

MASTER PLAN: 1. Existing Conditions

This summary provides background data on the Louisville Muhammad Ali International Airport (the Airport) and existing airport facilities and conditions. This information on the Airport's existing conditions will guide the Master Plan in determining future facility requirements and the formulation of airport development alternatives. The Airport is owned and operated by the Louisville Regional Airport Authority. Located within the city limits of Louisville in Jefferson County, the Airport serves the town of Louisville and the surrounding Kentuckiana region, with passenger air carriers, including: Allegiant Air, American Airlines and American Eagle; Delta Air Lines and Delta Connection; Frontier Airlines; Southwest Airlines; United Airlines and United Express. In addition to commercial flights, the Airport is also the nation's 2nd busiest in terms of air cargo tonnage, and serves as home to United Parcel Service's (UPS) Worldport, which is the worldwide hub for UPS.



Courtesy LRAA



Airport Facilities



Airfield

The airfield occupies about 75% of the total Airport land area and includes three runways (two north-south parallel runways and one east-west cross-wind runway), associated taxiways, aprons, hold pads, and other safety-related protection zones.



Passenger Terminal Complex

The passenger terminal complex includes a concourse accommodating 23 aircraft gates; passenger processing facilities that accommodate ticketing, baggage claim, and security screening functions; ground transportation facilities including access roadways, parking garages, and surface parking lots.



UPS Worldport

UPS Worldport is the largest automated package handling facility in the world, and the center point of UPS's worldwide air network. The sort facility encompasses 5.2 million-square-feet and occupies the majority of the area between Runways 17L-35R and 17R-35L south of Runway 11-29.



Air Cargo

The air cargo area includes facilities for belly freight, the United States Postal Service, and other cargo operations by airlines.



General Aviation

One fixed base operator, Atlantic Aviation, is located on the east side of the Airport and provides a range of services for general aviation users, including fueling and maintenance.



Military

The Kentucky Air National Guard 123rd Airlift Wing is located on the east side of the Airport.



Support Facilities

Primary support facilities are located throughout the site and include: airline maintenance facilities, a fuel farm located at the Atlantic Aviation facility (east of the airfield), FAA Airport traffic control facilities, employee parking, Aircraft Rescue and Firefighting (ARFF), and airfield maintenance facilities.



LEGEND

- | | | | | | |
|--------------------------------------|--|-----------------------------------|--------------------------------|---|------------------------------------|
| 1 Airport Terminal | 10 Cell Phone Lot | 19 Compass Airlines (Maintenance) | 28 Fuel Farm | 37 Airport Traffic Control Tower | 46 Reserved for Future Development |
| 2 Parking Garage | 11 Authority Administration Offices | 20 FedEx | 29 Privately-Owned Hangars | 38 Aircraft Rescue and Fire Fighting Facility | 47 Airport Property Line |
| 3 Rental Car Center | 12 Authority Maintenance and Support Offices | 21 Air Cargo Facilities | 30 Kentucky Air National Guard | 39 Authority Storage | |
| 4 U.S. Customs and Border Protection | 13 Republic Airways (Maintenance) | 22 Atlantic Aviation | 31 UPS Worldport | 40 Electrical Vault | |

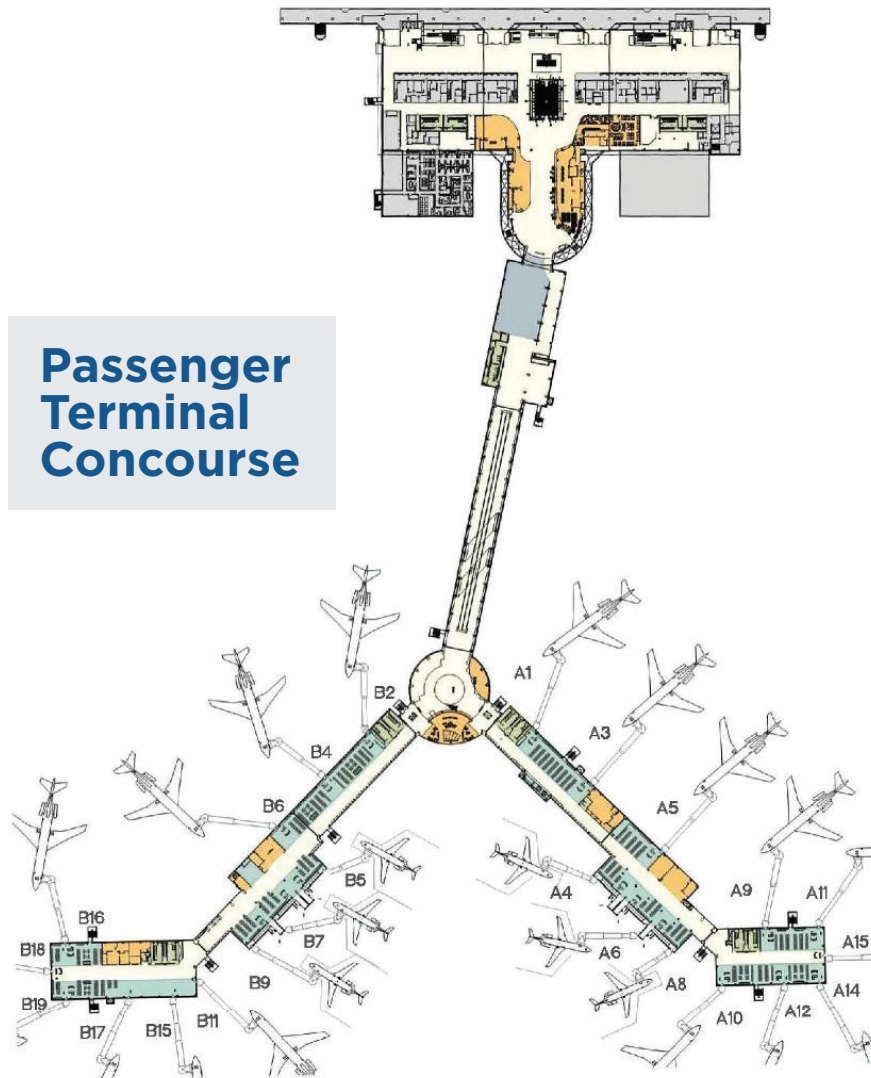
Military



The Kentucky Air National Guard 123rd Airlift Wing operates at the Airport. The Air National Guard is a separate component of the United States Air Force. The KyANG base occupies approximately 82 acres of the Airport site and is located east of the airfield, adjacent to Runway 17L-35R. The current base was constructed in 1995 and is located on the eastern side of the Airport adjacent to I-65 and Grade Lane. Base facilities include a 696,000-square-foot apron that can be accessed via Taxiways E and G for the parking of 10 C-130 aircraft, a maintenance hangar, Aircraft Rescue and Firefighting facility, motor pools, and other support buildings used for functions such as engineering and administration. The Air National Guard's mission is to support combat-ready airlift, air logistics expertise, contingency response, special operations, civil engineering, medical support, medical operations, explosive ordnance disposal and base operating support to meet United States' national security objectives; and to provide public protection, mitigation, response and recovery during state and national crises.

