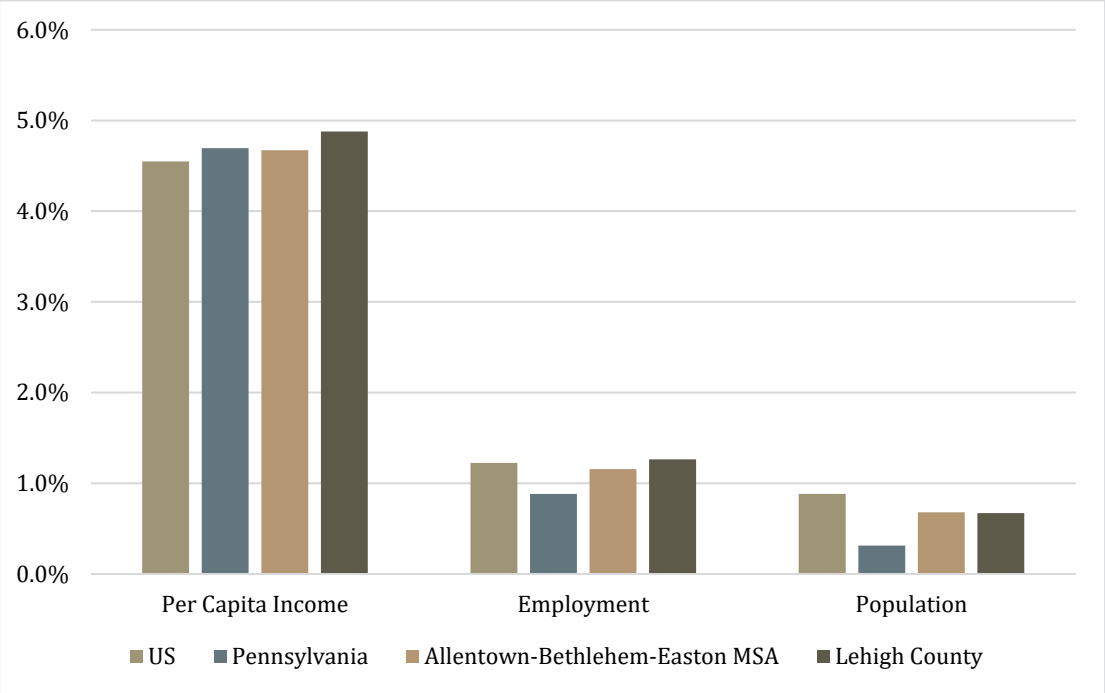
Table 3.11 | Historic and Projected Income Per Capita Growth Rates

Year	Lehigh County	Allentown-Bethlehem-Easton MSA	Pennsylvania	US
AAGR 2007-2017	1.9%	2.1%	2.7%	2.5%
AAGR 2013-2017	2.6%	2.7%	2.8%	2.8%
Forecasted AAGR 2018-2038	4.9%	4.7%	4.7%	4.5%

Source: Woods & Poole Economics, Inc. 2017; C&S Engineers, Inc.
AAGR: Average Annual Growth Rate

Figure 3.3 compares the annual socioeconomic growth rates for Lehigh County, Allentown-Bethlehem-Easton MSA, Pennsylvania, and the United States over the master plan forecast period.

Figure 3.3 – Forecasted Growth Rates for 2018-2038



Source: Woods & Poole Economics, Inc. 2017; C&S Engineers, Inc.

3.8 Development of Forecast Framework

The following presents the forecast frameworks considered for projecting activity at XLL, as well as the selected scenarios for the forecast framework.

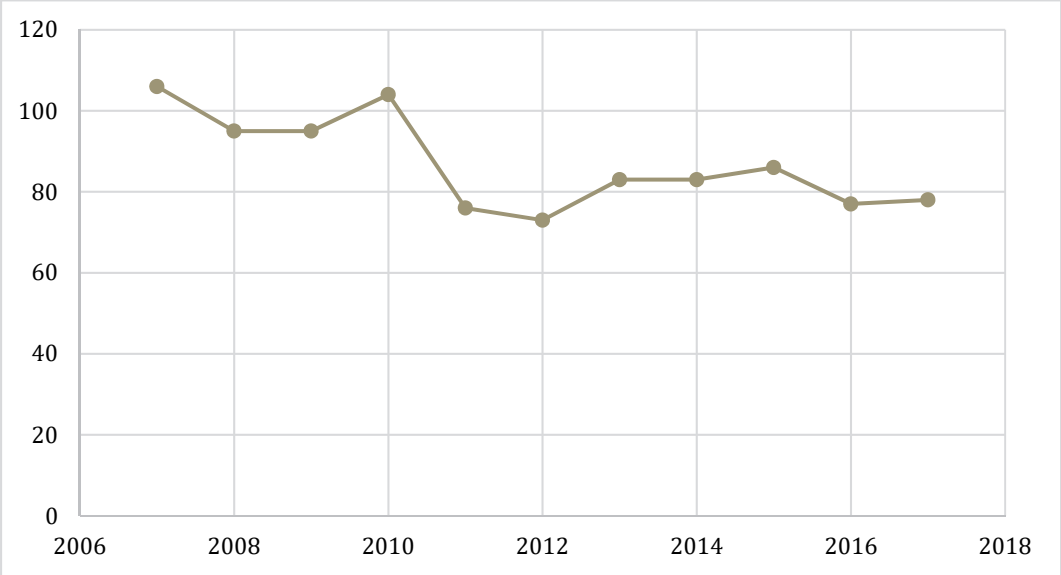
3.8.1 Based Aircraft Forecast Methodologies

Trend Analysis

Trend analysis involves the evaluation of historical data to develop projections of future activity. This method delivers a straight-line projection for future activity at XLL.

Historical based aircraft information for XLL was retrieved from the FAA TAF, and is presented on **Figure 3.4.** The data provided by the TAF shows a decline in the average annual growth rate (AAGR) in the 10-year historical period of -2.36 percent for based aircraft at the Airport from the years 2007 to 2017. The five-year trend in the AAGR shows improvement from the 10-year trend in based aircraft, with an AAGR of 1.63 percent. For the purpose of the based aircraft forecast for XLL, **the five-year trend with an AAGR of 1.63 percent** will be used for evaluation.

Figure 3.4 — XLL Based Aircraft History



Source: FAA TAF, January 2018
AAGR: Average Annual Growth Rate, used when data is available for consecutive years

Regression Analysis of Socioeconomic Factors

Regression analysis is a statistical methodology that correlates factors of aviation demand (dependent variables) such as based aircraft or operations to socioeconomic measures (independent variables) such as population, employment or income. This is useful when reliable forecasts are available for the independent variables. Specifically, a regression analysis comparing socioeconomic factors (independent variables) and the total number of based aircraft (dependent variable) within the Airport's service area (Lehigh County) can be used to project future totals.

In comparing the past five years of based aircraft data with the past five years of population, employment, and per capita income data for Lehigh County, the r-squared value[8] (**Appendix C**) for all three socioeconomic factors was lower than 0.5 . Perfect correlation results in an r-squared value of 1.0. Thus, this regression analysis meaningful and useful correlation with based aircraft. Therefore, the AAGR for population, employment and per capita income cannot be utilized for comparison with the based aircraft forecast.

[8] The percentage of the response variable variation that is explained by a linear model. R-squared is always between 0 and 100%: 1) 0% indicates that the model explains none of the variability of the response data around its mean. 2) 100% indicates that the model explains all the variability of the response data around its mean. In general, the higher the R-squared, the better the model fits your data. http://blog.minitab.com/blog/adventures-in-statistics-2/regression-analysis-how-do-i-interpret-r-squared-and-assess-the-goodness-of-fit

Comparison with Lehigh Valley International Airport Forecasts

The general aviation forecast for the *Lehigh Valley International Airport (ABE) Master Plan Update*, approved by the FAA in 2017, uses the *FAA Aerospace Forecast FY 2016-2036*[9] for comparison with its based aircraft forecast. The average annual growth rate of 0.7 percent is utilized for the based aircraft forecast at ABE based on the FAA TAF forecasted totals for based aircraft. The rationale for using the 0.7 percent is that it is comparable to the published annual average growth rate for the total GA fleet, which is 0.2 percent. While the *FAA Aerospace Forecast FY 2016-2036* is a data source used in this report as well, this forecast utilizes the updated *FAA Aerospace Forecast FY 2017-2037* for consistency throughout the report. The current national growth rate published in the ***FAA Aerospace Forecast FY 2017-2037*** **for the total GA fleet is 0.1 percent**. This annual average growth rate of 0.1 percent will be used in consideration for the XLL based aircraft forecast.

Comparison with Pennsylvania Statewide Aviation System Plan Update (2016) Forecast

As mentioned earlier in Section 3.6.1, the **PA SASP 2016 Forecast for GA airports in Pennsylvania depict an average annual growth rate for based aircraft of 0.58 percent** throughout their 20-year forecast period (2016-2036). This annual average growth rate of 0.58 percent will also be used in consideration for the XLL based aircraft forecast.

Comparison with TAF Forecast for XLL

As depicted in Table 3.7, the **FAA Terminal Area Forecast for XLL depicts an average annual growth rate for based aircraft of 1.11 percent** throughout the forecast period (2018-2038). This annual average growth rate of 1.11 percent will also be used in consideration for the XLL based aircraft forecast.

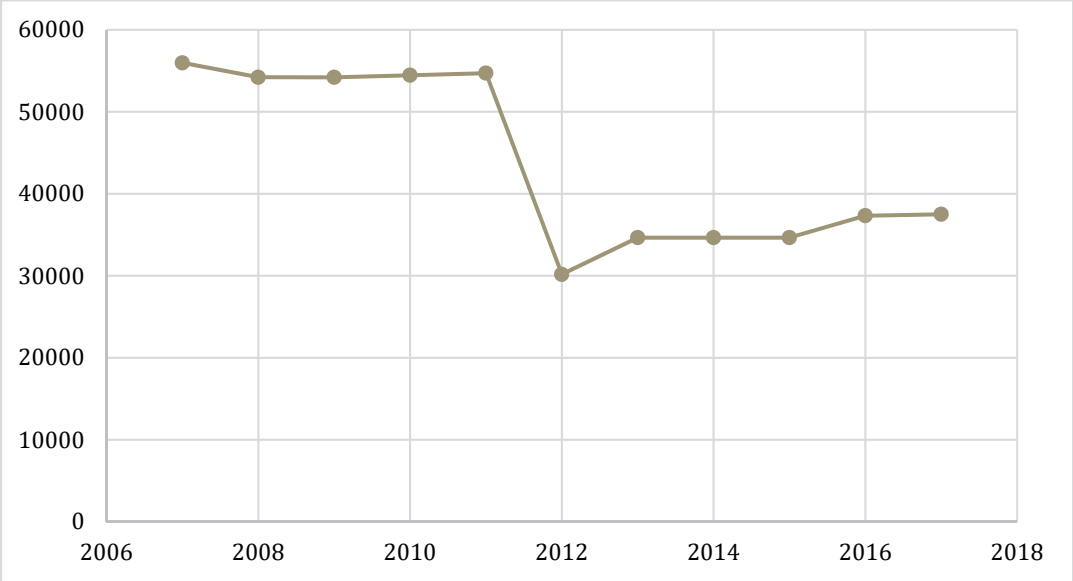
3.8.2 Operations Forecast Methodologies

Trend Analysis

Historical trends in operations were also reviewed to determine the applicability of trend analysis for the Airport's activity forecast. The 10-year historical period data was reviewed from the FAA TAF. As detailed in the historical data reflected in Table 3.1, a steep decline is shown from 2011 to 2012, giving the 10-year trend an AAGR of -2.4 percent (see **Figure 3.5**). The five-year historical trend yielded an average annual growth rate of 4.6 percent. With the external factors of financial crisis in 2011, as well as the sizable disparity between the 10-year and 5-year historical trends, the 10-year trend growth rates will not be utilized for comparison in this forecast. With a steady rate of growth shown, the past **5-year historical trend of operations at the Airport with the AAGR of 4.6 percent** will be considered for the XLL forecast.

[9] FAA, FAA Aerospace Forecast, Fiscal Years 2016-2036

Figure 3.5 — XLL TAF Operations History



Source: FAA TAF, January 2018
AAGR: Average Annual Growth Rate,

Regression Analysis of Socioeconomic Factors

When evaluating the past five years of operations data with the past five years of population, employment, and per capita income data for Lehigh County, the r-squared value derived through a regression analysis (**Appendix C**) for per capita income and population were over 75 percent and could show a meaningful correlation with operations. Employment comparisons with operations provided a lower r-squared value and will not be used.

The Lehigh County forecasted growth rate for per capita income over the next 20 years is 4.9 percent annually, while population is forecast to grow at 0.7 percent annually. For the purpose of operations at XLL and the realistic evaluation of the 5-year historical trends recorded, the **Lehigh County population forecast growth rate of 0.7 percent** will be considered for the operations forecast.

Comparison with National Trends and FAA Terminal Area Forecast for XLL

The general aviation forecast in the *FAA Aerospace Forecast FY 2017-2037* utilizes specific growth rates for each individual type of aircraft as well as an annual average growth rate for the total U.S. GA fleet. The growth rate published in the ***FAA Aerospace Forecast FY 2017-2037*** **for the total U.S. GA fleet is 0.1 percent**. This annual average growth rate of 0.1 percent will be used in consideration for the XLL operations forecast. [10]

[10] https://www.faa.gov/data_research/aviation/aerospace_forecasts/media/FY2017-37_FAA_Aerospace_Forecast.pdf, Table 28

As depicted in Table 3.7, the **FAA Terminal Area Forecast for XLL depicts an average annual growth rate for operations of 0.47 percent** throughout the forecast period (2018-2038). This annual average growth rate of 0.47 percent will be used in consideration for the XLL operations forecast.

Comparison with Pennsylvania Statewide Aviation System Plan Update (2016) Forecast

As mentioned earlier in Section 3.6.1, the **PA SASP 2016 Forecast for GA airports in Pennsylvania depict an average annual growth rate for operations of 0.50 percent** throughout their 20-year forecast period (2016-2036). This annual average growth rate of 0.50 percent will also be used in consideration for the XLL operations forecast.

