Eastern Iowa Airport
Sustainable Master Plan

July 2023

Kimley»Horn

in association with

Amperage // BJSA // Foth // HMMH // Hubpoint // Martinez

EASTERN IOWA AIRPORT

FLYCID

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SUSTAINABLE MASTER PLAN

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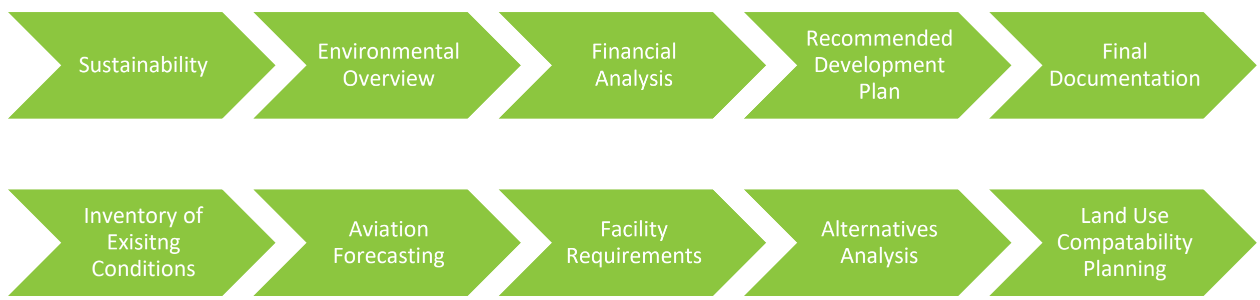
PREFACE

As defined by the FAA's Advisory Circular 150/5070-6B, *Airport Master Plans*, an "airport master plan is a comprehensive study of an airport and usually described the short-, medium-, and long-term development plans to meet future aviation demand." This Sustainable Master Plan document was prepared for the Eastern Iowa Airport to provide the airport owner, stakeholders, and regulatory agencies with an organized and rational plan for maintaining and developing airport facilities into the planning horizon.

MASTER PLAN PROCESS

The master plan process involved several key elements, as identified in coordination with the Airport and in alignment with the guidance provided by the FAA. The key study elements for this Sustainable Master Plan include documenting the existing conditions, forecasting future aviation activity, identifying future facility requirements, developing alternative development scenarios, studying land use compatibility, reviewing sustainability practices and environmental impacts, and providing a recommended development plan. The general outline of the master plan process is shown in **Figure P.1**. While coordination with the FAA occurs throughout the planning process, the aviation forecast and the Airport Layout Plan (ALP) are the two elements that require formal FAA acceptance or approval.

Figure P.1: Master Plan Process



Prepared By: Kimley-Horn, 2021.

GOALS

The goals of this Sustainable Master Plan project were developed in coordination with the Airport and the FAA at the onset of the master planning process and are designed to 1) address the requirements of the Airport given the evolving demands of the industry, and 2) address emerging technical issues. Goals include:

- Identify future aviation demand, including passengers, aircraft operations, air cargo, and based aircraft
- Determine facility improvements that are needed to accommodate future demand and to address FAA design standards
- Look for ways to incorporate sustainability into the plan
- Develop an affordable implementation plan for facility improvements based on the Airport's financial capabilities
- Update the Airport Layout Plan to the FAA's current standards, and to show future improvements.

FOCUS AREAS

To tailor this Sustainable Master Plan to the unique challenges that Eastern Iowa Airport faces, the Plan has several focus areas as described below:

- ***Sustainability*** – A focus area of this Sustainable Master Plan is to document the current greenhouse gas emissions (GHG). The Airport can leverage the current GHG baseline to evaluate future projects and reduce the overall carbon footprint. This Sustainable Master Plan will also look at other sustainability efforts that may be beneficial to the Airport and the community.
- ***Land Use Planning*** – Recent approvals of residential developments near the Airport has put a sharp focus on managing incompatible land use. Noise exposure contours and overflight data will be used to identify areas that should be protected. The technical analyses incorporated as part of the master plan process will help develop a strategy for the Airport to work with multiple jurisdictions to protect the Airport from further incompatible development encroachment.
- ***Air Cargo*** – The air cargo business at CID provides exceptional benefits to the region and allows the Airport to generate more revenue. This Sustainable Master Plan will include specialized research to inform the air cargo forecasts and to inform the Airport's long-range planning.
- ***Stakeholder Engagement*** – The Airport has many stakeholders and this sustainable master plan effort will be leveraged to provide meaningful opportunities for engagement with them. The focus areas of sustainability and land use compatibility, for example, will include stakeholders relevant to that subject. Other focus areas will engage with stakeholders important to the success of the Sustainable Master Plan.
- ***Forecasting*** – Forecasting is a critical component to developing future development plans. The forecasting efforts for this Sustainable Master Plan must consider the effects of the COVID-19 pandemic and explore various potential future "scenarios" to account for the uncertainty of future aviation activity. The data from the scenarios will be used to inform sensitivity analyses on facility requirements, alternatives analyses, and the financial feasibility analysis.
- ***Airfield*** – This Sustainable Master Plan will focus on several airfield items, including a potential runway extension to support growing aviation demand. The potential extension of Runway 9/27 and a future proposed parallel runway north of the Airport will be reviewed.
- ***Airport Financial Planning*** – The financial component of the sustainable master plan is intended to help the Airport position for the future with the confidence to implement the recommended Capital Improvement Plan, toward the goal of financial self-sufficiency. This Sustainable Master Plan will include a financial feasibility analysis to arrive at a master plan-recommended capital improvement program.
- ***General Aviation/Fixed Base Operations*** – Additional general aviation facilities are expected to be analyzed and incorporated into the Sustainable Master Plan.
- ***Aircraft Deicing*** – Passenger aircraft deicing operations are currently conducted by the individual airlines at the gate. This Sustainable Master Plan will explore locations for dedicated remote deicing facilities.

ASSUMPTIONS

The Baseline Year for documenting existing conditions is 2021. However, due to the impacts of the pandemic, 2019 will be used as a strong reference year. The aviation forecast years include 2026, 2031, and 2041 for the 5-, 10-, and 20- year planning horizons.

STAKEHOLDER ENGAGEMENT

This master planning process included a variety of stakeholder engagement efforts. These efforts are documented more specifically in later sections of this report and following is a summary of those accomplishments.

- **General Public**. Web summaries of the Sustainable Master Plan chapters were developed and placed on the Airport's web page. This allows for anyone to review what is going on with the planning project. In addition to the web summaries, Airport Leadership leverages many opportunities to discuss the Sustainable Master Plan with local groups.
- **Land Use Management Stakeholders**. This element of the Sustainable Master Plan included extensive engagement with 12 jurisdictions in the vicinity of the Airport as well as private land developers. Multiple meetings were hosted by the Airport to bring together planners and leaders from these groups. Information gathered during these meetings was used to identify strategies to enhance the effectiveness of land use compatibility practices within the jurisdictions. Details of those engagements are documented in Appendix C-1. Below is a list of the municipalities that Airport Leadership engaged with:
    - Benton County
    - Iowa County
    - Johnson County
    - Linn County
    - City of Cedar Rapids
    - City of Ely
    - City of Fairfax
    - City of North Liberty
    - City of Norway
    - City of Shueyville
    - City of Swisher
    - City of Walford
- **Air Cargo**. This element of the Sustainable Master Plan included engagement with current air cargo tenants of the Airport: FedEx, UPS and DHL. The effort also included significant outreach to related industries to assess the potential future need for additional air cargo facilities.

SUSTAINABLE MASTER PLAN ORGANIZATION

The Sustainable Master Plan for the Eastern Iowa Airport will guide development at the Airport through 2041 and beyond. The documentation process included a series of working papers, which documented the key findings of the various master plan elements. Following review and refinement, the working papers were reformatted to chapters of the final Sustainable Master Plan Report. In addition to the main chapters, supplemental information is included in the form of appendices. Following is the list of chapters and appendices contained in this document:

Chapters

Appendices

Chapter One

Existing Conditions

CHAPTER 1: EXISTING CONDITIONS

1.1 INTRODUCTION

This chapter provides background information and a focused inventory of existing facilities and conditions at Eastern Iowa Airport (CID or the Airport). Information and data for this inventory were sourced from Airport site visits, discussions with the Airport staff and stakeholders, and various agencies and public records. This information provides the basis for determining future facility requirements and the formulation of airport development alternatives.

1.2 AIRPORT OVERVIEW

Eastern Iowa Airport is located within Linn County in the limits of the City of Cedar Rapids, as shown in **Figure 1.1**. Located approximately seven miles southwest of downtown Cedar Rapids, the Airport serves the Iowa City/Cedar Rapids Corridor and the border regions of Illinois and Wisconsin. CID is publicly owned by the City of Cedar Rapids and is operated by the Cedar Rapids Airport Commission. The Airport has been an integral part of the state's aviation system since commercial service began at CID in 1947. In addition to CID, Iowa has seven commercial service airports, the closest of which are located in Waterloo, Dubuque, Burlington, and Des Moines.[1]

The Airport is classified in the FAA's National Plan of Integrated Airport Systems (NPIAS) as a primary, small hub commercial service airport.[2] The Airport accommodates commercial service, general aviation (GA), and air cargo operations. Passenger air carriers servicing CID include Allegiant Air, American Airlines, Delta Air Lines, Frontier Airlines, and United Airlines. Cargo operators at the Airport include UPS, FedEx, and DHL. As of September 2021, CID provides non-stop service to 17 domestic destinations.[3]

- AIRPORT SITE

The Airport is located on an approximately 1,000-acre site, zoned as a Public Airport by the City of Cedar Rapids Zoning Ordinance.[4] Surrounding zoning designations include agriculture, suburban mixed use regional center, light industrial, public institutional, suburban residential, public parks and open space, and general industrial. The existing Airport site includes the following primary components:

- Airfield: The airfield includes two runways (one primary runway and one crosswind runway), associated taxiways, aprons, and other safety related protection zones.
- Passenger Terminal Complex: The passenger terminal complex includes one concourse that contains a total of nine gates. The facility also includes the areas and equipment required for passenger processing, including ticketing, security screening, and baggage claim.
- Air Cargo: The air cargo areas include the buildings dedicated to processing air cargo operations and the associated apron areas. The air cargo facilities are operated by UPS, FedEx, and DHL.

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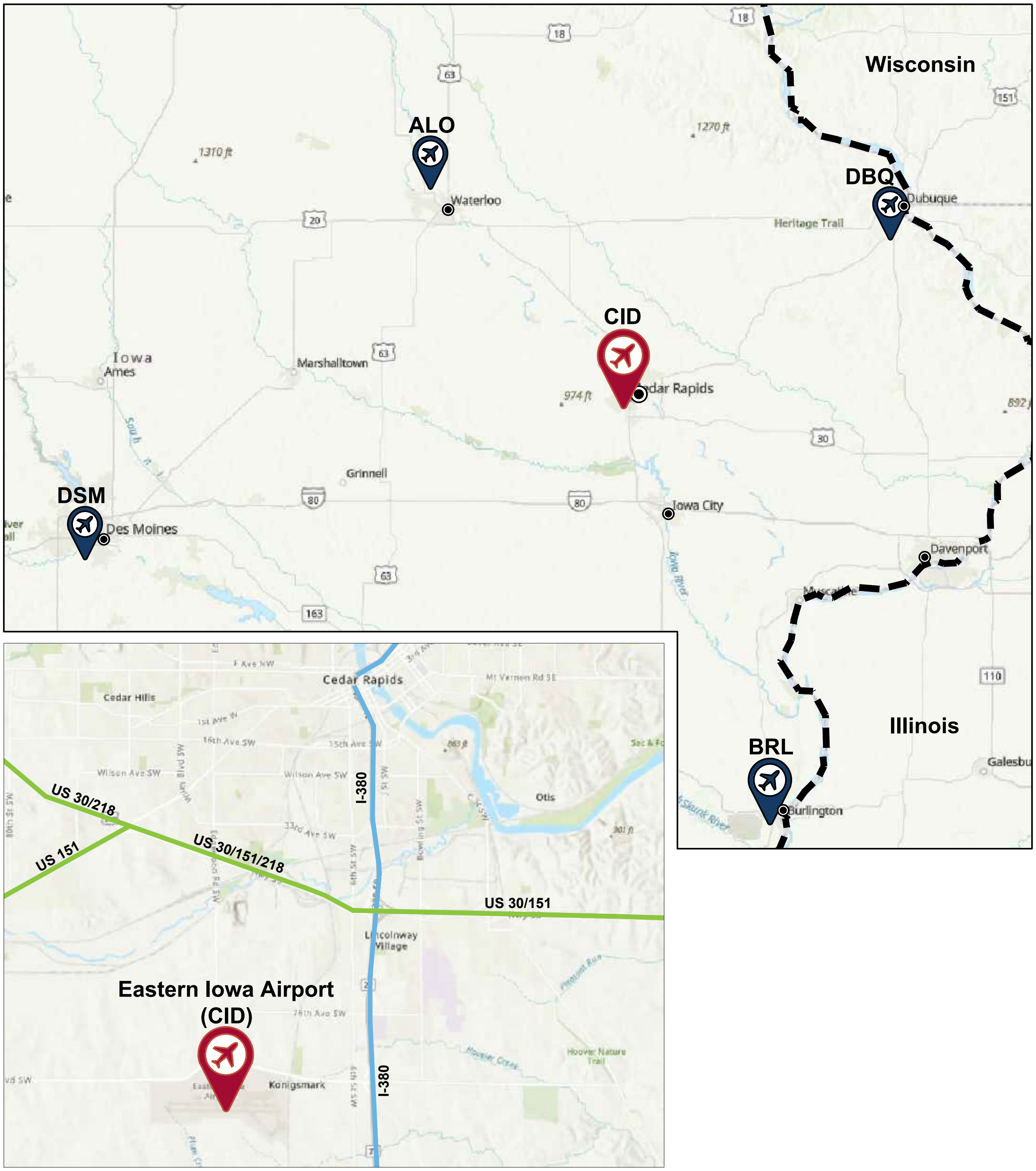
[1] Source: Iowa DOT Website, Airport Information (accessed October 2021).