Passenger Terminal Building

The Airport passenger terminal building is comprised of a single two-level terminal which connects to Concourses A and B oriented in a “Y” shape and located on the north side of the Airport. The total area within the terminal building is approximately 417,000 square-feet. As this Master Plan was being developed, plans were being drawn to modernize the terminal’s facilities and enhance its appearance.



Strengths to Build Upon

When the airport succeeds, it does more than transport passengers and cargo safely where they need to go—it supports the thriving regional economy:

- Growth at the Airports translates into additional jobs, payroll, business expenditures and construction projects, as well as generates additional local and state tax revenues for the region.
- The Airport fuels the economy by helping retain and attract business, conventions and tourists.
- The Airport provides access to world markets overnight and connects passengers and aircargo to world destinations quickly.
- In 2018, Louisville's Airports generated recurring economic impacts of: 83,000 jobs (nearly 1 in 8 jobs in the Louisville Metro area comes from Airport operations), \$10.4 billion in final demand output from operations, and \$454.1 million contributed to state and local taxes (nearly \$1 in every \$7 in Louisville Metro tax revenue comes from Airport operations).
- UPS Worldport employs more than 25,000 people and has attracted more than 300 businesses that rely on quick delivery services.

Weaknesses to Hone

In order to strengthen the Airport, the Master Plan must focus in on what needs improving:

- **Passenger Airlines:** Airfares at the Airport are higher than other competing cities. It is important to make sure that there is strong competition among airlines, which the Airport has been working on steadily. Ultimately, more routes and better competition should result in lower fares. It is also important to maintain a lean cost structure for the airlines to operate at the Airport. The Airport currently has a lean cost structure, which makes it attractive to airlines; and the Master Plan focuses on maintaining that.

Opportunities to Grow Business

The Master Plan creates opportunity to make changes and open new doors for the Airport moving forward:

- **Air Service:** Three airline business models emerged following past industry crises: network airlines, national airlines, and ultra-low-cost carriers (ULCC). The Authority has opportunities to attract additional air service from each airline type, but any efforts must address different business models to be successful. Relatively high airfares at Louisville have led to recent significant growth primarily from the ULCC segment with 11 new destinations added over the last two years.

Threats to Plan For

The Master Plan enables the Airport to plan for potential future circumstances that may arise:

- **External Events:** Unforeseen external events may trigger impacts to aviation activity. These events include terrorism, regional conflicts, economic bubbles, and pandemics.

MASTER PLAN: 2. Aviation Forecasts

Forecasting aviation activity is an essential step in the Master Planning process. The projection of future activity levels (passenger volumes, aircraft operations, based aircraft) provides the basis for determining the adequacy or inadequacy of airport facilities in meeting current and future demand. Forecasts of aviation demand provide the basis for outlining existing and future airfield capacity and facility requirements, funding needs, and the timing of when improvements need to be online and operational. This summary provides information on the LRAA's views on future demand. Forecasts for cargo, passenger enplanements, and aircraft operations are discussed in the figures presented below

Cargo Industry Trends

According to the FAA, the Airport was the second highest ranked airport in the U.S. for total pounds of cargo throughput in 2019, behind only Memphis International Airport. In 2019, nearly 6.2 billion pounds of freight and cargo were processed at the Airport. UPS is the largest employer in the Louisville Metropolitan Area and the majority of its workforce is employed at the Airport. UPS regularly utilizes subcontracted cargo carriers to assist with delivery, particularly during seasonal peak periods. FedEx and other air cargo carriers also maintain a significant presence at the Airport.

Historical fluctuations in cargo volume processed at the Airport directly corresponded with fluctuations in U.S. gross domestic product (GDP) in a given time frame.

It is anticipated that domestic cargo volume processed in the U.S. and the Airport will continue to be directly tied to U.S. and world economic conditions, and that cargo operators will adjust their fleets, workforce, and processing facility needs to directly respond to demand in real time. Overall, cargo volume at the Airport is projected to increase 2.3% annually.

Passenger Enplanement Forecasts

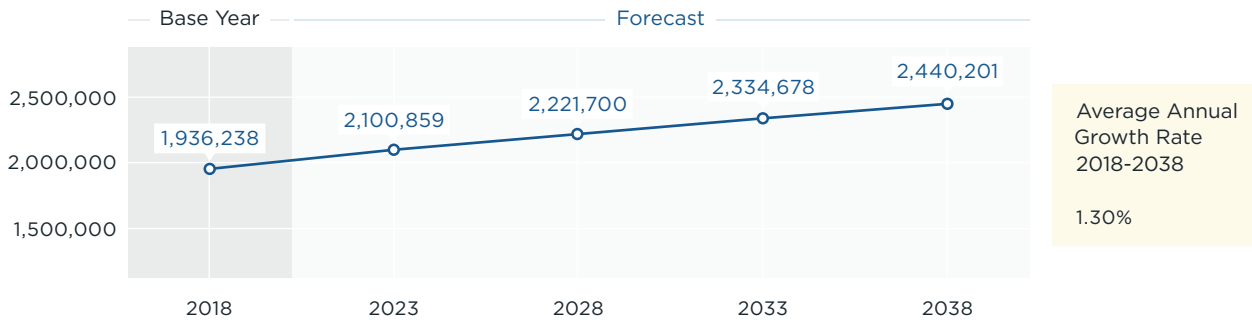
Forecasts of passenger enplanements are used as inputs to determine terminal needs and other important infrastructure elements such as vehicle parking facilities and access/circulation networks. In conjunction with assumptions regarding passenger load factor and aircraft seat capacity, forecast enplanement volumes are also utilized to identify commercial operations, which drive facilities such as passenger boarding gates, apron and holding areas, and others.

The following graphs present summaries of operations by type and passenger activity for the Baseline forecasts developed in this working paper. As shown, total operations are projected to increase from 169,699 to 199,267 between 2018 and 2038 for the Baseline Forecast.