3.9 Development of the Forecast for XLL

3.9.1 Based Aircraft Forecast

After taking the based aircraft forecast scenarios described above into consideration and comparing the forecasted data with each scenario, the preferred based aircraft forecast is the **FAA TAF Based Aircraft forecast with an AAGR of 1.11 percent** and is depicted in bold on **Table 3.12** and **Figure 3.6.**

Table 3.12 | XLL Based Aircraft Forecast Scenarios

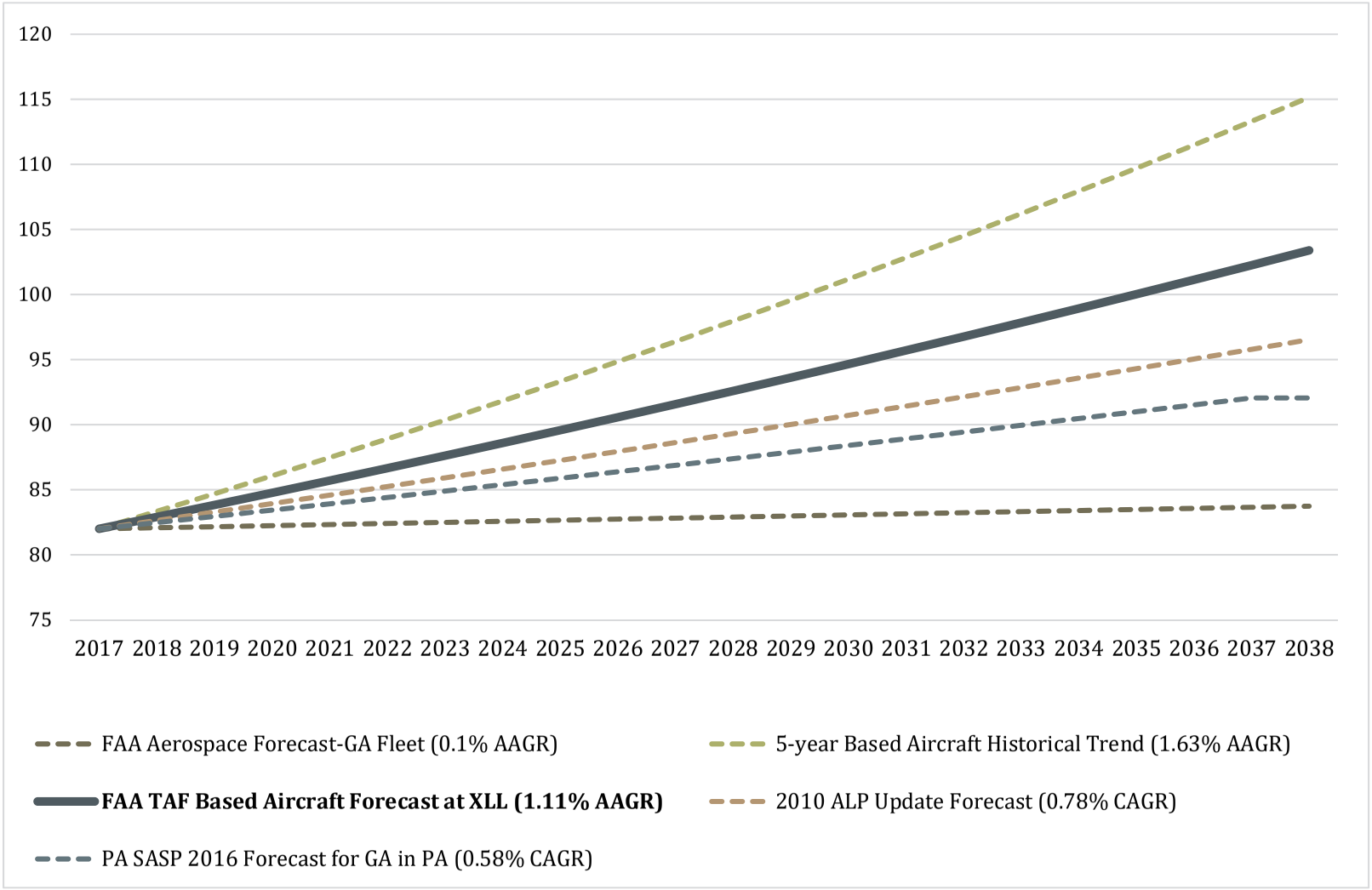
	Annual Growth Rate	2017 Existing*	2023 Forecast	2028 Forecast	2038 Forecast
FAA Aerospace Forecast for GA Fleet AAGR	0.1%	82	82	83	84
5-year Based Aircraft Historical Trend AAGR	1.63%	82	90	98	115
FAA TAF Based Aircraft Forecast at XLL AAGR	**1.11%**	**82**	**88**	**93**	**103**
PA SASP Update 2016	0.58%	82	85	87	92
2010 ALP Update Forecast	0.78%	82	86	89	97

Source: C&S Engineers, Inc.; FAA TAF; FAA Aerospace Forecast; LNAA; and Woods and Poole Economics, Inc.

*Existing Based Aircraft Counts from LNAA, February 2018

Note: Some percentages and forecasted numbers vary because of rounding.

Figure 3.6 | XLL Based Aircraft Forecast



Source: C&S Engineers, Inc.; FAA TAF; FAA Aerospace Forecast; LNAA; and Woods and Poole Economics, Inc.

3.9.2 Operations Forecast

As noted, several forecasts have been developed specifically for XLL or national aviation activity that are worth considering. **Table 3.12** shows the growth rates used in these sources and applies the increase or decrease to existing activity from the determined counts in Section 3.5 to compare future projections. Based on the correlation of Lehigh County population growth trends over the past five years and the 5-year historical operations trend at XLL, the preferred operations forecast is the **Lehigh County Population Forecast AAGR** and is depicted in bold on **Table 3.13** and **Figure 3.7**.

Table 3.13 | XLL Operations Forecast Scenarios

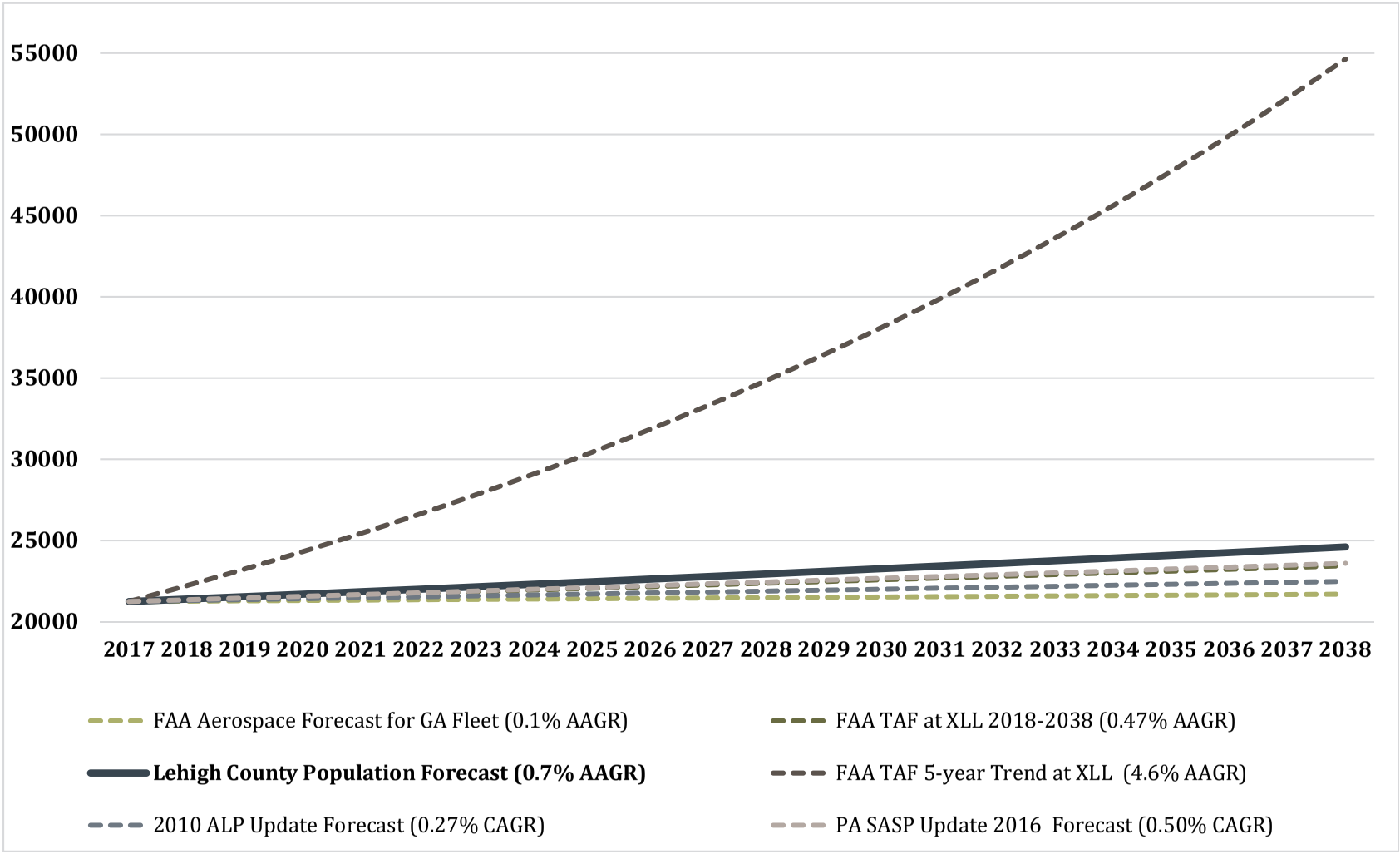
	Annual Growth Rate	2017 Existing*	2023 Forecast	2028 Forecast	2038 Forecast
FAA TAF at XLL 2018-2038	0.47%	21,248	21,854	22,373	23,447
PA SASP Update 2016	0.50%	21,248	21,893	22,446	23,594
Lehigh County Population Forecast AAGR	**0.7%**	**21,248**	**22,156**	**22,943**	**24,600**
FAA Aerospace Forecast for GA Fleet	0.1%	21,248	21,376	21,483	21,699
FAA TAF 5-year Trend at XLL	4.6%	21,248	27,830	34,847	54,637
2010 ALP Update Forecast	0.27%	21,248	21,595	21,888	22,486

Source: C&S Engineers, Inc.; FAA TAF; FAA Aerospace Forecast; LNAA; and Woods and Poole Economics, Inc.

*Existing Operations, See Table 3.7

Note: Some percentages and forecasted numbers vary because of rounding.

Figure 3.7 | XLL Operations Forecast



Source: C&S Engineers, Inc.; FAA TAF; FAA Aerospace Forecast; LNAA; and Woods and Poole Economics, Inc.

3.9.3 Fleet Mix Forecast

The fleet mix of an airport is made up of aircraft that are based at the facility as well as the transient aircraft that operate there. Historical based aircraft information for XLL was retrieved from the FAA TAF to ascertain the average annual growth rates and trends, while existing information was collected from the Authority. As identified in **Table 3.14** the fleet mix forecast is derived from the preferred XLL Based Aircraft Forecast AAGR of 1.11% broken down by fleet mix categories with existing fleet mix percentages.

Table 3.14 | Based Aircraft Forecast at XLL by Fleet Mix

Aircraft Type	Existing	Fleet Mix Percentage	Forecast Fleet Mix (AAGR 1.11%)			
	2017	2017	2023	2028	2033	2038
Single-Engine	63	77%	67	71	75	79
Multi Engine	13	16%	14	15	16	16
Turboprop	0	0%	0	0	0	0
Jet	0	0%	0	0	0	0
Rotorcraft	6	7%	6	7	7	8
Total	**82**	**100%**	**88**	**93**	**98**	**103**

Source: C&S Engineers, Inc., FAA TAF, LNAA

Growth rates for the existing operations fleet mix were kept consistent with the preferred AAGR used for the XLL Operations Forecast (see **Table 3.15**). While the FAA Aerospace Forecast predicts slight decreases in operations of both single-engine and multi-engine propeller aircraft nationwide, the growth rates of those aircraft categories at XLL were forecast to increase slightly. This was primarily based off feedback provided by airport tenants, LNAA, and the evaluation of regional forecasts.

Table 3.15 | Operations Forecast at XLL by Fleet Mix

Aircraft Type	Existing	Fleet Mix Percentage	Forecast Fleet Mix (AAGR 0.7%)			
	2017	2017	2023	2028	2033	2038
Single-Engine	16,998	80%	17,725	18,354	19,066	19,680
Multi Engine	1,275	6%	1,329	1,377	1,426	1,476
Turboprop	637	3%	665	688	713	738
Jet	106	0.5%	111	115	119	123
Rotorcraft	2,231	10.5%	2,326	2,409	2,494	2,583
Total	**21,248**	**100%**	**22,156**	**22,943**	**23,757**	**24,600**

Source: C&S Engineers, Inc., FAA TAF, LNAA, TFMSC

3.10 Comparison with FAA Terminal Area Forecast

Table 3.16 presents a comparison between the preferred forecast for the Airport as developed herein and the FAA TAF. Based on the XLL existing operations counts for 2017 having a large discrepancy with the published FAA TAF existing operations for 2017 (21,248 v. 37,505 respectively), the percent difference between the two counts is not reasonable to determine if the FAA TAF and forecast are within a 10 percent difference. By utilizing the 2017 FAA TAF operations count of 37,505 as a baseline and projecting a forecast for the 20-year period with the 0.7 percent AAGR used for the preferred XLL operations forecast, the comparison is found to be more comparable and falls within the FAA guidelines of 10 percent.

Table 3.16 | Comparison between XLL Operations Forecast and FAA TAF

Forecast Year	Airport Forecast	FAA TAF January 2018	FAA ADJUSTED TAF 0.7% AAGR*	% Difference TAF Comparison
Existing 2017	21,248	37,505	37,505	-
2018	21,397	37,680	37,768	**0.2%**
2023	22,156	38,570	39,108	**1.4%**
2028	22,943	39,480	40,496	**2.6%**
2033	23,757	40,411	41,933	**3.8%**
2038	24,600	41,363	43,422	**5%**

Source: FAA TAF January 2018 and C&S Engineers, Inc.
*XLL Operations Forecast AAGR, Section 3.9.2

The Airport Layout Plan Update has documented that the number of aircraft operations presented in the FAA TAF is inconsistent with existing conditions (2017) at the Airport. The FAA updates the TAF annually and the number of aircraft operations and based aircraft reported under 2017 will likely be corrected in the next iteration based on the actual numbers recorded at XLL.

3.11 Recommended Demand Forecast Summary

3.11.1 Peak Period Characteristics

Defining peak periods for aviation demand is an essential step in the planning process. Peak activity refers to specific sets of time (e.g. seasonal, monthly, daily, etc.) in which the number of aircraft operations (arrivals and departures) is at its highest frequency, putting increased demand on airport facilities. At XLL, understanding peak period demands assists in determining where specific airfield improvements may be needed to address increased aircraft departure queue times or to determine if adequate transient parking exists during specific times.

Peak periods of aviation demand were calculated using existing aircraft operations activity information and were broken down by monthly operations, daily operations, and hourly departures with the following methodology:

- Peak Month Operations: This level of activity is defined as the calendar month when peak aircraft operations occur. By analyzing fuel sales records for 2017, the peak month was July with 11% of sales for the year. The peak month of July will be utilized with a correlation of 11 percent of the fuel sales to annual operations.

  Peak Month Operations = Annual Operations * 0.11

- Design Day Operations: This level of operations is defined as the average day within the peak month (ADPM).

  Design Day Operations (ADPM) = Peak Month Operations / 30

- Design Hour Operations: This level of activity is defined as the peak hour within the ADPM. From experience at similar facilities, these operations will range between 10 – 15 percent of the ADPM operations. Therefore, 12.5 percent was used for this calculation.

  Design Hour Operations = ADPM Operations x 0.125

Table 3.17 presents a summary of the Airport's aviation activity forecast including peak period operations. The breakdown of operations into itinerant and local operations is based on an assumed 10 percent itinerant and 90 percent local operations split based on the FAA TAF.

