BURKE LAKEFRONT AIRPORT (BKL)

Airport Layout Plan (ALP) Update Narrative Report

WORKING PAPER #2: FACILITY REQUIREMENTS - DRAFT

July 2021

BKL®

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Prepared By:

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3 FACILITY REQUIREMENTS

This chapter analyzes the ability of BKL and its existing facilities to accommodate the current and anticipated levels of activity as described in **Chapter 2, *Forecasts of Aviation Demand***. The analysis provided has been used to identify deficiencies and determine facility needs throughout the 20-year planning period. There should also be consideration for maintenance, rehabilitation, and reconstruction of the airport infrastructure based on the age and condition. The scope of this ALP Update focuses on the airfield capacity and associated airfield design standards, including land use and land ownership, as well as potential impacts to BKL from the Confined Disposal Facilities (CDF)s. The passenger terminal is deemed to be adequate in terms of space and was not addressed or part of this ALP Update scope of work. Therefore, the elements assessed in this chapter include:

- Airfield Facility Requirements
- Support/GA Facility Requirements

The facility requirements provide a basis for assessing the capability of existing airport facilities to accommodate current and future levels of activity. The evaluation of this relationship frequently results in the identification of deficiencies that can be alleviated through planning and development activities. Analyses of various airside functional areas were performed with the guidance of several publications, including Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5300-13A, *Airport Design*; AC 150/5060-5, *Airport Capacity and Delay*; and FAA Order 5090.3B, *Field Formulation of the National Plan of Integrated Airport Systems (NPIAS)*. These facility requirement calculations were developed for the planning period of 2021 through 2041 and were based on various forecast components. They should be regarded as generalized planning tools.

3.1 PLANNING FACTORS

To properly plan for the future of BKL, it is necessary to translate forecasted aviation demand into the specific types of facilities that are required to adequately serve the identified demand. This chapter uses the results of the forecasts conducted in **Chapter 2**, as well as established planning criteria, to determine the airfield (i.e., runways, taxiways, navigational aids, marking and lighting) and support (i.e., hangars, aircraft parking apron, ARFF, maintenance, etc.) facility requirements. Although the aviation forecast covers the 20-year planning horizon, a more important metric than specific timeframes is the concept of planning activity levels (PALs), as specific requirements may have different planning activity levels than others. For example, the demand for additional hangar space may be needed by a level of activity during PAL 2; however, airfield design changes due to a future critical aircraft grouping may be needed by PAL 1. Future airport development should be tied to activity warranting that particular level of development, not specific years. For that reason, the BKL facility requirements were evaluated in terms of capacity & safety standards, as well as maintenance, rehabilitation, and reconstruction.

3.1.1 Capacity and Safety Standards

The number of aircraft operations, number of based aircraft, aircraft fleet mix, and the critical aircraft dimensions and approach speed have the greatest impact on the airfield infrastructure.

Because BKL has Part 135 air service, the number of enplaned passengers is also a key planning factor. For this study, the terminal and other passenger facilities are not included in the scope of work, but the passenger enplanements have a significant impact on the available funding through the Airport Improvement Program (AIP).

Infrastructure improvements based on capacity and safety standards are a function of the activity at the airport. The PALs represent the activity levels believed to trigger the need for additional capacity or improvements based on the aircraft using the airport, If the preferred forecast proves conservative (i.e. the high growth forecast scenarios is realized because of successful airport marketing and route development initiatives, etc.), some recommended improvements may be advanced in schedule. In contrast, if demand occurs at a rate that is slower than the preferred forecast projects, the improvements will be deferred accordingly. As actual activity levels approach a PAL and trigger the need for a facility improvement, sufficient lead time for planning, design, and construction must be considered to ensure that the facilities are available for the impending demand.

3.1.2 Maintenance, Rehabilitation, & Reconstruction

Infrastructure improvements associated with maintenance, rehabilitation, and reconstruction of facilities are based on the existing condition and the age of the facility. Therefore, these projects are triggered by age more than activity and are based on the service life of a specific facility. Maintenance activities are relatively small and are not considered capital expenses, thus are not included in this analysis. Rehabilitation costs are typically considered capital expenses and the frequency of rehabilitation is a function of the service life. Typical service lives and rehabilitation frequencies of infrastructure facilities are presented in **Table 3-1**.

Table 3-1 – Typical Airfield Infrastructure Lifespan

Facility	Service Life	Rehabilitation
Airfield Pavements	20-30 years	10 years
Lighting and Navaids	15-20 years	8-12 years
Drainage and Erosion Control Facilities	25-50 years	15-20 years
Bridges and Major Structures	50-75 years	20-30 years
Earthwork / Safety Areas	60-100 years	30-50 years
EMAS (Engineered Materials Arresting System)	20 years	20 years
Hangars and Industrial Buildings	30-60 years	20-30 years
Terminals	60-100 years	20-30 years

Source: Hudson, Haas, Waheed, 1997. Airport & Runway Classification

3.2 AIRSIDE FACILITY REQUIREMENTS

It is important for airports to assess their existing infrastructure to determine the need for future improvements and associated airfield requirements. The airside facility requirements analysis includes an examination and evaluation of:

- Critical Aircraft
- Airfield Capacity & Configuration
- Runway Length Analysis & Design Standards
- Pavement

- Airfield Lighting, Navigational, and Landing Aid Requirements
- Taxiway Design Standards
- Aprons

The following sections provide a description of each item and an evaluation of existing and future requirements according to current FAA and industry standards.

3.2.1 Critical Aircraft

The design, or critical, aircraft is defined as the most demanding aircraft operating or projected to operate on the airport's runway, taxiway, or apron. According to the FAA, the critical aircraft can be either a specific aircraft model or a composite of several aircraft and must account for a minimum of 500 annual operations.

As discussed within **Chapter 2**, the critical aircraft is classified using the Aircraft Approach Category (AAC), the Airplane Design Group (ADG) and the Taxiway Design Group (TDG). **Table 3-2** presents the applicability of these classification systems to the FAA airport design standards for individual airport components (such as runways, taxiways, or aprons).

Table 3-2 – Applicability of Aircraft Classifications

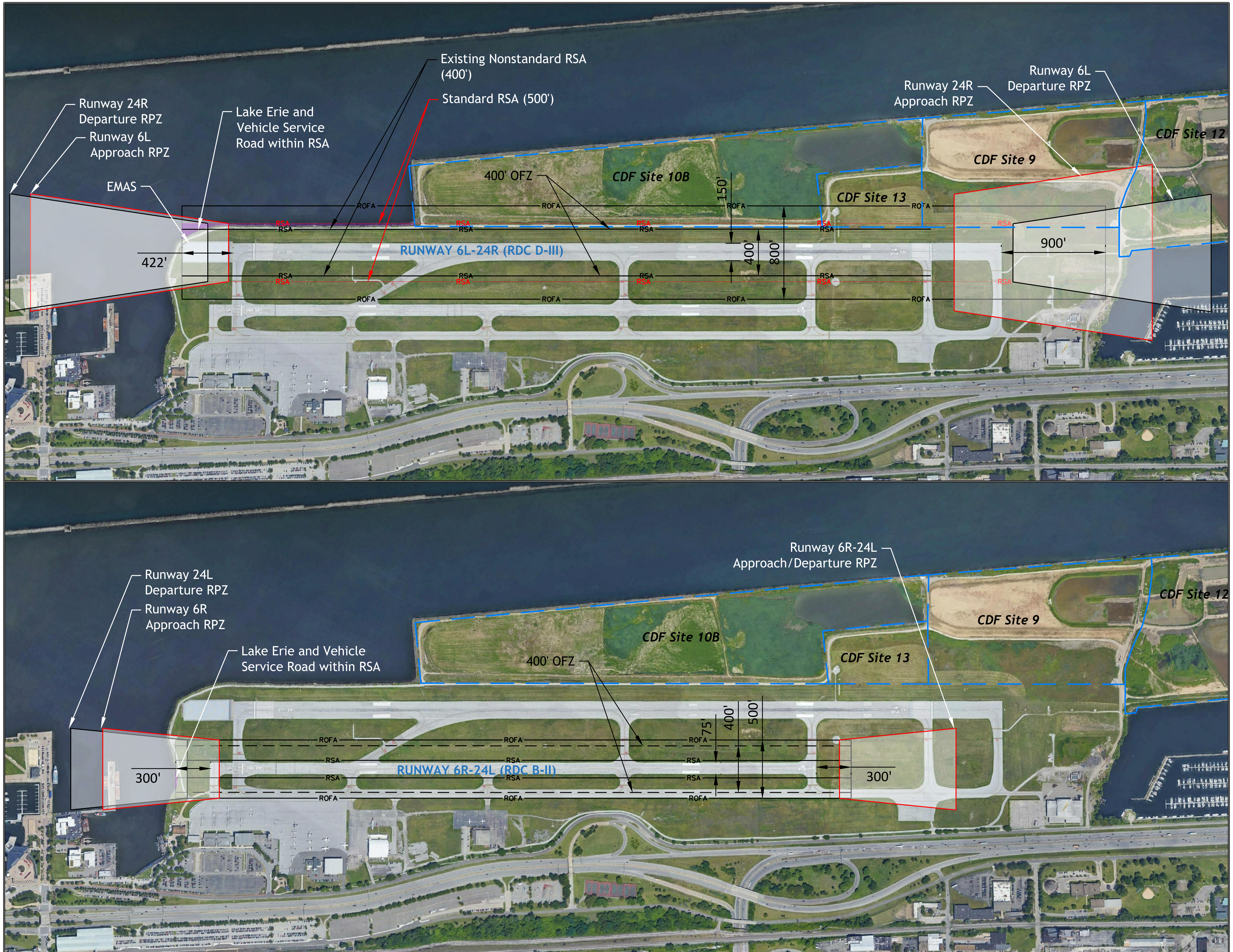
Aircraft Classification	Related Design Components
Aircraft Approach Category (AAC)	Runway Safety Area (RSA), Runway Object Free Area (ROFA), Runway Protection Zone (RPZ), runway width, runway-to-taxiway separation, runway-to-fixed object
Airplane Design Group (ADG)	Runway, Taxiway, and apron Object Free Areas (OFAs), parking configuration, taxiway-to-taxiway separation, runway-to-taxiway separation
Taxiway Design Group (TDG)	Taxiway width, radius, fillet design, apron area, parking layout

Source: FAA AC 150/5300-13A, CHA, 2021.

The selected ACC and ADG are combined to form the Runway Design Code (RDC), which specifies the appropriate design standards for each runway. In addition to the ACC and ADG, the RDC consists of a third component related to runway visibility minimums, expressed as Runway Visual Range (RVR). Based on the evaluation in **Chapter 2,** AAC 'D' and ADG 'II' aircraft operations currently make up the existing family of critical aircraft, which is a change from the 2017 ALP that utilized the Cessna Citation XL as the critical aircraft for geometric design which is AAC 'C' and ADG 'II'.

Due to recent operational trends of AAC D and ADG III aircraft at BKL, the future critical aircraft[1] is projected to increase to D-III. As previously discussed in **Chapter 2**, from 2010 to 2019, ADG III operations grew by 10.7% AAGR. The predicted optimistic COVID recovery to 2019 levels is expected to be 2022. Using the same 10.7% growth rate, it is expected the 500 operations threshold would be met by 2024 in an optimistic scenario, and 2026 in the pessimistic scenario (PAL 1). **Figure 3-1** provides an overview of the existing (D-II) and future (D-III) design standard conditions that will be carried forward. Runway 6R-24L will remain RDC B-II through the planning period.

[1] A list of critical aircraft for existing and future conditions were previously presented in **Chapter 2** and have been approved by the FAA. It is important to note the list is representative of the types of aircraft foreseen to operate at BKL throughout the forecast period, rather than the exact aircraft that will operate at the Airport.