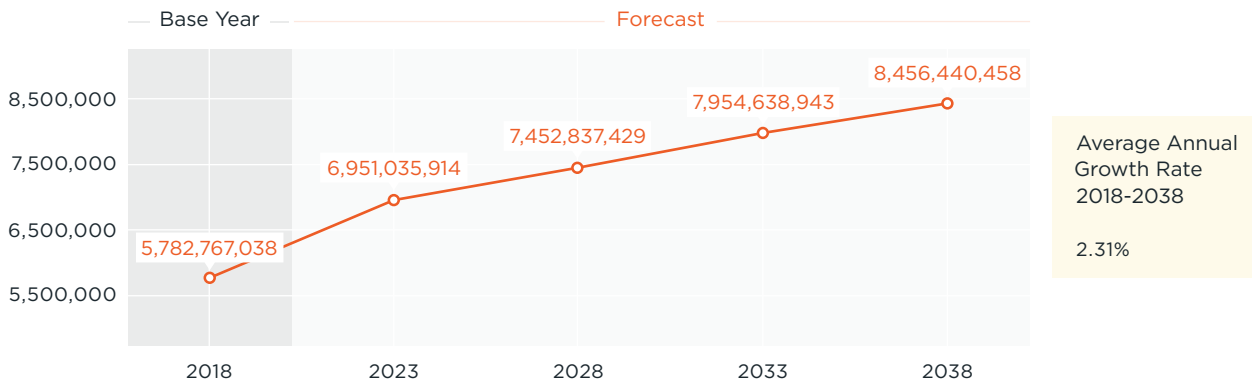
A Note on COVID-19

Aviation forecasts were prepared prior to the COVID-19 pandemic and do not reflect the downturn in traffic that occurred in 2020. For planning purposes, it is assumed that the long-term forecasts continue to provide a solid basis for long-term planning, notwithstanding the potential occurrence of external events which may cause temporary decreases in aviation activity.

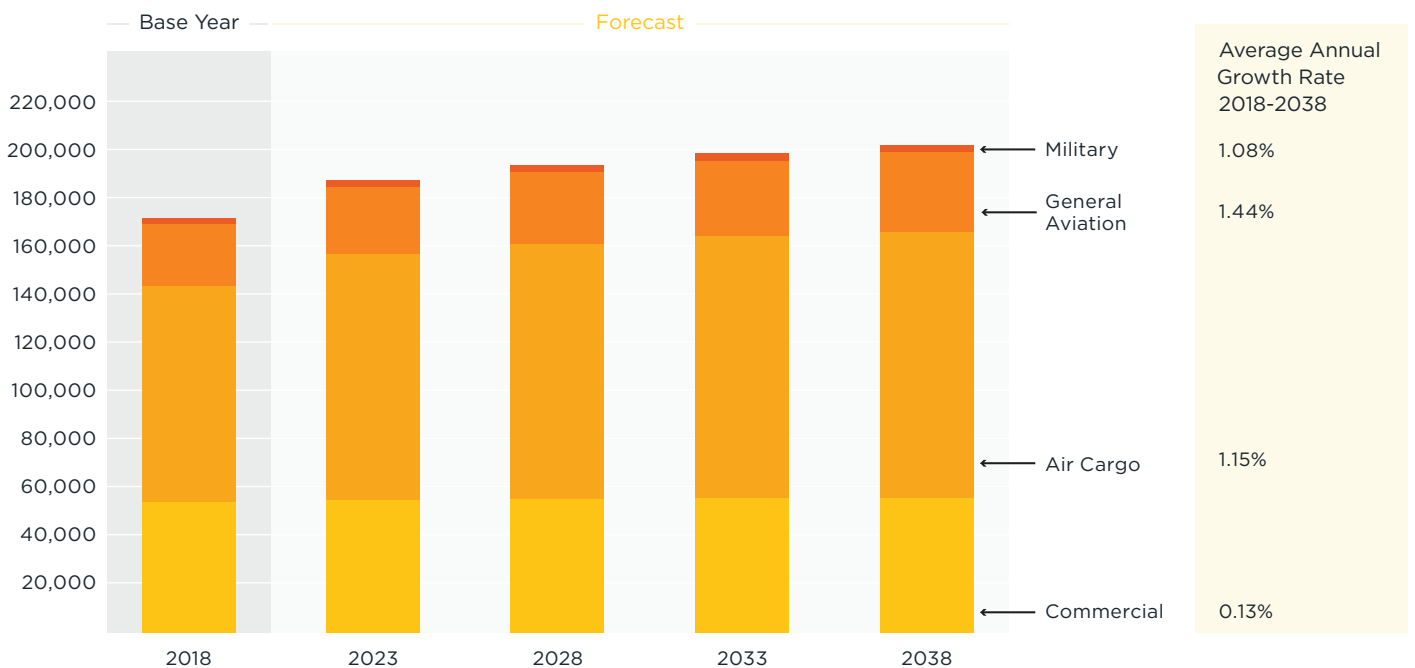
Passenger Enplanements



Cargo Volume (lbs.)



Aircraft Operations



MASTER PLAN: **3. Facility Requirements**

This summary provides information on the facilities of the Louisville Muhammad Ali International Airport that are required to accommodate aviation demand throughout the 20-year forecast period.

Within the context of a master plan, each airport facility (such as the passenger terminal, the runways, the taxiways, etc.) is analyzed using methods developed by the Federal Aviation Administration and other sources such as the Transportation Research Board. Professional judgment and experience are also relied upon to arrive at conclusions about what is needed for the Airport to function efficiently and anticipate future demand and trends.

For example, the capacity of the runways to accommodate landings and takeoffs is compared to the existing and projected demand levels to inform whether a new runway is needed (we concluded that the number of runways at the Airport is fine and they do not need to plan for any more). The taxiway system was analyzed to determine if it caused any delays. The planning team observed that there were in fact delays happening, causing flights to be late departing. The Master Plan also looked at the geometry of the taxiways to make sure they were designed according to the latest safety standards.

In the passenger terminal building, the Master Plan included an analysis of each of the interior spaces to determine whether they were too small or too big to accommodate existing and projected demand. Areas such as the security screening checkpoint were analyzed carefully and we determined that it should be expanded so travelers wouldn't have to wait too long to get through to the concourses. Other facilities such as public parking were analyzed to make sure there would be enough spaces for the traveling public.

Summary of Requirements

A summary of Airport facility requirements organized according to functional areas is provided in the table below. As shown, many Airport facilities provide sufficient capacity to accommodate demand forecast throughout the planning period. However, a number of facilities will need to be modified or expanded to accommodate future activity and/or improve Airport operational capabilities or levels of service.