[2] Source: National Plan of Integrated Airport Systems, 2023-2027, Appendix A (accessed October 2021).

[3] Source: FlyCID Website, Airlines & Nonstops (accessed October 2021).

[4] Source: Cedar Rapids Zoning Ordinance, Chapter 32 (accessed October 2021).

Figure 1.1: Airport Location Map



LEGEND

- Iowa State Line
- Interstate
- US Highway
- Commercial Airport

Source: ArcGIS Pro, Accessed October 2021 | Prepared by: Kimley-Horn, 2021

- General Aviation: The site has one fixed base operation (FBO), operated by Signature Flight Support. They have facilities in two locations to provide a range of services for GA users, such as fueling and maintenance.
- Support Facilities: Support facilities at the Airport include the administration building, equipment buildings, airport traffic control tower (ATCT), aircraft rescue and firefighting (ARFF), and maintenance facilities.
- Landside: The Airport's landside facilities include access roadways, parking lots, rental car facilities, and commercial vehicles areas.

In addition to the Airport site, the Airport owns approximately 2,200 acres of land with various non-aeronautical functional designations. **Figure 1.2** provides a map of parcels owned by the Airport and the parcels' current uses. Airport property includes the approximately 500-acre CID SuperPark, which is designated for future industrial development. Additional Airport property consists of commercial, agricultural, industrial, and residential uses. Various other Airport-owned parcels are also available for lease.

- AIRPORT ACCESS

The primary access to the Airport is provided via Wright Brothers Boulevard (a.k.a. State Highway 84/County Road E70), located along the north side of the Airport. Wright Brothers Boulevard connects the Airport to Interstate 380, a segment of the 563-mile highway known as the Avenue of Saints connecting St. Louis, Missouri to St. Paul, Minnesota. CID is bounded to the east by 18th Street SW, to the south by Walford Road, and to the west by Cherry Valley Road SW. The passenger terminal complex and parking facilities are accessed via Arthur Collins Parkway SW and the cargo facilities are accessed via Cessna Place SW.

- AVIATION ACTIVITY

The aircraft enplanements, operations, and based aircraft are all key metrics for understanding the aviation activity at the Airport. The information in this section provides a broad overview of the historical activity, which is expanded upon in *Chapter 2 – Aviation Forecasts.*

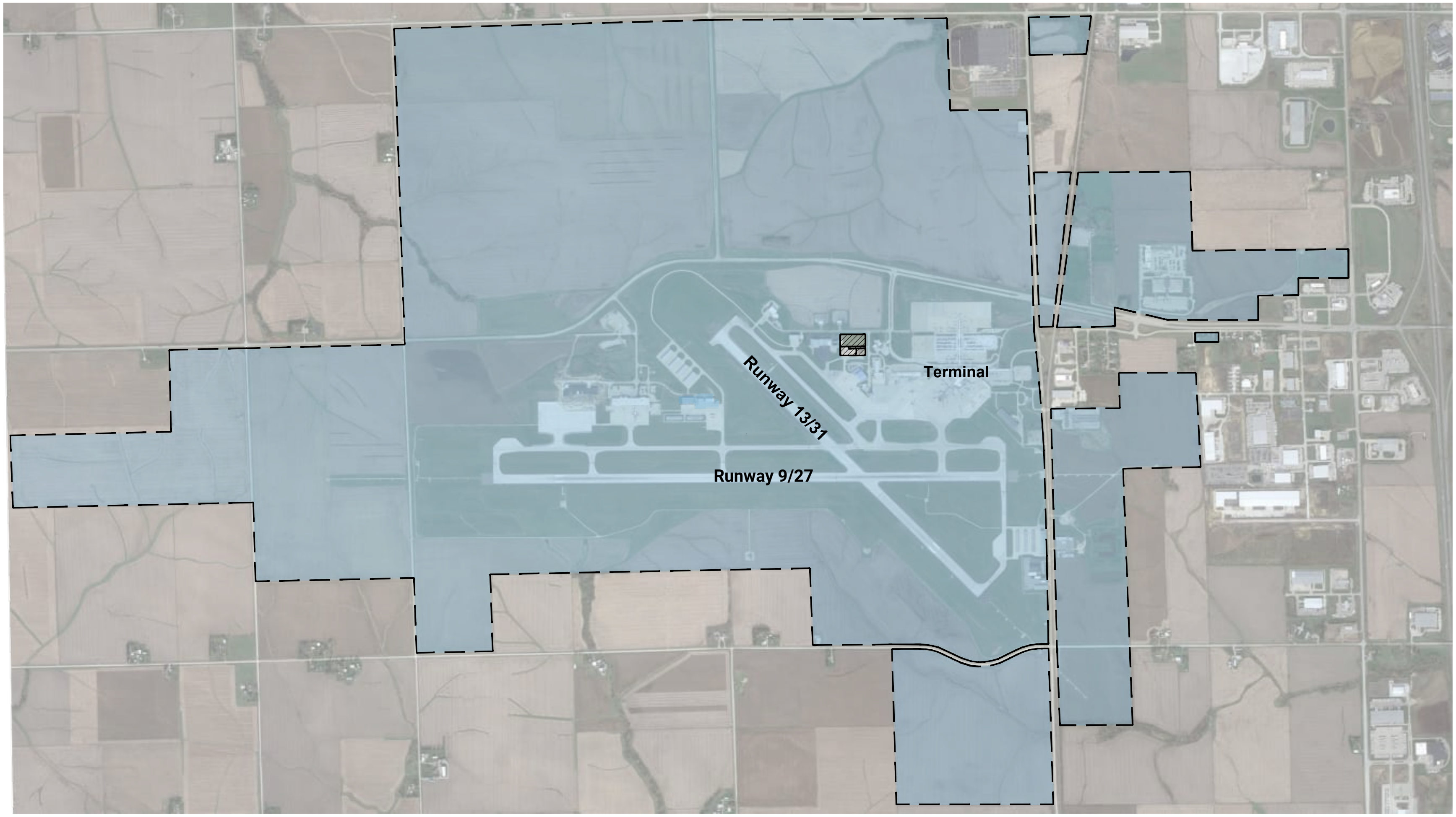
Passenger Enplanements

A passenger enplanement is defined as a passenger boarding a plane at a particular airport. The total number of passengers is approximately double the number of enplaned passengers. The total number of annual passengers at CID is summarized in **Table 1.1** for 2017 through 2021.[5] In 2019, CID held approximately 27% of the passenger market share of commercial airports within a 100-mile radius.[6] Enplanements decreased significantly in 2020 due to the COVID-19 pandemic, however monthly data trends in the second half of 2021 are suggesting the Airport is recovering quickly.

[5] Source: FlyCID Website, Annual Passenger Statistics (accessed November 2021).

[6] Source: FAA Terminal Area Forecast, Fiscal Year 2020 – 2045 (published July 2021).

Figure 1.2: Airport Property



LEGEND
- Airport Property Line
- Airport Property
- Private Property

0 675 1350 2700 Feet
N

Source: Foth Infrastructure and Environment, LLC, 2022 | Prepared by: Kimley-Horn, 2022.

Aircraft Operations

An aircraft operation constitutes of a landing or take-off that occurs at the airport. **Table 1.1** summarizes the total number of aircraft operations between 2017 and 2021[7]. Total operations include commercial operations, cargo operations, military operations, and general aviation operations. Commercial and general aviation activity makes up for than 90% of the aircraft operations at CID.

Based Aircraft

According to the FAA, a based aircraft is defined as an aircraft that is stationed at an airport for the majority of the year and typically includes single-engine, multi-engine, jets, and rotorcraft.[8] As of 2021, Airport records indicate that CID has 112 single-engine, 4 multi-engine, 11 jets, and 1 helicopter based at the Airport. As shown in **Table 1.1**, historical records indicate that the number of based aircraft has remained stable.

Table 1.1: Aviation Activity Summary, 2017 - 2021

Year	Total Passengers	Operations	Based Aircraft
2017	1,143,816	49,421	128
2018	1,205,983	48,601	128
2019	1,342,736	52,816	128
2020	615,935	41,764	128
2021	1,058,726	43,372	128

Sources: Airport Records; FlyCID Website, FAA OPSNET Database (accessed January 2022).

[7] Source: FAA OPSNET Database (accessed January 2022).

[8] Source: AIP Handbook, Appendix A. Definition of Terms (accessed November 2021).

1.3 AIRFIELD AND AIRSPACE

- AIRFIELD FACILITIES

Airfield facilities include those that directly support aircraft operations such as runways, taxiways, aprons, and navigational aids (NAVAIDs). **Figure 1.3** depicts the runway network, taxiway network, and apron areas. **Figure 1.4** presents the results of an airfield pavement condition index (PCI) assessment, completed in 2021 by Foth Infrastructure and Environment, LLC.

Runways

The Airport has two runways: a primary runway located in an east-west orientation (designated Runway 9/27) and a crosswind runway oriented southeast and northwest (designated Runway 13/31). Existing runway characteristics are presented in **Table 1.2.**

Design Standards

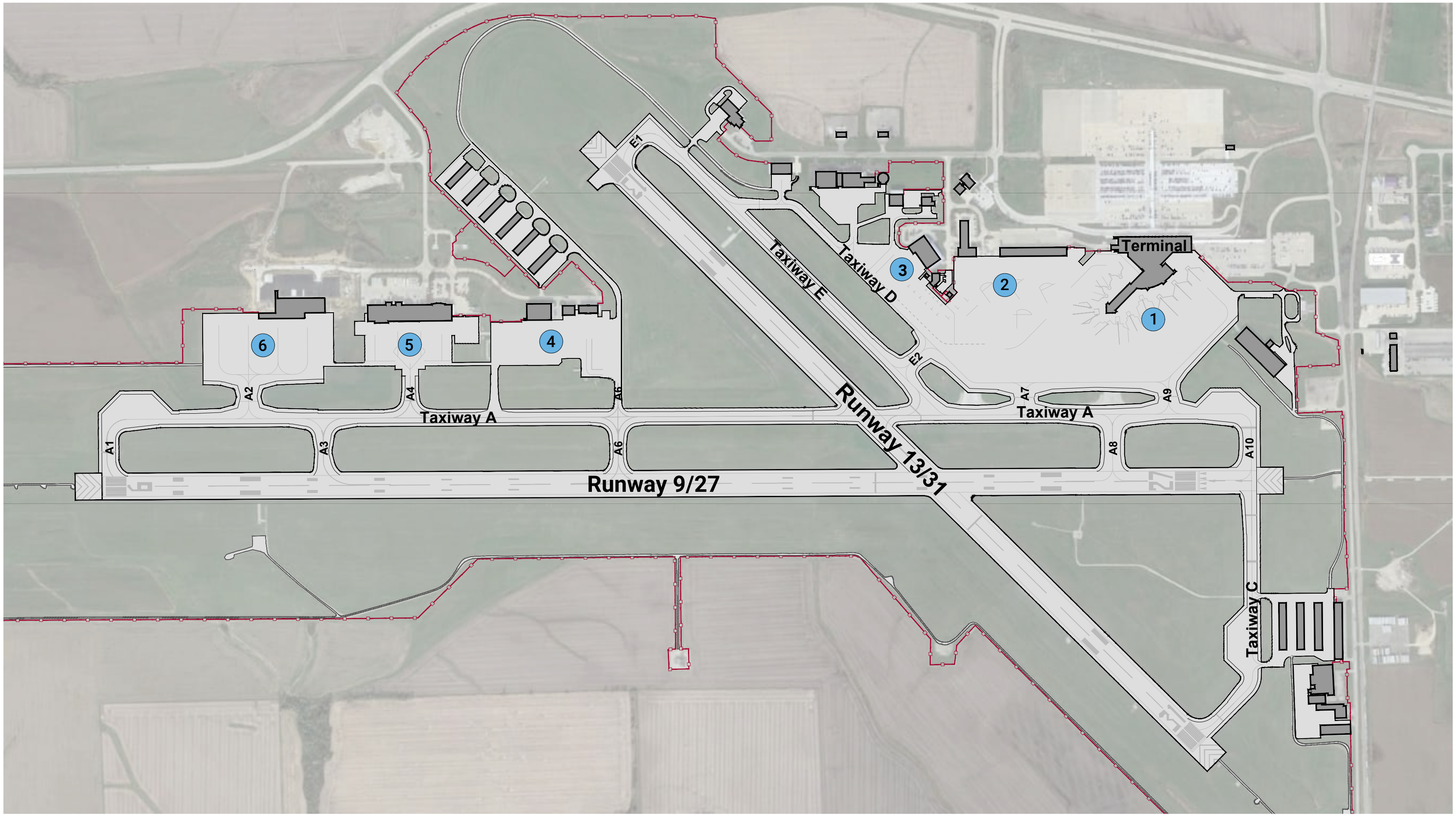
Airport design standards are a set of infrastructure criteria that promote safe and efficient aircraft operations. Contained within FAA Advisory Circular 150/5300-13B, Airport Design, design standards must be met for an airport to be eligible for federal grants.