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GRAPHIC SCALE (FEET)
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Figure 3-1
Airfield Design Standards

3.2.2 Airfield Capacity Requirements

Airfield capacity is defined as the maximum rate that aircraft can arrive at, or depart from, an airfield with an acceptable level of delay. It is a measure of the number of operations that can be accommodated at an airport during a given time period, which is determined based on the available airfield system (e.g., runways, taxiways, NAVAIDs, etc.) and airport activity characteristics. The current guidance provided by the FAA to evaluate airfield capacity is described in AC 150/5060-5, *Airport Capacity and Delay*. The following provides a brief definition of the two capacity parameters:

- Annual Service Volume (ASV): A reasonable estimate of the airport's annual maximum capacity, accounting for annual weather characteristics, runway use, aircraft fleet mix, and other conditions.
- Hourly Airfield Capacity: The maximum number of aircraft operations that can take place on the runway system in one hour. As airport activity occurs in certain peaks throughout the day, accommodating the peak hour activity is most critical.

AC 150/5060-5 provides the estimated ASV and hourly airfield capacity for VFR and IFR operations based on various runway configurations and the type of aircraft operating, or projected to operate, at the airport. **Table 3-3** presents the ASV and hourly airfield capacity for the dual runway configuration and type of aircraft operating at BKL, while **Table 3-4** presents the forecasted operational limits at specific capacity levels.

Table 3-3 – Capacity Factors (Independent Parallel Runway Configuration)

Factor	2019	BASE	PAL 1	PAL 2	PAL 3	PAL 4
Annual Operations	40,185	31,979	38,571	39,256	39,897	40,503
Annual Service Volume	155,961	99,291	99,798	101,571	96,183	97,644
Capacity Level	**25.8%**	**32.2%**	**38.6%**	**38.6%**	**41.5%**	**41.5%**

Source: AC 150/5060-5, *Airport Capacity and Delay*; CHA
*Based on runway configuration #2 and mix index of 121 to 180

Table 3-4 – Capacity Levels (Independent Parallel Runway Configuration)

Capacity Level	2019	BASE	PAL 1	PAL 2	PAL 3	PAL 4
60%	93,577	59,574	59,879	60,942	57,710	58,587
80%	**124,769**	**79,432**	**79,839**	**81,257**	**76,947**	**78,115**
100%	155,961	99,291	99,798	101,571	96,183	97,644

Source: AC 150/5060-5, *Airport Capacity and Delay*; CHA
*Based on runway configuration #2 and mix index of 121 to 180

As shown on **Table 3-4**, the current and forecasted annual and peak hour operations for BKL are anticipated to remain well below the ASV and hourly operations in the current runway configuration.

Separately from the critical aircraft defined by aircraft activity, the FAA classifies runways for federal funding eligibility through the guidance in FAA Order 5100.38D, *Airport Improvement Program (AIP) Handbook*. A "secondary runway" is eligible for AIP funding if justified; however, if classified as an additional runway it would be ineligible for funding. FAA Order 5100.38D, Appendix G, Table G-1, defines "secondary" and "additional" as:

- Additional Runway is defined as 1) there is more than one runway on the airport; 2) the ADO has determined that this runway does not meet the requirements of a crosswind, and 3) the ADO has determined that the additional runway does meet the requirements to be designated as a secondary runway.
- Secondary Runway is defined as 1) there is more than one runway at the airport; 2) the runway is not a crosswind runway; and 3) the primary runway is operating at 60% or more of its annual capacity.

Similar to the capacity analysis shown in **Tables 3-3** and **3-4** for a parallel runway configuration, an analysis was conducted on 6L-24R in a single runway configuration to determine whether a single runway at BKL would exceed the 60% annual capacity threshold. As shown in **Table 3-5** and **Table 3-6**, Runway 6L-24R adequately accommodates ASV and hourly operations in a single runway configuration; therefore, Runway 6R-24L will continue to be classified as an "additional" runway and be ineligible for federal funding.

Table 3-5 – Capacity Factors (Single Runway Configuration)

Factor	2019	BASE	PAL 1	PAL 2	PAL 3	PAL 4
Annual Operations	40,185	31,979	38,571	39,256	39,897	40,503
Annual Service Volume	114,869	73,130	73,503	74,809	80,156	81,374
Capacity Level	**35.0%**	**43.7%**	**52.5%**	**52.5%**	**49.8%**	**49.8%**

Source: AC 150/5060-5, *Airport Capacity and Delay*; CHA
*Based on runway configuration #1 and mix index of 121 to 180

Table 3-6 – Capacity Levels (Single Runway Configuration)

Capacity Level	2019	BASE	PAL 1	PAL 2	PAL 3	PAL 4
60%	68,921	43,878	44,102	44,885	48,094	48,824
80%	91,895	58,504	58,803	59,847	64,125	65,099
100%	114,869	73,130	73,503	74,809	80,156	81,374

Source: AC 150/5060-5, *Airport Capacity and Delay*; CHA
*Based on runway configuration #1 and mix index of 121 to 180

3.2.3 Airfield Configuration

The general configuration of the airfield, including the number of runways along with their location/orientation, should allow the airport to meet anticipated air traffic demands and maximize wind coverage and operational utility for all types of aircraft expected to utilize BKL on a regular basis. The FAA recommends a minimum 95% wind coverage for a runway system at an airport. This means that 95 percent of the time, the yearly crosswind coverage at an airport is within acceptable limits for the types of aircraft operating on the runways. As shown in **Table 3-7**, the current parallel runway configuration at BKL does not provide adequate wind coverage for the lower crosswind components (specifically for RDC A-I/II and B-I/II aircraft).

Table 3-7 – BKL Wind Coverage

	10.5 Knots	13 Knots	16 Knots	20 Knots
All Weather	**81.20%**	**88.35%**	95.09%	98.61%
VFR Conditions	**81.67%**	**88.86%**	95.62%	98.91%
IFR Conditions	**78.23%**	**85.05%**	**91.70%**	96.77%

Source: NOAA, National Climate Center; Station 725245 (2011-2020).

Furthermore, the 2010 *General Aviation and Part 135 Activity Survey* indicated that these smaller aircraft do not fly as often during IFR weather conditions. It is significant to note that wind coverage in the 16-knot category is below 95% in IFR conditions. As a result, 8.3% of the time in IFR conditions, ADG C-III and D-III aircraft are unable to operate at BKL. Per AC 150/5300-13A, *Airport Design*, when a crosswind runway is impractical, the operational tolerance to crosswinds can be addressed by providing a wider runway then required for additional safety, as is the case at BKL.

Due to the changes in the earth's magnetic declination over time, the compass heading of a runway and its associated end number can change. Current magnetic declination information was obtained from the National Oceanic and Atmosphere Administration (NOAA). The current headings and declinations of the runway ends at BKL are as follows:

- Runways 6L and 6R
  - Current headings: 065° magnetic, 058° true
- Runways 24R and 24L
  - Current headings: 245° magnetic, 238° true
  - Current Declination
- Declination: 8° 20' W ± 0° 23' changing by 0° 1' W per year

Given the magnetic declination changes that have occurred since the previous ALP, and the ongoing shift per year, the runway numbers should be re-evaluated during the next rehabilitation project.

3.2.4 Runway Length Analysis

To ensure that BKL can support existing and anticipated aircraft and airline operational demands, a runway length analysis was performed based on specific aircraft performance characteristics as documented in the manufacturer's Aircraft Planning Manuals (APMs). Inadequate runway length can limit the operational capability of an airport, including the aircraft types that can operate and the destinations that the airport serves. Runway lengths can place restrictions on the allowable takeoff weight of the aircraft, which then reduces the amount of fuel, passengers, or cargo that can be carried. Per the guidance provided in AC 150/5325-4B, *Runway Length Requirements for Airport Design*, the following factors were used in the runway length calculations for BKL:

<u>Aircraft Specifics</u>

- Model and Engine Type – the aircraft version and engine type. The most common and demanding aircraft specific to BKL were used.

- Payload – represents the carrying capacity of the aircraft, including passengers, baggage, and cargo. For this analysis, both 90 percent and 100 percent were chosen as the payload for planning purposes.
- Estimated Takeoff Weight – the estimated weight at takeoff, which includes the payload and the fuel required to reach the intended destination (with reserve fuel). The estimated takeoff weight varies by aircraft, payload, and destination.
- Estimated Landing Weight – the estimated weight at landing. For this analysis, maximum landing weight (MLW) was used to determine runway landing requirements.

For this analysis, two aircraft were evaluated: the Airport's critical aircraft, the Cessna Citation XL5 (B-II); and the more demanding, Gulfstream V (D-III). Additionally, aircraft as large as the Boeing 757-200 (D-IV) occasionally operate at BKL. Though these are not 'regular' (500 or more per year) operations, it was still evaluated for the purposes of runway length.

Airport Specifics

- Temperature – the atmospheric temperature at the airport. Warmer air requires longer runway lengths because the air is less dense, thus generating less lift on the aircraft. The average temperature (83°F) of the hottest month (July) at BKL was used in the calculations.
- Elevation – the elevation above sea level at the airport. As elevation increases, air density decreases, making takeoffs longer and landings faster. The elevation at BKL is established at 539 feet mean sea level (MSL).
- Runway Gradient – the average slope of the runway, expressed as a percentage. The runway gradients at BKL are not significant enough to impact runway length requirements.
- Stage Length (flight distance) – the length in nautical miles (nm) to the intended destination. The stage length determines the amount of fuel an aircraft will require on takeoff to complete its flight, thus impacting aircraft weight and runway length requirements.
- No obstacles impacting departure climb were not included, since this factor is not accounted for in the APMs.

Table 3-8 – Existing Takeoff Length Requirements

Aircraft Model	Takeoff Length at MTOW (feet)	Takeoff Length at Typical Operating Weight* (feet)	Existing Runway Takeoff Length (feet)
Cessna Citation XL5	4,230	2,710	6,603
Gulfstream V	6,110	4,750	
Boeing 757-200	8,250	5,450	

Source: Aircraft Planning Manuals, AC 150/5325-4B, CHA, 2021.

Note: Runway lengths were calculated at 59° F – Standard Day + 27° F at 500 MSL.

* Typical Operating Weight calculated as weight with 75% payload and fuel for standard range stage length

Only the largest aircraft serving the Airport (Boeing 757-200 and similarly sized aircraft) would exceed the available takeoff length when operating at maximum takeoff weight (MTOW), which is not a typical operation, nor is it necessary at BKL. Based on this, the existing 6,603-foot length of Runway 6L-24R is a satisfactory length for aircraft anticipated to use BKL in the planning period.

3.2.5 Runway Design Standards

Each runway at BKL is assigned a Runway Design Code (RDC) based on the critical aircraft. The RDC signifies the design standards that the runway should meet. As previously discussed, Runway 6L-24R should be categorized as runway design group D-II today and D-III in the future, while Runway 6R-24L will remain B-II. The key FAA design and safety standards related to the runways at BKL (as defined in AC 150/5300-13A, *Airport Design*) are described below.

Runway Width and Separation

Runway width requirements are based on the critical aircraft associated with each runway. For RDC D-II, the required runway width is 100 feet, while for RDC B-II it is 75 feet. Currently, Runway 6L-24R is 150 feet wide and 6R-24L is 100 feet wide, thereby exceeding this design requirement by 50 and 25 feet. This additional width is justified due the lack of crosswind coverage at BKL. The runway is adequate for the future RDC D-III.

Per AC 150/5300-13A, *Airport Design*, when a crosswind runway is impractical, the operational tolerance to crosswinds can be addressed by designing to the next higher RDC; in this case D-III which requires 150 feet in width, and B-III which requires 100 feet in width.