		Estimated Requirement			
Facility	Existing	2023	2028	2033	2038
Airfield					
Design Aircraft	747-400ER	747-800F	747-800F	747-800F	747-800F
Primary departure Runway length	11,890	11,890	11,890	11,890	11,890
Instrument approach capability					
Calm wind runways	CAT IIIc	CAT IIIc	CAT IIIc	CAT IIIc	CAT IIIc
Other runways	CAT I	CAT I	CAT I	CAT I	CAT I
Passenger Terminal					
Public Space	190,733	184,000	186,700	193,000	193,400
Airline Space	86,822	60,600	61,200	62,000	62,200
Concession Space	37,792	40,800	46,900	49,000	51,100
FIS	-	21,700	21,700	27,800	27,800
Non-Public Space	98,725	94,000	95,900	98,800	98,400
Ground Transportation					
Parking					
Public Parking (stalls)	5,600	6,460	6,840	7,190	7,520
Employee Parking (stalls)	460	510	540	560	580
Rental Car Ready/Return (stalls)	720	720	770	810	850
QTA Vehicle Storage (stalls)	500	500	530	560	590
Air Cargo					
Cargo building space (0.6 SF/ton)	35,300	35,490	35,570	35,650	35,740
Aircraft parking apron (SF)	300,000	53,740	53,830	71,870	71,960
General Aviation (Based Aircraft)					
Apron area (SF)	224,000	249,500	249,500	266,500	276,500
Hangar space (SF)	121,500	147,000	157,000	164,000	174,000
Airline and Airport Support					
Aircraft rescue and firefighting	E	E	E	E	E
Glycol (Type 1) storage (gal)	6,000	4,639	5,125	5,610	6,099
Jet-A fuel tank demand	6	7	7	8	9

MASTER PLAN:

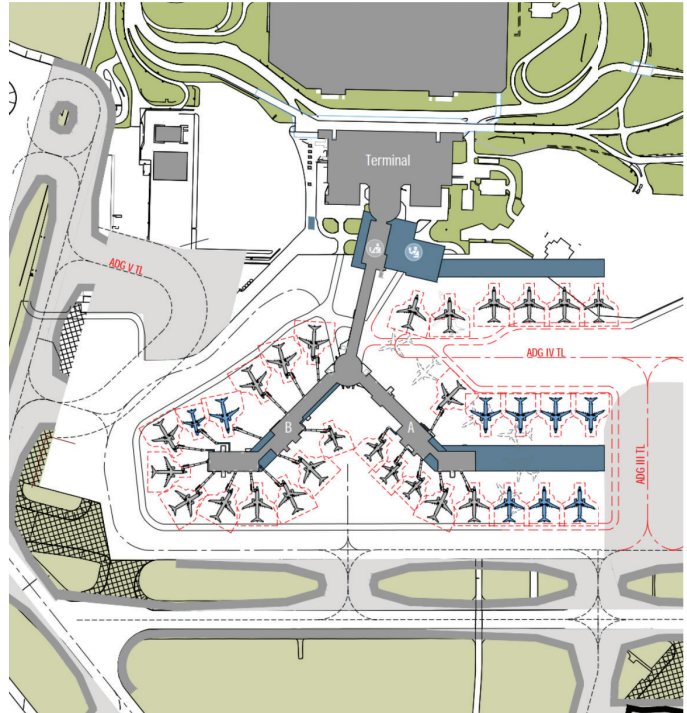
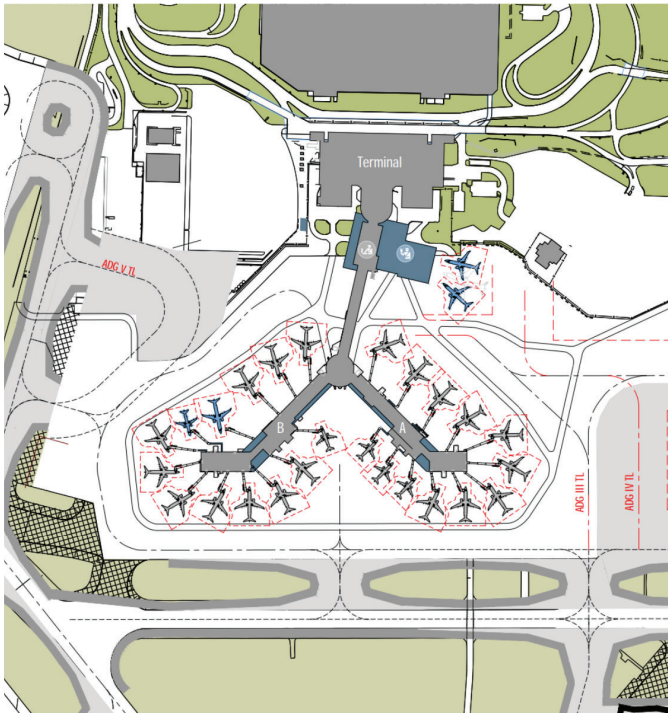
4. Alternatives Development and Analysis