Table 3.17 | Queen City Municipal Airport Demand Forecast Summary with Peak Period Operations

	2017	2018	2023	2028	2033	2038
Based Aircraft	82	83	88	93	98	103
Operations	21,248	21,397	22,156	22,943	23,757	24,600
Itinerant	*2,125*	*2,140*	*2,216*	*2,294*	*2,376*	*2,460*
Local	*19,123*	*19,257*	*19,940*	*20,649*	*21,381*	*22,140*
Peak Month	2,337	2,354	2,437	2,524	2,613	2,706
Average Day Peak Month	78	78	81	84	87	90
Design Hour	10	10	10	11	11	11

Source: C&S Engineers, Inc., LNAA

3.12 Critical Aircraft

In order to maintain and develop an airport that meets FAA defined design standards, as well as the needs of the airport users, it is critical to have a clear understanding of the specific types of aircraft (e.g. manufacturer and model) that operate at the airport. Due to the varying size and speed characteristics of each aircraft type, the airport must be planned and designed to provide proper accommodations. An essential step in the ALP Update process is the identification of the critical aircraft or design aircraft that will guide the standards used for separation and geometric design of the airport facilities. The critical aircraft is defined by the FAA as the most demanding aircraft that performs, or is projected to perform, at least 500 annual operations at an airport. This can be recognized as a specific aircraft model or composite of similar aircraft models. It should also be noted that when there is more than one runway, the most demanding aircraft for each runway may be different and should be evaluated separately.

Based Aircraft

As noted in Section 3.5 and provided in **Appendix C**, the LNAA indicated there are 82-based aircraft at the Airport. There are currently six based helicopters, 68 A-I aircraft, four B-I aircraft, and four B-II aircraft.

Aircraft Operations

Aircraft operations data collected from October through December 2017 noted 135 ADG II aircraft, as shown previously in **Table 3.6**. A closer look at the data indicated they were all AAC B aircraft. The B-II aircraft observed at the airport are shown in **Table 3.18.** The table also indicates if their maximum takeoff weight is above or below the criteria for small aircraft (aircraft at or below 12,500 pounds are considered small) and their projected 2017 and 2038 operations count.

Table 3.18 | B-II Aircraft Operations Information (Runway 7-25)

Aircraft	AAC + ADG	Maximum Takeoff Weight (MTOW)	Oct-Dec 2017 Counts	Projected Annual 2017 Operations	Projected Annual 2038 Operations
C550 – Cessna Citation II	B-II	Over 12,500 lbs.	2	9	10
BE30 - Beechcraft Super King Air 300	B-II	Over 12,500 lbs.	35	152	176
BE20 - Beechcraft Super King 200	B-II	12,500 lbs. or under	54	235	272
BE9L – Beechcraft King Air 90	B-II	12,500 lbs. or under	27	117	135
C90A – Beechcraft King Air C90A	B-II	12,500 lbs. or under	2	9	10
C90GTI – Beechcraft King Air C90GTI	B-II	12,500 lbs. or under	2	9	10

Source: Patriot Technologies, Inc., C&S Engineers, Inc.

When the B-II aircraft activity is sorted by runway use, all but 11 of the observed operations from October through December were noted on Runway 7-25. Projecting the three-month counts on Runway 7-25 to an existing annual operations number indicates that the B-II family of aircraft has 531 operations at XLL and meets the 500 operations threshold for determining the critical aircraft for this runway. Since there are not enough operations for the larger B-II aircraft to meet the minimum criteria on its own currently or in the future, the **B-II small aircraft family should be considered the existing and future critical aircraft family for Runway 7-25 at XLL**. While the Beechcraft Super King Air 200 does not have 500 operations on its own, there is one based at the Airport, it accounts for the most operations of the B-II aircraft observed, and it is the most demanding of the B-II small aircraft operating at XLL. **It is recommended that the Beechcraft Super King Air 200 (ADG B-II small, TDG 2) is the existing and future critical aircraft for Runway 7-25 at XLL**. This maintains the critical aircraft from the previous 2010 Update. The characteristics of the critical aircraft are shown in **Table 3.19**.

Table 3.19 | Beechcraft Super King Air 200 - Aircraft Characteristics

Characteristics	Beechcraft Super King Air 200
Length	43 FT 9 IN
Wingspan	54 FT 6 IN
Height	15 FT
Maximum Takeoff Weight	12,500 lbs.
Takeoff Distance*	2,579 FT
Landing Distance*	2,845 FT

Source: http://www.airliners.net/aircraft-data/raytheon-beechcraft-king-air-200/328;
*http://www.planeandpilotmag.com/article/beechcraft-king-air-200-300-350/#.WqGHLY-cGM8

A closer look at the aircraft using Runway 15-33 shows that it is primarily being used by A-I aircraft. Projecting the three-month counts as they were above for Runway 7-25 indicates that the A-I family of aircraft has over 2,600 operations on Runway 15-33. Further evaluation (see **Table 3.20**) shows that the Diamond 20 Katana is the only aircraft to exceed 500 operations on Runway 15-33 currently or in the future. **It is recommended that the Diamond 20 Katana (ADG A-I small, TDG 1A) aircraft is the existing and future critical aircraft for Runway 15-33 at XLL**.

Table 3.20 | A-I Aircraft Operations Information (Runway 15-33)

Aircraft	AAC + ADG	Maximum Takeoff Weight (MTOW)	Oct-Dec 2017 Counts	Projected Annual 2017 Operations	Projected Annual 2038 Operations
DA20 - Diamond	A-I	12,500 lbs. or under	187	813	941
DA40 - Diamond	A-I	12,500 lbs. or under	60	261	302
DA42 - Diamond	A-I	12,500 lbs. or under	35	152	176
PA28 - Piper	A-I	12,500 lbs. or under	25	109	126

Table 3.21 | Diamond DA 20 Katana - Aircraft Characteristics

Characteristics	Diamond DA 20 Katana
Length	23 FT 4 IN
Wingspan	35 FT 8 IN
Height	6 FT 11 IN
Maximum Takeoff Weight	1,764 lbs.
Takeoff Distance*	1,640 FT
Landing Distance*	1,360 FT

Source: FAA Aircraft Characteristics Database (January 2018)
https://www.faa.gov/airports/engineering/aircraft_char_database/
*https://www.planeandpilotmag.com/article/2017-diamond-da20/#.WvM0GUxFyM8

Section 4—Facility Requirements

This section summarizes the Airport's ability to accommodate future aviation demand throughout the planning period to 2038. Facility requirements represent what should be planned under a 'best case scenario' to meet the projected demand. It includes the analysis of airfield capacity as well as airside design standards and landside requirements. In reality, physical and financial resources often impose constraints on the development of the entirety of these requirements. For this reason, in forthcoming analyses, alternative development options will be created to meet facility requirements.

As shown in Section 2.5 and especially in Figure 2.4, the primary runway, Runway 7-25, has sufficient wind coverage to accommodate the 13 knot allowable crosswind component. A more detailed look at the weather and wind data for the Airport indicated that while the coverage does not appear to ever get below the 95% threshold, it does get very close at the 10.5 knot component at 95.79%. Through coordination with the FAA ADO, it was agreed that there are numerous benefits and operational necessities that justify maintaining the Airport Improvement Program (AIP) eligibility for Runway 15-33 even though the justification based on wind coverage is not met. **Appendix D** provides the full Runway 15-33 justification document provided to the FAA ADO, but a number of key reasons for maintaining AIP eligibility for this runway are provided below:

- Previous wind data has shown the necessity of the crosswind runway, and the current coverage is just barely above the requirement. Weather patterns and conditions can change over time and maintaining the current layout would allow LNAA to maintain compliance in the future.
- As discussed in the LNAA Strategic Plan, as growth continues at Lehigh Valley International Airport (ABE) in terms of commercial and cargo services, the capacity to serve the GA community needs to be maintained at XLL and Braden Airpark (N43). This would alleviate demand and traffic separation at ABE, while still providing local and valuable service to all based aircraft. Cargo development options included on the draft Airport Layout Plan for ABE would eliminate T-hangars at ABE; thus requiring the relocation of GA aircraft and their subsequent operations to XLL.
- Reconstruction of Runway 7-25 will be required soon and without Runway 15-33, XLL would close during this reconstruction. The Airport is also built in a sinkhole-prone region, so maintaining two runway ensures the availability of a runway in the event of a sinkhole-related closure.
- With a successful flight school that averages 35 operations per day, Runway 15-33 is critical for training during crosswind landings, along with becoming familiar with the flight patterns adjacent to the 'south' mountain and landing on a shorter runway. In addition, having only one runway would require all aircraft to use Runway 7-25, even in the event of a strong crosswind that could pose substantial risk to students/new pilots and those in small aircraft.

Since the coverage gets closest to the threshold for the 10.5 knot component and Runway 15-33 is mostly used by smaller aircraft, as noted in Section 3.12, Runway 15-33 would be designated an A-I small runway which would have different design standards compared to Runway 7-25, a B-II small runway. Therefore, both runways will remain at the Airport but will have different designations and related design standards.

4.1 Airside/Airfield Capacity

Airfield capacity is a measure of terminal area airspace and airfield saturation. It is defined as the maximum rate at which aircraft can arrive and depart an airfield with an acceptable level of delay. Measures of capacity include the following:

- Hourly Capacity of Runway – the maximum number of aircraft operations that can take place on the runway system in one hour
- Annual Service Volume – the annual capacity or a maximum level of annual aircraft operations that can be accommodated on the runway system with an acceptable level of delay

The 2010 Airport Master Plan Update and Narrative Report included an analysis of airfield capacity at XLL based on 32 peak hour and 58,946 annual forecasted operations through 2027 and determined that operational delays were expected to be tolerable with a 26% demand to annual service volume ratio, not requiring major enhancements to the airfield. As noted in Section 3, current and forecasted operations are lower now than noted in the 2010 Update: 21,248 annual operations in 2017 and 24,600 forecasted operations in 2038 for a demand to annual service volume ratio of just over 10%. Since the FAA begins to plan for capacity improvements at a 60% ratio and implement them at 80%, it is assumed that the airfield at XLL is adequate to accommodate future hourly and annual service demands through 2038.

4.2 Airfield Requirements

Airfield facilities, as described in this report, include the runways, taxiways, required safety areas, and airfield instrumentation and lighting. From the demand/capacity analysis, it was concluded that the Airport's present runway system is adequate to accommodate demand throughout the planning period. The following outlines airfield facility requirements at XLL through 2038.

4.2.1 Airport Design Standards and Critical Aircraft

FAA Advisory Circular 150/5300-13A-Consolidated Change 1, *Airport Design*[11], identifies the design standards to be maintained at the Airport. These design criteria provide a guide for airport designers to assure a reasonable amount of uniformity in airport landing facilities. Any criteria involving widths, gradients, separations of runways, taxiways, and other features of the landing area must incorporate wide variations in aircraft performance, pilot technique, and weather conditions. The FAA design standards provide for uniformity of airport facilities and serve as a guide to aircraft manufacturers and operators with regard to the facilities that may be expected to be available in the future.

The selection of appropriate FAA airport design criteria is based primarily upon the critical or design aircraft, or family of aircraft that will be using the Airport. As identified in **Section 3.12**, the data and analysis available for the Airport indicate that the existing and future critical aircraft is a B-II small family of aircraft

[11] Federal Aviation Authority Advisory Circular 150/5300-13A-Consolidated Change 1, *Airport Design*. Accessible at: https://www.faa.gov/airports/resources/advisory_circulars/index.cfm/go/document.current/documentNumber/150_5300-13

for Runway 7-25 and includes the Beechcraft Super King Air 200. The existing and future critical aircraft for Runway 15-33 was identified as an A-I small and includes the Diamond DA 20 Katana aircraft. The most demanding aircraft in both the B-II small and A-I small aircraft at XLL are listed below in **Table 4.1** along with their characteristics.

Table 4.1 | Existing and Future Critical Aircraft

Characteristics	Runway 7-25 Beechcraft Super King Air 200 B-II small/TDG 2	Runway 15-33 Diamond DA 20 Katana A-I small/TDG 1A
Length	43 FT 9 IN	23 FT 4 IN
Wingspan	54 FT 6 IN	35 FT 8 IN
Height	15 FT	6 FT 11 IN
Maximum Takeoff Weight	12,500 lbs.	1,764 lbs.
Takeoff Distance*	2,579 FT	1,640 FT
Landing Distance*	2,845 FT	1,360 FT

Source: Appendix 1 of AC 150/5300 13-A; *http://www.planeandpilotmag.com (see Tables 3-19 and 3-21)

The specific airport design standards, listed below in **Table 4.2**, have been applied assuming Aircraft Approach Category (AAC) A (approach speed of less than 91 knots) and Airplane Design Group (ADG) I (tail height of less than 20 feet) with visual approaches as well as AAC B (approach speed of 91 knots or more but less than 121 knots), ADG II (tail height of 20 to less than 30 feet and wingspan of 49 to less than 79 feet), and visibility minimums of not lower than one mile.

Table 4.2 | Runway Design Standards

	RW 7-25 B-II Small Not Lower than 1 Mile Visibility Minimum	Standard(s) Met?	RW 15-33 A-I Small Visual	Standard(s) Met?
RUNWAY DESIGN				
Runway Length	See RW Length Analysis		See RW Length Analysis	
Runway Width	75’	Yes	60’	Yes
Shoulder Width	10’	N/A	10’	N/A
Blast Pad Width	95’	N/A	80’	N/A
Blast Pad Length	150’	N/A	60’	N/A
Wind Crosswind Component	13 knots	Yes	10.5 knots	Yes
RUNWAY PROTECTION				
Runway Safety Area (RSA)				
Length beyond departure end	300’	Yes	240’	Yes
Length prior to threshold	300’	Yes	240’	Yes
Width	150’	Yes	120’	Yes
Runway Object Free Area (ROFA)				
Length beyond runway end	300’	Shrubbery/small trees along RW 7 end, both RW ends have a roadway and fence in the corners of the ROFA	240’	Yes
Length prior to threshold	300’		240’	Yes
Width	500’		250’	Yes
Runway Obstacle Free Zone (ROFZ)				
Length beyond runway end	200’	Shrubbery/small trees at southwest corner of RW 7	200’	Yes
Width	250’		250’	Yes
Approach Runway Protection Zone (RPZ)				
Length	1,000’	RW 7 end – interstate highway & residential parcels at the very end RW 25 end - roadway, car dealership buildings & parking, & gas station	1,000’	RW 33 end – Lehigh Street, Industrial Buildings, & Parking
Inner Width	250’		250’	
Outer Width	450’		450’	
Acres	8.035		8.035	
Departure Runway Protection Zone (RPZ)				
Length	1,000’	Same as above	1,000’	Same as above
Inner Width	250’		250’	
Outer Width	450’		450’	
Acres	8.035		8.035	
Runway Separation				
Runway centerline to:				
Holding position	125’	Yes	125’	Yes
Parallel Taxiway/Taxilane centerline	240’	No – 200’ (TW A to RW 7-25)	150’	Yes
Aircraft parking area (nearest)	250’	Yes	125’	Yes

Sources: C&S Engineers, Inc. analysis May 2019 FAA AC 150/5300-13A – Table 3-5. Runway design standards matrix

Table 4.3 | Runway Design Characteristics Deficiencies and Excess

Runway Design Characteristic	Excess/Deficiencies B-II small	Excess/Deficiencies A-I small
Runway Length	See Runway Length Analysis	See Runway Length Analysis
Runway Width		+15’
Runway Object Free Area	Shrubbery/small trees along both sides of RW 7 end, both RW ends have a roadway and fence in the corners of the ROFA	RW 15 & 33 ends – roadway and fence in the corner of the ROFA
Runway Obstacle Free Zone	Shrubbery/small trees at southwest corner of RW 7	
Runway Protection Zones	RW 7 end – interstate highway & residential parcels at the very end RW 25 end - roadway, car dealership buildings & parking, & gas station	RW 33 end – Lehigh Street, Industrial Buildings, & Parking
Runway Centerline to Parallel Taxiway/Taxilane centerline	-40’ (TW A to RW 7-25)	

Source: C&S Engineers, Inc. May 2019

The shrubbery/small trees within the Runway 7-25 ROFA and ROFZ should be removed as part of an obstruction removal design project currently progressing that is addressing on- and off-airport mitigation for critical obstructions. If the mitigation of the roadway and fence in the ROFA at all of the runway ends is not feasible, a modification of standards (MOS) should be requested from the FAA.