Another significant design standard for safety is distance of the runway centerline to the parallel taxiway centerline. While Runway 6L-24R does not have a parallel taxiway, the separation between it and Runway 6R-24L is currently 500 feet. This is not considered non-standard as long as there are not simultaneous operations on both runways.

Runway Safety Area (RSA)

The RSA is a rectangular area bordering a runway that is intended to reduce the risk of damage to aircraft in the event of an undershoot, overrun, or excursion from the runway. The RSA is required to be cleared and graded such that it is void of potentially hazardous ruts, depressions, or other surface variations. Additionally, the RSA must be drained by grading or storm sewers to prevent water accumulation, be able to support snow removal and firefighting equipment, and be free of objects except those required because of their function.

<u>Runway 6R-24L</u>

The RSA for a RDC B-II runway is required to be 150 feet wide and extend 300 feet beyond the runway end. Currently the RSA beyond the Runway 6R end is non-standard (see **Figure 3-2**). The existing airport vehicle service road is approximately 257 feet from the end of runway and a small portion (approximately 0.04 acres) of Lake Erie and its shoreline are also within the RSA beyond Runway 6R.

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Figure 3-2
Runway 6R Design Standard Issues

Runway 6L-24R

There are currently greater than 500 operations of AAC D/ADG II aircraft utilizing 6L-24R. Based on FAA design criteria, the standard RSA dimensions for RDC D-II are 500 feet in width centered on the runway centerline extending 1,000 feet beyond each runway end. According to FAA AC 150/5300-13A, RSA length prior to a landing threshold can be reduced to 600 feet if the runway end is equipped with electronic or visual vertical guidance, which both ends of 6L (precision approach path indicators) and 24L (ILS and approach lighting system) currently are equipped with. In 2013, the non-standard RSA was addressed with the installation of an Engineered Materials Arresting System (EMAS) beyond the 6L end. A standard EMAS provides a level of safety that equals an RSA built to the dimensional standards discussed above; therefore, an RSA using a "standard EMAS" installation meets the FAA standard. A standard EMAS is constructed to stop the design aircraft from exiting the runway at 70 knots. Currently the 422-foot EMAS beyond the Runway 6L end provides standard RSA beyond the runway end. In addition, distance between the end of the EMAS bed and the displaced threshold provides 600 feet of RSA for landing aircraft. Likewise, the RSA beyond the Runway 24R end is also standard, providing 1,000 feet beyond the declared end of runway, as well as 600 feet for landing aircraft. The 2017 Master Plan utilized C-II as the RDC for Runway 6L-24, which only required a 400-foot wide RSA. Since the existing RDC for Runway 6L-24R will be changed to D-II as part of this ALP Update (and D-III in the future), the RSA is required to be 500 feet wide or 250 feet off of the runway centerline (see **Figure 3-3**). The 500-foot wide RSA encumbers 1.23 acres of Lake Erie, and 4.1 acres of CDF 10B (currently maintained and operated by the U.S. Army Corp of Engineers). The RSA length and width requirements will remain the same when the RDC transitions to D-III over the planning period.

Runway Object Free Area (ROFA)

The ROFA is a rectangular area surrounding a runway intended to provide enhanced safety for aircraft operations by ensuring the area remains clear of parked aircraft or other equipment not required to support air navigation or the ground maneuvering of aircraft.

Runway 6R-24L

The ROFA design standard for RDC B-II runways is 500 feet wide, centered on the runway centerline, and extending 300 feet beyond each runway end. The existing ROFA is currently standard as it is free and clear of obstructions, parked aircraft, or other equipment. Although the vehicle service road is within the ROFA, it is airport controlled so this condition is permitted.

Runway 6L-24R

The FAA design standards require a RDC D-II/III runway to have a ROFA that is 800 feet wide extending to a length of 1,000 feet beyond the runway ends. In 2020, Runway 6L operating lengths were reduced 100', utilizing declared distances (6,503' for TORA, TODA, and ASDA and 6,325' for LDA). These declared distances were implemented for a 6L operation to mitigate a portion of the existing Vehicle Service Road (VSR) located within the ROFA. Although airport-controlled service roads are normally permitted within the ROFA, this portion of the eastern service road is utilized by trucks accessing the CDFs via the gate at Aviation High School. In addition, there is approximately 32 acres of ROFA that is not currently on BKL property, encompassing portions of Lake Erie and CDF 10B (refer back to **Figure 3-3**).

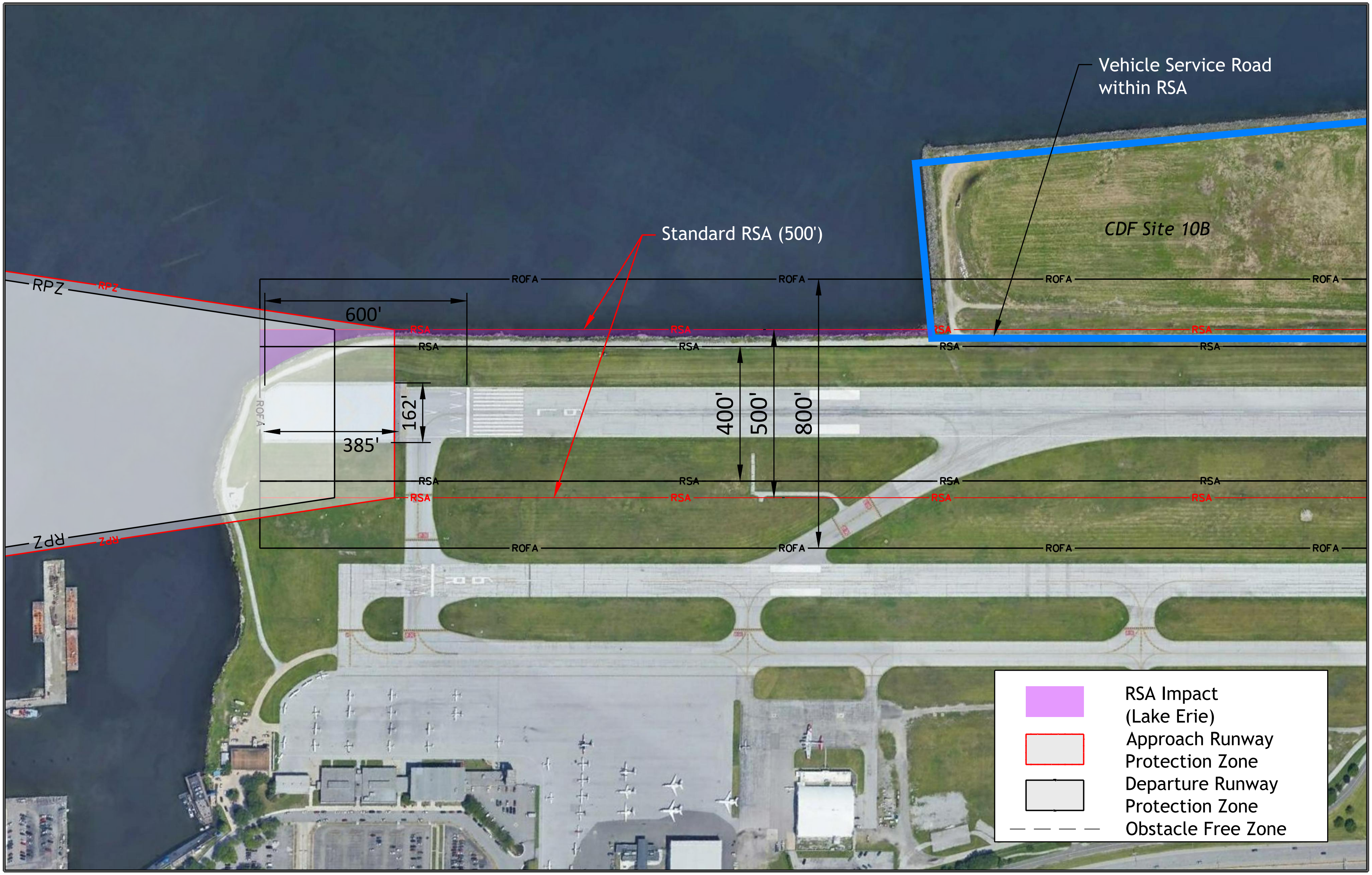

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Figure 3-3
Runway 6L Design Standard Issues

Runway Protection Zone (RPZ)

The RPZ is a trapezoidal area located 200 feet beyond the runway end and centered on the extended runway centerline. The RPZ is primarily a land use control that is meant to enhance the protection of people and property on the ground through airport control. Such control includes clearing of RPZ areas of incompatible objects and activities. Development that is discouraged within the RPZ includes roads, structures, and places of public gathering. New development within an RPZ or new RPZ size/location of an RPZ is subject to FAA review on a case-by-case basis to reduce risk to people and property on the ground. Mitigation tactics for new or existing land uses may include removal/relocation of the object or modifying usable runway length (declared distances) to relocate the RPZ outside of the land use. For runways with displaced landing thresholds, the runway end may have two different RPZs: an approach RPZ (beginning 200 feet from the landing threshold) and a departure RPZ (beginning 200 feet from the departure end of runway). The approach RPZ dimensions for a runway end is a function of the aircraft approach category and approach visibility minimums associated with the approach runway end. The departure RPZ is a function of the aircraft approach category and departure procedures associated with the runway. For BKL, Runways 6L, 6R, and 24L all have displaced thresholds, so all three runway ends will have separate approach and departure RPZs. **Table 3-9** identifies the RPZ standards, while **Figure 3-4** and **Figure 3-5** depict them and respective encumbrances.

Table 3-9 – Existing Runway Protection Zones

RPZ	Design Code	Length	Inner Width	Outer Width	Acres
24R Approach	D-II/III 4000	1,700’	1,000’	1,510’	48.978
24R Departure	D-II/III	1,700’	500’	1,010’	29.465
6R Approach	B-II visual	1,000’	500’	700’	13.770
6R Departure	B-II	1,000’	500’	700’	13.770
6L Approach	D-II/III visual	1,700’	500’	1,010’	29.465
6L Departure	D-II	1,700’	500’	1,010’	29.465
24L	B-II visual	1,000’	500’	700’	13.770

Source: CHA, 2021.

<u>Runway 6R & 6L RPZ(s)</u>

The RPZs for 6R and 6L are not entirely contained and/or controlled by the airport. Some of the land uses within these RPZs are open water, Voinovich Park, a boat charter dock loading/unloading area (Good Time III), and a restaurant. Given the location of BKL, it is unlikely the City would gain complete control of the RPZ for Runway 6L or 6R.

<u>Runway 24R & 24L RPZ(s)</u>

The RPZ for 24L is entirely owned and controlled by the airport; however, the RPZ for 24R does have land use issues similar to the 6 end with portions of Lake Erie and a privately-owned marina. Although most of the RPZs for 24R are on airport property, the property is utilized to operate CDF 12 and portions of CDF 9. As shown on **Figure 3-5,** there are CDF haul roads within the RPZ and dredged material is also stored within the RPZ.