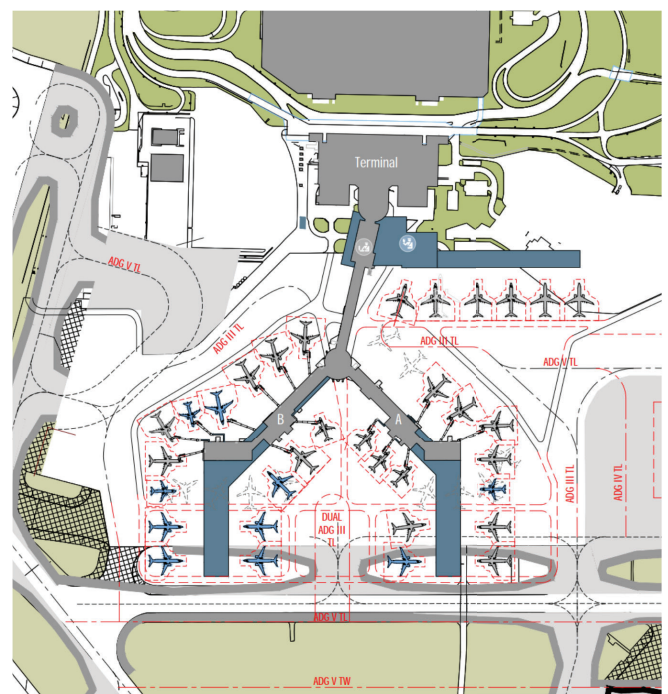
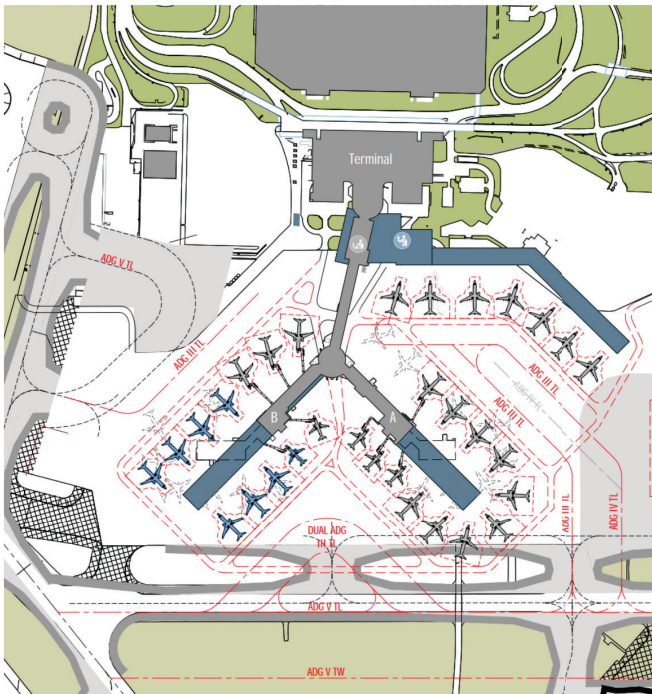
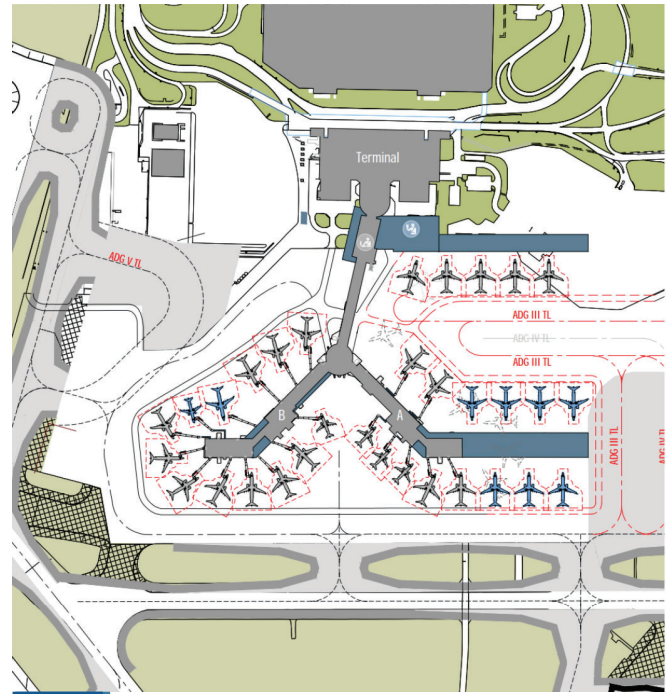
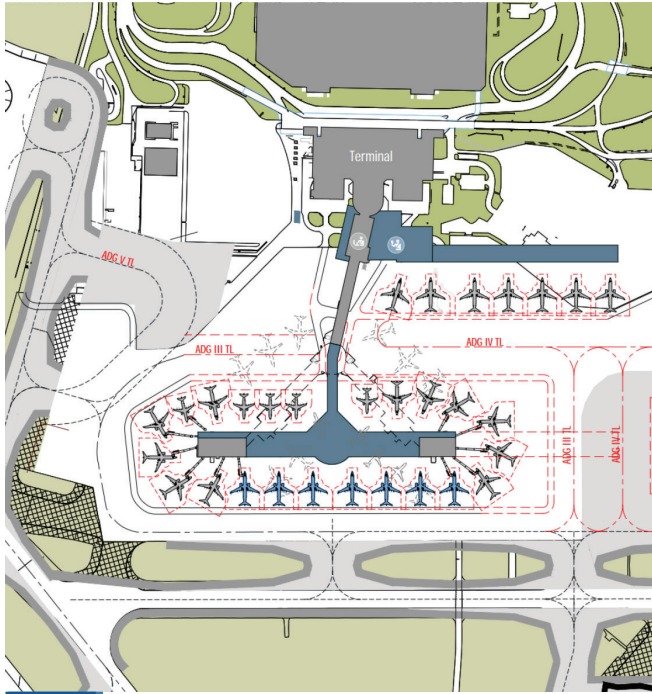
Alternatives are intended to accommodate aviation demand forecasts and facility needs of the Louisville Muhammad Ali International Airport (the Airport) over the 20-year planning horizon. Alternatives are developed for the Airport's major functional areas, including airfield, passenger terminal, landside access and parking facilities, and support functions. Some alternatives require multiple variations and careful analysis of the pros and cons while others may only require a single, logical solution. This summary provides an overview of the process used to develop alternatives for this Master Plan.

Passenger Terminal

The facility requirements analysis demonstrates the need to enhance certain elements of the terminal, including the modernization of the security screening checkpoint and the addition of a Federal Inspection Services (FIS) facility. A small number of additional gates are needed to serve demand throughout the 20-year planning horizon. Additionally, alternatives for the design and construction of an enhanced security screening checkpoint and FIS facility (including international arrival gates and expanded concourses) were evaluated for long-term planning purposes.

Long-Term Terminal Alternatives





Alternative 4 was selected as the preferred alternative. The orientation and location of the FIS function would allow for a new concourse and dual taxilanes for aircraft. This alternative would foster the efficient use of space and would not adversely impact airfield operations.

Airfield

The airfield alternatives for this Master Plan were informed by two primary components: 1) addressing safety and mitigating non-standard conditions; and 2) enhancing capacity and reducing aircraft delay. Forecasts show that no major capacity projects are required at the Airport over the next 20 years.

Several airfield alternatives are included in the recommended development plan to enhance safety and comply with FAA standards. Extensions to Taxiway C and D are recommended to allow for additional ground movement options and ultimately reduce aircraft delays. Enhancements to Taxiway L are also recommended to reduce airline congestion in the terminal apron/gate area.

An extension to Runway 17L-35R was also evaluated to provide a more balanced airfield. The recommended alternative will reclaim approximately 700 feet of pavement that was previously part of the runway. An example of a situation where alternatives were evaluated to solve a problem is near the end of Runway 35R. The Master Plan studies several ways to relief congestion and allow better flow of aircraft. One of those alternatives is shown below.



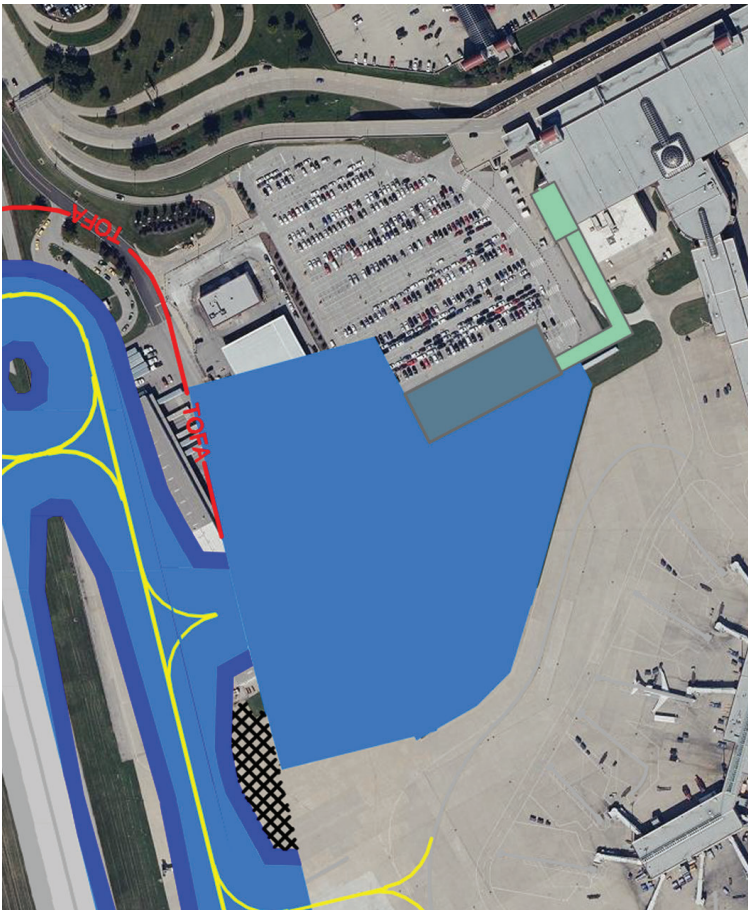
Taxiway D Connector Alternative

This shows one of the ways to relieve congestion on the airfield in the vicinity of Runway 35R.