Portions of the Runway 7 and 25 RPZs as well as the Runway 15 RPZ are controlled by avigation easements to ensure those areas remain free and clear of any structure, tree, or other object which would constitute an obstruction or hazard. It is recommended that the rest of the RPZs come under control of the LNAA through acquisition or avigation easements.

In addition to the runway design standards, the FAA sets design standards for airport taxiway systems based on the established critical aircraft ADG and Taxiway Design Group (TDG). **Table 4.4** summarizes the TDG for each aircraft in the critical family of aircraft at the Airport based on their Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance.

Table 4.4 | Taxiway Design Group

Aircraft	TDG
Beechcraft Super King Air 200	2
Diamond 20 Katana	1A

Source: Appendix 1 of AC 150/5300-13-A

The existing and future TDG for the Airport is TDG 2. The standard taxiway width for TDG 2 aircraft is 35 FT. As shown in Table 2.7, all taxiway widths at the Airport meet or exceed the required existing and future TDG design standards. **Table 4.5** presents specific taxiway design standards based on the Airport's ADG (II). Similar to the ROFA along the north side of the Runway 7 end, the Taxiway A OFA on the north side contains shrubbery and small trees. As noted previously, the separation between Taxiway A and Runway 7-25 does not meet standard. Due to topographic constraints, the costs of providing the required separation may exceed benefits. A modification of standards should be requested from the FAA if providing the required separation is not deemed feasible.

Table 4.5 | Taxiway Design Standards based on ADG

Taxiway Characteristic	ADG II Standard	Standard(s) Met?
Taxiway Protection		
TSA	79'	Yes
Taxiway OFA	131'	No – shrubbery/small trees off north side of TW A at RW 7 end
Taxilane OFA	115'	Yes
Taxiway Separation		
Taxiway Centerline to:		
Parallel Taxiway/Taxilane Centerline[1]	105'	Yes
Taxiway to Fixed or Moveable Object	65.5'	Yes
Parallel Taxilane Centerline[1]	97'	N/A
Taxilane to Fixed or Movable Object	57.5'	Yes

[1] These values are based on wingtip clearances. If direction reversal between parallel taxiways is needed, use this dimension or the dimension specified in Table 4-14 or 4-15 of FAA AC 150/5300-13A- Consolidated Change 1, whichever is largest

Source: Table 4-1, Design standards based on Airplane Design Group, FAA AC 150/5300-13A-Consolidated Change 1

4.2.2 Runway Orientation Analysis

The orientation of runways for takeoff and landing operations is a function of wind velocity and direction, together with the ability of aircraft to operate under adverse conditions. As a general rule, the primary runway

at an airport is oriented as closely as practicable in the direction of the prevailing winds. The most desirable runway configuration will provide the largest wind coverage for a given maximum crosswind component. The crosswind component is the vector of wind velocity and direction that acts at a right angle to the runway. Further, runway wind coverage is that percent of time in which operations can safely occur because of acceptable crosswind components. The desirable wind coverage criterion for a runway system has been set by the FAA at 95% for any aircraft forecasted to use the Airport on a regular basis.

All-weather, VFR, and IFR wind roses were developed for the Airport using information gathered from weather observations taken at the Airport from 2008 through 2018. As shown on Figure 2-4 in the existing conditions chapter, the wind coverage exceeds the FAA's recommended 95% wind coverage and provide coverage for both the existing and future critical aircraft. The beginning of this section noted the reasons Runway 15-33 will remain operational and eligible for FAA AIP funding.

4.2.3 Runway Length Analysis

FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*[12], outlines the process to identify runway length requirements. Five steps are used to determine the recommended runway length:

1. Identify the list of critical design aircraft that will make regular use of the proposed runway for an established planning period of at least five years.
2. Identify the airplanes that will require the longest runway lengths at maximum take-off weight (MTOW).
3. Use Table 1-1, *Airplane Weight Categorization for Runway Length Requirements* from FAA AC 150/5325-4B and the airplanes identified in step #2 to determine the method that will be used for establishing the recommended runway length.
4. Select the recommended runway length from among the various runway lengths generated by step #3 per the process identified in chapters 2, 3, or 4, as applicable.
5. Apply any necessary adjustment to the obtained runway length, when instructed by the applicable chapter of this AC, to the runway length generated by step #4 to obtain a final recommended runway length.

Step 1 – Identify critical design aircraft(s)

The selection of appropriate FAA airport design criteria is based primarily upon the critical or design aircraft that will be utilizing the Airport. The critical aircraft is defined by the FAA as the most demanding aircraft that performs or is projected to perform at least 250 annual departures (or 500 annual operations at the facility). As noted previously, the critical aircraft for Runway 7-25 is the Beechcraft Super King Air 200 (ADG B-II small) and the critical aircraft for Runway 15-33 is the Diamond 20 Katana (ADG A-I small).

[12] Federal Aviation Authority Advisory Circular 150/5325-4B, *Runway Length Requirements for Airport Design*. Accessible at: https://www.faa.gov/airports/resources/advisory_circulars/index.cfm/go/document.current/documentNumber/150_5325-4

Step 2 – Identify the aircraft that require the longest runway lengths at MTOW

In this step, the MTOW is used to define the airplane group for the runway length analysis. **Table 4.6** on the following page shows the characteristics of aircraft in the design families for each runway.

Table 4.6| Design Aircraft Characteristics

Aircraft	Engine Type	MTOW (lbs.)	Approach speed (knots/hour)	Wingspan	AAC +ADG	Number of Passengers
BE20 - Beechcraft Super King Air 200	Turboprop	12,500	98	54.5’	B-II small	6
BE9L – Beechcraft King Air 90	Turboprop	9,650	100	50.25’	B-II small	5
C90A – Beechcraft King Air C90A	Turboprop	10,100	100	50.25’	B-II small	5
C90GTI – Beechcraft King Air C90GTI	Turboprop	10,100	98	50.25’	B-II small	5
DA20 - Diamond	SE	1,764	59	35.67’	A-I small	1
DA40 - Diamond	SE	2,888	87	38.17’	A-I small	4
DA42 - Diamond	ME	4,407	88	44.5’	A-I small	4

Source: Appendix 1 of AC 150/5300 13-A, https://www.globalair.com

Step 3 – Determine the method that will be used for establishing recommended runway length

Based on Table 1-1 of FAA Advisory Circular 140/5325-4B, *Runway Length Requirements,* the critical families of aircraft used for the runway length analysis for both runways are classified as small airplanes so Chapter 2; Paragraph 205 Figure 2-1 will be used to determine the appropriate runway length for both runways.

Step 4– Select the recommended runway length

The design approach for the airplane weight category selected in Step 3 requires the following information:

- Percentage of Fleet: 100 percent of fleet, due to XLL’s proximity to the Allentown-Bethlehem-Eaton metropolitan area
- Airport Elevation: 399 feet above sea level
- Mean Daily Maximum Temperature of the Hottest Month: 87.9°F
- Approach speeds of 50 knots or more and less than 10 passengers (See **Table 4.6** above)

Based on this information and Figure 2-1 of the Runway Length Requirements AC, the recommended runway length to accommodate the existing critical aircraft is approximately 3,700 FT. See **Appendix D** for more information regarding the runway length determination.

Step 5– Apply any necessary runway length adjustments

According to FAA guidance, runway length adjustments for effective runway gradients and wet and slippery runway conditions are not necessary for the small aircraft that make up the critical aircraft families for the runways at XLL.

Runway Length Requirement Summary

Runway 7-25 is currently 3,949 feet and Runway 15-33 is 3,159 feet long. The recommended runway length for the critical families of aircraft for both runways is 3,700 feet. The length of Runway 7-25 is sufficient whereas Runway 15-33 is deficient by approximately 540 feet.

4.2.4 Runway Width Analysis

Runway width is a dimensional standard that is based upon the physical characteristics of aircraft using the Airport. As shown in Table 4.2, Runway 7-25 is currently 75 feet wide and meets the width requirement of for a design group II runway with not lower than one-mile visibility. Runway 15-33 is currently 75 feet wide, 15 feet wider than the required 60 feet for a design group I runway with visual approaches. The AIP eligibility for the maintenance of the entire width of Runway 15-33 would need to be determined, when applicable.

4.2.5 Pavement Condition

According to FAA guidance, the types of aircraft and critical aircraft expected to use an airport throughout the planning period are used to determine the required pavement strength of runway surfaces. Pavement strength is an estimate on average levels of activity, expressed in terms of aircraft landing gear type and configurations. Pavement strength is not the maximum allowable weight for a surface, although significant operations by aircraft heavier than the critical aircraft may significantly reduce its lifespan.

An airport pavement management study (APMS) was conducted by PennDOT and noted in the Pavement Condition portion of Section 2.6. This study highlighted the need for reconstruction of Runway 15-33, Taxiway C, Taxiway B, and portions of Taxiway A. Major rehabilitation needs were noted for the remainder of Taxiway A and the apron near the conventional hangars. The LNAA is currently designing the rehabilitation of Taxiway B, has programmed the design of the rehabilitation of Runway 15-33 in 2020 with construction expected from 2022 through 2024, and has programmed the realignment and reconstruction of Taxiway C in 2024.

The rehabilitation of Taxiway A along with any other needs anticipated within the 20-year planning period will also be considered in the development plan.

4.2.6 Instrumentation and Lighting

According to the current Airport Capital Improvement Program (ACIP), the Runway 15-33 lighting system is over 20 years old and is currently experiencing problems that are beyond routine maintenance. The Runway 15-33 lighting system is expected to be designed in 2021 and constructed in 2024, after the runway

rehabilitation project is complete. There is also currently a project indicated on the ACIP to install PAPIs on each end of Runway 15-33 in 2025. There is currently no visual approach systems on either end of Runway 15-33 while Runway 7 has a GPS approach and a PAPI and Runway 25 has a PAPI.

4.2.7 Airspace Protection and Obstructions

Existing obstructions noted as part of the 2017 *AGIS Mapping Upload and Obstruction Analysis* study were discussed in Section 2.6.5. There is currently an obstruction removal design project progressing that is addressing on- and off-airport mitigation for critical obstructions that would affect approach procedures, runway/taxiway safety areas, navigational aids, and/or available runway length. Construction is anticipated late 2019 through 2020.

4.3 Landside and Support Systems Facility Requirements

The planning of landside facilities should be based upon a balance of airside and landside capacity, access/circulation improvements, aircraft storage needs, helicopter activity, user services and amenities, and support the LNAA's strategic vision for the Airport. One of the five strategic goals for the LNAA is to 'develop business and GA facilities and services to rejuvenate the full range of aviation services and attract corporate customers to serve local businesses to meet their air travel needs.' One of their short-term objectives to meet that goal is to fund new T-hangar facilities at XLL and a long-term objective is to ensure that XLL and Braden Park have the capacity to meet future GA demands so LVIA can focus on commercial and cargo activity growth. With those goals and objectives in mind, the consideration of future aircraft storage facilities such as conventional/bulk hangars, T-hangars, and tie-down areas will be maximized at the Airport as opposed to considered based on a calculation of the minimum anticipated needs based on the approved forecast. The subsequent required spaces for support facilities such as auto parking and terminal space will be determined as potential aircraft storage facilities are considered. Based on conversations with the LNAA staff, the following should be considered:

- Users would prefer to use paved tie-down areas - there are plenty of grass tie-down spaces, but they are not used. Ensure tie-downs are close to the pilot/terminal area.
- Need helicopter parking areas
- Rehabilitate/replace T-hangar Building 9
- T-hangars are the preferred parking storage option
- Equipment storage is needed, considering location at the end of Building 8 or behind Building 6
- Right-size the terminal and FBO facilities
- Pilots would like a restaurant at the Airport

Terminal Facility

The current terminal is 4,886 square-feet and is used as airport administration space and includes a pilot lounge and amenities, tenant office space, etc. Using the planning assumptions noted in *ACRP Report 113: Guidebook on General Aviation Facility Planning* and the forecasted number of peak hour operations at XLL, the

terminal should be between 2,750 to 4,125 square-feet. Specific airport needs would ultimately dictate the size of the terminal to accommodate the users of the airport, such as the desire for a restaurant or community-use spaces. Since the existing 4,886 square-foot terminal does not include a restaurant or flexibility for other uses, a larger facility of 8,000 to 10,000 square-feet could be considered.

Fuel Facility

As noted in Section 2.8.4, there is not a consolidated fuel farm facility at the Airport and Jet-A fuel is provided via a truck. Consideration should be given to a potential location for a consolidated fuel farm facility that would supply Avgas and Jet-A fuel and allow for self-fueling.

Drainage Systems

In 2018, a Drainage Systems Evaluation for the Airport was conducted to evaluate the existing systems, determine future stormwater detention and treatment needs, and provide potential locations and sizing for new facilities at a conceptual level. The evaluation recommended the rehabilitation of most of the existing infrastructure with improved regular maintenance but noted that the existing system capacity is not a concern. It identified specific structure and pipe replacements and repairs throughout the existing system. There are also recommendations noted based on the current Airport Layout Plan (ALP) development plans that should be considered as the plan with this master plan update is developed. Actual sizing and location of any drainage elements would be dependent on the final scope and design of each project. The figures that show the existing drainage system and proposed drainage systems are provided in **Appendix D** for reference.

City of Allentown Lease

As stated previously, the City of Allentown leases approximately 8 acres of Airport property including the Vultee Hangar for non-aeronautical use. The lease allows the Authority to reduce the size of the leased property or terminate the lease with the appropriate notice. This master plan will consider future development options with and without this property available to the Authority for potential aeronautical development.

4.4 Facility Requirements Summary

This section provides a summary of all the capital improvement projects to be considered as noted in this or previous sections of the Master Plan Update.

- Reconstruct Runway 15-33
- Extend Runway 15-33
- Upgrade Runway 15-33 lighting
- Install PAPIs for Runway 15-33
- Address Runway 7-25 ROFA/ROFZ/TOFA deficiencies or request MOS
- Control RPZs
- Address Taxiway A separation deficiency or request MOS

- Mitigate obstructions
- Reconstruct and/or relocated Taxiway C
- Reconstruct Taxiway B
- Reconstruct/rehabilitate Taxiway A
- Rehabilitate apron adjacent to terminal/conventional hangars
- Expand or construct new terminal building
- Construct equipment storage building
- Install consolidated fuel farm
- Maximize aircraft storage facilities via additional paved tie-downs, helicopter parking, and T-hangars and/or rehabilitating existing facilities, as well as provide sufficient support infrastructure (parking, access, etc.)
- Drainage systems rehabilitation/replacement

Section 5—Development Options

The master plan process is one of inventorying existing conditions and environmental considerations (Section 2), developing a forecast of anticipated operational activity (Section 3), and identifying the facilities needed to accommodate future demand (Section 4). After the facility requirements have been identified, a series of development options to satisfy them must be identified and evaluated.

This section includes the evaluation of proposed development options at the Airport. It does not include a discussion on acquiring land for controlling existing RPZs, existing obstructions to be mitigated, pavement to be rehabilitated, or drainage system improvements that do not have alternatives to consider besides not completing the specific project. It is assumed these projects would move forward when needed, funding is available, or it is feasible to do so with a related project.