Design standards are determined by the design aircraft, Airport Reference Code (ARC), Runway Design Code (RDC), and Taxiway Design Group (TDG).[9] The design aircraft is the most demanding aircraft that conducts at least 500 operations per year at an airport (excluding touch-and-go activity), which is reflective of the demand that will regularly be placed on airport facilities. In the case of airports with multiple runways, like CID, a design aircraft is designated for each runway based on the respective operations. ARC is comprised of two components: the aircraft approach category (AAC) and the airplane design group (ADG). As shown in **Table 1.3** and **Table 1.4**, respectively, the AAC is related to aircraft approach speed and the ADG is determined by the design aircraft's wingspan and tail height. The AAC, ADG, and a runway's approach visibility minimums (see **Table 1.5**) make up the Runway Design Code (RDC), which determines design standards that apply for a particular runway. TDG is based on the undercarriage dimensions of the design aircraft and prescribes taxiway width and fillet standards.

Based on the existing Airport Layout Plan (ALP), updated in 2014, Eastern Iowa Airport was designated with an Airport Reference Code (ARC) of D-IV. The RDC for Runways 9/27 and 13/31 were D-IV and C-II, respectively. The Airport's design aircraft were the McDonnell Douglas MD-83 and the Boeing B757-200, and all taxiways at CID accommodated TDG 5 aircraft. The Airport's existing and future ARC and critical design aircraft are evaluated in *Chapter 2 – Aviation Forecasts*, which will consider that some of the previous critical aircraft are not the dominant aircraft they once were.

[9] Source: FAA Advisory Circular 150/5300-13B, Airport Design (published 2014).

Figure 1.3: Airfield Facilities



LEGEND

- Existing Airfield Pavement
- Existing Airport Buildings
- Airfield Markings
- Airside Security Fence

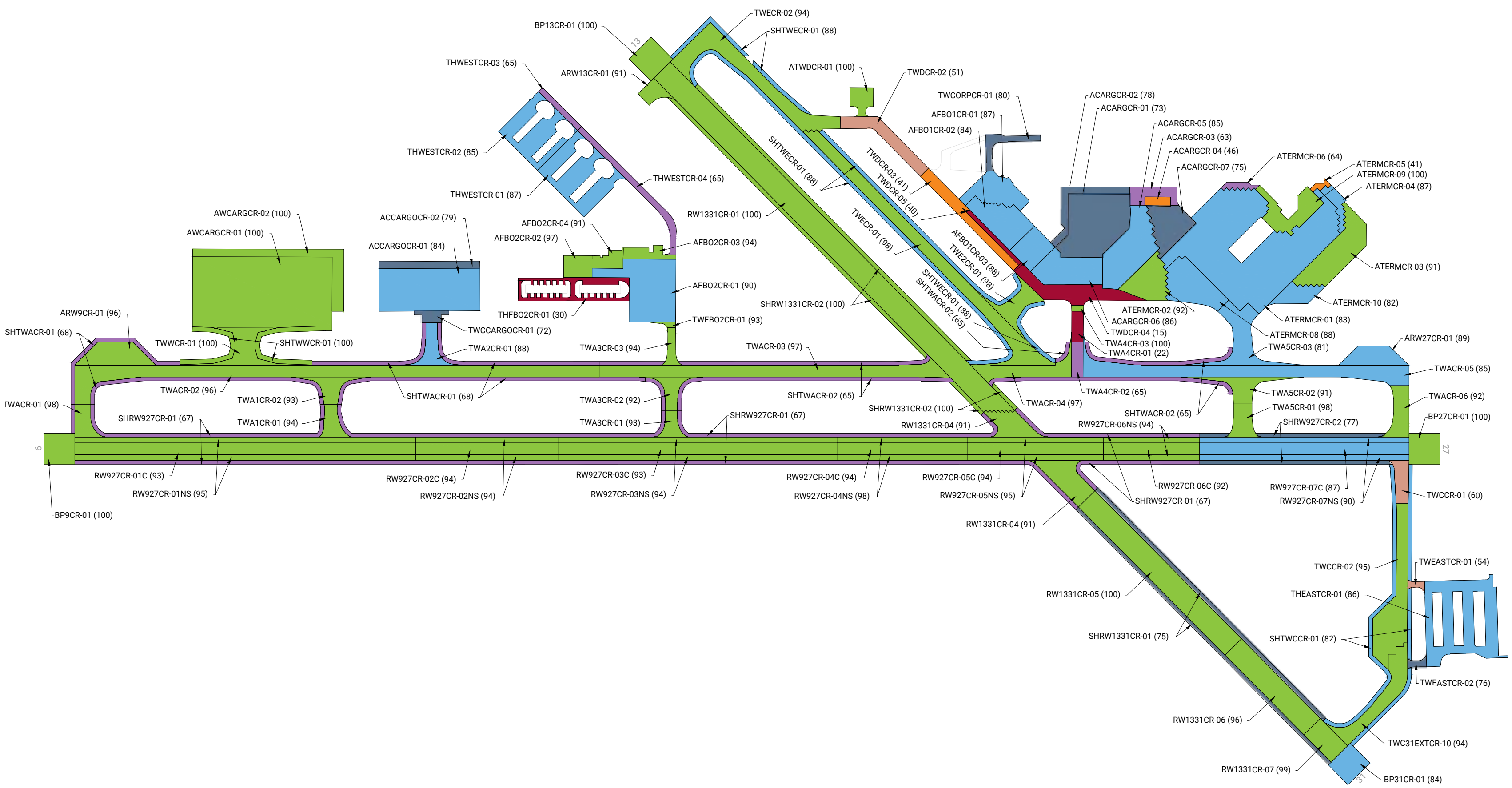
Apron Areas
1. Terminal
2. East Cargo
3. East FBO
4. West FBO
5. Central Cargo
6. West Cargo

0 300 600 1200 Feet

N

Prepared by: Kimley-Horn, 2021.

Figure 1.4: Airfield Pavement Condition Index, 2021



LEGEND

- PCI = 91-100
- PCI = 81-90
- PCI = 71-80
- PCI = 61-70
- PCI = 51-60
- PCI = 41-50
- PCI = 0-40

Branch Identifier
Section Identifier
PCI Value
RW927CR-01C (100)

Section Break Line

0 225 550 1100 Feet

N

Source: Foth Infrastrcture and Enviornment, LLC, 2021 | Prepared by: Kimley-Horn, 2021

Table 1.2: Runway Data

	Runway 9	Runway 27	Runway 13	Runway 31	Design Standard (D-IV)
Basic Runway Data					
Runway Length (feet)	8,600		6,200		Varies (a)
Runway Width (feet)	150		150		150
Displaced Threshold Length (feet)	--	425	--		--
Pavement Type	Concrete		Concrete		--
Runway Marking	Precision		Non-Precision		--
Load Bearing Capacity (Landing System)					
Single (lbs)	120,000		120,000		--
Dual (lbs)	227,000		172,000		--
Dual Tandem (lbs)	360,000		360,000		--
Lighting and NAVAIDS					
Runway Lights	HIRL		HIRL		--
Centerline Lights	No		No		--
Approach Lighting	MALSR		--	MALSR	--
Approach Aids	PAPI		PAPI	VASI	--
	RVR		--		--
	RNAV		RNAV		--
	VOR		--		--
	ILS		--		--
Runway Declared Distances (feet)					
Takeoff Run Available (TORA)	8,600		6,200		--
Takeoff Distance Available (TODA)	8,600		6,200		--
Accelerate-Stop Distance Available (ASDA)	8,175	8,600	6,200		--
Landing Distance Available (LDA)	8,175		6,200		--
Runway Safety Areas (Length/Width) (feet)					
Runway Safety Area (RSA)	10,175’/500’		8,200’/500’		1,000’/500’
Runway Object Free Area (ROFA)	10,175’/800’		8,200’/800’		1,000’/800’
Runway Obstacle Free Zone (ROFZ)	9,000’/400’		6,600’/400’		200’/400’
Runway Protection Zone (RPZ)	2,500’/1,000’		1,700’/1,000’	2,500’/1,000’	2,500’/1,000’ (b)
Precision Obstacle Free Zone (POFZ)	200’/800’		200’/800’		200’/800’

(a) Runway length requirement varies based on aircraft operational considerations.

(b) Design standard based on approach runway protection zone. Departure runway protection zones have a minimum length of 1,700 feet.

Sources: FAA 5010 Airport Master Record (accessed September 2021); Nearmap (accessed September 2021); FAA Advisory Circular 150/5300-13B, Airport Design (published 2014).

Table 1.3: Aircraft Approach Categories

Aircraft Approach Category	Approach Speed
A	Approach speed less than 91 knots
B	Approach speed 91 knots or more but less than 121 knots
C	Approach speed 121 knots or more but less than 141 knots
D	Approach speed 141 knots or more but less than 166 knots
E	Approach speed 166 knots or more

Source: FAA Advisory Circular 150/5300-13B, , Airport Design (published 2014).

Table 1.4: Airplane Design Groups

Airplane Design Group	Tail Height (feet)	Wingspan (feet)
I	< 20’	< 49’
II	20’ - < 30’	49’ - < 79’
III	30’ - < 45’	79’ - < 118’
IV	45’ - < 60’	118’ - < 171’
V	60’ - < 66’	171’ - < 214’
VI	66’ - < 80’	214’ - < 262’

Source: FAA Advisory Circular 150/5300-13B, , Airport Design (published 2014).

Table 1.5: Visibility Minimums

Runway Visual Range (RVR) (feet) (a)	Instrument Flight Visibility Category (statute mile)
5,000	Not lower than 1 mile
4,000	Lower than 1 mile but not lower than ¾ mile
2,400	Lower than ¾ mile but not lower than ½ mile
1,600	Lower than ½ mile but not lower than ¼ mile
1,200	Lower than ¼ mile

(a) RVR values are not exact equivalents.

Source: FAA Advisory Circular 150/5300-13B, , Airport Design (published 2014).

Wind Conditions

Ideally, aircraft operate in headwind to increase lift for takeoff and resistance for landing. Therefore, wind direction and speed can greatly impact aircraft operations. Negative impacts due to wind conditions can be mitigated with proper runway orientation. Per the FAA, a runway should be oriented to accommodate at least 95% wind coverage for a respective runway’s RDC.[9] If a runway does not provide 95% coverage, construction of a crosswind runway may be advised. **Table 1.6** presents the allowable crosswind components based on the Airport’s RDC, as stipulated by the FAA. **Table 1.7** summarizes the wind coverage at CID for various crosswind tolerances using wind data from 2011 to 2020. Although Runway 9/27 is considered the primary runway when compared to Runway 13/31 due to its length, precision approach capabilities, and superior lighting, Runway 13/31 has slightly higher wind coverage at lower allowable crosswind components. However, both runways meet the 95% required threshold at 16 knots.

Table 1.6: Allowable Crosswind Component Per Runway Design Code

Runway Design Code	Allowable Crosswind Component
A-I and B-I	10.5 knots
A-II and B-II	13 knots
AIII, B-III, C-I through D-III, and D-IV through D-VI	16 knots
E-I through E-VI	20 knots

Source: FAA Advisory Circular 150/5300-13B, , Airport Design (published 2014).

Table 1.7: Runway Wind Coverage

	Runway 9/27 (a)	Runway 13/31 (b)	Combined
All Weather Coverage			
10.5 knots	84.49%	89.40%	95.12%
13 knots	91.31%	94.20%	97.95%
16 knots	97.30%	97.91%	99.37%
20 knots	99.41%	99.45%	99.90%
IFR Weather Coverage (c)			
10.5 knots	83.51%	85.64%	94.25%
13 knots	90.71%	91.43%	97.50%
16 knots	96.94%	96.48%	99.18%
20 knots	99.14%	98.93%	99.81%
VFR Weather Coverage (d)			
10.5 knots	84.58%	90.13%	95.28%
13 knots	91.37%	94.77%	98.05%
16 knots	97.38%	98.22%	99.42%
20 knots	99.48%	99.57%	99.92%

(a) Calculated using true north orientations of 91.7 degrees and 271.7 degrees.
(b) Calculated using true north orientations of 136.7 degrees and 316.7 degrees.
(c) IFR (Instrument Flight Rules) defined as a cloud ceiling less than 1,000 feet or visibility less than three miles.
(d) VFR (Visual Flight Rules) defined as a cloud ceiling greater than 3,000 feet and visibility greater than five miles.

Source: FAA Airport Data and Information Portal (ADIP) Wind Analysis Tool (accessed September 2021).

Taxiways

The Airport's runways are supported by a system of taxiways that provide access between the runways and the apron areas. Taxiways allow for controlled and organized movement between areas of the airfield, including runways, the passenger terminal area, cargo areas, and GA facilities. All taxiways at CID range from 75 feet to 100 feet wide and are lined with medium intensity taxiway lighting (MITL).