Airport Access and Belly Cargo

Roadway simplification will be beneficial for passengers and commercial vehicles that utilize the terminal entrance road. Currently, delivery and construction vehicles traverse the terminal entrance road on the upper level, which represents an unnecessary mingling with public vehicles and places a heavy toll on the second level roadway structure, ultimately reducing its useful life. Various alternatives were developed to re-route the commercial vehicles, and the recommended alternative proposes a new loading and receiving dock on the west side of the terminal building to separate delivery and construction traffic from the public.

The area west of the terminal building became a focus area for the alternatives analysis. As alternatives were being developed separately (such as the need to find a new location for the belly cargo building, which is necessary for the extension of Taxiway C) consolidated alternatives were developed to provide solutions to multiple problems. A consolidated ground transportation center west of the passenger terminal, which includes the relocated belly cargo facility and a new security access gate, would enable greater operational efficiencies and allow the facilities to be relocated from their existing locations in advance of future development. An alternative was developed, shown below, that includes the new belly cargo facility at an east-west orientation, a consolidated receiving facility for the terminal.

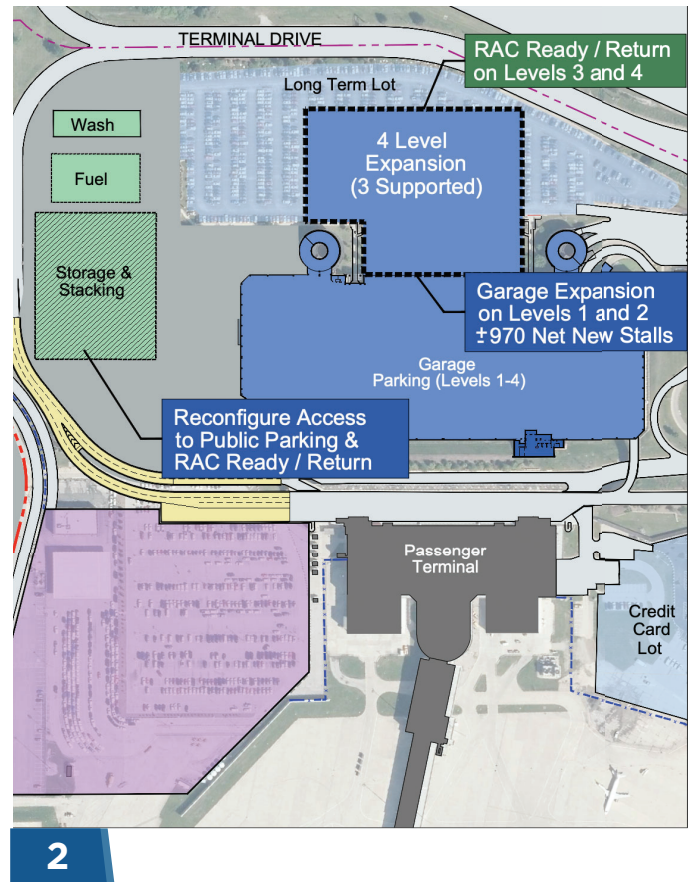
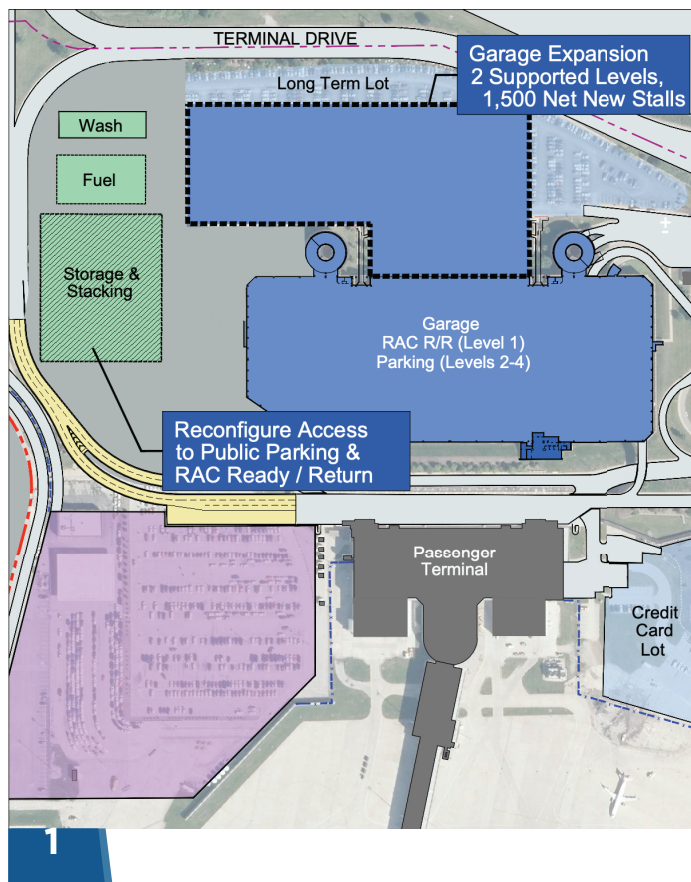