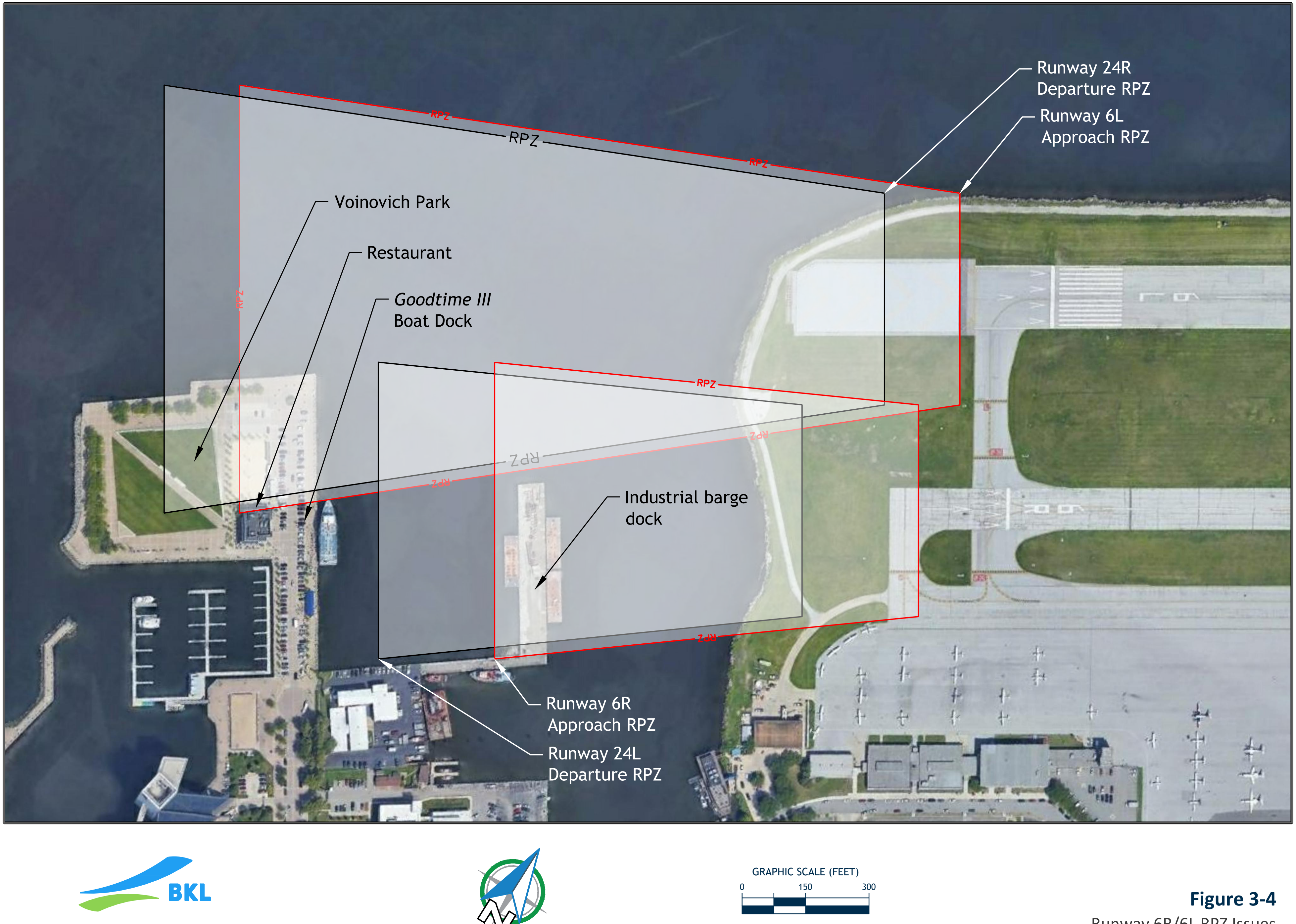

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Figure 3-4
Runway 6R/6L RPZ Issues

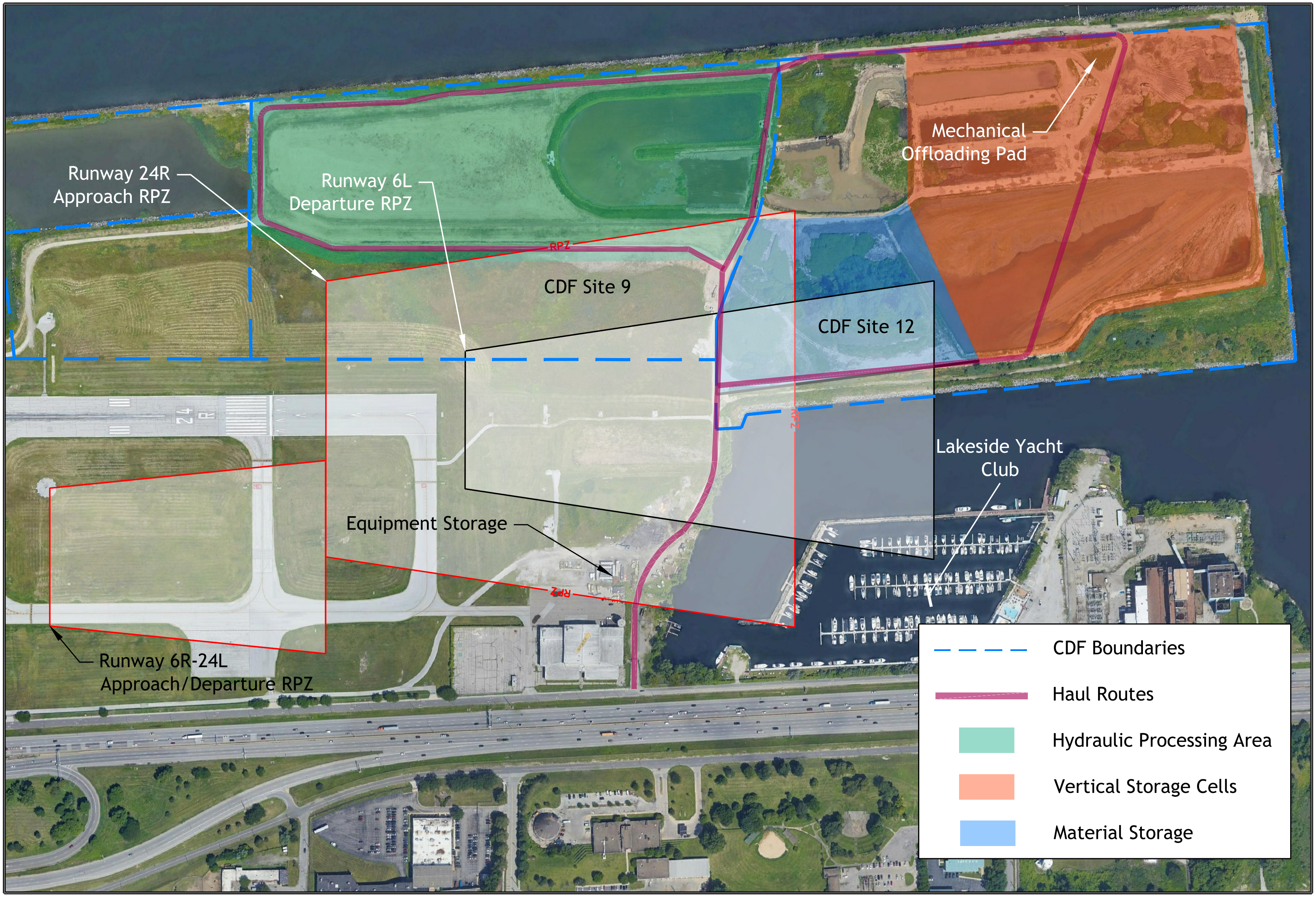

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Figure 3-5
Runway 24R/24L RPZ Issues

Runway Obstacle Free Zone (ROFZ)

The ROFZ is a volume of airspace centered above the runway that is required to be clear of all objects, except for frangible navigational aids that need to be in the ROFZ because of their function. The ROFZ provides clearance protection for aircraft landing or taking off from the runway. The ROFZ is the airspace above a surface whose elevation at any point is the same as the elevation of the nearest point on the runway centerline. The ROFZ extends 200 feet beyond each end of the runway, and its width is based on visibility minimums and aircraft size. The ROFZ width for Runways 6L-24R and 6R-24L is each 400 feet, meeting FAA standards for up to D-III compliance.

Building Restriction Line (BRL)

Though not a specific FAA design standard, the BRL is a reference line which provides generalized guidance on building location and height restrictions. The BRL is typically established with consideration to OFAs and RPZs as well airspace protection by identifying areas of allowable building heights such as 35 feet above ground level. It should be noted that site-specific terrain considerations (i.e. grade/elevation changes) may allow buildings taller than indicated by the generalized BRL to be developed within the limits of the BRL. These height restrictions are typically based on FAR Part 77 standards and are evaluated for each specific site development plan. In this case, the BRL is based on the Air Traffic Control Tower Line of Sight, running at an angle from the tower cab towards the runways. The 2017 ALP depicts a shift to this BRL, pending a redevelopment of Runway 6R-24L into a parallel taxiway. This will be further examined in the alternatives analysis. Currently, no structures impede the BRL of either runway.

Runway Shoulders

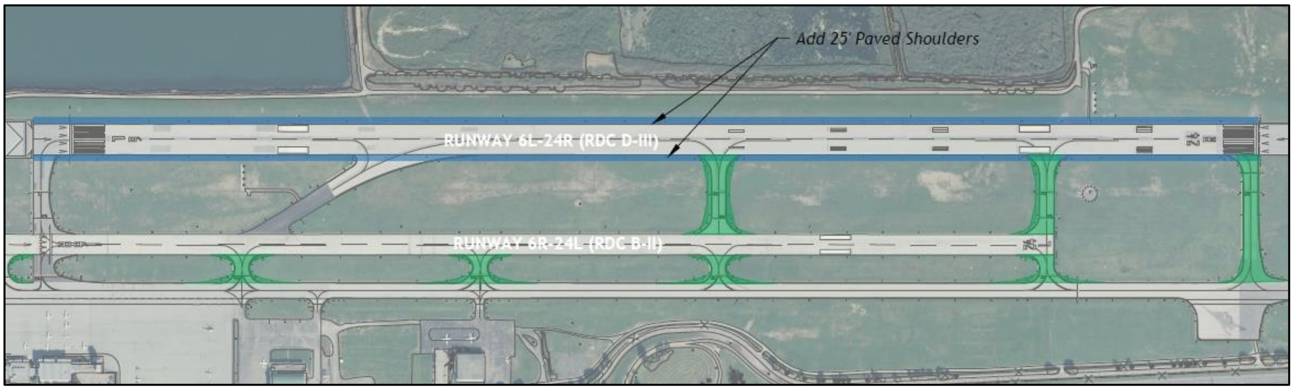
Shoulders provide resistance to blast erosion and accommodate the passage of maintenance and emergency equipment and the occasional passage of an airplane veering from the runway. The FAA recommends paved shoulders for runways accommodating Group III aircraft and higher. FAA AC 150/5300-13A indicates the required shoulder width to be 25 feet on either side of a Group III, though only 10-foot shoulders are recommended for Group II runways. Neither runway at BKL currently has paved shoulders. *When the Airport were to transition to Group III in the forecast period, 25-foot wide paved shoulders on the runway(s) are recommended.*

Runway shoulders are shown in **Figure 3-6**, along with enhancements to the taxiway system which will be discussed in following sections.

Runway Blast Pads

Similar to runway shoulders, blast pads are intended to provide erosion protection at the runway end. Conformance to FAA design criteria requires that 120-feet wide by 150-feet long blast pads be placed symmetrically at the end of each Group II runway. None of the runway ends at BKL provide a standard blast pad.

Figure 3-6 – Recommended Runway and Taxiway Improvements



Source: CHA, 2021.

Table 3-10 identifies the existing conditions at BKL and the geometric standards required within the planning period. Runway deficiencies will be addressed during the development of recommended runway alternatives.