Runway 9/27 is flanked to the north by a full-length parallel taxiway (Taxiway A). Taxiway A is connected to Runway 9/27 by five exit taxiways (A1, A3, A6, A8, and A10) and is connected to the cargo aprons, GA facilities, and the passenger terminal apron via five connector taxiways (A2, A4, A6, A7, and A9). The Runway 31 approach end is connected to the departure threshold of Runway 27 by Taxiway C. Runway 13 is served by the partial-length parallel Taxiway E, with connector E1 at the Runway 13 approach end. Taxiway E also provides access to the passenger terminal apron via connector E2 and to the ARFF. Taxiway D runs parallel to Taxiway E and provides access to the passenger terminal apron and the east GA campus.

Apron Areas

Apron areas are the non-movement areas of an airfield, adjacent to the passenger terminal and/or hanger areas, to accommodate aircraft unloading, loading, and servicing. The passenger terminal apron is the largest apron on the airfield and includes parking positions for a maximum of 12 aircrafts. The passenger terminal apron can be accessed via Taxiway D and taxiway connectors E2, A7, and A8. Immediately west of the passenger terminal apron are the east cargo apron and the east FBO hanger apron. The east cargo apron is currently used only for DHL cargo operations. West of Runway 13/31 are three additional apron areas: the west FBO apron, the central cargo apron, and the west cargo apron. Access to these aprons is provided via taxiway connectors A6, A4, and A2, respectively.

There are no dedicated aircraft deicing or remain-over-night (RON) parking aprons at the Airport. Aircraft deicing is performed at or near the gates for passenger aircraft and on the cargo aprons for cargo aircraft. According to Airport staff, existing deicing locations result in some conflicts with aircraft blocking other gates and aircraft. A recent passenger terminal apron expansion, completed in November 2021, serves as a new location to position aircraft for deicing operations.

Lighting and Markings

The Airport has several lighting systems that operate at night or during periods of low visibility. As presented above in **Table 1.2**, Airport lighting installations include:[10]

- Runway Edge Lighting: Both runways are equipped with High Intensity Runway Lights (HIRL). These lights are clear, amber, tallow, red, or green depending on their location on the runway.
- Approach Lighting System: Runways 9, 27, and 31 are equipped with Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) systems. MALSR systems are installed in the Airport approach zones along the extended centerline of the runway and consist of a combination of threshold lamps, light bars, and flashers to provide visual information to pilots on final approach.
- Runway End Identifier Lights (REILs): Runway 13 is equipped with REILs, two synchronized, unidirectional flashing lights for runway end identification.
- Precision Approach Path Indicator (PAPI): Runways, 9, 13, and 27 have PAPI lighting systems that provide visual glide slope guidance for non-precision approaches using a combination of red and white lights that are only visible at certain descent angles. Runway 9/27 is equipped with a PAPI 4R/L and Runway 13 is equipped with a PAPI 4L.
- Visual Approach Slope Indicator (VASI): Runway 31 has a VASI 4L lighting system that provides visual descent guidance in a similar manner to the PAPI lighting system.

Runway 9-27 is marked as a precision instrument runway, while Runway 13/31 is marked as a non-precision runway. All taxiways at CID have centerline stripes with enhanced centerline and hold line markings at the required locations.

[10] Source: FAA 5010 Airport Master Record (accessed September 2021).

Navigational Aids

In addition to the lighting systems and markings previously noted, the Airport is equipped with various NAVAIDs to assist pilots with takeoff and landing procedures. NAVAIDs at CID include:[10]

- Glideslope Antenna: The glideslope is a component of the Instrument Landing System (ILS) on Runway 9/27. The glideslope provides a directional radio signal between 329.15 and 335 MHz frequency to provide vertical guidance. Vertical guidance helps the pilot remain above obstructions and reach the runway at the proper touchdown zones.
- Localizer Antenna: The localizer is a component of the Instrument Landing System (ILS) on Runway 9/27. The localizer provides a directional radio signal between 108 and 112 MHz frequency to provide horizontal guidance.
- Distance Measuring Equipment (DME): DME is a measuring device that utilizes radio signals to display the slant distance between the ground and an aircraft.
- Runway Visibility Range (RVR): Runways 9 and 27 have an RVR system to provide the horizontal distance a pilot can expect to see down a runway.
- Airport Surveillance Radar (ASR): ASR is an Airport-wide radar system to detect and display the presence and position of aircraft in the terminal area.
- Automated Surface Observing System (ASOS): An ASOS is a weather reporting system that transmits weather messages to pilots and other airport users.

Security

The airfield is enclosed by an eight-foot chain-link fence with three strands of barbed wire on top to prevent unauthorized access of people, vehicles, and wildlife. Airfield access is provided through 19 access gates along the fence’s perimeter. The fence is compliant with Title 14 Code of Federal Regulations (CFR) Part 139.

- AIRSPACE

This section describes the airspace and operations governed by air traffic control (ATC) at CID. The VFR sectional chart displaying the Airport and the surrounding airspace is presented in **Figure 1.5**.

Class C Airspace

Eastern Iowa Airport lies within Class C airspace. Class C airspace is generally classified as airspace from the surface to 4,000 feet above ground level (AGL) that surrounds medium-sized commercial airports. The airspace consists of a vertical cylindrical surface with a radius of five nautical miles (NM) and an outer radius of ten nautical miles that extends from 1,200 feet to 4,000 feet AGL.[11] Aircraft must establish two-way radio communication with ATC prior to entering and while operating within this airspace.

Air Traffic Control

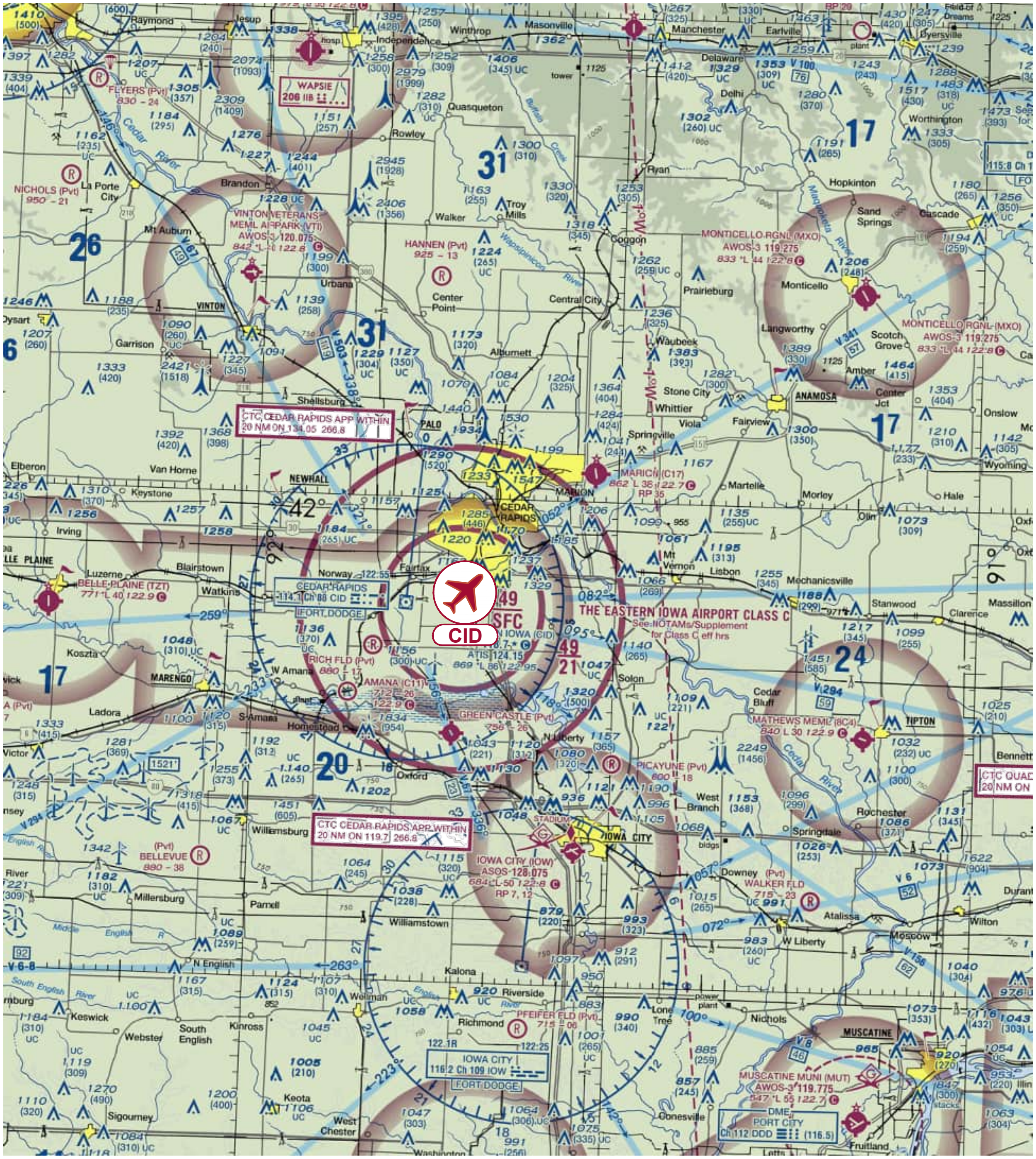
The ATCT is responsible for providing aircraft with clearances to land at and take off from CID, as well as controlling aircraft movement in the movement areas of the airfield. The ATCT is operated and staffed by the FAA. The tower is located west of the passenger terminal apron, is approximately 106 feet tall, and has sufficient visibility over all areas of the airfield. The tower is operated daily from 5:00 a.m. to 11:30 p.m. [10] Adjacent to the ATCT is a building leased to the FAA as a Systems Service Center which maintains NAS facilities and equipment.

Obstructions

Runways 9 and 27 are classified as FAR 77 "PIR" approaches, Runway 13 is classified as a "C" approach, and Runway 31 is classified as a "D" approach. [10] These classifications specify the approach surfaces for each runway, which dictate the slope and horizontal distance of the surfaces, thus impacting the likelihood of obstructions. On the Runway 27 approach, a railroad, located 740 feet from the runway end, obstructs the boundary of the approach surface.[10] None of the runways have a close-in obstruction, classified as any obstruction in the approach within 200 feet of the runway end.

[11] Source: FAA Aeronautical Information Manual, Chapter 3 (accessed October 2021).

Figure 1.5: Airspace Sectional Chart



LEGEND

	Class C Airspace
	Class E Airspace
	Group Obstructions

Source: FAA Chicago Sectional Aeronautical Chart, Accessed October 2021 | Prepared by: Kimley-Horn, 2021

1.4 PASSENGER TERMINAL COMPLEX

The Donald J. Canney Terminal, depicted in **Figure 1.6,** is a two-story building that recently underwent a passenger terminal modernization based on recommendations from the 2014 Master Plan.[12] The following sections provide a description of the updated passenger terminal.

- CID Terminal Modernization Program

The passenger terminal modernization project was divided into several phases, with the first phase completed in 2015 and the third phase completed in 2019. Phases I through III included a new exterior building façade, signage replacements, updated interior finishes pre- and post-security, and a 58,000-square-foot expansion. The project included an expanded TSA checkpoint, new post-security concessions, and two new passenger loading bridges. The interior and exterior complement one another with a natural design, incorporating wood and stone elements. Skylights throughout the passenger terminal also provide natural light.

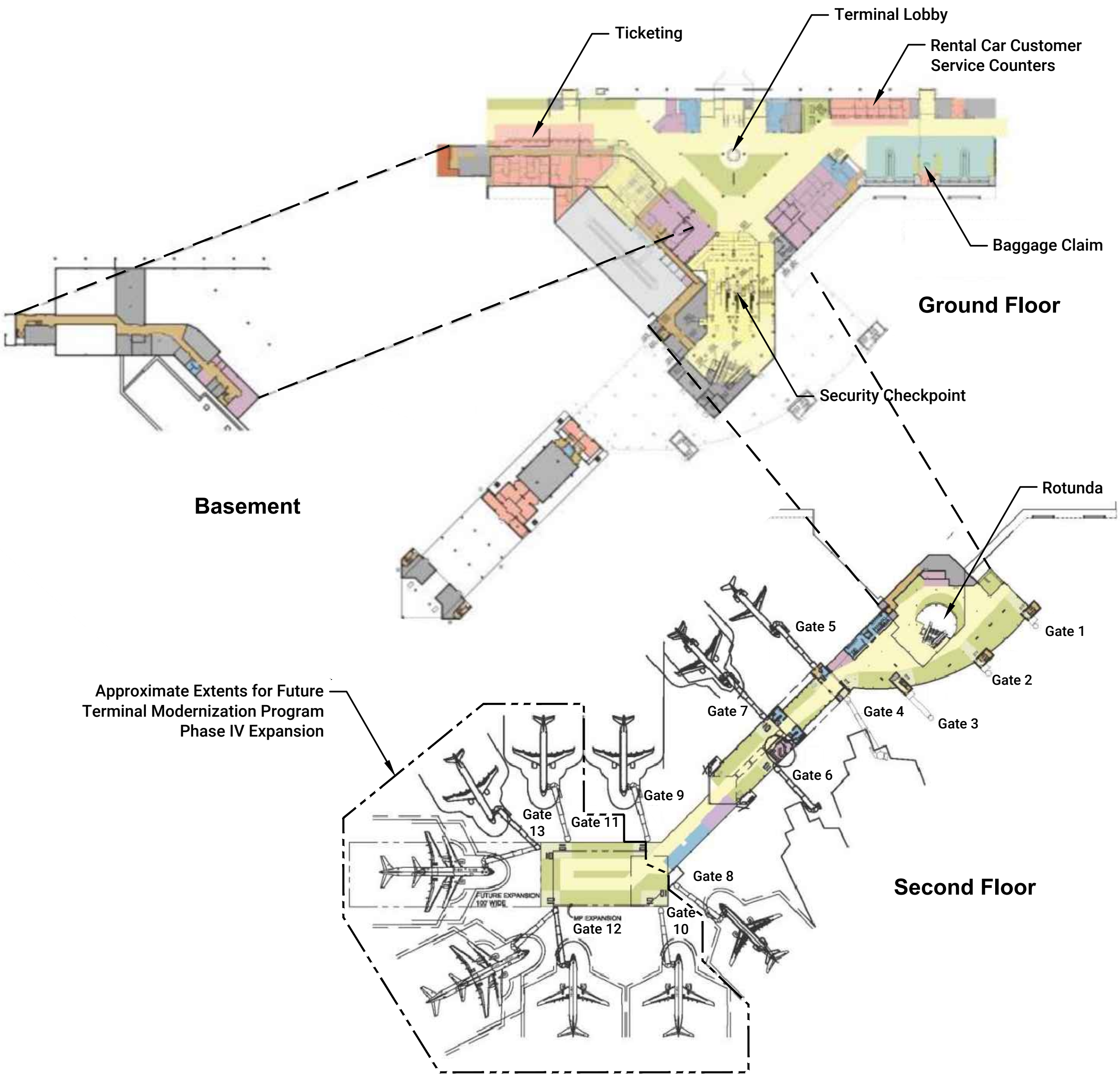
Phase IV of the modernization program will expand the concourse to include four additional gates and a minimum of two RON positions. The requirements for the program were based on aviation demand projections and existing deficiencies of the passenger terminal established in the 2014 Master Plan. A concourse expansion is necessary to serve an increasing number of larger aircraft. Phase IV may be divided into two projects: Phase IV.1 addresses deficiencies in the existing concourse not addressed in Phase III and includes a small expansion for the concourse, and Phase IV.2 will include the remainder of the concourse expansion. The implementation schedule for Phase IV indicates expected construction during 2023 and 2024.