5.1 Current Projects

The following projects are currently underway at the Airport. Although alternatives from these projects will not be included in this report, they are listed as projects in this section since they will not be complete prior to the completion of this master plan update.

- Obstruction Removal Design – Consistent with the recommendations included within the June 2017 *AGIS Mapping Upload and Obstruction Analysis* report, the March 2018 *Short Environmental Assessment*, and May 4, 2018 Finding of No Significant Impact (FONSI), this project will remove critical on-airport obstructions what would affect approach minimums, navigational aids, and/or runway length available for landing. It includes the following on-airport mitigation: removal of approximately five acres of tree/brush canopy, four individual trees, and restoration of work areas. This project was separated into two phases: Phase 1 will be completed in 2020 and Phase 2 will be completed in 2021. This obstruction removal will mitigate airfield safety area concerns.

5.2 Airfield Options

Airfield options were developed based on the facility requirement and FAA needs developed in **Section 4.** They were developed within existing Airport boundaries and show necessary runway and taxiway design concepts consistent with that of forecasted demand. For this reason, airfield projects presented in this section only have one development option available.

5.2.1 Runway 15-33

As indicated in Section 4, the critical aircraft for Runway 15-33 is the Diamond 20 Katana (ADG A-I small). With this transition from a B-II runway to an A-I small runway, Runway 15-33 will have a width 15 feet wider than standard. Pavement removal associated with narrowing the runway to meet the design standard is not included. It is anticipated that this will be done in conjunction with the anticipated upcoming pavement rehabilitation project and will include a decision by the LNAA and FAA as to whether or not the entire width will be maintained with or without FAA AIP funding.

Given the runway length analysis conducted in **Section 4.2.3**, Runway 15-33 is deficient in length by 540 feet for the design aircraft. Although this runway extension is technically recommended to ensure full functionality of the design aircraft, pursuing this runway extension is not recommended for the Airport due to physical constraints by surrounding roadways. There is only approximately 340 feet of space between the Lehigh Parkway South and the end of Runway 15 and between Lehigh Street and the end of Runway 33. Although a runway extension would technically fit within current airport boundaries, if pursued on both runway ends this would require land acquisition for controlling RPZs, roadway relocation, additional obstruction surveying and mitigation, taxiway relocation, as well as the installation of additional runway lighting. Since these projects would be relatively high cost for a comparatively small runway extension and impose visual and noise impacts on residential surrounding communities, it was not considered for final alternatives development.

5.2.2 Runway 7-25

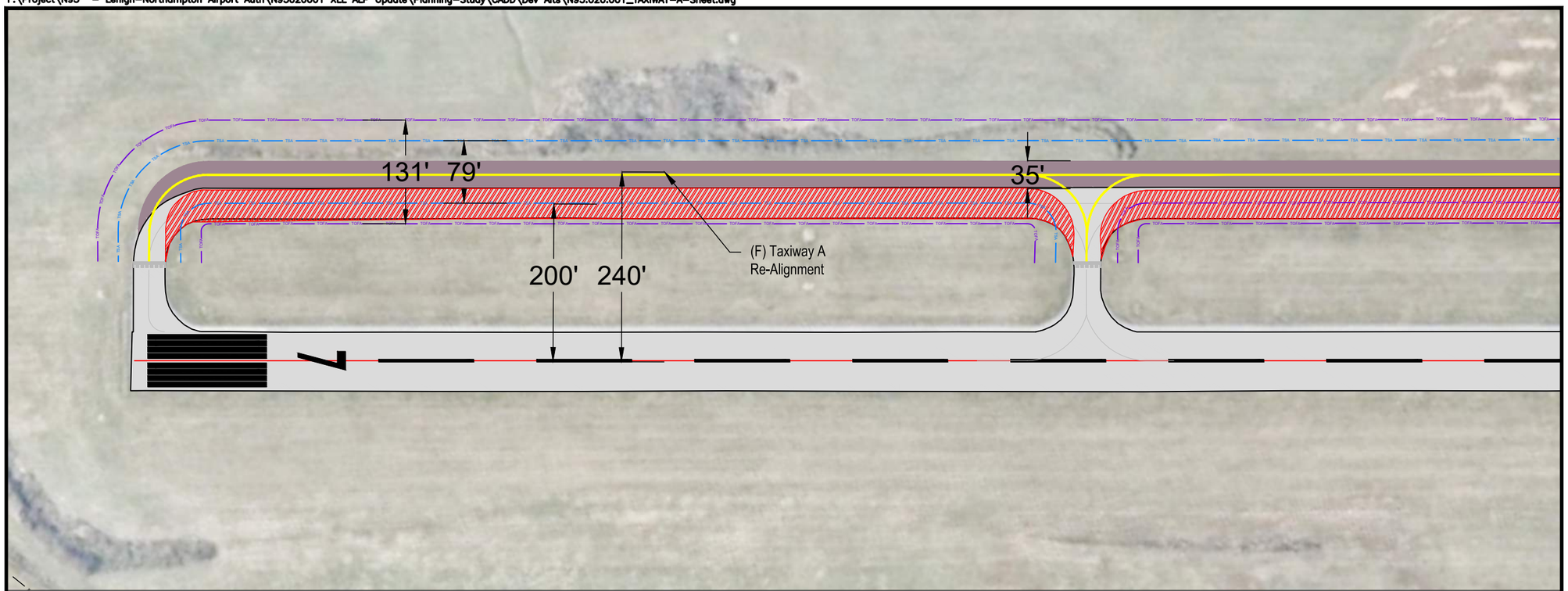
Runway 7-25 is currently 3,949 feet, which is more than the required 3,700 feet of length needed by the design aircraft, the Beechcraft Super King Air 200. Extending the runway to 4,000 feet of length was discussed with LNAA due to user-desire, but was ultimately decided against due to similar reasons as indicated above for the Runway 15-33 extension. Ultimately, a 300 foot runway extension would not achieve a higher amount of utility commensurate with the financial resources that the extension would require such as the need to relocate/extend taxiways, acquire land within the relocated RPZs, complete additional obstruction mitigation, relocate existing PAPIs and REILs, and install additional runway lighting. Furthermore, it would create noise and visual impacts to surrounding residential communities.

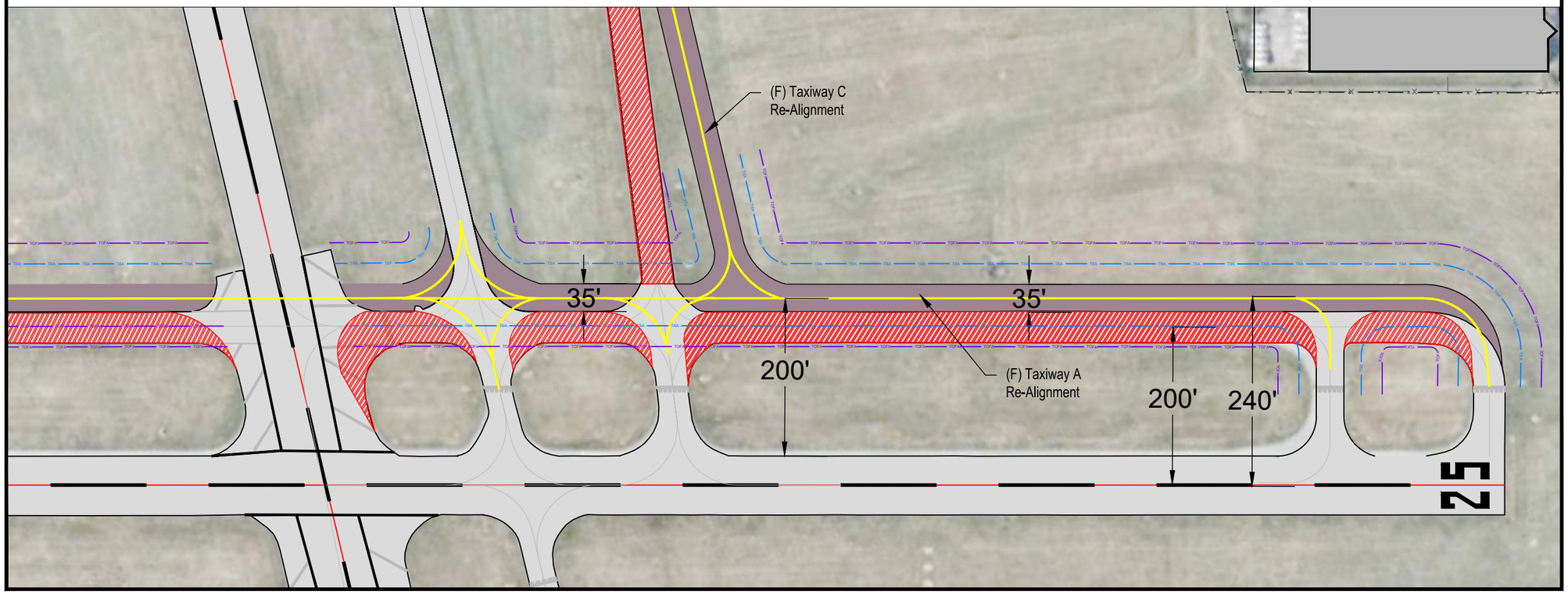
5.2.3 Taxiway Realignments

Taxiway A Realignment

The separation between Runway 7-25 and parallel Taxiway A is deficient by 40 feet and its OFA on the north side contains shrubbery and small trees. It is recommended to correct this (**Figure 5.1**) and establishing this separation will require removal of the existing Taxiway A, significant grading, shrub removal, and then its reconstruction. In addition, taxiways A1, A2, A3, A4, and B would also have to be modified.

As indicated in the 2018 Drainage System Evaluation Report completed by C&S Engineers, Inc. (**Appendix E**), the topography of this portion of the airfield receives most of the stormwater runoff from the southern to southwestern parts of the airfield, where it drains offsite to a vegetated swale west of the Airport and Little Lehigh Creek. Due to these topographic constraints, the costs of providing the required separation may exceed its benefits, in which case a modification of standards (MOS) is recommended rather than relocation/reconstruction.





LEGEND		
EXISTING	DESCRIPTION	FUTURE
	Airfield Pavement	
	To Be Removed	
TOFA	Taxiway Object Free Area (TOFA)	N/A
TSA	Taxiway Safety Area (TSA)	N/A

N

0 75 150 Feet

1 inch = 75 feet
When printed at 11 in. by 17 in.

Queen City Municipal Airport
Master Plan Update

Taxiway A Realignment

Figure 5 . 1

Taxiway B1 Relocation

FAA Advisory Circular 150/5300-13A – Airport Design, provides guidelines for taxiway design. Guidance indicated by this document indicates that one goal of taxiway design is to achieve "indirect access." This means that taxiways should not "lead directly from an apron to a runway without requiring a turn. Such configurations can lead to confusion when a pilot typically expects to encounter a parallel taxiway but instead accidentally enters a runway."[13]

Given the above, the existing configuration of Taxiway B1 between Runway 15 and Taxiway B is recommended for removal since it provides direct access from the terminal area to Runway 15. Instead, two stub taxiways are recommended for construction to the north and south of existing Taxiway B1 between Runway 15 and Taxiway B. This improved geometry will eliminate confusion for pilots and enhance safety and security of the airfield.

5.3 Terminal Area and General Aviation Facilities Options

Following a preliminary meeting with the LNAA to discuss their goals and visions, C&S developed two development options that were presented to the public at a workshop held at the Airport on December 12, 2019. Components of these development options, Option 1 (**Figure 5.2**) and Option 2 (**Figure 5.3**), are described below and summarized in **Section 5.3.7**.

5.3.1 Terminal Building Expansion and Electrical Vault Relocation

One goal of development at the Airport is to maximize space wherever possible and to incorporate or upgrade amenities to enhance the passenger experience. Both Options 1 and 2 recommend the expansion of the airport terminal by 8,000 SF and the construction of a new landside terminal parking lot. This expansion will include capacity for renovated bathrooms, a pilot's lounge, a conference room, additional office space, and a space for a restaurant. Locating an on-airport restaurant will provide an additional source of tenant revenue for the LNAA and create a space to foster the growth of the GA pilot community by incentivizing additional pilots to visit the Airport.

With the upgrade and expansion to the terminal building, it is also recommended to remove the electrical vault that is currently located inside the terminal building to a more accessible location. This relocation is intended to improve accessibility to the electrical vault circuit breakers and is necessitated by frequent electrical outages at Hangar 9. Both development options recommend a new location for this facility above ground behind the terminal building, adjacent to the terminal parking lot. This location was chosen due to its central location and close proximity to utility access on Vultee Street.

[13] FAA AC 150/5300/13A, Airport Design. (2014). Pg. 117-118. Accessed 1/14/20. Available at: https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5300-13A-chg1-interactive-201907.pdf

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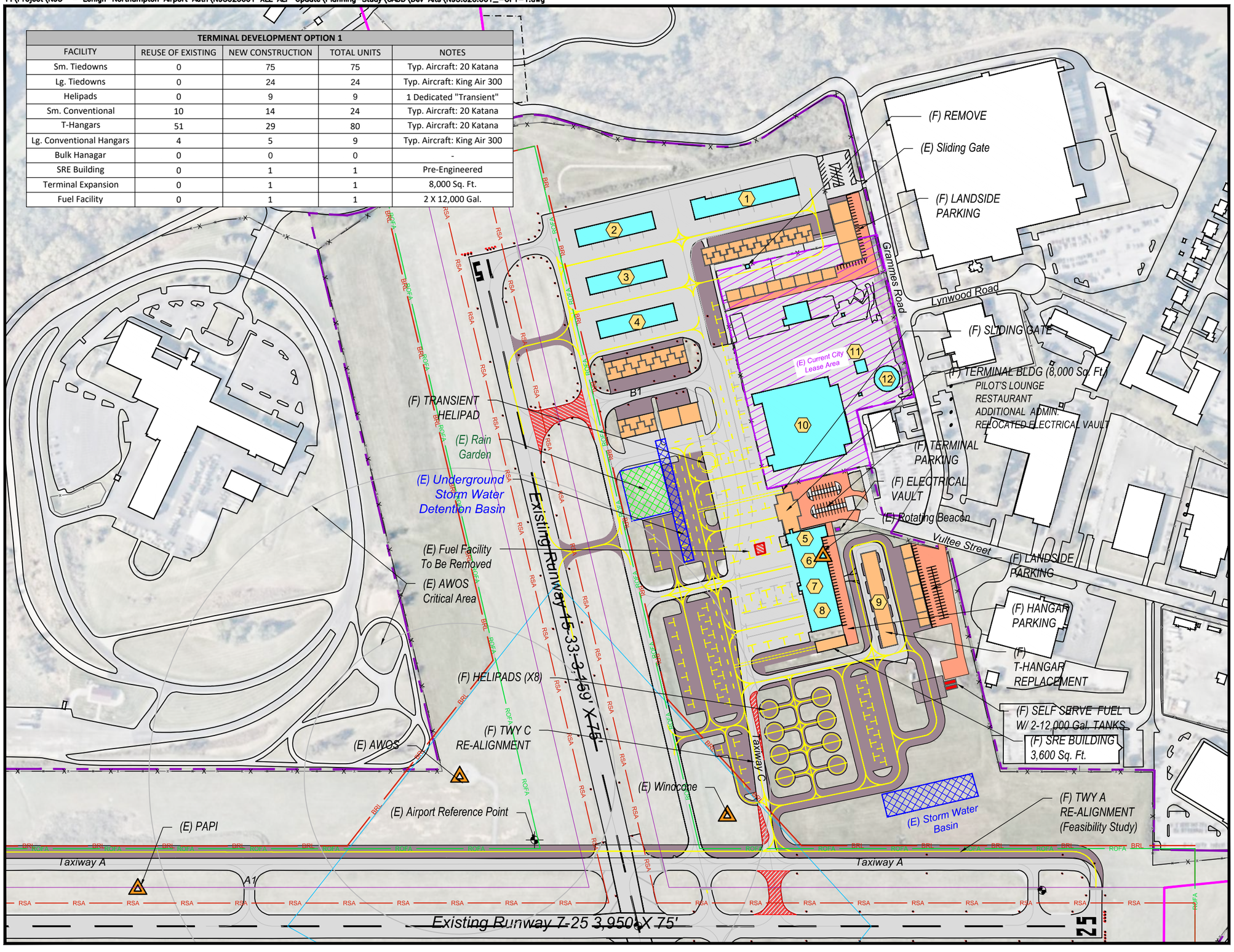
TERMINAL DEVELOPMENT OPTION 1				
FACILITY	REUSE OF EXISTING	NEW CONSTRUCTION	TOTAL UNITS	NOTES
Sm. Tiedowns	0	75	75	Typ. Aircraft: 20 Katana
Lg. Tiedowns	0	24	24	Typ. Aircraft: King Air 300
Helipads	0	9	9	1 Dedicated "Transient"
Sm. Conventional	10	14	24	Typ. Aircraft: 20 Katana
T-Hangars	51	29	80	Typ. Aircraft: 20 Katana
Lg. Conventional Hangars	4	5	9	Typ. Aircraft: King Air 300
Bulk Hanagar	0	0	0	-
SRE Building	0	1	1	Pre-Engineered
Terminal Expansion	0	1	1	8,000 Sq. Ft.
Fuel Facility	0	1	1	2 X 12,000 Gal.