Table 3-10 – FAA Runway Design Standards

Design Standard	Existing Conditions		Runway Design Code (RDC) Standards (w/visual visibility minimums)		
	6L-24R C-II (3/4 mi.)	6R-24L B-II (visual)	B-II (RW 6R-24L)	D-II (RW 6L-24R Ex.)	D-III (RW 6L-24R Fut.)
Runway Width	150’	100’	75’	100’	150’
RSA Width	**400’**	150’	150’	500’	500’
RSA Length Past RW End	*422’/1,000’	300’ / 300’	300’ / 300’	1,000’ / 1,000’	1,000’
ROFA Width	800’ / 800’	500’ / 500’	500’ / 500’	800’ / 800’	800’
ROFA Length Past RW End	*422’/1,000’	300’ / 300’	300’ / 300’	1,000’ / 1,000’	1,000’
Runway OFZ Width	400’	400’	400’	400’	400’
Separation Between:					
Runway Centerline to Parallel Taxiway/Runway Centerline	500’ (to RW 6R-24L)	**218’ (to TW G)**	240’ (Taxiway)	700’ (Runway)	700’ (Runway)
Runway Centerline to Edge of Aircraft Parking	820’	320’	250’	400’	500’
Runway Centerline to Hold line	250’	**152’**	200’	250’	250’
Approach Runway Protection Zone (RPZ):					
Length	1,700’ / 1,700’	1,000’ / 1,000’	1,000’	1,700	1,700’
Inner Width	500’ / 1,000’	500’ / 500’	500’	500’	500’
Outer Width	1,010’ / 1,510	700’ / 700’	700’	1,010’	1,010’
Departure Runway Protection Zone (RPZ)					
Length	1,700’ / 1,700’	1,000’ / 1,000’	1,000’	1,700’	1,700’
Inner Width	500’ / 500’	500’ / 500’	500’	500’	500’
Outer Width	1,010’ / 1,010’	700’ / 700’	700’	1,010’	1,010’

Source: FAA AC 150/5300-13A, CHA, 2021.
*standard EMAS bed off the end of Runway 6L

3.2.6 Pavement

Pavement is one of the most important infrastructure features of an airport. If an airport has failing pavement (runway, taxiway, or apron), aircraft operations will suffer and can affect aircraft safety. Implementing an effective airport pavement maintenance-management program is a grant assurance requirement for airport owners that accept Federal funds. This section outlines the existing runway pavement strength and identifies pavements that will need to be addressed in the short- and long-term planning period.

Strength

Pavement strength is driven by multiple factors. Initially, the airport needs to determine the design aircraft that will be using the airport. The design aircraft is determined by one single-most demanding aircraft, or a mix of the most demanding aircraft, that drive the pavement section. The pavement design aircraft differs from the "critical aircraft" used for geometric standards as the pavement design aircraft does not need 500 annual operations. By identifying the design aircraft, the airport can determine the pavement strength needed for the pavement surfaces on the airfield. The FAA has identified a standard method to report pavement strength at an airport and can be found in FAA AC 150/5335-5: *Standardized Method of Reporting Airport Strength – PCN.* If the design aircraft is determined to have a maximum gross weight of greater than 12,500 pounds, the ACN-PCN method is used to calculate what the pavement is capable of handling.

Aircraft Classification Number (ACN) is the number that expresses relative effect of an aircraft at a given configuration on a pavement structure for a specified subgrade strength. The Pavement Classification Number (PCN) is a number that expresses the load-carrying capacity of a pavement for unrestricted operations. Therefore, if a particular aircraft at a given weight has an ACN less than, or equal to, the PCN of a particular pavement, no restrictions need to be placed on operation of that aircraft on that pavement. **Table 3-11** depicts the standard ACN-PCN reporting method

Table 3-11 – ACN-PCN Reporting

	Pavement Type	Subgrade Type (CBR)	Tire Pressure (psi)	Method of Determination
Numerical Value	R – Rigid	A – High (> 13 CBR)	W: no limit	T – Technical Study
		A – Medium (> 8 CBR < 13)	X: 182 - 254	
	F – Flexible	A – Low (> 4 CBR < 8)	Y: 74-181	U – Using Aircraft
		A – Very Low (< 4 CBR)	Z: 0-73	

Source: FAA AC 150/5335-5C

Certified FAR Part 139 airports are required to publish their PCN information for their runways. The existing PCN and loading bearing capacity found in the BKL 5010 are shown in **Table 3-12**.

Table 3-12 – Published PCN for BKL Runways

	Runway 6L-24R	Runway 6R-24L
Pavement Load Bearing and Pavement Classification Number	Single wheel: 93.0 Double wheel: 113.0 Double tandem: 170.0 PCN: 84/F/C/X/T	Single wheel: 43.0 Double wheel: 50.0 Double tandem: 82.0 PCN: 63/F/C/X/T

Source: Airport Master Record (BKL 5010), CHA, 2021.

According to FAA AC 150/5335-5, for flexible (asphalt) pavements, aircraft in excess of 10 percent of the reported PCN should be restricted from operating at their maximum takeoff weight to avoid potential damage to the pavement. This overload situation would be an ACN of 92 for Runway 6L-24R and ACN of 69 for 6R-24L. The ACN values of the most demanding aircraft that operate at BKL are shown in **Table 3-13**. Based on this data, the runways are strong enough to support the aircraft operating at BKL now and throughout the planning period.

Table 3-13 – ACN Values for BKL Pavement Design Aircraft

Aircraft Type	ACN Value (Flexible)
B739 - Boeing 737-900	56
B752 - Boeing 757-200	60
A320 - Airbus A320 All Series	47
B738 - Boeing 737-800	56
Gulfstream V	31
B737 - Boeing 737-700	49
B735 - Boeing 737-500	43
A319 - Airbus A319	50
A321 - Airbus A321 All Series	63

Source: Transport Canada Advisory Circular No. 302-011, *Aircraft Classification Numbers*.

Pavement Condition & Maintenance

According to the *BKL Airport Pavement Management (APM) System Update* (April 2017), BKL has over 3.3 million square feet of pavement. Maintenance is necessary throughout the useful life of the pavement. FAA Grant Assurance #11 requires airports to implement a Pavement Preventative Maintenance program. This program assures an effective airport pavement maintenance-management program that will be used throughout the useful life of any pavement constructed, reconstructed, or repaired with federal funds. It has been five years since the last update to the pavement management plan at BKL.

The result of the BKL APM was assigning each piece of pavement a Pavement Condition Index (PCI). The FAA describes PCI as a number rating based on the type and severity of distresses observed on the pavement surface. The PCI value of the pavement condition is represented by a numerical index between 0 and 100, where 0 is the worst possible condition and 100 is the best possible condition. In 2017, over 20% of BKL's pavement had not been addressed in over 20 years or its age was unknown or undocumented. Typically, pavement with a PCI of 71-100 require preventive maintenance (crack sealing, surface treatments, seal coats, etc.). A PCI ranging from 41-70 will require more extensive rehabilitation, such as mill and overlay. Any PCI less than 40 normally requires a full depth reconstruction of the pavement.

As part of the BKL APM, a PCI deterioration rate was calculated for the pavement at BKL for five consecutive years ending in 2021. **Table 3-14** depicts what pavements had predicted PCI levels below 70 by 2021.

Table 3-14 – Predicted CY 2021 Pavement Condition Index Below 70

Pavement	Predicted PCI (2021)	Last Construction Date	Remarks
Taxiway 'G' (approx. 6,000')	61 & 62	1986, 2004	660' extension of TW 'G' in 2013 as part of the RSA project is not included
Taxiway 'F'	52	2003	N/A
Taxiway 'E'	61 & 69	1998, 2006	N/A
Taxiway 'B' (approx. 350')	53	2003	Section of pavement with PCI 53 is located within lateral RSA of Runway 6L-24R
Runway 6L-24R (approx. 5,780')	68	1998	Sections of Runway 6L-24R not included in the PCI 68 are the new pavements (820') that were added when the runway shifted in 2013.
Apron (approx. 10,000 SY	14	Unknown	N/A
Apron (approx. 11,000 SY)	14 & 21	Unknown	N/A
Taxiway 'G' Hold Pad (approx. 6,000 SY)	14 & 21	Unknown	N/A

Source: BKL 2017 Airport Pavement Management Systems Update

As the 2017 BK APM indicates, there are various pavements at BKL that will require attention in the short term and the long term. It should be noted that the APM did show Runway 6R-24L with very low PCIs; however, this runway was rehabilitated in 2018 & 2019 by multiple Ohio Department of Transportation grants. In addition, a rehabilitation project for Taxiway 'B', 'E', and 'F' are currently being designed and will be constructed in Summer of 2022 by mill and overlay. Runway 6L-24R should be addressed in the next five years so the rehabilitation method can be a mill and overly, and not a reconstruction. Taxiway 'G' should also be addressed in the short term. Although not as important as runways and taxiways, the two aprons with very low PCI most likely require complete reconstruction.

3.2.7 Airfield Lighting

Airfield lighting allows for the safe operation of aircraft during nighttime hours and low visibility conditions. Lighting on the airfield includes runway and taxiway edge lighting, Precision Approach Path Indicator (PAPI) lights, Runway End Identifier Lights (REILs), and the marker beacon.

Runway and Taxiway Edge Lighting

Both runways at BKL are equipped with High-Intensity Runway Light (HIRL) systems. Furthermore, all the Airport's taxiways are equipped with Medium-Intensity Taxiway Lighting (MITL) systems. The systems are up-to-date and meet FAA standards.

PAPIs

A PAPI system is in use at BKL. Runways 6L and 24R are both equipped with a four-light unit (PAPI-4), both of which meet FAA guidelines. Both PAPI systems were installed in 2013 and are FAA owned.

REILs

At BKL, REILs are positioned at the ends of Runways 6L and 24L to provide rapid and positive identification of the end of the runway, both of which are FAA-owned and meet their guidelines.

Rotating Beacon

The rotating beacon at BKL is located atop the air traffic control tower, adjacent to the terminal. It functions as the indicator for locating the Airport at night and meets FAA standards.

Apron Lighting

Apron floodlight systems illuminate the terminal apron and the FBO apron.

Based on the above findings, airfield lighting systems at BKL are adequate.

3.2.8 Navigational and Landing Aid Requirements

Pilots utilize a variety of navigational aids (NAVAIDs) and instrument procedures, including Very High Frequency (VHF) Omni Direction Range (VORs), instrument approach procedures (IAPs) and NAVAIDs, and approach lighting systems (ALS). By providing point-to-point guidance information or position data, NAVAIDs assist pilots to locate airports, land aircraft, taxi aircraft, and depart safely and efficiently from airports during nearly all meteorological conditions.

Instrument Approach Procedures and NAVAIDs

At BKL, instrument approaches are available only for Runway 24R. This consists of a Category I Instrument Landing System (ILS), as well as RNAV/GPS. The other three runway ends (6L, 6R, and 24L) are all visual approaches.

Table 3-15 – NAVAIDs

Runway	Runway Markings	Approach Lighting	Minimum Ceiling (AGL)/ Visibility	Instrument Approach Types
6L	Precision	PAPI, REIL	VFR	-
24R	Precision	PAPI, MALSF	¾-mile	ILS (Category I), LOC, GPS
6R	Basic	-	VFR	-
24L	Basic	REIL	VFR	-

Source: FAA Airport Master Record (Form 5010), Accessed 2021, CHA, 2021.

Instrument Approach Lighting Systems

As previously mentioned, the Airport operates an ILS for approaches to Runway 24R, which consists of a localizer (LOC), a glide slope (GS), and the approach lighting system (ALS). A Medium-Intensity Approach Lighting System with Sequenced Flashers (MALSF) is utilized for Runway 24R at BKL. This system is FAA-owned and was installed in 2013.

Based on the findings above, the NAVAIDs and landing aids at BKL are adequate, however, potential enhancements will be discussed in the alternatives chapter.