- Passenger Terminal Entrances

The primary entrances to the passenger terminal are located along the north side of the building at the curbside drop-off/pick-up areas. One door provides access to the ticketing area, one door provides access to arrivals/baggage claim, and two doors provide access to the main passenger terminal lobby area. An additional door on the east side of the passenger terminal building provides access to the commercial ground transportation area, rental car lot, and the employee parking lot. All passenger terminal doors are automatic, and two sets of doors are provided at each entry for temperature regulation. Visitors arriving from the public parking lots can either use one of the two exterior stairways to access the curbside roadway crosswalks to the passenger terminal or the pedestrian tunnel underneath the roadway that provides access to the main passenger terminal lobby area.

[12] Source: CID Terminal Modernization Program Phase IV, Programming/Pre-Design Report, Mead & Hunt (2018).

Figure 1.6: Passenger Terminal Complex Map



LEGEND

- Airlines and Car Rental Offices
- Baggage Claim
- Baggage Support
- Building Utilities
- Circulation: Public
- Circulation: Non-Public
- Concessions / TSA
- Holdroom / Public Waiting
- Maintenance / Janitor
- Restrooms
- Security Checkpoint / Baggage

Source: Mead & Hunt CID Modernization Program Phase IV Programming/Pre-Design Report, 2018 | Prepared by: Kimley-Horn, 2021

- **Terminal Lobby**

The terminal lobby is located in the center of the pre-security area of the passenger terminal building. The lobby area includes an information center, a restaurant, a gift shop, restrooms, vending machines, an ATM, a mother's nursing room, seating, and interactive information displays. Ceiling-mounted directional signage provides clear guidance for passengers. A secured TSA office area and a baggage support area are located adjacent to the lobby.

- **Ticketing**

The passenger terminal's ticketing area is located on the west side of the lobby. The ticketing area provides positions for both full-service airline agents (all airlines) and self-service electronic kiosks (selected airlines) to support passenger check-in and baggage processing. The number of ticketing positions for each airline is summarized in **Table 1.8**. Limited seating is provided along the north side of the ticketing area.

Table 1.8: Ticketing Positions

Airline	Agent	Self-Service Devices	Total
Allegiant Air	2	0	2
American Airlines	6	2	8
Delta Airlines	6	5	11
Frontier Airlines	3	2	5
United Airlines	6[a]	4[a]	6[b]
Unallocated Space	1	0	1
Total	**24**	**13**	**33**[b]

(a) Four of the United Airlines self-service devices are located at the existing agent booths. These four positions can either be used as an agent booth or a self-service device, resulting in the remainder of two positions that are dedicated to full-service agent check-in positions.

(b) Does not double-count the dual-purpose self-service and agent positions since they cannot be utilized simultaneously.

- **Baggage Claim**

The baggage claim area of the passenger terminal is located on the east side of the lobby. The area contains baggage claim devices, rental car service counters, a conference room, and a display space currently used for University of Iowa memorabilia. Two "T" shaped flat-plate baggage claim devices are located along the south side of the baggage claim area, providing a total of approximately 100 linear feet of claim frontage. Seating, equipped with outlet charging ports, is located throughout the area for waiting passengers.

The rental car service counters are located along the north wall of the baggage claim area. Four rental car booths are provided, for a total of nine service positions that are each allocated by rental car company. Adjacent to the rental car booths is one additional booth occupied by the Airport's guest services.

- Security Checkpoint

The passenger terminal has a single security screening checkpoint, located on the south side of the passenger terminal lobby. The area provides three lanes with two walk-through metal detectors and one advanced imaging technology body scanner to facilitate access to the secured concourse area. Frosted screening panels separate the lobby area from the security checkpoint and queuing area. Adjacent to the security checkpoint are three glass exit portals for arriving passengers.

- Concourse

The Airport has a single concourse, which hosts nine gates. Four additional gates will be available once Phase IV of the Terminal Modernization Program is complete. The concourse is located on an elevated area, accessible by stairs, escalators, or elevators located at the post-security checkpoint indoor rotunda. Most Airport concessions are located on the concourse, including two restaurants, a coffee kiosk, and a grab-and-go store. Other amenities in the concourse include seating, restrooms, an outdoor patio, and a literary kiosk.

1.5 LANDSIDE ACCESS AND PARKING

This section describes the landside access and parking facilities at the Airport, as illustrated in **Figure 1.7** and **Figure 1.8.**

- AIRPORT ACCESS ROADWAYS

The Airport access roadways provide an interface between the regional roadway network and the Airport facilities such as the passenger terminal curb front, rental car lot, public and employee parking areas, commercial vehicle loading areas, and support facilities.

Primary access to CID is provided by Arthur Collins Parkway SW, which provides access to passenger terminal curbside facilities, public parking, commercial vehicle operations, and Lippisch Place SW. Arthur Collins Parkway SW is a divided roadway that connects to Wright Brothers Boulevard, which turns into a one-way road after the intersection with Lippisch Place SW. Arthur Collins Parkway SW is located north of the passenger terminal area and curves in a circular fashion to the south and east. Lippisch Place SW intersects Arthur Collins Parkway SW near the Airport entrance to provide access to the east FBO, Collins Aerospace, the ATCT, and the ARFF building. Further west of the passenger terminal area, Cessna Place SW provides access to the cargo facilities and the west campus GA facilities.

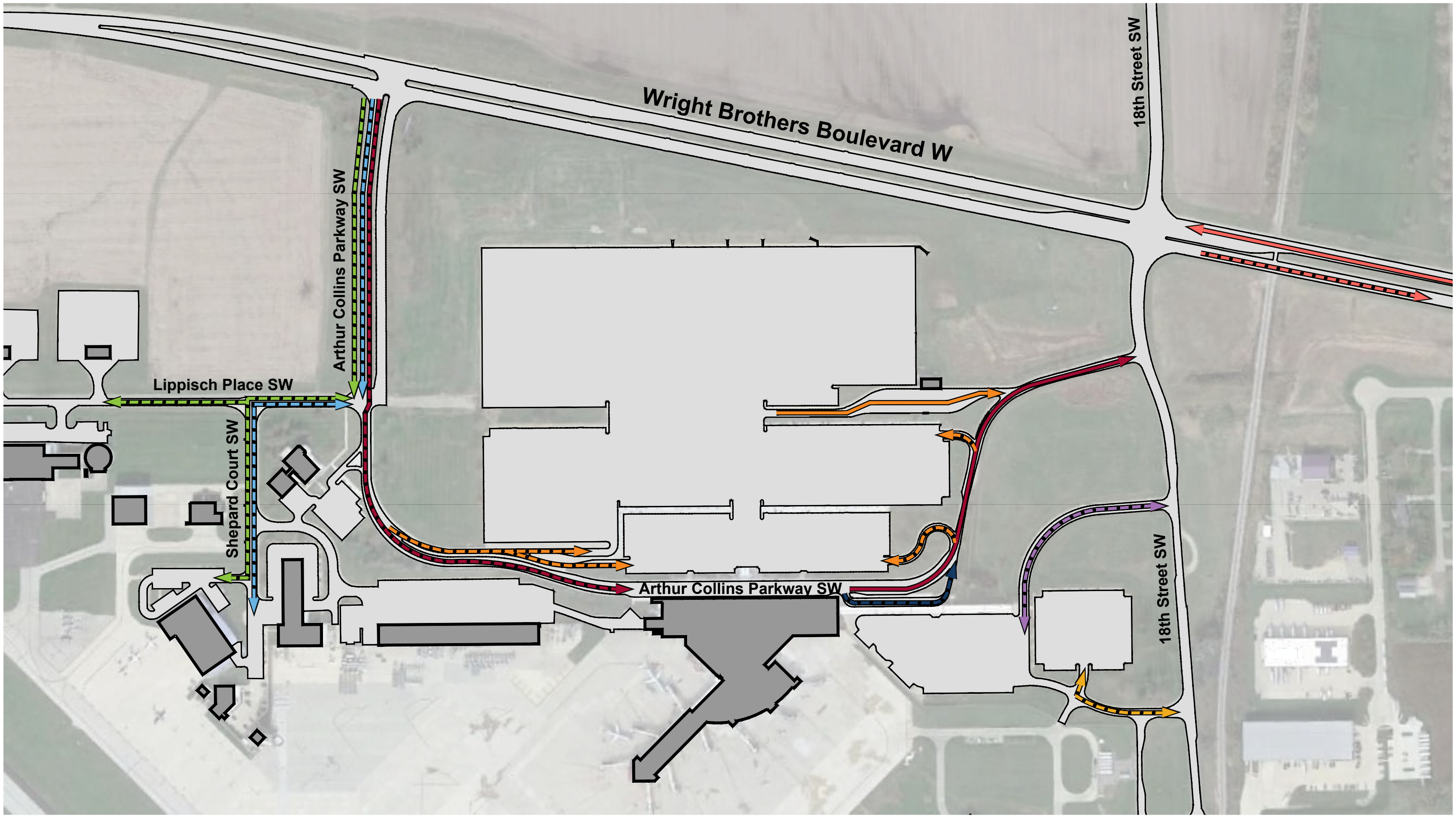
To the east of the passenger terminal area, the rental car and employee parking lots are accessed via 18th Street SW and Chanute Place SW. Further south, 18th Street SW leads to the former Iowa National Guard site and additional GA hangers.

Wayfinding signage is provided along all Airport access roadways to guide customers to their desired location. Signage is generally adequate in size with clear messaging. Additionally, dynamic insets are provided for two signs to indicate to passengers if the public parking lots are open or closed.

- PASSENGER TERMINAL CURBSIDE FACILITIES

At the passenger terminal's curbside area, Arthur Collins Parkways SW consists of three thru-lanes and one dedicated loading/unloading lane. It was observed that, on occasion, the thru lanes are also used as loading/unloading lanes. The single-level curbfront extends the entire north side of the passenger terminal, for an approximate total curbing length of 600 linear feet. Two crosswalks and exterior stairs connect the passenger terminal to the short- and long-term vehicle parking lots. The western half of the curbside is allocated for departures and the eastern half is designated for arrivals. Benches are provided throughout the curbside area for customer comfort. A Skycap/Valet booth is located on the curbside to assist customers with services such as baggage handling, jump starts, valet parking, and wheelchair assistance. Valet parking services are offered at $16 per day. Signage for the departure and arrival curbside areas is attached to the building canopy beams.