LEGEND		
EXISTING	DESCRIPTION	FUTURE
	Buildings (On or Off Airport Property)	
	Airfield Pavement	
	Roads/Parking Lot Pavement	
	To Be Removed	
	Fuel Farm	
	Current City Lease Area	N/A
	Storm Water Basin or Rain Garden	N/A
	Fence	
	Airport Property Line	N/A
	Runway Safety Area (RSA)	N/A
	Runway Object Free Area (ROFA)	N/A
	Runway Obstacle Free Zone (ROFZ)	N/A
	Runway Protection Zone (RPZ)	N/A
	Building Restriction Line (BRL 25')	N/A
	Runway Visibility Zone (RVZ)	N/A
ARP	Airport Reference Point	N/A
	Navigational Aid (NAVAID)	N/A
	Airfield Light	N/A

EXISTING FACILITIES TABLE		
ID	Facility Description	Top Elevation (MSL)
1	T-Hangar	408.2'
2	T-Hangar	398.8'
3	T-Hangar	398.6'
4	T-Hangar	397.1'
5	Terminal	401.0'
6	Hangar	409.4'
7	Shop	409.5'
8	Hangar	403.3'
9	T-Hangar	387.8'
10	City Garage	419.9'
11	City Storage Shed	405.7'
12	Sand Storage Facility	418.5'

N

0 150 300 600 Feet

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Development Option 1

Figure 5 . 2

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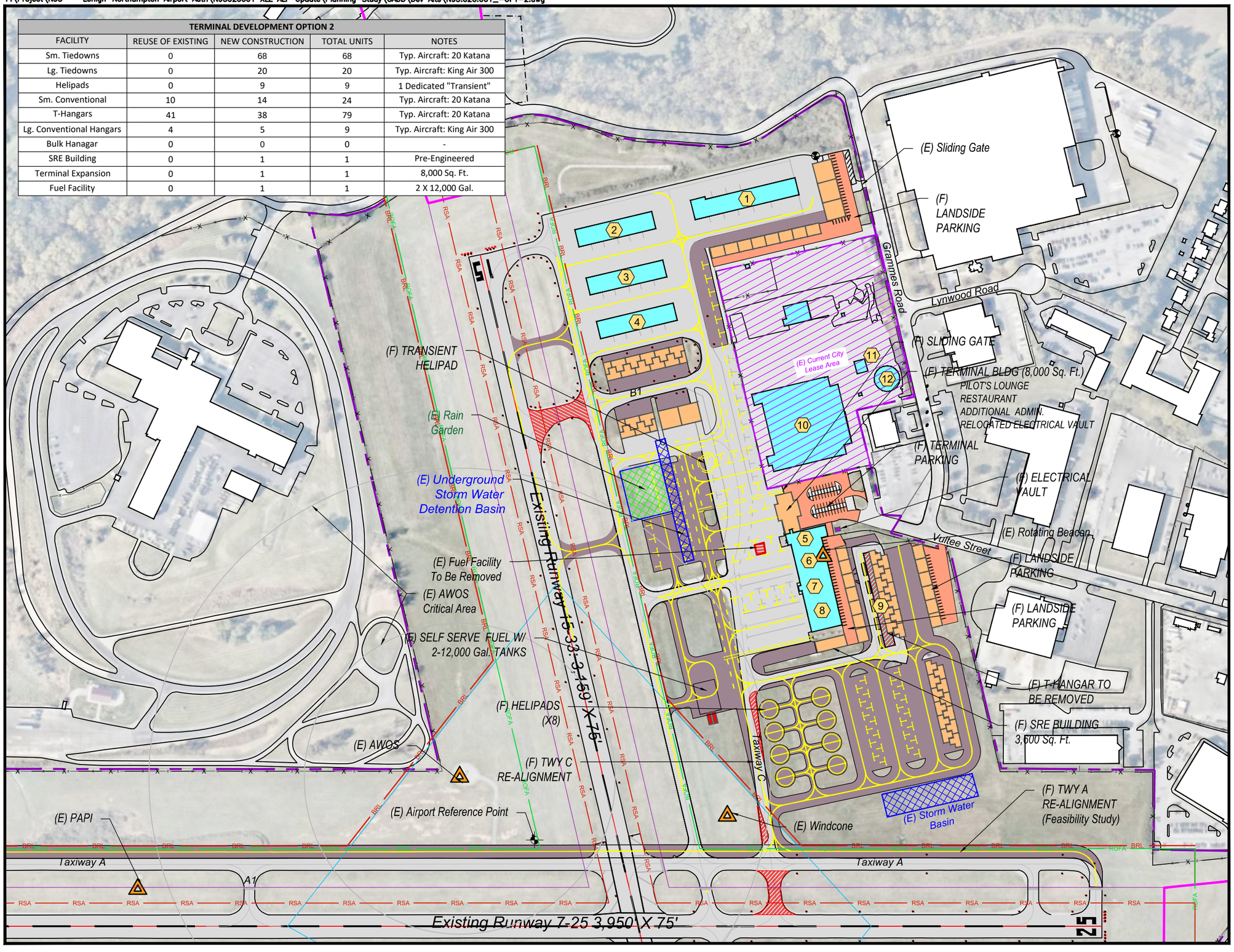
TERMINAL DEVELOPMENT OPTION 2				
FACILITY	REUSE OF EXISTING	NEW CONSTRUCTION	TOTAL UNITS	NOTES
Sm. Tiedowns	0	68	68	Typ. Aircraft: 20 Katana
Lg. Tiedowns	0	20	20	Typ. Aircraft: King Air 300
Helipads	0	9	9	1 Dedicated "Transient"
Sm. Conventional	10	14	24	Typ. Aircraft: 20 Katana
T-Hangars	41	38	79	Typ. Aircraft: 20 Katana
Lg. Conventional Hangars	4	5	9	Typ. Aircraft: King Air 300
Bulk Hanagar	0	0	0	-
SRE Building	0	1	1	Pre-Engineered
Terminal Expansion	0	1	1	8,000 Sq. Ft.
Fuel Facility	0	1	1	2 X 12,000 Gal.



LEGEND		
EXISTING	DESCRIPTION	FUTURE
	Buildings (On or Off Airport Property)	
	Airfield Pavement	
	Roads/Parking Lot Pavement	
	To Be Removed	
	Fuel Farm	
	Current City Lease Area	N/A
	Storm Water Basin or Rain Garden	N/A
	Fence	
	Airport Property Line	N/A
	Runway Safety Area (RSA)	N/A
	Runway Object Free Area (ROFA)	N/A
	Runway Obstacle Free Zone (ROFZ)	N/A
	Runway Protection Zone (RPZ)	N/A
	Building Restriction Line (BRL 25')	N/A
	Runway Visibility Zone (RVZ)	N/A
ARP	Airport Reference Point	N/A
	Navigational Aid (NAVAID)	N/A
	Airfield Light	N/A

EXISTING FACILITIES TABLE		
ID	Facility Description	Top Elevation (MSL)
1	T-Hangar	408.2'
2	T-Hangar	398.8'
3	T-Hangar	398.6'
4	T-Hangar	397.1'
5	Terminal	401.0'
6	Hangar	409.4'
7	Shop	409.5'
8	Hangar	403.3'
9	T-Hangar	387.8'
10	City Garage	419.9'
11	City Storage Shed	405.7'
12	Sand Storage Facility	418.5'

N

0 150 300 600 Feet

1 inch = 300 feet
When printed at 11 in. by 17 in.

Queen City Municipal Airport
Master Plan Update

Development Option 2

Figure 5 . 3

5.3.2 SRE Building

Both development options show the construction of a new Snow Removal Equipment (SRE) building located to provide equipment access to the airfield and Vultee Street. This pre-engineered building will be 3,600 SF (36 FT wide x 100 FT long and 16 FT tall) and is intended to provide space for both SRE storage and maintenance.

5.3.3 Fuel Farm Relocation and Upgrade

Both development options recommend siting a consolidated fuel farm facility consisting of two above ground 12,000 gal. fuel tanks with a self-serve system. Options 1 and 2 differ on location with Option 1 siting the facility in the terminal area, adjacent to existing Hangar 9 and Option 2 siting the facility off of Taxiway C.

The main benefit of siting the fuel farm in a central location as indicated in Option 1 is that it provides easy access to pilots utilizing the self-serve fuel while also making the fuel farm itself more easily accessible to fuel delivery vehicles and necessary utilities. Overall, this location allows for enhanced safety and security of the facility. However, siting the fuel farm in this location does utilize apron space that could otherwise be used for revenue generating sources such as tie-downs. It can also encroach on space that could otherwise be used to enhance aircraft flow through the terminal area.

The siting location presented in Option 2 is in a non-central location. The benefit of this is that it maximizes available space at the airport that would otherwise be non-revenue generating. However, this location does not separate fuel delivery vehicles from aircraft movement areas since it would require fuel trucks to traverse Taxiway C to reach the facility. This could create risks to safety and security.

5.3.4 Hangar Development

Both development options recommend utilizing underused space to develop additional tie-downs and hangars. In total, Option 1 proposes the construction of 29 nested T-hangars, 23 small box hangars (including Hangar 9 reconstruction with 9 units), and 5 large box hangars while Option 2 proposes the construction of 38 nested T-hangars, 21 small box hangars, and 5 large box hangars. Small box and T-hangars are sized to accommodate *20 Katana*-sized aircraft (1,500 and 1,200 SF in area respectively) while large box hangars are sized to accommodate *King Air 300*-sized aircraft (3,100 SF in area). Differences between the two development options, by development area, are summarized below.

City Lease Area

Option 1 recommends utilizing 1.6± acres of the northernmost portion of the property that is currently leased to the City of Allentown to construct eight small box hangars and three large box hangars with adjacent landside parking. Reclaiming this space for airport use and removing this portion of perimeter fencing will also allow for fifteen nested T-hangars to be located south of Building 1.

Option 2 is similar to Option 1 in that it also proposes the construction of eight small box hangars, three large box hangars, and adjacent landside parking. However, this option does not reclaim the current City

Lease Area for airport use and thus does not have the space available for the additional fifteen nested T-hangars and associated taxilanes in this area.

Taxiway B1 Area

Both development options propose the construction of fourteen nested T-hangars and two large box hangars with associated pavements surrounding Taxiway B1.

Hangar 9 Area

Both development options show the addition of six small box hangars east of Hangar 9 with adjacent landside parking. This reconfiguration will also necessitate the need for the relocation of the gas tank at the end of Taxiway H.

Option 1 proposes the full replacement of Hangar 9 in its current location and maintains its existing amount of small aircraft units (nine). Meanwhile, Option 2 shows the full removal of Hangar 9 with a replacement of twelve small nested T-hangars. This demolition allows for the reconfiguration of the area, allowing space for seven small box hangars west of Hangar 9. Option 2 also shows the addition of twelve small nested T-hangars to be located south of the demolished and rebuilt Hangar 9 in the area that Option 1 proposed a new fuel facility.

5.3.5 Tie-down Development

The reconfiguration of the area around the terminal allows for the addition of new large and small tie-downs under both development options. Small tie-downs are sized to accommodate *20 Katana*-sized aircraft (24 FT width by 17 FT length) and large tie-downs are sized to accommodate *King Air 300*-sized aircraft (28 FT width by 24 FT length).

Option 1 utilizes underused areas on the inner portion of the airfield between the terminal area and Taxiway B for additional tie-downs. This configuration allows for the preservation of land northwest of the Runway 25 end for future development.

Due to the need for the space for fuel truck movements on the inner portion of the airfield under Option 2, this option does not proposes tie-downs between the terminal area and Taxiway B. Instead, this option utilizes more of the underused area between Taxiway A and the terminal area for tie-downs.

In total, Option 1 proposes 24 large tie-downs and 75 small tie-downs while Option 2 proposes 20 large tie-downs and 68 small tie-downs.

5.3.6 Helipad Development

Both development options show the addition of eight helipads off of Taxiway C to accommodate growing rotary-wing aircraft operations at the airport. One transient helipad is also located near the terminal apron. All units measure 3,300 SF.

The proposed location of the helipads will allow for the reconfiguration of Taxiway C, for improved geometry and better utilization of space. Additionally, the portion of Taxiway C located between Runway 7-25 and parallel Taxiway A will also be removed to eliminate this direct access to the runway.

5.4 Development Options 1 and 2 Summary

The differences between development Option 1 and Option 2 are summarized in **Table 5.1** on the following page.

Table 5.1| Development Option 1 and 2 Comparison

Facility	Option 1	Option 2
Runway 15-33	Runway length and width unchanged from existing	Runway length and width unchanged from existing
Runway 7-25	Runway length and width unchanged from existing	Runway length and width unchanged from existing
Taxiway A Realignment	Taxiway A is relocated 40' to meet the 240' separation requirement between the Runway 7-25 centerline and its centerline for the "B-II small" ADG. If infeasible, a MOS is requested.	Taxiway A is relocated 40' to meet the 240' separation requirement between the Runway 7-25 centerline and its centerline for the "B-II small" ADG. If infeasible, a MOS is requested.
Taxiway B1 Removal	Taxiway B1 between Runway 15-33 and Taxiway B is removed and two adjacent stub taxiways (one north and one south) are constructed.	Taxiway B1 between Runway 15-33 and Taxiway B is removed and two adjacent stub taxiways (one north and one south) are constructed.
Taxiway C Realignment	Taxiway C is reconfigured.	Taxiway C is reconfigured.
Terminal Building Expansion & Electrical Vault Relocation	8,000 SF Terminal Building expansion with relocation of Electrical Vault above ground near Vultee St.	8,000 SF Terminal Building expansion with relocation of Electrical Vault above ground near Vultee St.
SRE Building	New 3,600 SF SRE Building for storage and maintenance.	New 3,600 SF SRE Building for storage and maintenance.
Fuel Farm Relocation and Upgrade	Located behind existing Hangar 9 with fuel delivery vehicle access separated from aircraft movements.	Located off of Taxiway C.
Hangar 9 Development	Full replacement of Hangar 9 in its existing location and relocation of gas tank.	Full removal of Hangar 9 and its replacement with T-hangars and relocation of gas tank.
Reclamation of portion of City Lease for Airport use	Yes	No
Total Count of Proposed:		
Small T-Hangars	29	38
Small Box Hangars	23	21
Large Box Hangars	5	5
Small Tie-downs	24	20
Large Tie-downs	75	68
Helipads (Based and Transient)	8 based and 1 transient	8 based and 1 transient

Source: C&S Engineers, Inc. January 2020.