3.2.9 Taxiway Design Standards

Taxiway design standards ensure that taxiways can accommodate wing-tip clearances of aircraft with the widest wingspans, as well as wheel tracking paths of the most demanding aircraft landing configurations. Each taxiway may be designed to accommodate the critical aircraft expected to use that taxiway and may have different standards than other taxiways at the Airport. The applicable design standards for individual taxiways are dependent upon the areas and facilities each taxiway supports. Given the location of the primary Runway 6L-24R, all the taxiways at BKL should be designed for the most demanding aircraft.

Taxiways design standards are based on two separate critical aircraft groupings:

- ✈ Taxiway Design Group (TDG), which is based on the main landing gear width and cockpit-to main-gear distance of the design aircraft. Design standards based on TDG include taxiway width, taxiway edge safety margin, taxiway shoulder width, and taxiway fillet dimensions.
- ✈ Aircraft Design Group (ADG), which is based on the wingspan and tail height of the design aircraft. Design standards based on ADG include taxiway safety area, taxiway object free area, taxiway-to-runway separation, and wingtip clearance requirements.

The most demanding aircraft currently utilizing all taxiways at BKL are TDG 3 and ADG III aircraft (737-800 & A320). The recommended taxiway width for TDG 3 aircraft is 50 feet. All taxiways at BKL are 75 feet in width; therefore, TDG 3 is appropriate for the planning period and will allow all sports teams and other charter service to taxi uninhibited. Taxiway design standards associated with these TDGs and ADGs are described in **Table 3-16** and **Table 3-17**.

Table 3-16 – Taxiway Design Standards based on Airplane Design Group (ADG)

Design Standard	ADG	
	II	III
Protection Standards		
Taxiway Safety Area (TSA) Width	79 feet	118 feet
Taxiway Object Free Area (TOFA) Width	131 feet	186 feet
Wingtip Clearance	26 feet	34 feet
Separation Standards		
Taxiway Centerline to Parallel Taxiway	105 feet	152 feet
Taxiway Centerline to Fixed or Moveable Object	65.5 feet	93 feet
Taxilane Centerline to Fixed or Movable Object	57.5 feet	81 feet

Source: FAA AC 150/5300-13A.

Table 3-17 – Taxiway Design Standards based on Taxiway Design Group (TDG)

Design Standard	TDG			
	2	3	4	5
Protection Standards				
Taxiway Width	35 feet	50 feet		75 feet
Taxiway Edge Safety Margin	7½ feet	10 feet		15 feet
Taxiway Shoulder Width	15 feet	20 feet		30 feet

Source: FAA AC 150/5300-13A.

Presently, the taxiway system meets ADG III and TDG 5 standards. It is important to note that as the taxiway system at BKL exceeds the required FAA width standards, this additional width may have to be justified prior to future reconstruction projects. The FAA could require the taxiways to be narrowed, possibly by converting the additional pavement to shoulders.

Taxiway Separation

As with runways, the distance of taxiway centerlines from fixed and/or movable objects is critical. While there are no dual parallel taxiways at BKL, the required separation for a RDC B-II runway (Runway 6R-24L) centerline to parallel taxiway (TW G) is 240 feet and the current separation is currently 218 feet, depicted in **Figure 3-7**. This non-standard condition should be addressed in the planning period.

Figure 3-7 – Nonstandard Taxiway Separation

Source: CHA, 2021.

Taxiway Width and Shoulders

The recommended taxiway width is 50 feet for TDG-3. Currently, all existing taxiways measure approximately 75 feet in width exceeding the design requirements. Similar to runways, shoulders are recommended for a TDG-3 airport, which should be 20 feet. Currently, there are no paved taxiway shoulders.

Taxiway Safety Area (TSA) and Taxiway Object Free Area (TOFA)

Presently, all taxiways at the Airport follow the proper TSA dimensions of 118 feet in width and all TOFA dimensions of 186 feet in width. Currently a closed portion at the far eastern end of Taxiway G (depicted in **Figure 3-8**) has a non-standard TOFA by the Aviation High School building, though this segment is currently restricted to helicopter operations only.

Figure 3-8 – Aviation High School Site

Source: CHA, 2021.

Nonstandard Grading

Currently, Taxiways E and F do not meet FAA design criteria for taxiway surface gradients, as required per FAA AC/150-5300-13A. Both taxiways are insufficient based on guidance that states, "*the minimum distance between points of intersection of vertical curves is 100-feet multiplied by the sum of the grade change (in percent) associated with the two vertical curves*". Additionally, portions of both taxiways fail to meet criteria which states the "*maximum transverse pavement grade for Approach Category D shall be 1.0%-1.5%*". This is currently being addressed during a design project with a Modification of Standards (MOS) applied for both noncompliant taxiways.

Taxiway Fillets

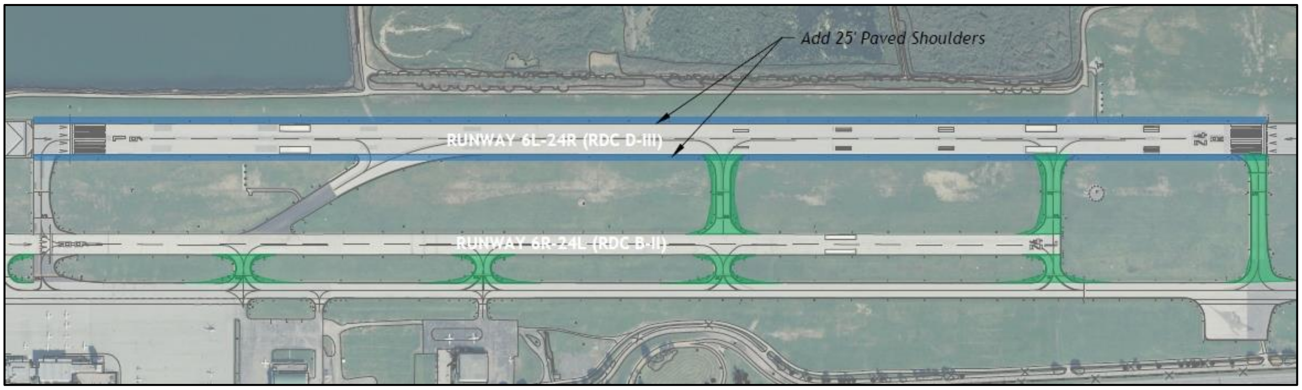
For taxiway turns onto runways, aprons, or additional taxiways, there are FAA design standards for the geometry of the paved fillets, based on the angle of the turn. Currently, Taxiways C, D, F, and H fail to comply with these standard fillet dimensions. It is recommended that the additional pavement necessary to bring this fillet up to standard be applied, as this is a requirement for TDG 3 and higher.

The identified taxiway deficiencies can be summarized as follows:

- Paved taxiway shoulders are inadequate on all Taxiways
- Taxiways C, D, E, F, and H fail to provide sufficient paved areas at the fillets

These nonstandard fillets, and their corrected configuration, are shown on **Figure 3-9**.

Figure 3-9 – Recommended Runway and Taxiway Improvements



Source: CHA, 2021.

Direct Runway-to-Apron Access

Recent guidance in FAA AC 150/5300-13A now recommends against ‘direct access’, specifically a taxiway connecting an apron area directly to the runway. This is due to the concern that these configurations can lead to confusion when a pilot typically expects to encounter a parallel taxiway. This can be resolved by adding a turn in place of a straight-line access, or with pavement removal. Overall, this is an effort to reduce and eliminate potential runway incursion issues and so-called high energy intersections and ‘hot spots’. While there are no official ‘hot spots’ at BKL, there are multiple taxiways allowing direct access from the apron to Runway 6R-24L. These areas, and potential pavement removal solutions, are depicted in **Figure 3-10**. Note that the access from Taxiway ‘C’ to the eastern most apron and hangar area would need to be relocated. This and other alternatives for relocating taxiway access to be compliant will be discussed in the Alternatives chapter.

Figure 3-10 – Runway 6R-24L Direct Access

Source: CHA, 2021.

3.2.10 Aprons

Aircraft parking aprons are intended to accommodate a variety of functions, including the loading and unloading of passengers, the refueling, servicing, maintenance, and parking of aircraft, and any movements of aircraft, vehicles, and pedestrian's necessary for such purposes.

Aprons

BKL provides two basic areas for aircraft parking. The terminal apron is used for Ultimate Air gate parking as well as support and servicing operations located on the eastern side of the terminal apron. The remaining apron is used by existing tiedowns of smaller aircraft utilized by the flight schools. Most of the based and transient GA jet aircraft consist of ADG II/III commercial and charters that utilize the apron between the terminal and the FBO terminal/hangar. That apron space is classified as based aircraft apron space, as itinerant apron space for transient aircraft at the airport.

Aircraft Parking & Apron Space

GA activity at BKL represents the largest portion of annual airport operations and includes various types of private, corporate, and business aircraft flights. GA aircraft are accommodated by the Fixed Based Operator (FBO), Signature Flight Support. For this analysis, a peak month-average day (PMAD) methodology was used to gauge the approximate number of GA aircraft that park on the FBO aprons during an average day of the peak month. The following is a description of the PMAD aircraft parking evaluation shown in **Table 3-18**.

- GA Itinerant Operations – According to the BKL activity data for 2020, itinerant GA operations accounted for approximately 65 percent of total GA operations.
- GA Peak Month Itinerant Operations – After analyzing data obtained from the Air Traffic Control Tower at BKL, the month of July was determined as the peak month. In July 2020, BKL received approximately 14 percent of its total Itinerant GA operations.
- GA PMAD Operations – The GA peak month itinerant operations were divided by the number of days in July (31).
- GA Itinerant Arrivals – The number of PMAD operations was reduced to 65 percent to derive the approximate number of GA itinerant arrivals requiring parking. This 65 percent rate of itinerant aircraft is based on typical GA facilities of BKL's size and operational activity, and data provided by the FBO.

- GA Itinerant Aircraft Parked on the Apron – According to the FBOs, GA itinerant arrivals typically remain parked on the apron for an extended period during the day; therefore, parking space should be provided for the number of aircraft anticipated to use the apron during an average day of the peak month. For the purposes of this evaluation, it was assumed that 80 percent (based on typical GA facilities comparable to BKL, and data provided by the FBO) of itinerant GA operations utilize the FBO aprons and, in turn, was used in the subsequent analysis for apron space.

Table 3-18 – GA Itinerant Aircraft Parked on the Apron

Activity	Base	PAL 1	PAL 2	PAL 3	PAL 4
GA Operations	24,333	27,688	28,097	28,512	28,933
GA Itinerant Operations	15,717	17,883	18,148	18,416	18,688
Peak Month GA Itinerant Operations	3,297	3,752	3,807	3,864	3,921
PMAD Itinerant GA Operations	106	121	123	125	126
GA Itinerant Arrivals	53	61	61	62	63
GA Itinerant Arrivals Parked on Apron	**43**	**48**	**49**	**50**	**51**

Source: BKL, CHA, 2021.

<u>FBO Itinerant Operations Apron</u>

The Signature Flight Support facilities at BKL, which include hangars, a terminal building, and apron space, are situated immediately east of the terminal facility. In addition to the primary apron area surrounding the main terminal and the FBO terminal, Signature maintains two aprons around their corporate hangars, approximately 94,000 SF and approximately 80,000 SF. As of 2021, BKL has 18 based aircraft according to BasedAircraft.com. However, based on discussions with the Airport, BasedAircraft.com is not currently up to date, therefore the most accurate inventory according to airport personnel is 35, as shown in **Table 3-19**.

Table 3-19 – Based Aircraft (As of May 2021)

Single-Engine Piston	Turbo-Prop	Jet	Rotorcraft	Total
18	0	11	6	35

Source: Signature, BKL, CHA, 2021.

Determining the forecasted fleet mix based on the FAA Aerospace Forecast produced the number of each type of aircraft that will need space for parking.