Figure 1.7: Terminal Area Roadway Access



LEGEND

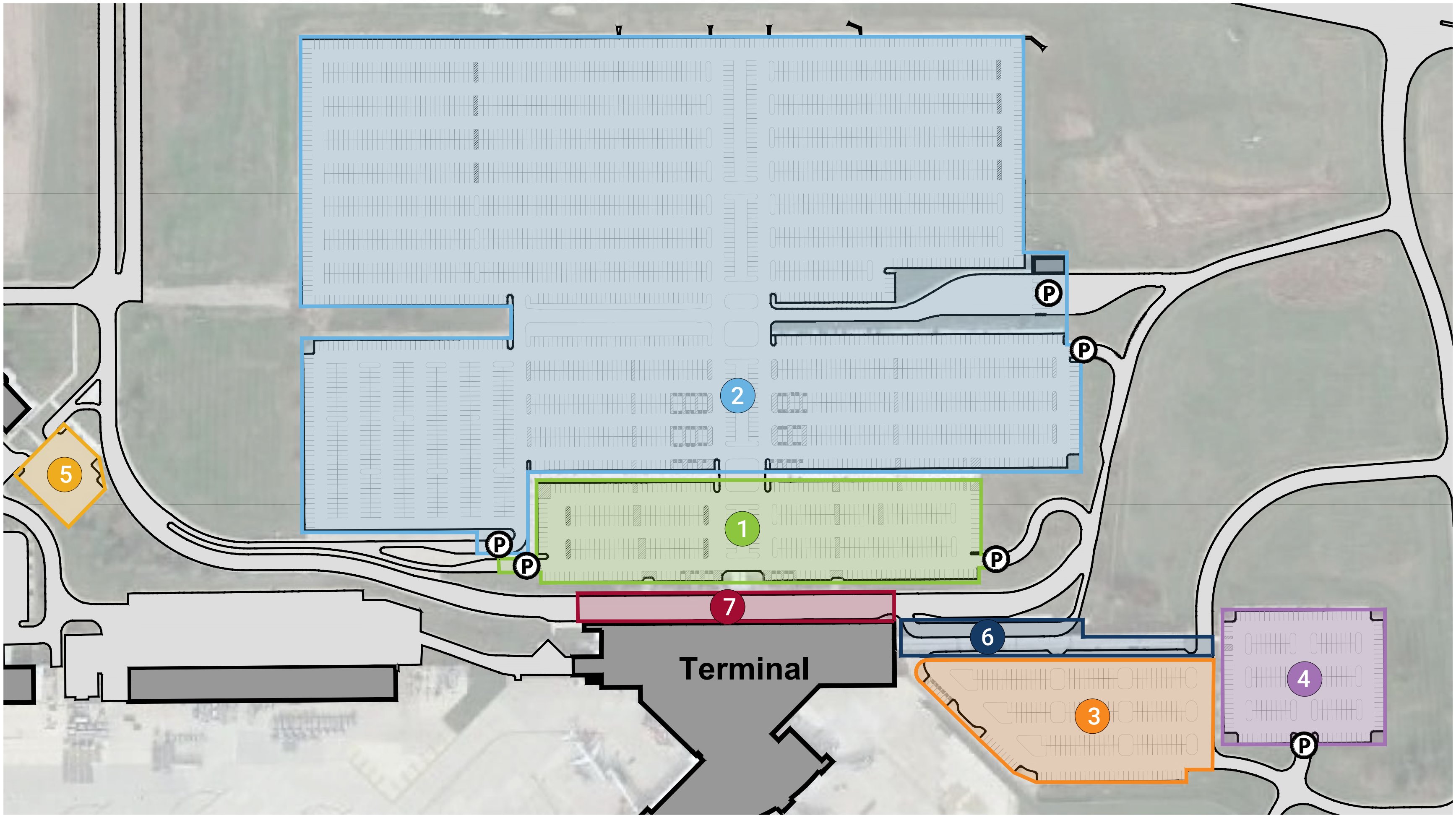
- Existing Roadways and Surface Lots
- Existing Airport Buildings
- To Terminal Curbfront
- From Terminal Curbfront
- To Public Parking
- From Public Parking
- To/From Commercial Vehicle Area
- To/From Rental Car Ready and Return
- To/From Employee Parking
- To/From East General Aviation Facilities
- To/From East Cargo Facility
- To Interstate I-380
- From Interstate I-380

0 125 250 500 Feet

N

Prepared by: Kimley-Horn, 2021.

Figure 1.8: Terminal Area Landside Facilities



LEGEND

- Existing Roadways and Surface Lots
- Existing Airport Buildings
- Parking Access Control
- 1 Short-Term Parking Lot
- 2 Long-Term Parking Lot
- 3 Rental Car Ready and Return Lot
- 4 Employee Parking Lot
- 5 Cell Phone Lot
- 6 Commercial Vehicle Area
- 7 Curbside Loading and Unloading Zone

Prepared by: Kimley-Horn, 2021.

- PARKING FACILITIES

The Airport provides parking for passengers, visitors, and employees with a variety of parking options. Parking available at the Airport include short-term parking, long-term parking, rental car parking, employee parking, and a cell phone lot. Several support facilities have dedicated parking areas for their users, which will be discussed later within this chapter. **Figure 1.8** shows the location of the parking facilities and **Table 1.9** summarizes the existing parking supply. All existing parking facilities are surface lots.

Table 1.9: Existing Parking Supply

Parking Facility	ADA Stalls	Standard Stalls	Total Stalls
Short-Term Lot	9	415	424
Long-Term Lot (a)	52	3,292	3,344
Rental Car Lot	0	235	235
Employee Lot	0	189	189
Cell Phone Lot	0	18	18
Total	**61**	**4,149**	**4,210**

(a) Includes Lot Area E and Gravel Lot Area.
Sources: Airport Base Map, Foth Infrastructure and Environment, LLC. (October 2021); Nearmap (accessed October 2021).

Short-Term and Long-Term Public Parking Lots

Short-term parking is offered in the lot directly north of the Airport passenger terminal and is closest in proximity to the passenger terminal. Access is provided by two, two-lane entry plazas, one located west of the parking lot and the other located east of the lot after the passenger terminal curbside area. Exiting parking patrons pass through one of the two motion-censored gates into the long-term lot to access the five-lane shared exit plaza. In addition to standard public parking stalls, the short-term lot includes several stalls for Fly Local Supporters and for Orange Permit holders. Short-term parking is priced at $14 per day. [13]

Long-term parking is offered in the lot north of the Airport passenger terminal and the short-term lot. Similar to the short-term lot, access is provided by two two-lane entry plazas, one on each side of the lot. Exiting patrons follow signs directly to the shared exit plaza. Long-term parking is priced at $8 per day.

The short- and long-term parking lots provide several amenities to parking patrons, including electric vehicle (EV) charging stations and a covered walkway. The covered walkway was enhanced in 2015 to include side enclosures for added weather protection. The lots do not operate with a parking guidance system or a reservation system.

Rental Car Lot

The rental car lot is located immediately east of the passenger terminal. Parking spaces are allocated in the lot by rental car agencies. The rental car brands that operate at the Airport are Alamo, Avis, Budget, Dollar, Enterprise, Hertz, and National. Three of the rental car agencies operate as dual brands, including Alamo/National, Avis/Budget, and Hertz/Dollar, while Enterprise operates as a single brand. The lot is used

[13] https://flycid.com/parking/

for both user pick-up of ready cars and user drop-off for the return of rental cars. Key drops are available for all agencies at the entrance to the passenger terminal to facilitate the return of rental cars.

Employee Lot

The employee lot is located along Chaunte Place SW to the east of the rental car lot. The employee lot has one entry lane and one exit lane, regulated via control gates activated by employee badges. The employee lot serves the passenger terminal staff and is provided free of charge. Other employees park at the stalls provided at the various support facilities around Airport property.

Cell Phone Lot

The cell phone lot is located along the entry roadway to the passenger terminal and is shared with the administration building parking lot. The uncontrolled lot has 18 dedicated stalls for waiting that are clearly signed. Vehicles in the cell phone lot must be attended at all times.

- COMMERCIAL GROUND TRANSPORTATION

Ground transportation services that are currently available at CID include taxis, transportation network companies (TNCs) (e.g., Uber, Lyft), airport shuttles, hotel shuttles, and public transit. The main commercial vehicle area is located immediately east of the passenger terminal, adjacent to the rental car lot. All ground transportation operators are permitted to drop off passengers at the passenger terminal curbside area but should pick up passengers at the commercial curbside. Cedar Rapids bus Route 11 is an exception, which drops off and picks up passengers from a dedicated location at the far west end of the passenger terminal curbside area. In addition to the commercial ground operators, there are also positions allocated to authorized vehicles and rental cars along the curbside. Taxi staging occurs on the commercial curbside, while TNCs must stage on a site north of Lippisch Place SW.

There are currently five taxi services, three bus services, six shuttle/limo services, and Uber and Lyft services available at CID. Signs mounted to the covered walkway beams and post-mounted signs assist operators and passengers with wayfinding. The number of allocated curbside positions available for each operator is presented in **Table 1.10**.

Table 1.10: Existing Ground Transportation Positions

Operator	Quantity
Taxis (Traditional and Prepaid)	9
TNCs (Uber and Lyft)	3
Airport Shuttles	3
Airport Express	4
Hotel Shuttles	3
Rental Cars	8
Authorized Vehicles	6

Sources: Airport Base Map, Foth Infrastructure and Environment, LLC. (October 2021); Nearmap (accessed October 2021).

- RENTAL CAR FACILITIES

The Airport offers rental car customer service, rental car parking, and quick turnaround facilities in close proximity to the passenger terminal. Customer service counters are provided within the passenger terminal near the baggage claim area. The rental car parking area, also often referred to as a rental car ready-and-return, is located directly to the east of the passenger terminal. As previously noted, the lot is used for both user pick-up of ready cars and user drop-off of returned cars. Spaces are allocated in the lot by rental car agencies.

The quick turnaround (QTA) service facility is located on the east side of 18th Street SW, across the street from the airport maintenance facility. The QTA is shared among the Airport's rental car agencies and includes refueling equipment, car wash bays, and maintenance bays.

Table 1.11 summarizes the Airport's existing rental car facilities.

Table 1.11: Existing Rental Car Facilities

Facility	Quantity
Customer Service Counters	9
Rental Car Lot Stalls	235
QTA – Fueling Positions	8
QTA – Car Wash Bays	2
QTA – Maintenance Bays	8
QTA Vehicle Storage Positions	517

Sources: Airport Base Map, Foth Infrastructure and Environment, LLC. (October 2021); Google Earth (accessed October 2021).

1.6 GENERAL AVIATION

The GA facilities at the Airport include an FBO, conventional aircraft hangers, T-hangers, and a self-service fueling facility. The GA facilities are for private, corporate, and charter aviation users.

- FIXED BASE OPERATOR (FBO)

The Airport has two FBO facilities, operated by Signature Flight Support. Signature provides GA users and airport tenants services such as fueling, hangar leasing, aircraft maintenance, and flight crew and passenger amenities. The largest FBO facility is the west facility, located west of Runway 13/31. This facility includes three conventional hangers. The second FBO hanger is located northwest of the ATCT. A new 18,000-square-foot FBO hanger and 9,500-square-foot building are currently in design, both of which will be located between the existing west FBO hanger and the FedEx cargo facility. These buildings are owned by the Airport.

- HANGAR FACILITIES

There are two groupings of T-hangers on airport property. Six T-hangar buildings are located north of the west FBO facility. Each of these hanger buildings has ten hangar units. These buildings house privately owned single-engine aircraft. The east hangers are located north of the former Iowa National Guard site. The east hanger site has four buildings and also houses privately owned aircraft. These buildings include three T-hangar buildings with 16 units each and a box hanger building with seven units. All hanger rentals are 30-day leases. These buildings are owned by the Airport.

The area to the northeast of Runway 13/31 hosts several large corporate hangers. These include three hangers occupied by Collins Aerospace, one hanger occupied by Kinze Manufacturing, and one hanger occupied by CRST The Transportation Solution, Inc. The Collins Aerospace and CRST hangars are on private property, located on-airport. Another hanger, previously occupied by Alliant Energy, is slated to serve as the home for the future Kirkwood Community College Aircraft Maintenance Program (AMP). These buildings are owned by the Airport.

1.7 AIR CARGO

The Airport accommodates FedEx, UPS, and DHL cargo operators at three cargo areas. Recent and ongoing projects are focusing on the relocation of some cargo operations in order to centralize all cargo operations on the north side of Runway 9. Cargo aircraft operations occur primarily between 4:30 a.m. to 8:30 a.m. and 9:30 p.m. to 11:45 p.m.

The west cargo apron is dedicated to a new 53,800-square-foot, state-of-the-art UPS facility, which opened for operation in July 2021. Accessed via Taxiway A2, the apron accommodates parking for four narrow-body aircraft.

East of the UPS facility is the FedEx facility, located at the central cargo apron. Accessed via Taxiway A4, the apron accommodates parking for two narrow-body and two regional aircraft. The facility is adequately sized for current operations, with approximately 90,827 square feet of space. However, Airport staff has indicated that FedEx is exceeding future operations projections and that additional apron space may be required.

The east cargo campus, located adjacent to the passenger terminal, includes the DHL facility and the east cargo building, previously utilized by UPS. The DHL building is approximately 22,000 square feet, and DHL primarily utilizes one aircraft parking position. A new DHL facility is planned and is proposed to be located west of the new UPS facility. The former UPS facility is currently used for miscellaneous equipment storage.

The Airport’s air cargo market area is also supported by the passenger airlines. However, belly cargo is processed and loaded/unloaded in the passenger terminal area, not a dedicated belly cargo area.

1.8 SUPPORT FACILITIES

- AIRPORT MAINTENANCE FACILITY

The airport maintenance facility is located southeast of the passenger terminal. The majority of the building is used for airport support equipment, such as snow removal equipment. The remaining portion of the building is used as a maintenance bay for airport support equipment. The building also hosts four tanks for pavement deicing material storage. The 52,700-square-foot building is approximately 20 years old and is reaching storage capacity. However, the building cannot be expanded in its existing location due to land constraints. Landside access to the maintenance facility is provided via 18th Street SW.