5.5 Preferred Development

Feedback from the public workshop on development Options 1 and 2, along with the LNAA's overarching vision for the Airport, were considered in the creation of the final preferred development plan. Ultimately, Option 2 was selected as the preferred alternative but with some alterations.

5.5.1 Option 2 Alterations

Changes to Option 2 that are discussed below include alterations to the following components:

- FBO apron tie-downs configuration
- Helipad layout
- Taxiway C alignment
- Fuel Farm Layout
- SRE Building location
- City Lease Area development
- Hangar 9

Feedback from the public workshop (comments located in **Appendix F** indicated a desire to maintain apron space in front of the FBO for itinerant aircraft, creating a "VIP experience." Discussion with the LNAA indicated that this idea aligned with their goal of eliminating the potential for overcrowding on the FBO apron. As indicated by the preferred development option, Option 2 has been altered to remove tie-downs in this area and to instead accommodate a "VIP Ramp."

Pilots at the public workshop also indicated a need for changes to the helipad layouts shown on Option 2. Due to the high volume of Lehigh Valley Health Network's hospital helicopter operations at the Airport, there is a greater need for itinerant helipads than what was shown in Option 2. The preferred development plan accommodates these existing operations by relocating two helipads from Taxiway C to be near the terminal apron. This placement will accommodate the unique access/egress and efficiency needs of emergency helicopter operations. With the reconfiguration of the proposed helipad development, Taxiway C is also able to be realigned to become parallel with Taxiway B.

The reconfiguration of the helipad from Option 2 also changes the reconfiguration of the fuel farm. Although the fuel farm in the preferred development option is similar in location to that of Option 2, it is configured slightly differently, and located slightly closer to the terminal apron. This location allows for the addition of a taxiway connector between Taxiways B and C. Overall, this layout is a better configuration of space given other changes to the terminal area and it is more easily accessible and visible form the terminal apron.

The preferred development also resituates the SRE Building to be located closer to Hangar 8, allowing fuel truck access from Vultee Street, through the landside parking lot behind the terminal, and south of the SRE building, across Taxiway C to the relocated fuel farm. This reconfiguration provides for fuel farm vehicle access without having to go through the aircraft activity area in front of the terminal and flight school.

Discussion with the LNAA also indicated the preference for the development configuration shown for Option 1 in the City Lease Area. The northern portion of the City Lease Area that Option 1 proposes to develop is currently underused and could be of a better use for airside development. Therefore, the proposed development indicates the reclamation by the Airport of this space.

Hangar 9 is currently in need of repair. The last evaluation of the hangar was conducted by C&S Engineers in 2015. The hangar most likely that the hangars condition has continued to degrade since this evaluation recommended extensive repairs. This makes the current extent of the repairs needed unknown. The preferred development proposes an up-to-date evaluation of Hangar 9 to determine if the hangar should be repaired or replaced in kind. For planning purposes estimates and phasing assume a replacement in kind would be required.

5.5.2 Preferred Development Option Summary

Table 5.2 summarizes the final preferred development option as shown on **Figure 5.4** on the following page.

Table 5.2| Development Option Projects

Facility	Preferred Development Option
Runway 15-33	Runway length and width unchanged from existing
Runway 7-25	Runway length and width unchanged from existing
Taxiway A Realignment	Taxiway A is relocated 40' to meet the 240' separation requirement between the Runway 7-25 centerline and its centerline for the "B-II small" ADG. If infeasible, a MOS is required.
Taxiway B1 Removal	Taxiway B1 between Runway 15-33 and Taxiway B is removed and two adjacent stub taxiways (one north and one south) are constructed.
Taxiway C Realignment	Taxiway C is realigned to be parallel with Taxiway B. The portion of this taxiway between Taxiway A and Runway 7-25 is removed.
Terminal Building Expansion & Electrical Vault Relocation	8,000 SF Terminal Building expansion with relocation of Electrical Vault above ground near Vultee St.
SRE Building	New 3,600 SF SRE Building for storage and maintenance, shifted closer to Hangar 8.
Fuel Farm Relocation and Upgrade	Located adjacent to the terminal apron.
Hangar 9 Development	Evaluate for repair or replace in kind and relocation of gas tank.
Reclamation of portion of City Lease for Airport use	Yes
Total Count of Proposed:	
Small T-Hangars	29
Small Box Hangars	14
Large Box Hangars	5 and 14,000 SF Bulk hangar
Small Tie-downs	70
Large Tie-downs	6
Helipads (Based and Transient)	4 based and 2 transient

Source: C&S Engineers, Inc. January 2020.

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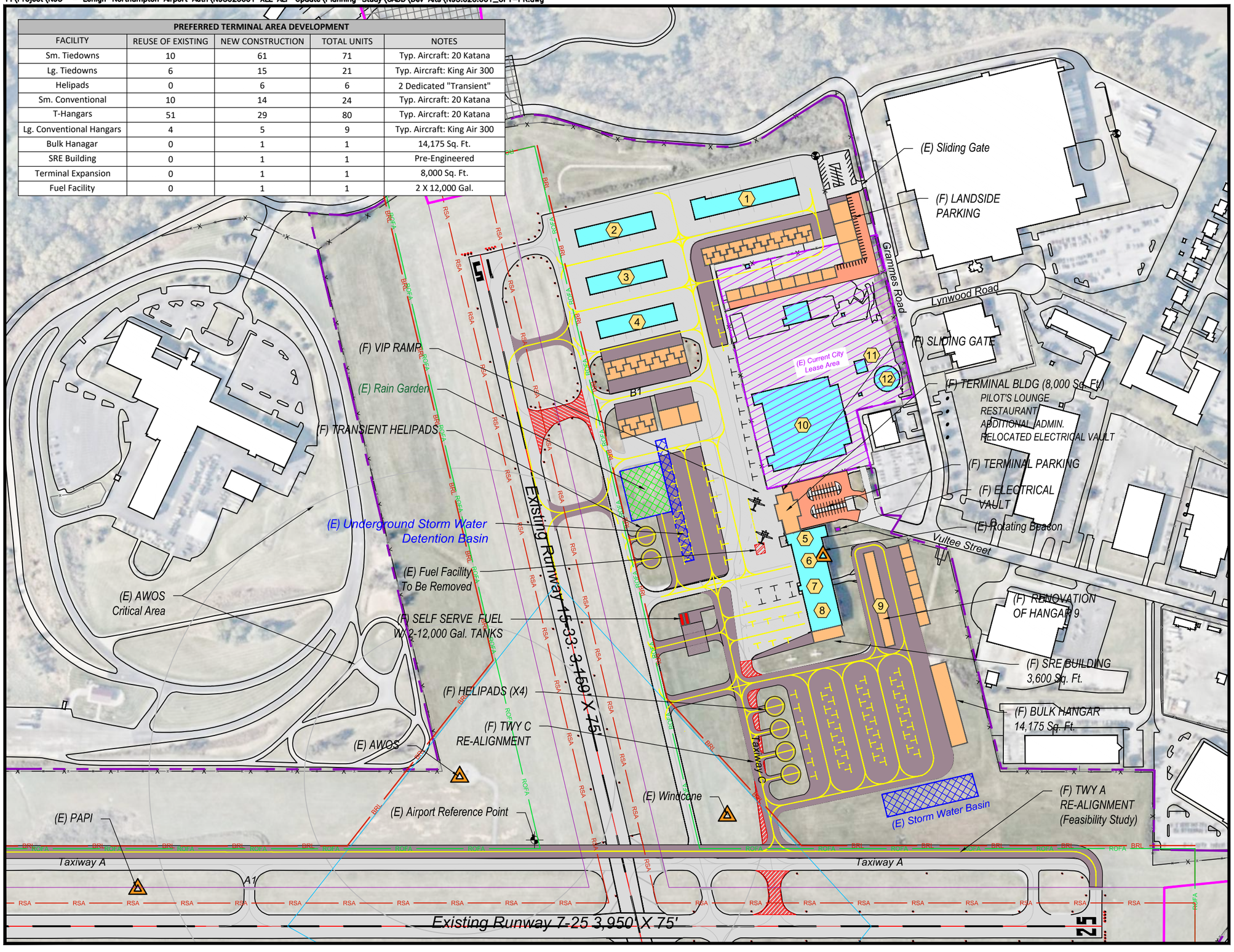
PREFERRED TERMINAL AREA DEVELOPMENT				
FACILITY	REUSE OF EXISTING	NEW CONSTRUCTION	TOTAL UNITS	NOTES
Sm. Tiedowns	10	61	71	Typ. Aircraft: 20 Katana
Lg. Tiedowns	6	15	21	Typ. Aircraft: King Air 300
Helipads	0	6	6	2 Dedicated "Transient"
Sm. Conventional	10	14	24	Typ. Aircraft: 20 Katana
T-Hangars	51	29	80	Typ. Aircraft: 20 Katana
Lg. Conventional Hangars	4	5	9	Typ. Aircraft: King Air 300
Bulk Hanagar	0	1	1	14,175 Sq. Ft.
SRE Building	0	1	1	Pre-Engineered
Terminal Expansion	0	1	1	8,000 Sq. Ft.
Fuel Facility	0	1	1	2 X 12,000 Gal.



LEGEND		
EXISTING	DESCRIPTION	FUTURE
	Buildings (On or Off Airport Property)	
	Airfield Pavement	
	Roads/Parking Lot Pavement	
	To Be Removed	
	Fuel Farm	
	Current City Lease Area	N/A
	Storm Water Basin or Rain Garden	N/A
	Fence	
	Airport Property Line	N/A
	Runway Safety Area (RSA)	N/A
	Runway Object Free Area (ROFA)	N/A
	Runway Obstacle Free Zone (ROFZ)	N/A
	Runway Protection Zone (RPZ)	N/A
	Building Restriction Line (BRL 25')	N/A
	Runway Visibility Zone (RVZ)	N/A
ARP	Airport Reference Point	N/A
	Navigational Aid (NAVAID)	N/A
	Airfield Light	N/A

EXISTING FACILITIES TABLE		
ID	Facility Description	Top Elevation (MSL)
1	T-Hangar	408.2'
2	T-Hangar	398.8'
3	T-Hangar	398.6'
4	T-Hangar	397.1'
5	Terminal	401.0'
6	Hangar	409.4'
7	Shop	409.5'
8	Hangar	403.3'
9	T-Hangar	387.8'
10	City Garage	419.9'
11	City Storage Shed	405.7'
12	Sand Storage Facility	418.5'

N

0 250 500 1000 Feet

1 inch = 500 feet
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Queen City Municipal Airport
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Preferred Development Option

Figure 5 . 4

Section 6—Preferred Development, Implementation, and Financial Plan

Following an evaluation of all development options and a workshop with LNAA staff, the preferred projects were then combined for a preferred airport-wide development concept that was reviewed, evaluated for conflicts, and serves as the preferred development plan for the Airport.

Through this process, which considered the strategic goals of the LNAA, and the preferred development concept, phasing considerations related to timing, as well as affordability, were also considered. The end result presents the individual projects within timeframes for implementation. These are presented in the following timeframes:

- Phase 1 – 0 to 5 years, or 2020-2025
- Phase 2 – 6 to 10 years, or 2026-2030
- Phase 3 – 11 to 20 years, or 2031-2040

Table 6.1 on the following page includes the phased projects as well as their planning-level cost estimates. The table also identifies the potential environmental requirements for the National Environmental Policy Action (NEPA) based on each project. Depending on the timing and location of some projects, the environmental documentation requirements could and should be combined for the sake of efficiency and avoiding segmented analysis. For the purposes of this document, the anticipated environmental requirements are noted for each project individually. Any requirements for coordination or mitigation by the Commonwealth of Pennsylvania would be accounted for as part of the NEPA process.

Figure 6.1 on Page 6-3 shows a graphic depiction of all planned projects.

In addition to the projects noted on the following pages, modification of standards requests should be submitted for the roadways and fence that are located within the runway object free areas off each runway end.

Table 6.1 | Preferred Development Projects

Project #	Year	Project Description	Cost Estimate	NEPA Doc	CATEX Source
Phase 1					
1-1	2020	Obstruction Removal	$1,000,000	EA	
1-2	2020-2023	Rehabilitate Runway 15-33 w/Taxiway B	$7,371,000	CATEX	5-6.4e
1-3	2021-2023	Runway 15-33 Lighting & Electrical Vault	$1,998,000	CATEX	5-6.3b
1-4	2022	SRE Building	$737,000	CATEX	5-6.4f
1-5	2022	Aviation Fuel Farm	$2,055,000	EA	
1-6	2022	Taxiway A Feasibility Study	$100,000	CATEX	5-6.4e
1-7	2023	Taxiway A Rehabilitation	$3,462,000	CATEX	5-6.4e
1-8	2023-2025	Hangar Development 1	$7,401,000	CATEX	5-6.4f
1-9	2024-2025	Hangar Development 2	$13,094,000	CATEX	5-6.4f
1-10	2024-2025	Proposed Avigation Easements (RPZ)	$762,000	CATEX	5-6.4bb
		Phase 1 Total Cost Estimate :	**$37,980,000**		
Phase 2					
2-1	2026	VIP Ramp (Markings)	$12,000	CATEX	5-6.4e
2-2	2026-2027	Taxiway C Realignment	$3,624,000	EA	
2-3	2027-2028	Terminal Improvements & Expansion	$2,638,000	EA	
2-4	2029	T-Hangar 9 Renovations	$1,874,000	CATEX	5-6.4f
2-5	2029	Transient Parking Expansion with Helipads	$1,694,000	CATEX	5-6.4f
2-6	2030	Taxiway Connectors	$998,000	CATEX	5-6.4e
		Phase 2 Total Cost Estimate :	**$10,840,000**		
Phase 3					
3-1	2029 - 2030	T-Hangar & Single Unit Hangar Development	$26,955,000	CATEX	5-6.4b; 5-6.4r
3-2	2031	Single Unit Hangar Development	$2,792,000	CATEX	5-6.4f
3-3	2032	Bulk Hangar & Parking Apron	$9,143,000	EA	
		Phase 3 Total Cost Estimate :	**$38,890,000**		
		Total Cost Estimate :	**$90,710,000**		

Source: C&S Engineers, Inc.
EA = environmental assessment
CATEX = categorical exclusion