General planning assumptions and (based on recommendations in FAA AC *150/5300-13A Airport Design*) professional experience were used to determine the following apron space requirements for the different aircraft types (which included clearance and safety areas, and sufficient space to power-in/power-out for multi-engine and jet aircraft):

- Single/Multi-Engine Piston = 2,700 SF per aircraft
- Turboprop = 5,400 SF per aircraft
- Jet = 13,500 SF per aircraft

As discussed in **Chapter 2**, with anticipated growth in GA, there will be a likelihood of an increased numbers of transient aircraft to require short-term storage space at BKL. The forecasted amount of Peak Month Average Day (PMAD) aircraft on the apron are shown, as a result this assumes for the Airport to be at its highest anticipated level of demand, as opposed to on any given day.

The assumption that 80% of those itinerant arrivals will remain on the apron for the day is then applied. This peak aircraft demand is shown in **Table 3-20**. Anticipated apron space based on that demand is presented in **Table 3-21**.

Table 3-20 – Forecasted Itinerant Aircraft Demand

Aircraft Type	Base	PAL 1	PAL 2	PAL 3	PAL 4
Piston	34	36	37	38	38
Turbo-Prop	1	1	1	1	2
Jet	8	11	11	11	11
PMAD GA Operations	106	121	123	125	126
GA Itinerant Arrivals	53	61	61	62	63
Total Aircraft Parked on Apron (PMAD Peak Hour Operations)	**43**	**48**	**49**	**50**	**51**

Source: CHA, 2021.

Table 3-21– Anticipated Itinerant Apron Space Demand

Aircraft Type	Parking Space (SF)	Current Capacity	Base	PAL 1	PAL 2	PAL 3	PAL 4
Piston	3,000	326,000 SF	102,000	108,000	111,000	114,000	114,000
Turbo-Prop	5,400		5,400	5,400	5,400	5,400	10,800
Jet	13,500		108,000	148,500	148,500	148,500	148,500
Total Apron Space Required			**215,400**	**261,900**	**264,900**	**267,900**	**273,300**

Source: AC 150/5300-13A: Appendix 5, CHA, 2021.

BKL currently has approximately 244,000 square feet of based aircraft space, including the Terminal Apron and the FBO apron surrounding Bulk Hangar #2 (immediately east of the FBO Terminal). There is approximately 326,000 square feet of itinerant apron space east of the Terminal and surrounding the FBO Terminal. The projected total apron space required is a combination of based aircraft space and itinerant aircraft space. It is also significant to note that in certain special events (multiple major sporting events, conventions, etc.), the itinerant apron space has exceeded capacity and Taxiway G has needed to be utilized for itinerant parking. While this analysis only accounts for corporate itinerant jets, as noted earlier, larger narrowbody jets frequently visit the airport to cater to special events. Based on this, it is recommended that additional itinerant apron space be considered by the end of the forecast period.

FBO Facilities Apron Storage Summary

According to the BKL activity data, and as previously discussed, itinerant GA operations accounted for approximately 65 percent of total GA operations at the airport. Many of these operations utilized itinerant parking aprons and tie-down areas, as well as hangar space in the GA area. Itinerant aprons are typically utilized for transient aircraft that are only visiting or remaining at the airport for a short period of time (i.e., a few hours to overnight).

Should an aircraft be at the airport for longer, tie-down parking is typically used to clear the itinerant apron for additional aircraft.

Given the transient nature of the small jets in the forecast period, it is important to note that most of these aircraft will likely utilize itinerant parking aprons, tie-down areas, and apron storage space, as opposed to hangar space. Aircraft aprons provide parking and tie-down positions for based and itinerant aircraft, as well as staging areas for aircraft stored in conventional hangars; however, hangar space is typically reserved for aircraft based at the FBO.

3.3 SUPPORT FACILITY REQUIREMENTS

A review of existing and future support facilities was necessary to identify additional facilities needed over the 20-year planning horizon.

3.3.1 Based Aircraft Storage Facilities

Hangar requirements are generally a function of the number and type of based aircraft, owner preferences, hangar rental costs, and area climate.

Currently, aircraft based at BKL use both the based aircraft apron and existing hangar storage space. Due to weather conditions, hangars are highly desirable in the Cleveland region as snowstorms, frost, ice, and intense wind can cause damage to parked aircraft. Additionally, during warmer months, heat and sun exposure can damage avionics and fade paint. Thunderstorms and hailstorms also occur, with the potential to cause considerable amounts of damage.

At BKL, available Airport property and future expansion space for the GA area is limited. Taxiway 'G' and Runway 6R-24L to the north and North Marginal Road to the south impede future growth. The CDF sites and Lake Erie on the northern side of the Airport property restrict any additional growth, without significant landfill. Based on the needs identified in this section, alternatives for additional hangar placement within Airport property is discussed in **Chapter 4**.

Aircraft Storage Requirements

Locally based operators at BKL provide the current hangar space. The hangar storage areas, which are leased to the various aircraft owners, consist of three bulk-hangars (i.e., corporate hangars). **Table 3-22** depicts each hangar at the airport, its approximate size, and the total amount of storage provided for based aircraft at BKL (excluding tie-down spaces); while **Table 3-23** identifies the breakdown of aircraft based at BKL.

Table 3-22 – Existing Aircraft Hangar Units

Hangar Type	Approximate Size (Sq. Ft.)
Bulk Hangar #1 (FBO Terminal)	18,000
Bulk Hangar #2	22,000
Bulk Hangar #3	14,000
Total	**54,000**

Source: Signature, CHA 2021.

Table 3-23 – BKL Based Aircraft (As of May 2021)

Aircraft Type	Aircraft Count
Piston	18
Turbine	0
Jet	11
Helicopter	6
Total	**35**

Source: Signature, BKL, CHA, 2021.

To develop a projection of required hangar space, assumptions were made based on average square feet of space required to store each type of aircraft and the forecasted fleet mix in the planning period, which were then compared to the projections made by the Airport's FBO. Similarly, to determining apron space requirements, the following assumptions were made based on aircraft size:

- Single/Multi-Engine Piston = 1,600 SF per aircraft
- Turboprop = 3,800 SF per aircraft
- Jet = 7,400 SF per aircraft

Table 3-24 provides anticipated hangar space requirements based on these assumptions.

Table 3-24– Hangar Space (Stalls) Requirements

Aircraft Type	Planning Period Recommended Number of Hangar Stalls				
	Base	PAL 1	PAL 2	PAL 3	PAL 4
Piston	18	18	17	17	16
Turbo-Prop	0	1	1	1	1
Jet	11	11	12	13	13
Total Hangar Stalls	**29**	**29**	**29**	**30**	**29**

Source: CHA, 2021.

Given the lack of single-stall hangars and the flexibility of parking configurations in box hangars, hangar-stall demand may not necessarily reflect the supply and demand of space at BKL. **Table 3-25** shows the current useable hangar space, based aircraft apron space, the future hangar space requirements, and the forecasted deficit of space by square footage. It is important to note that while not all based aircraft currently utilize hangar space, those based on the tiedown ramp are typically single-engine piston aircraft. These projections assume a desire of hangar availability for all based aircraft by the end of the planning period, particularly given weather conditions at BKL.

Table 3-25 – Based Aircraft Storage Space Requirements (Sq. Ft.)

Aircraft Type	Current Capacity	Planning Period Recommended Hangar Storage Space (SF)				
		Base	PAL 1	PAL 2	PAL 3	PAL 4
Piston	54,000 SF (Hangar) 244,000 SF (Apron)	28,800	29,074	29,350	29,628	29,908
Turbo-Prop		0	3,800	3,800	3,800	3,800
Jet		81,400	83,160	84,956	86,793	88,669
Total Hangar Space		**110,200**	**116,034**	**118,106**	**120,221**	**122,377**

Source: CHA, 2021.

Based on the forecasted growth of aircraft, hangar demand will increase significantly through the end of the planning period, and there is already a shortage in the baseline period.

While the development of T-hangars was a common theme during the flight school interviews, further expansion of corporate hangar space will be necessary for turbo-prop and jet-based aircraft storage. Additionally, the structural foundation requirements to construct hangars at BKL demand very deep footings as the airport is built on fill material. Given the amount of footings required for a T-hangar, when compared to a box or larger corporate hangar, this could make T-hangars cost prohibitive.

3.3.2 Aviation Fueling Facilities

Signature Flight Support is responsible for operating the Airport's fuel storage and dispensing facilities. As discussed in **Chapter 1**, fuel is stored in four tanks: three 20,000-gallon tanks for Jet-A, and one 12,000-gallon tank for Avgas. This gives a total capacity of 60,000 gallons for Jet-A, and 12,000 gallons for Avgas.

Based on 2020 and historic fuel consumption data provided by Signature, growth in fuel consumption was assumed for the 20-year forecast period by determining a ratio of the fuel consumed (2017-2019) to the commercial and GA operations in 2020.

The ratio was then applied to each projected year's operations to determine approximate fuel consumption, assuming the ratio remains static. The results were then split by the PMAD factors identified in **Chapter 2** to estimate an average daily usage of fuel throughout the forecast period. Finally, the daily usage was applied to the actual reserve availability at the Airport. After evaluating the Airport's fuel storage needs, it was determined that the Airport has sufficient fuel storage capacity. **Table 3-26** depicts the forecast of air carrier and GA operations at BKL, while **Table 3-27** and **Table 3-28** depict the anticipated fuel demand for Jet-A and Avgas, respectively.

Table 3-26 – Commercial and GA Operations

Year	Commercial	GA	Total Commercial and GA	Existing Total Fuel Capacity (Gallons)
2019	9,435	30,407	39,842	72,000
Base	7,283	24,333	31,616	
PAL 1	10,516	27,688	38,204	
PAL 2	10,793	28,097	38,890	
PAL 3	11,019	28,512	39,531	
PAL 4	11,203	28,933	40,136	

Source: Signature, BKL, CHA, 2021.

Table 3-27 – Jet-A Fueling Storage Requirements (Jet-A)

	Base	PAL 1	PAL 2	PAL 3	PAL 4
Total Airport Operations	31,979	38,570	39,256	39,897	40,502
Jet-A Operations	26,160	31,950	32,540	33,080	33,560
Jet-A PMAD Operations	180	210	220	220	220
Gallons per Jet-A Operation	48	48	48	48	48
Gallons per PMAD Jet-A Operation	**8,550**	**9,980**	**10,450**	**10,450**	**10,450**
Necessary 5-Day Fuel Reserve (Gallons)	**42,750**	**49,900**	**52,250**	**52,250**	**52,250**
Existing Capacity (Gallons)	**60,000**				

Source: CHA, 2021.

Table 3-28 –Fueling Storage Requirements (Avgas)

	Base	PAL 1	PAL 2	PAL 3	PAL 4
Total Airport Operations	31,979	38,570	39,256	39,897	40,502
AvGas Operations	5,820	6,622	6,720	6,820	6,941
AvGas PMAD Operations	39	48	48	49	50
Gallons per AvGas Operation	9	9	9	9	9
Gallons per PMAD AvGas Operation	**360**	**430**	**440**	**450**	**450**
Necessary 5-Day Fuel Reserve (Gallons)	**1,800**	**2,150**	**2,200**	**2,250**	**2,250**
Existing Capacity (Gallons)	**12,000**				

Source: CHA, 2021.

Based on this analysis, the Airport will not likely exceed its immediate demand for Avgas or Jet-A fuel during the planning period, while also being able to maintain a 5-day reserve.