- AIRCRAFT RESCUE AND FIRE FIGHTING FACILITY (ARFF)

The ARFF at CID is located northeast of Runway 13/31, near the Runway 13 approach end. The building consists of a large garage area, offices, meeting rooms, and dormitory areas and associated amenities for staff. Access to the ARFF facility is located at the west end of Lippisch Place SW. There are 20 dedicated parking stalls for building visitors and staff outside of the airport operations area (AOA) fence and an additional 15 parking stalls within the AOA fence.

- FUEL STORAGE

Signature Flight Support serves as the fuel operator at CID. Fuel types available for aircraft are Jet A and AVGAS/100LL. Diesel and unleaded fuel are also available for ground vehicles. The fuel is stored at two fuel farm facilities. The east fuel farm is the primary fuel storage site and is located northeast of the airport maintenance facility. The west fuel farm is located to the west of the northwest GA hangers. Additionally, a self-service 100LL tank services the fueling station located at the west FBO campus. The self-service station is operated by the Airport. A summary of the fuel storage facilities and the refueling vehicles is presented in **Table 1.12**. All storage tanks are aboveground.

Table 1.12: Fuel Storage Capacity

Facility	Jet A (gal)	AVGAS/100 LL (gal)	Diesel/Gasoline
East Fuel Farm	56,000	12,000	13,000
West Fuel Farm	24,000	12,000 (a)	--
Self-Service Station	--	10,000	--
Refueler Vehicles	28,000	1,000	--

(a) Tank out of service as of March 2020.

Sources: Argus Fuel Facility Assessment (March 2020).

A new fuel farm located east of the airport maintenance facility will be completed in 2023 and will replace the existing east fuel farm. The new facility will include eight tanks, for a total Jet A storage capacity of 300,000 gallons. Space is available for future expansions of the fuel farm.

- Former Iowa Army National Guard Site

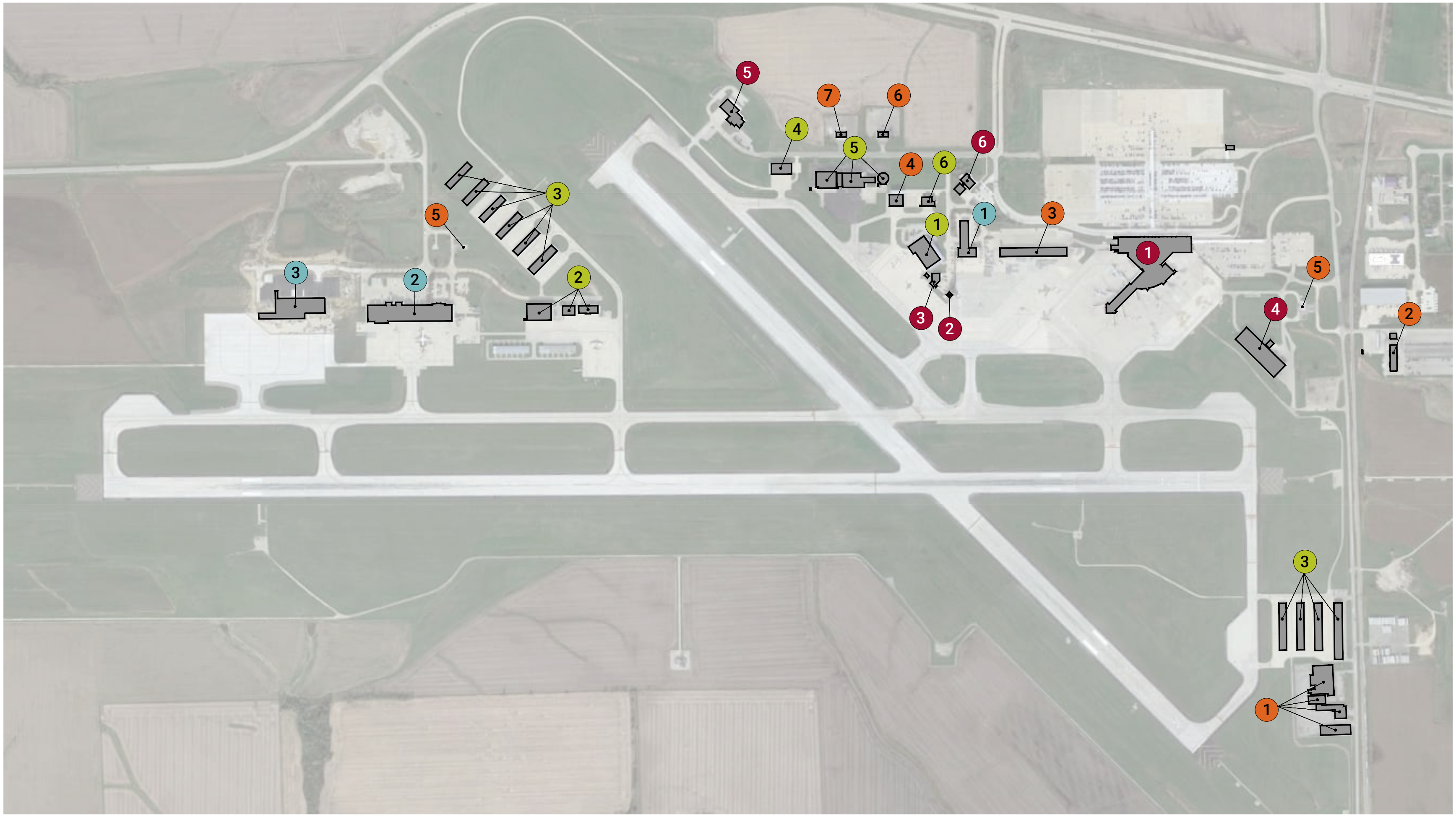
The former Iowa Army National Guard site is located south of the east T-hangers. The primary building is not currently used but serves as a storage location for some seasonal Airport equipment. Other buildings are leased out to the various tenants, including the Iowa State Patrol, several Cedar Rapids city departments, an electrical business, and an industrial equipment supplier. However, the buildings are in poor condition and are awaiting demolition.

- Airport Administration Building

The airport administration building is located along Arthur Collins Parkway SW northwest of the passenger terminal. The building includes offices for the Airport Director; the Directors of Operations, Finance, and Marketing; and administrative assistants. The building also includes a large commission meeting room, a smaller conference room, and an employee lounge. A breezeway connects the building to a maintenance garage with four bays. An adjacent parking lot provides 30 parking stalls that are shared with the Airport cell phone waiting area.

Although not necessarily airport support facilities, it is worth mentioning the Trailways and Deafinitely Dogs facilities are located along Lippisch Place SW, north of the Collins Aerospace hangers. While located on airport property, these facilities are leased out and not operated by the Airport.

Figure 1.9: Airport Buildings



LEGEND

Airport Support Buildings
1. Passenger Terminal
2. FAA Air Traffic Control Tower
3. FAA Technical Operations Center
4. Airport Maintenance Building
5. Airport Rescue and Firefighting Building (ARFF)
6. Airport Administration Building

Cargo Buildings
1. DHL Facility
2. FedEx Facility
3. UPS Facility

General Aviation Buildings
1. East FBO (Signature Flight Support)
2. West FBO (Signature Flight Support)
3. T-Hanger
4. Kinze Manufacturing Hanger
5. Collins Aerospace Hanger
6. CRST Hanger

Other
1. Former Iowa Army National Guard Campus
2. Rental Car Quick Turnaround (QTA) Facility
3. Former UPS Facility
4. Former Alliant Energy Hanger / Future Kirkwood Community College AMP Facility
5. Fuel Farm
6. Deafinitely Dogs!
7. Trailways Charter Bus Network

0 300 600 1200 Feet

N

Prepared by: Kimley-Horn, 2021.

1.9 ENVIRONMENTAL CONSTRAINTS

Known environmental constraints pertaining to potential master development recommendations are summarized in the following sections.

- THREATENED AND ENDANGERED SPECIES

There are 98 plant and animal species listed by the Iowa Department of Natural Resources (DNR) as being endangered, threatened, or a species of concern in Linn County. In addition, five species are listed by the U.S. Fish & Wildlife Service (USFWS) as threatened or endangered. The federally listed threatened species in the county include the prairie bush clover (*Lespedeza leptostachya*), the eastern prairie fringed orchid (*Platanthera leucophaea*), the western prairie fringed orchid (*Platanthera praeclara*), and the northern long-eared bat (*Myotis septentrionalis*). The Higgins eye pearly mussel (*Lampsilis higginsii*) is listed as endangered. No critical habitats are located within the project site.

Native habitat in the vicinity of the Airport has been mostly eliminated by previous grading and alternations, and the properties adjacent to the airport have been long-established for agricultural use. Any remaining native habitat likely resides adjacent to the mapped streams and wetlands (refer to **Figure 1.10** below). Review by the DNR will be requested for any future projects that may affect threatened and endangered species.

- AIR QUALITY

The airport is located in a county that is currently in attainment with the Clean Air Act National Ambient Air Quality Standards. As it stands, the airport is in accordance with these standards. The construction and operation of projects identified in *Chapter 5 – Recommended Development Plan and Financial Feasibility Analysis* would be expected to temporarily produce emissions of criteria pollutants.

- 4(F) RESOURCES

Section 4(f) resources include park and recreation lands, wildlife and waterfowl refuges, and historic sites listed on or eligible for the National Register of Historic Places. There are no park and recreation lands or wildlife and waterfowl refuges in the airport vicinity. However, there are historic sites that are listed on or eligible for the National Register of Historic Places near the airport.

- LAND USE

The airport is surrounded by important farmland. This includes prime farmland and farmland of statewide importance as defined by the USDA and certified by the NRCS State Conservationist, which is defined as land that includes areas of soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Federal projects that involve the conversion of farmland to non-agricultural use must comply with the Farmland Protection Policy Act (FPPA), which is administered by the USDA Natural Resources Conservation Service (NRCS). The airport is in an area that is subject to FPPA requirements.

- NOISE AND NOISE COMPATIBLE LAND USE

The FAA's 1050.1F Desk Reference notes that noise sensitive areas include residential, educational, health, and religious structures, and parks, recreational areas, areas with wilderness characteristics, wildlife refuges, and cultural and historical sites. While some of these types of land uses and sites are located near the airport, none are located within the existing 65 Day Night Average Sound Level (DNL) contour (see Figure 3-1 of the December 2022 Noise Technical Report) or within the 20-year (2041) forecasted 65 DNL contour (see Figure 3-2 of the December 2022 Noise Technical Report).

- SOCIOECONOMIC AND ENVIRONMENTAL JUSTICE

Based on the US Environmental Protection Agency's (EPA's) Environmental Justice Screening and Mapping Tool, there are no minority or low-income communities around the airport. Additionally, there are no schools, parks, childcare facilities, or other facilities serving children in the area.

- WATER RESOURCES

The Airport is located within the Iowa River and Cedar River watersheds, both of which are major tributaries to the Mississippi River in eastern Iowa. Based on information available from the DNR, five streams (Tissel Hollow Creek, Willow Creek, Hoosier Creek, South Hoosier Creek, Plum Creek, and Knapp Creek) and two wetlands are located within the vicinity of the Airport. There are 100-year and 500-year floodplains associated with the mapped streams (see **Figure 1.10**).

- STORMWATER MANAGEMENT

The Airport has a National Pollutant Discharge Elimination System (NPDES) permit, setting the conditions that the Airport needs to comply with regarding surface water discharges. The Airport also has a Stormwater Pollution Prevention Plan (SWPPP) that identifies existing airport facilities, potential pollutant sources, and recommendations for stormwater management.