**Terminal West Side
Cargo and Loading Deck**

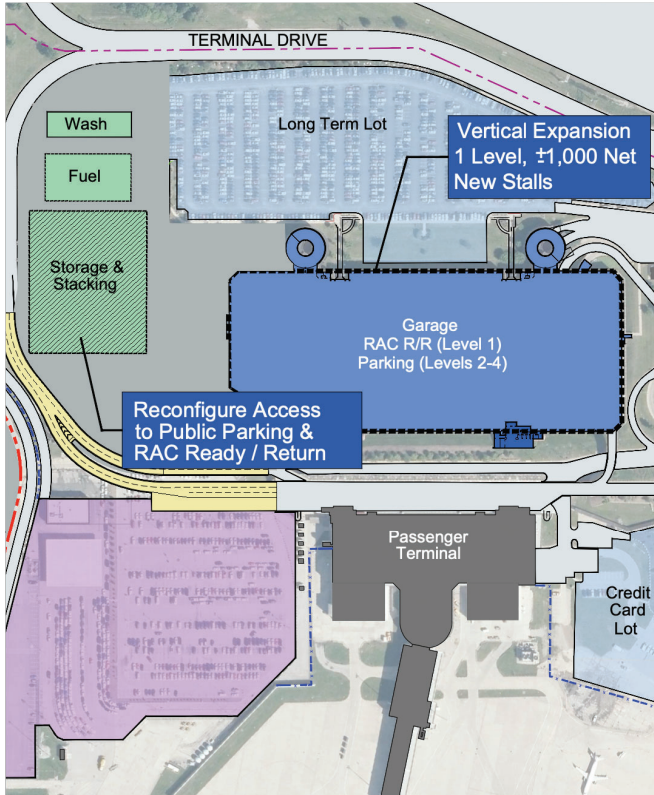
Auto Parking

Multiple alternatives were analyzed to increase space for public parking and rental car facilities. Some alternatives provide the parking at grade while others include a multi-level structure. Since there is the potential for major changes in consumer behavior related to use of cars, taxis, and services such as Uber and Lyft, many of these alternatives will remain available for the Airport to pursue. Below are a few of the alternatives that were explored and that remain options for the Airport Authority.

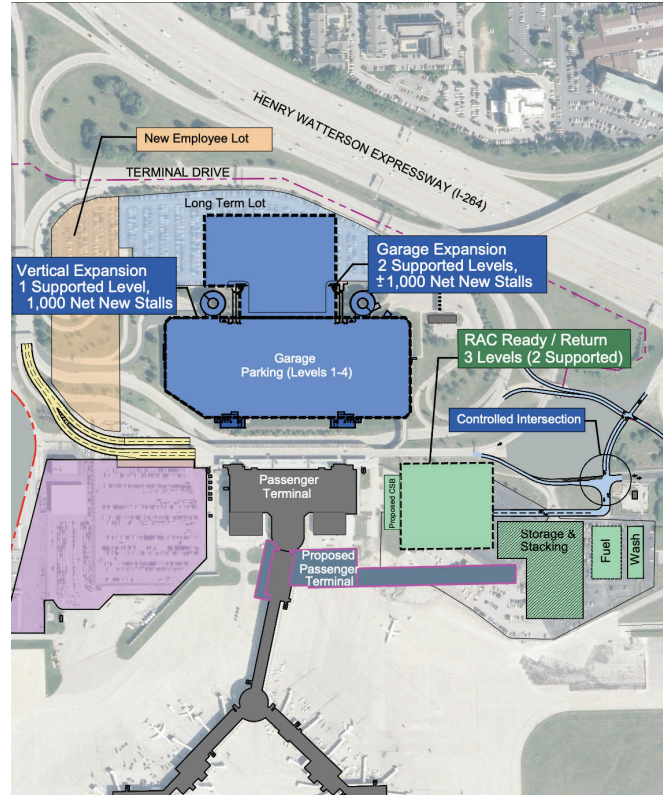
Auto Parking Alternatives



Auto Parking Alternatives Continued



3



4

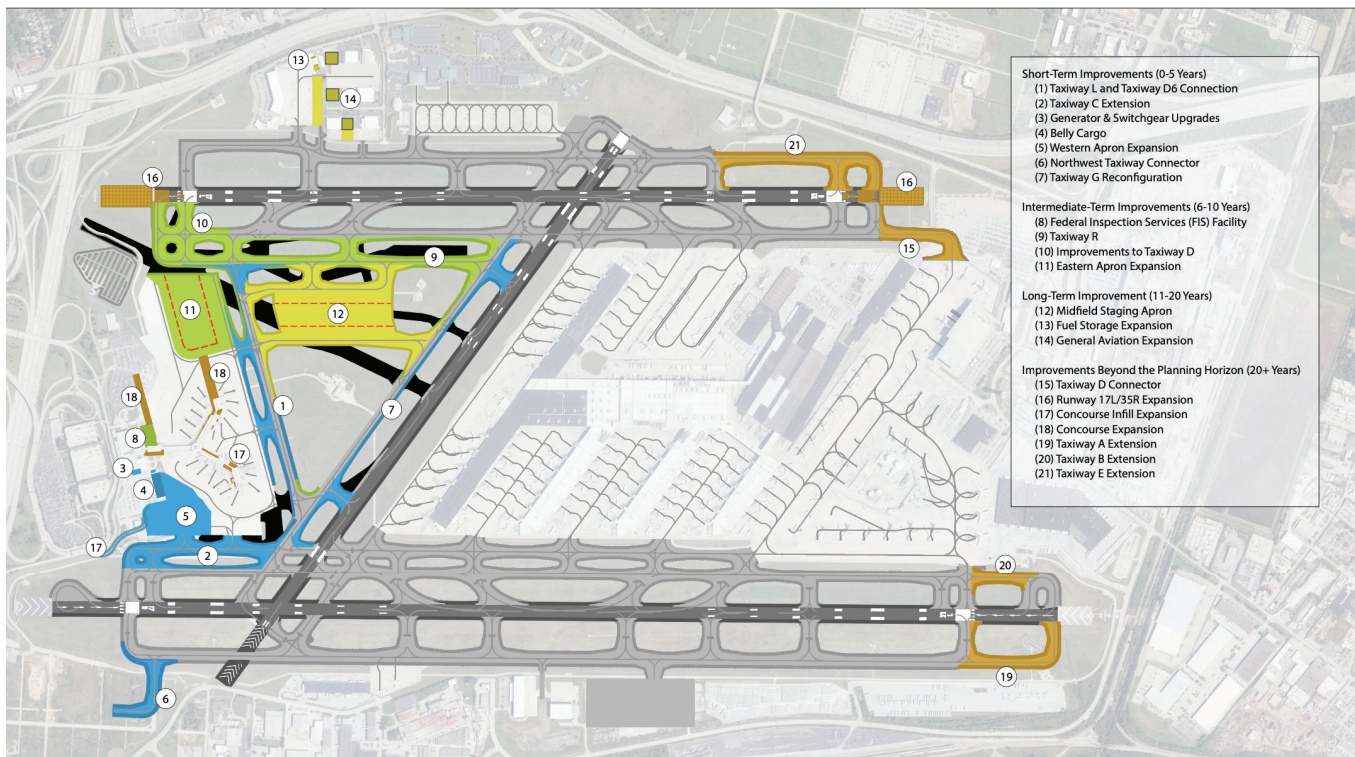
MASTER PLAN: 5. Recommended Development Plan

The Recommended Development Plan represents the culmination of the Master Planning process, and is accompanied by the Airport Layout Plan, which is the official representation of existing and proposed facilities at the Airport. Many of the projects can be characterized as very specific recommended improvements. For some future projects, such as those related to auto parking, this Master Plan does not include a recommendation for a single recommended facility. This is due to the fact that people's behavior is evolving when it comes to vehicle transportation and parking and it could change in profound ways. For this reason, multiple options for auto parking improvements remain in the plan and will need to be revisited in a few years.