3.3.3 Aircraft Deicing Facilities

Currently, deicing is handled on an as-needed basis, typically on the Terminal Apron. Deicing operations are handled by Signature, the FBO with their own truck. There is no designated deicing apron, though aircraft typically taxi 150-200 feet away from the terminal building, to maintain a sufficient distance. Given the Airport is currently operating below the typical thresholds (per the FBO and FAA AC *150/5300-14D Design of Aircraft Deicing Facilities*) for its own reclamation point, all used materials are collected and transported to CLE for disposal. The FBO has indicated that they would prefer a designated apron for deicing, as opposed to general space available on the terminal apron. Potential locations for a designated deicing apron will be discussed in the Alternatives chapter.

3.3.4 Aircraft Rescue and Firefighting Facilities (ARFF)

BKL currently has one ARFF facility, which is co-located with the maintenance facility, just west of the terminal. The combined ARFF/maintenance building is approximately 7,100 square feet.

This facility meets the existing building design requirements found in AC 150/5210-15A, *Aircraft Rescue and Firefighting (ARFF) Station Building Design*. The ARFF index (Index A) is expected to remain unchanged over the forecast period. The previous Master Plan recommended relocating the facility to the former Aviation High School site on the eastern edge of the airfield, in order to be more centralized to a proposed relocated Runway 6R-24L. As it is now likely that this new outboard runway may not be built within the planning period, the current ARFF location would remain adequate. However, alternative sites for the ARFF building should be investigated as the City has had interest in redeveloping that area for potential non-aeronautical use. This will be evaluated in the Alternatives chapter.

3.3.5 BKL Maintenance Facilities and Ground Support Equipment (GSE) Storage

The Airport's maintenance facilities are co-located with the ARFF facility, immediately west of the terminal is the Airport's maintenance and equipment storage facilities. This facility houses the Airport's snow removal equipment, maintenance, and utility vehicles. The Vehicle Storage building (closest to the terminal) is approximately 5,300 square feet. Based on discussions with tenants and the Airport, these facilities are currently adequately sized but may need to be expanded further along in the planning period, particularly given they were designed and constructed prior to the update of the most recent FAA guidance FAA AC 150/5220/18A, *Buildings for Storage and maintenance of Airport Snow and Ice Control Equipment and Materials*. As such, several changes were made in the AC associated with facility sizing, sleeping quarters, wash bays, etc., all of which the current facility is lacking; therefore, for the purposes of this study, it is recommended that the Airport consider expanding and/or relocating the SRE and BKL Maintenance Facility to accommodate design changes within the newest FAA guidance.

At BKL, the FBO owns and operates the ground service equipment (GSE), including aircraft tugs, cabin service vehicles, deicers, and waste disposal vehicles. This equipment is stored outside where space is available around the maintenance buildings and garage. An expanded storage shelter, to protect equipment from harsh weather conditions, would increase the service life of the equipment.

3.3.6 Air Traffic Control Tower Facilities

The Air Traffic Control Tower (ATCT) is located immediately east of the terminal building and is staffed as a contract tower. The ATCT is approximately 50-feet tall and is in operation from Monday at 7:00 AM through Saturday at 11:00 PM, and on Sunday from 8:00 AM-12:00 AM. Runway 6R-24L is closed when the tower is not operational. It is anticipated that the BKL ATCT will sufficiently serve the Airport throughout the forecast horizon.

3.4 CONFINED DISPOSAL FACILITIES

As discussed in the inventory section, the CDF operations for dredged materials from the shipping channel of the Cuyahoga River play a role in the facility requirements for BKL. In certain situations, the existing CDF operations impact some design standards for Runway 6L-24R, and future CDF operations could impact future development currently shown on the Future ALP. For these reasons, certain facility requirements for BKL are not generated by traditional items like development and capacity needs, but rather impacts from the CDF. Some of the impacts the CDF(s) have on BKL are broken out below by existing conditions and future conditions:

3.4.1 Existing

- Non-compatible land use within the RPZs: Although considered BKL property, approximately 46% of the approach RPZ of Runway 24R (or 22.3 acres) and 60% of the departure RPZ (or 17.8 acres) currently has non-compatible land uses within their boundaries. As part of the CDF operation, trucks use the airport vehicle service road (VSR) to access the in-bound dredge sediment staging area located within the southwest quadrant of CDF 12. Portions of this staging area are located within the approach and departure RPZs for Runway 6L-24R. To access the CDF, trucks travel through the RPZ, staging inside the RPZ for temporary loading, and exiting the CDF and the RPZ via the VSR. There are construction workers and vehicles inside the RPZ while the trucks are loaded.
- CDF Access: The truck traffic currently utilizes the VSR on the east side of the Airport, accessing the Airport Operations Area (AOA) through a controlled gate next to Aviation High School and traveling north to enter the CDF. The existing VSR is outside the existing Runway 6L-24R RSA and because of the 100’ reduction in declared runway length for a 6L operation, the vehicle service road is currently outside of the ROFA. The truck traffic utilizes an airport-controlled secure gate and an AIP-constructed service road (although the Port Authority has plans to improve that section of VSR).
- ASOS Impacts: The ASOS is owned by the FAA and maintained by National Weather Service (NWS). In 2012, the system was relocated out of the RSA, which was extended when the usable pavement behind the 24R threshold was extended as part of the 6L-24R RSA improvement project. At that time, there was no CDF 12 activity, nor was any planned. Since then, the activity has caused dust emissions from the truck traffic, and as the CDF berm is raised, it may cause future impacts on the ASOS and how it records and interprets current weather.

3.4.2 Future

As part of the 2017 Airport Master Plan Update, the City of Cleveland proposed to close existing Runway 6R-24L and construct a replacement runway to the north of the existing Runway 6L-24R (see **Figure 3-11**). The 2017 concept maintained the parallel runway layout but provided increased separation between the runways. The relocation of the existing Runway 6R-24L also resolved the non-standard separation between Taxiway ‘G’ and the existing inboard runway, as well as providing additional development areas on the south side of the airport. However, the U.S. Army Corp of Engineers has been analyzing alternatives as part of their 20-year dredge plan. Part of that ultimate plan is to continue using the Port Authority’s CDF 12, as well as their own operated CDF 10B to store dredged material. The proposed elevations at the end of the 20-year plan will be more than 20 feet higher than the existing elevations, which impact the proposed runway north of Runway 6L-24R currently on the approved 2017 ALP. Since that proposed runway is currently shown on the approved ALP, the FAA is protecting airspace for that runway. As part of the alternative’s analysis, this proposed runway should be reoriented or removed from the ALP based on the 20-year dredge plan and on-going CDF operations.

3.5 SUMMARY

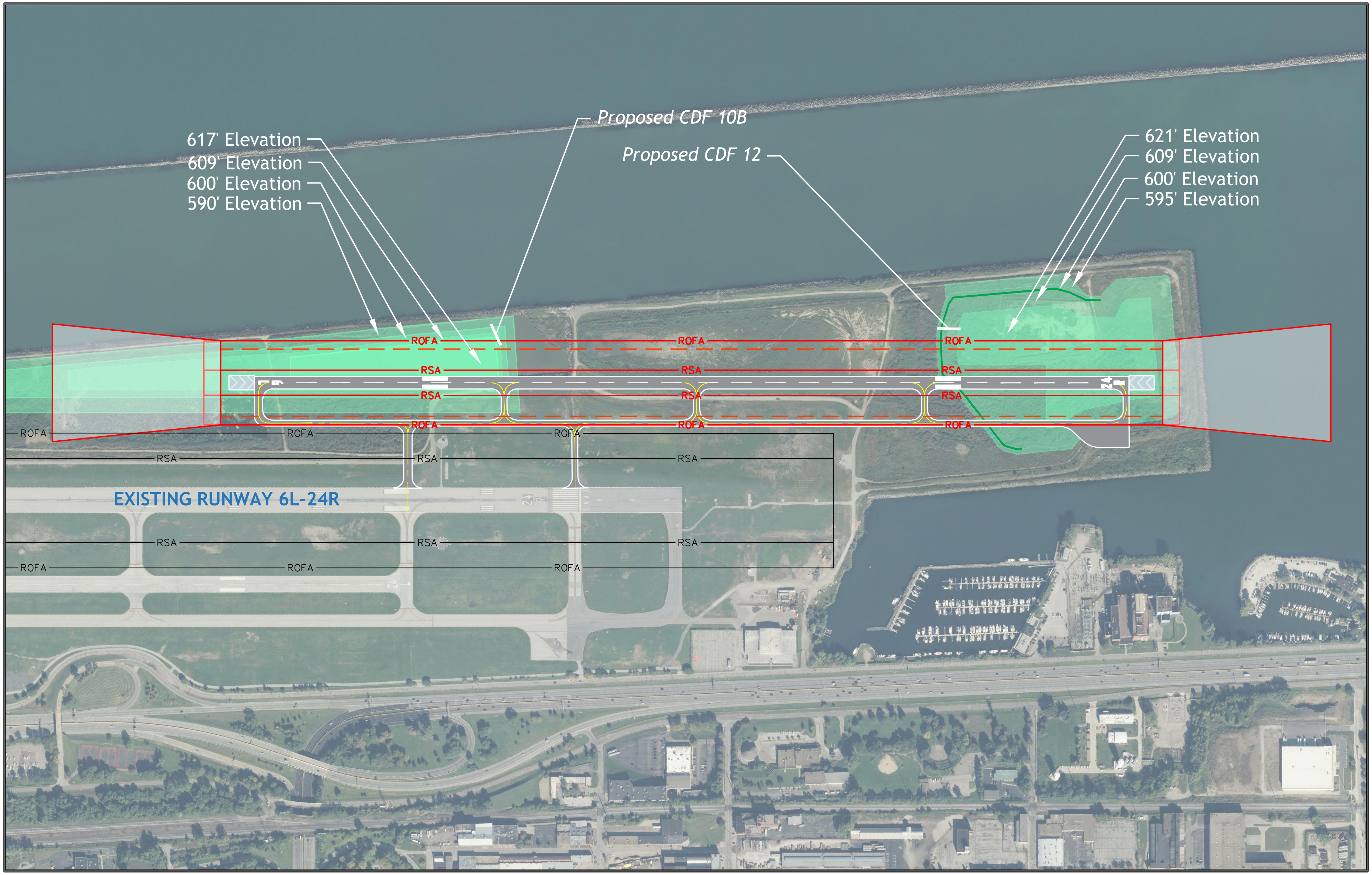
This chapter identifies safety and development needs for BKL based on fleet mix changes, as well as on-going and proposed CDF operations. These recommendations provide the basis for formulating alternatives to address recommended improvements. The following is a summary of the facility recommendations:

3.5.1 Airfield

- Consider removing proposed outboard runway from Future ALP
- Reclassify, if operations warrant, Runway 6L-24R from RDC D-II to D-III in the planning period
- Address lateral RSA for Runway 6L-24R
- Construct standard ROFA for Runway 6L-24R
- Consider paved shoulders for Runway 6L-24R
- Consider paved taxiway shoulders
- Address RSA beyond Runway 6R
- Consider standard blast pads for Runway 24R, 24L, and 6R
- Explore regaining 100’ of runway length for Runway 6L operation
- Correct non-standard separation between Runway 6R-24L and Taxiway ‘G’ to meet ADG Group II separation standards
- Correct non-standard direct access from apron to Runway 6R-24L
- Correct nonstandard fillet geometry on Taxiways C, D, E, F, and H
- Consider relocating the existing ASOS
- Prioritize and address airfield pavements via rehabilitation/reconstruction

3.5.2 General Aviation/Support Facilities

- Expand box hangar/corporate hangar space where available
- Consider developing additional T-hangar space
- Establish designated deicing space on Terminal Apron
- Consider expanding covered storage area for maintenance/snow removal equipment
- Consider reevaluating siting of new ARFF facility



BKL

BURKE LAKEFRONT AIRPORT

Figure 3-11

2017 ALP Proposed Runway