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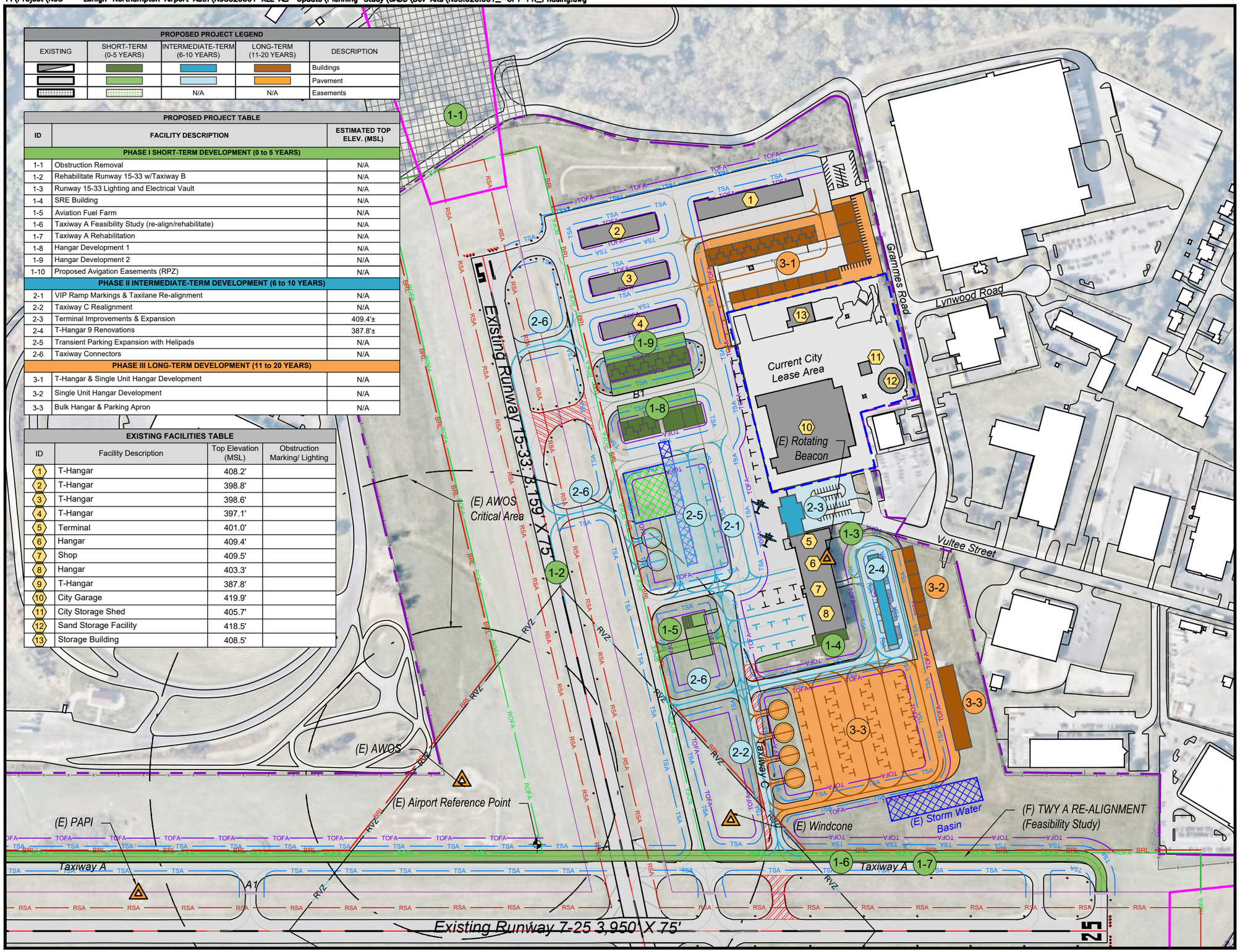
PROPOSED PROJECT LEGEND				
EXISTING	SHORT-TERM (0-5 YEARS)	INTERMEDIATE-TERM (6-10 YEARS)	LONG-TERM (11-20 YEARS)	DESCRIPTION
				Buildings
				Pavement
		N/A	N/A	Easements

PROPOSED PROJECT TABLE		
ID	FACILITY DESCRIPTION	ESTIMATED TOP ELEV. (MSL)
PHASE I SHORT-TERM DEVELOPMENT (0 to 5 YEARS)		
1-1	Obstruction Removal	N/A
1-2	Rehabilitate Runway 15-33 w/Taxiway B	N/A
1-3	Runway 15-33 Lighting and Electrical Vault	N/A
1-4	SRE Building	N/A
1-5	Aviation Fuel Farm	N/A
1-6	Taxiway A Feasibility Study (re-align/rehabilitate)	N/A
1-7	Taxiway A Rehabilitation	N/A
1-8	Hangar Development 1	N/A
1-9	Hangar Development 2	N/A
1-10	Proposed Avigation Easements (RPZ)	N/A
PHASE II INTERMEDIATE-TERM DEVELOPMENT (6 to 10 YEARS)		
2-1	VIP Ramp Markings & Taxilane Re-alignment	N/A
2-2	Taxiway C Realignment	N/A
2-3	Terminal Improvements & Expansion	409.4'±
2-4	T-Hangar 9 Renovations	387.8'±
2-5	Transient Parking Expansion with Helipads	N/A
2-6	Taxiway Connectors	N/A
PHASE III LONG-TERM DEVELOPMENT (11 to 20 YEARS)		
3-1	T-Hangar & Single Unit Hangar Development	N/A
3-2	Single Unit Hangar Development	N/A
3-3	Bulk Hangar & Parking Apron	N/A

EXISTING FACILITIES TABLE			
ID	Facility Description	Top Elevation (MSL)	Obstruction Marking/ Lighting
1	T-Hangar	408.2'	
2	T-Hangar	398.8'	
3	T-Hangar	398.6'	
4	T-Hangar	397.1'	
5	Terminal	401.0'	
6	Hangar	409.4'	
7	Shop	409.5'	
8	Hangar	403.3'	
9	T-Hangar	387.8'	
10	City Garage	419.9'	
11	City Storage Shed	405.7'	
12	Sand Storage Facility	418.5'	
13	Storage Building	408.5'	



LEGEND	
EXISTING	DESCRIPTION
	Buildings
	Off Airport Property Buildings
	Airfield Pavement
	Roads/Parking Lot Pavement
x x	Fence (7 FT) / Wildlife Fence (10 FT)
	Airport Property
	Avigation Easement
	Non-Aeronautical Development
RSA	Runway Safety Area (RSA)
	Runway Object Free Area (ROFA)
	Runway Obstacle Free Zone (ROFZ)
	Runway Visibility Zone (RVZ)
TSA	Taxiway Safety Area (TSA)
TOFA	Taxiway Object Free Area (TOFA)
	Runway Protection Zone (RPZ)
	Part 77 Approach Surface
PAPI	PAPI OCS Surface
	Threshold Siting Surface (TSS) OCS
	Building Restriction Line (BRL 25')
	Edge of Water
	Tree Stand Area
ARP	Airport Reference Point
	Survey Monument
	Navigational Aid (NAVAID)
	Railroad Tracks
	To Be Removed

N

0 150 300 600 Feet
1 inch = 300 feet
When printed at 11 in. by 17 in.

Queen City Municipal Airport
Master Plan Update

Preferred Development Project Phasing

Figure 6 . 1

6.1 Phase 1 Preferred Development (2020-2025)

For the first five years of the development plan, the Airport will continue their on-going projects as well as initiate new projects based on the Airport's needs.

Project 1-1 Obstruction Removal: The Airport recently finished an Obstruction Study to accurately identify all obstructions penetrating the runway approaches and safety critical surfaces. This project will be for the reimbursement of easement acquisitions and the construction of the project for the areas outside the existing easements.

Project 1-2 Rehabilitate Runway 15-33 w/Taxiway B: The runway and taxiway were last rehabilitated over 20 years ago. The pavement is in poor condition with longitudinal and transverse cracking, patches and rutting. This project will involve the rehabilitation of Runway 15-33 pavement, drainage repairs, and pavement marking. This project will continue development through 2023.

Project 1-3 Runway 15-33 Lighting & Electrical Vault: The runway lighting is currently direct buried cable and was installed over 20 years ago. The lighting system is currently experiencing larger scale problems that are beyond routine maintenance. The electrical vault is also over 20 years old and frequently prone to outages. This project replaces the existing medium intensity runway edge lights and signs with medium intensity LED lights and signs. This project also relocates an upgraded electrical vault outside of the terminal building.

Project 1-4 SRE Building: The Airport currently stores and maintains snow removal equipment outside. This project constructs a pre-engineered SRE building to provide shelter from the elements when storing or maintaining equipment.

Project 1-5 Aviation Fuel Farm: Based on the user survey, self-serve fueling is highly desired at the airport. This project constructs a new 12,000 gallon self-serve fuel facility with a dedicated taxilane off of Taxiway C.

Project 1-6 Taxiway A Feasibility Study: Separation between Taxiway A and Runway 7-25 does not meet standard. Due to topographic constraints, the costs of providing the required separation may exceed benefits. This feasibility study analyzes the cost and benefits of realigning Taxiway A.

Project 1-7 Taxiway A Rehabilitation: For the purposes of this Master Plan, it is assumed a modification of standards will be submitted and approved and the Airport would move forward with the rehabilitation of the taxiway. For planning purposes, if a realignment is progressed, the cost is estimated at approximately $5,500,000 and it is assumed a CATEX would be required.

Project 1-8 Hangar Development 1: The Airport has a growing waitlist for hangar space. This project, currently being planned, utilizes the existing apron planned for future hangars by continuing this development plan and constructing four 1500 SF T-hangars and two 4,000 SF conventional hangars.

Project 1-9 Hangar Development 2: The airport has a growing waitlist for hangar space. This project expands hangar development 1 with the addition of 25,000 SF of apron and ten 1,500 SF T-hangars.

Project 1-10 Proposed Avigation Easements (RPZ): Currently the airport does not fully control approximately 7 Acres of RPZ. This project acquires avigation/RPZ control easements for those properties within the RPZs not currently controlled by the Airport.

6.2 Phase 2 Preferred Development (2026-2030)

Following Phase 1, the preferred development for 2026 through 2030 includes airside, landside, as well as general aviation projects.

Project 2-1 VIP Ramp (Markings): Currently, passenger pathways to and from aircraft are unnecessarily lengthened by tie-downs in front of the terminal building. This project reconfigures the apron in front of the terminal building to accommodate unscheduled flights with a VIP ramp to the terminal building.

Project 2-2 Taxiway C Realignment: Taxiway C is not perpendicular to Taxiway A. This project also addresses geometry issues with Taxiway C by realigning the taxiway to be perpendicular with Taxiway A.

Project 2-3 Terminal Improvements & Expansion: A GA terminal is needed to provide space for lounge areas, restrooms, food services, and other areas for the needs of pilots and passengers. Based on Table 5-20 in Section 5, the Airport does not currently have adequate space to accommodate these areas. This project renovates the currently dated facility and constructs an additional 8,000 SF for pilots lounge, restaurant, and holdroom. This project also includes the needed landside parking configuration to accommodate a terminal expansion.

Project 2-4 T-Hangar 9 Renovations: Hangar 9 was last evaluated in 2015. This evaluation identified the need to replace multiple components. Due to the continued deterioration of the hangar this project proposes the reevaluation and repair or replacement of Hangar 9.

Project 2-5 Transient Parking Expansion with Helipads: There are increasing helicopter operations at the Airport due to air ambulance fueling. This project provides two helicopter parking positions in close proximity to the fuel farm and 53,800 SF of paved tie-down space to replace existing grass tie-downs.

Project 2-6 Taxiway Connectors: Currently, there is direct access from aprons to the Runway 15 end. This project offsets Taxiways B-2 and B-3. This offset will require a turn before accessing Runway 15-33 and provided proper taxiway geometry. The addition of self–serve fuel service will increases aircraft traffic between Taxiway B and C. This project also constructs an additional connector between Taxiway B and C to mitigate the increase of traffic in this area.

6.3 Phase 3 Preferred Development (2031-2040)

For the years 2031 through 2040 – the end of the forecast period, Phase 3 of the preferred development plan addresses the needs of additional development and infrastructure.

Project 3-1 T-Hangar & Single Unit Hangar Development: The City of Allentown currently leases property from the Authority near the terminal area. A portion of the lease would better serve the Airport if used for aeronautical development. This project utilizes 1.6± acres of this current lease for the construction of 15 small T-hangars, 8 small conventional hangars and 3 large conventional hangars.

Project 3-2 Single Unit Hangar Development: If demand for hangar space continues to grow, this project would address this demand by constructing 6 small conventional hangars behind existing Hangar 9.

Project 3-3 Bulk Hangar & Parking Apron: There are currently grass tie downs at the Airport just east of Taxiway C and south of the terminal area buildings. These tie-downs present the potential for damage to aircraft due to ground debris. This project constructs 26 small paved tie-downs with associated taxilanes to address this issue. If helicopter operations continue to increase at the airport this project includes 4 additional helipads as well as a 14,000 SF bulk storage hangar.

Section 7—Airport Layout Plan Drawing Set

Specific drawings of the XLL Airport Layout Plan (ALP) drawing set were updated in accordance with FAA guidelines outlined in AC 150/5070-6B, *Airport Master Plans* and consistent with the checklist provided in FAA Standard Operating Procedure (SOP) 2.00, *Standard Procedure for FAA Review and Approval of Airport Layout Plans (ALPs)*. The updated sheets were developed using the most recent ALP set developed in 2010, approved by the FAA in 2012, and updated via Pen and Ink change in 2017. The Airport Airspace and Inner Portion of the Approach Surface Drawings from the previous ALP set (Sheets 4-6) were not updated as part of this Master Plan Update.

This section summarizes the ALP drawings included in this update with descriptions of each sheet. The updated ALP drawing sheets are included in **Appendix G**. Each sheet included in the ALP set is listed by title with a designated sheet number and a box for a revision date. The signature block for submission, date, and FAA approval is included on Sheet 3.

Sheet 1, Title Sheet: The Title Sheet includes the Pennsylvania state map, and the location and vicinity maps depicting the Airport's location.

Sheet 2a, Airport Data Sheet: The Airport Data Sheet includes data tables with runway data, taxiway data, general airport data, existing modification of design standards, general notes, and wind rose diagrams and tables. The remaining ALP sheets utilize this data sheet to correspond to the full drawing set.

Sheet 2b, Existing Airport Layout Sheet: The Existing Airport Layout Sheet depicts the existing facilities and topography, safety and critical areas, and basic airport and runway data. The existing property line as well as survey monuments are included. Latitude and longitude coordinates are shown for runway ends, runway intersections, as well as the airport reference point. Navigational aids and lighting are depicted with a symbol corresponding to each. A legend is provided to illustrate line and symbol types for each attribute.

Sheet 3, Airport Layout Plan Sheet: The Airport Layout Plan (ALP) Sheet includes the ultimate facilities with topography, safety and critical areas, and basic airport and runway data. Departure and Part 77 approach surfaces for each runway end are illustrated. TSS OCS surfaces, PAPI surfaces, TERPS, and GQS surfaces are all represented where applicable for runway ends. Any change in location of navigation aids, lighting, etc. are depicted on the ALP sheet. A box for the FAA approval stamp is provided on this sheet, as well.

Sheet 7, Terminal Area Drawing Sheet: The Terminal Area Drawing Sheet is a larger scale drawing of the existing and proposed terminal area development to highlight key features.

Sheet 8, Exhibit A Property Inventory Map Sheet: The Exhibit A Property Inventory Map Sheet provides airport property and easement information and was updated in accordance with FAA SOP 3.00, *FAA Review of Exhibit "A" Airport Property Inventory Maps* based on the approved 2010 Airport Property Map and data provided by the LNAA.