This plan was crafted based on an understanding of the improvements needed at the Airport and also what is affordable for the Airport Authority.

Recommended Projects

The figure below highlights the projects recommended as part of the Master Plan. They are color-coded to show short-, intermediate-, and long-term projects over a 20-year period. It also shows projects which may be implemented more than 20 years into the future. These recommended projects serve to modernize the Airport in multiple ways.



Airfield

- Adhering to FAA safety and standards is a top priority for the Airport. Many of the airfield improvements—including taxiway reconstructions—will incorporate the latest FAA standards.
- Certain areas within the airfield experience bottle neck delays during peak periods of activity. One of those areas is located in the northwest section of the airfield, near the end of Runway 17R. Taxiway Charlie is proposed to be extended in this area to the full length of the runway it serves, to allow for additional bypass capability that has been shown through simulation will significantly reduce delays.
- Compliance with current FAA design standards, in relation to airfield geometry and safety, is another high priority for the Airport. Future taxiway constructions and/or reconstructions will be designed to comply with standards.
- Additional ground flow capacity surrounding the passenger terminal is needed to help manage flow near the terminal apron. The proposed taxiway enhancements will include extra connectors to help manage the flow in this area.

Passenger Terminal

- Plans for the Airport terminal include modernizing the terminal from both a functional and aesthetic perspective. This is a long-term process that will include replacing large components, such as elevators and escalators.
- The terminal plans also call for creating a completely new and different look for the airport--enhancing the passenger experience and creating a true Louisville sense of place.
- In order to better accommodate peak passenger periods, the security screening checkpoint will be expanded. This will result in lower wait times and will help the Airport prepare for future security technology.
- Building a Federal Inspection Station for international flights is also part of the terminal modernization plan.

Financial Feasibility

The estimated cost of the Capital Improvement Plan (CIP) over the 20-year period is approximately \$659 million in 2020 dollars. The Master Plan included an effort to model the Airport Authority's revenues and expenses, including the CIP, to determine what was affordable. This was an iterative process that considered overall affordability, along with project priorities. Due to the impacts of the COVID-19 virus and the resulting reduction in revenue for the Airport Authority in the near-term, the CIP was further refined.

The CIP will be paid for by leveraging a variety of funding sources, which are described below. No local tax monies will be used to fund the improvements.

Federal Funding Sources

This program provides grants for eligible infrastructure projects like runways and taxiways, covering up to 90% of the cost of those projects. A portion of these monies, called entitlements, are determined based on the number of passengers using the Airport. Discretionary grants come from a separate pool of funds, which an airport must compete for.

From 2021 to 2027, the Airport is projected to receive over \$182 million in AIP grants.

Passenger Facility Charges (PFC)

A \$4.50 charge is added to every airline ticket for passengers boarding an airplane. These revenues go to the airport to use for infrastructure projects, such as the terminal.

From 2021 to 2027, PFCs are projected to generate over \$41 million.

Customer Contract Fee (CCF)

Rental car companies charge a small amount per rental car transaction to cover the costs of on-airport rental car facilities, including future development. These revenues go towards building and maintaining infrastructure for rental cars.

From 2021 to 2027, this is expected to provide over \$54 million.

Airport Authority Funds

The Airport generates revenue from many sources, including landing fees, automobile parking, rental car fees, and terminal concessions, such as restaurants and retail.

From 2021 to 2017, the Airport Authority will invest significant amounts of its own money, generated at the Airport, to help fund the CIP.

General Aviation Revenue Bonds

It is expected that the Airport Authority will issue bonds at certain times to raise money for certain capital projects. Those bonds will be repaid using Airport Authority revenues.

From 2021 to 2027, this source of funding is expected to provide \$177 million.

MASTER PLAN:

6. Sustainability and Environment

Sustainability is a core value for the Louisville Regional Airport Authority. Environmental considerations—from where and what to build, to how to operate facilities—are key components of the Airport’s decision-making process. The Airport aims to be one of the most energy-efficient in the entire region by supporting ongoing sustainability initiatives, continuing to find ways to reduce environmental impacts, and building future sustainability initiatives into the Master Plan.

The following are current and future goals that will support the Airport in focusing on sustainability and environmental factors as key priorities:

Current Environmental Goals

Overall Energy Savings

- Geothermal heating and cooling will soon be installed inside the terminal.
- The installation of LED lighting inside the terminal, airfield, and everywhere else that lighting is found will reduce energy consumption throughout the Airport.

Terminal Sustainability Improvements

- Terminal lighting automatically dims when daylight is bright.
- Energy use is optimized by automatically adjusting indoor temperature, based on the number of people inside and typical busy periods throughout the day.
- An efficient cooling system with environmentally sensitive materials is in use.

Ground Service Equipment Modernization

- Two electric airfield vehicles have been purchased and electric charging infrastructure has been set up, both of which can be expanded further.

Recycling Programs

- Extensive programs reclaim ground-up airfield materials, like concrete, for reuse in new taxiways, while programs inside the terminal recycle passenger paper, bottles, and cans.

Consideration of Air Quality and Water Usage

- A dedicated public transit stop at the terminal reduces car emissions.
- The Airport’s diesel-powered vehicles are powered in part with biodiesel.
- Automatic shutoff water fixtures are installed in many airport buildings, including the terminal.
- Over 115,000 disposable plastic water bottles have been kept out of landfills thanks to the bottle-filling stations in the passenger terminal.
- Rain sensors pause normal watering when it is raining.

Future Environmental Goals

Sustainability initiatives planned for the future aim to build on the Airport's strong commitment to environmental responsibility. These projects would minimize impacts on the environment, meet safety standards, and enhance Airport efficiency. Potential future initiatives include the following, among many others:

- The geothermal heating and cooling system soon to be installed in the passenger terminal could be expanded to run underneath the airfield to melt snow faster and reduce the amount of cleaning chemicals used during winter.
- Solar panels could be installed on top of the parking garage or other airport locations.
- The existing illuminated messaging signs throughout the Airport could be swapped with LED versions to save energy and provide greater visibility.

Environmental Overview

To maximize environmental awareness, an environmental overview was prepared for the projects included in the Capital Improvement Plan. The following are some of the early conclusions reached:

- Most of the proposed development would occur on property that has been previously disturbed. Nonetheless, there will be some environmental issues that must be considered.
- Stormwater runoff will need to be addressed for some of the larger airfield paving projects, such as the large-scale hold pad located in the midfield.
- Construction activities alone can generate some environmental impacts, such as dust and noise. Although these impacts are temporary, they will need to be mitigated to reduce the impacts.
- Energy usage will be higher during construction activities.

The Louisville Regional Airport Authority will comply with the National Environmental Policy Act before implementing any of the projects in the CIP.