- HAZARDOUS MATERIALS

Hazardous releases have been identified within or adjacent to the Airport by the U.S. Environmental Protection Agency (EPA) and the DNR, including:

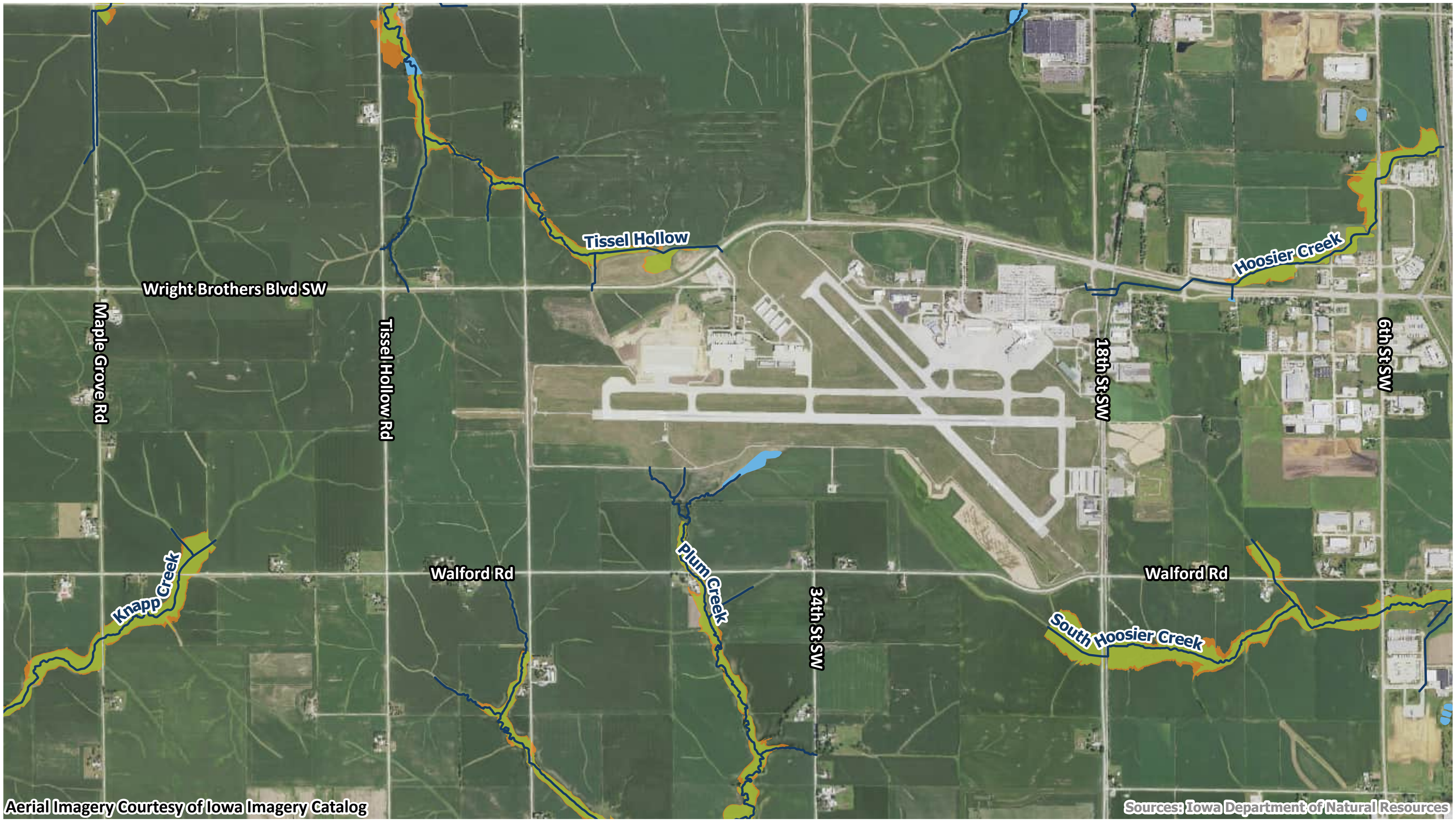
- 1 EPA Toxic Release
- 9 Spill Incidents
- 9 Leaking Underground Storage Tanks (LUSTs)

The general locations of these are shown on **Figure 1.11**.

The Airport's Spill Prevention, Control, and Countermeasure (SPCC) Plan establishes procedures, methods, and equipment to prevent the discharge of hazardous materials. It addresses topics such as spill prevention planning, response training, and mitigation planning and preparation. The SPCC Plan is reviewed, amended, and certified as appropriate every five years. Facilities that have oil in quantities greater than 1,320 gallons, including containers with a capacity of 55 gallons, must prepare a plan. Airport tenants owning and/or operating oil storage systems with aboveground capacities in excess of 1,320 gallons are required to maintain a copy of the SPCC Plan. The Airport Certification Manual, revised in 2021, identifies four hazardous material storage sites:

- East Cargo Apron: authorized areas for handling/storage hazardous cargo parking
- Central Cargo Apron: authorized areas for handling/storage hazardous cargo parking
- West FBO Apron: authorized areas for handling/storage hazardous cargo parking
- West Cargo Apron: authorized areas for handling/storage hazardous cargo parking
- Runway 9 Hold Bay: hot cargo parking

Figure 1.10: Water Resources



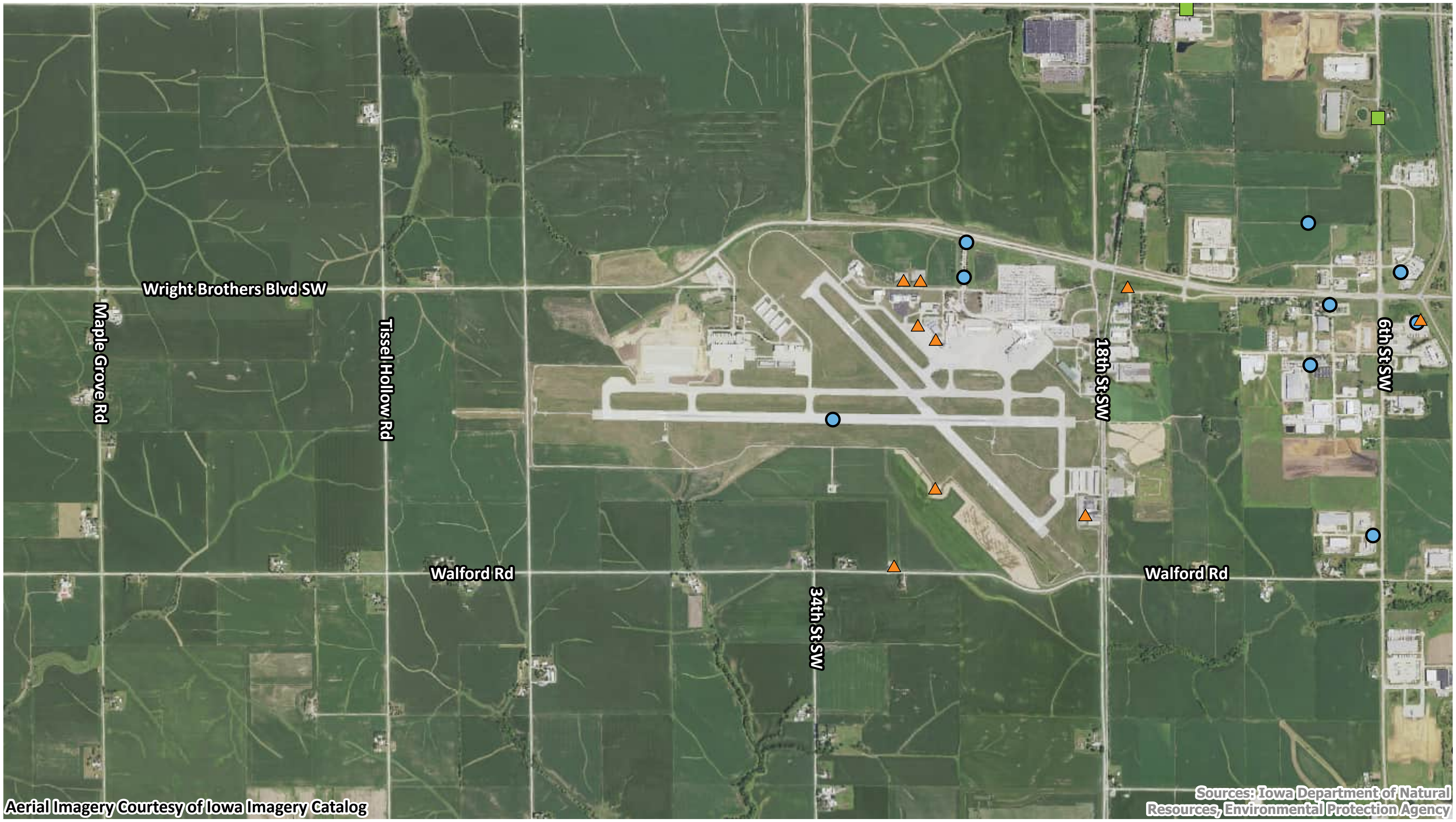
LEGEND

100-year Floodplain
500-year Floodplain
NWI of Iowa
Streams of Iowa

0 750 1500 3000 Feet

Prepared by: Kimley-Horn, 2021.

Figure 1.11: Contamination Sites



LEGEND

- Spill Incidents
- Leaking Underground Storage Tanks
- EPA Toxic Releases

0 750 1500 3000 Feet

N

Prepared by: Kimley-Horn, 2021.

- SOILS AND FARMLAND

In January 2012, a custom soil survey was retrieved from the U.S. Department of Agriculture (USDA) for Airport-owned property and the area within the immediate vicinity of the Airport property boundary. The most common soil types on or very close to airport property include Dinsdale silty clay loam, Kenyon loam, Colo silty clay loam, Klinger-Maxfield silty clay loams, Kenyon loam, Orthents, loamy, and Klinger silty clay loam.

The USDA defines prime farmland as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. Approximately 4,000 acres within and adjacent to the Airport are mapped as prime farmland, shown on **Figure 1.12**. In addition, approximately 2,000 acres within and adjacent to the Airport are mapped as farmland of statewide importance, which is defined as land that includes areas of soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Federal projects that involve the conversion of farmland to non-agricultural use must comply with the Farmland Protection Policy Act (FPPA), which is administered by the USDA Natural Resources Conservation Service (NRCS).

Hydric soils are soils that form under conditions of saturation, flooding, or ponding during the growing season and are saturated long enough to develop anaerobic conditions. According to the USDA Web Soil Survey, approximately 700 acres within and adjacent to the site are mapped with a hydric soil rating of 90% or higher, shown on **Figure 1.13**. Hydric soils can be an indication of wetlands, and a wetland evaluation would need to be completed prior to construction to confirm the presence of wetlands.

- ARCHITECTURAL RESOURCES

Two historic resources eligible for the National Register of Historic Places (NRHP) are located southwest of the Airport. Both are on Cherry Valley Road between Walford Road and Linn Johnson Road (see **Figure 1.14**). The Joseph Cerveny House and Farmstead was built circa 1890 and consists of a Queen Anne farmhouse, a small front gable cottage, a gambrel roof barn concrete silo, sheds, and outbuildings. The Wesley Cerveny Farmstead was built circa 1900 and consists of a farmhouse, small gabled house, front gable barn, double corncrib, sheds, and outbuildings.

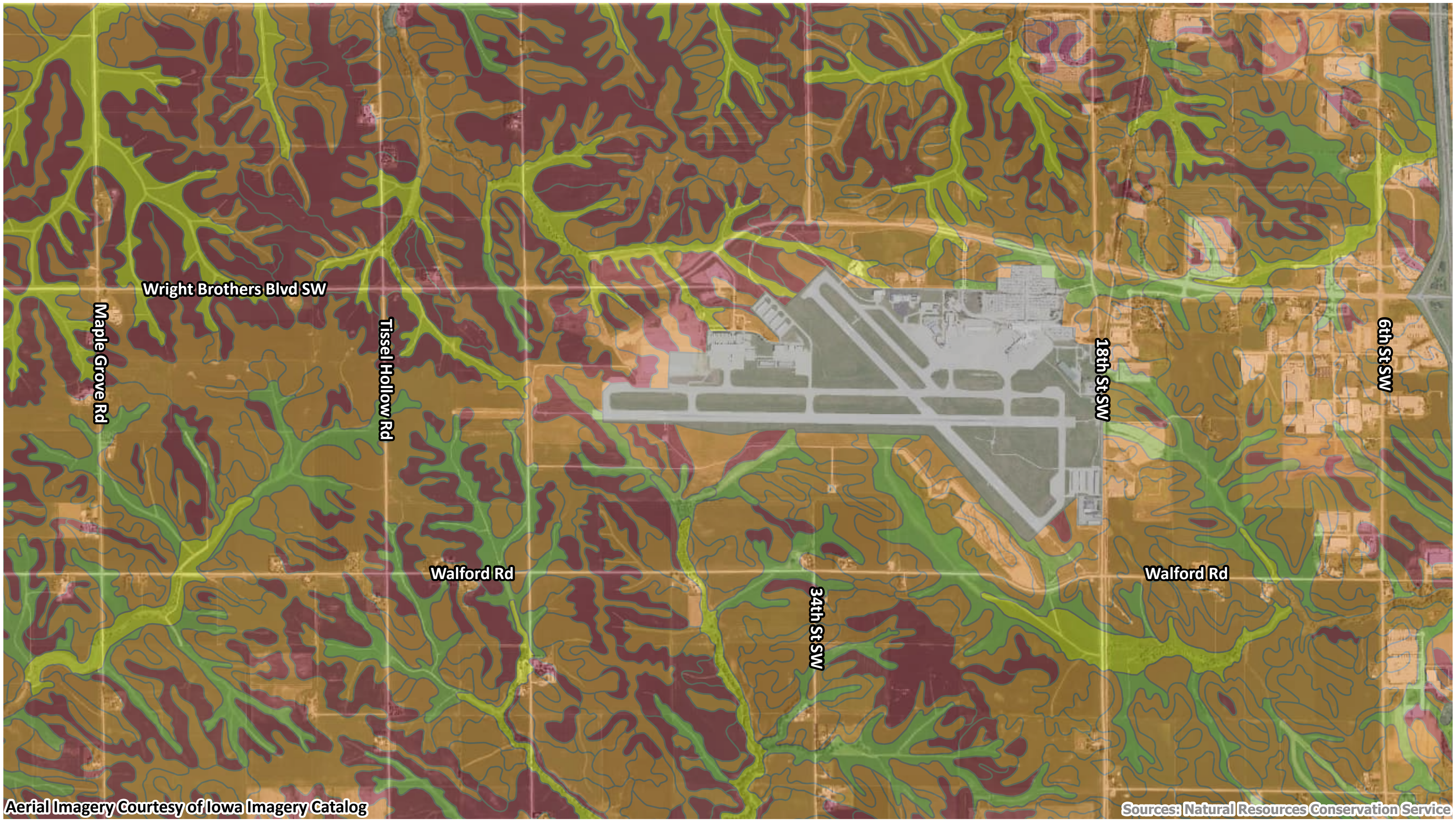
The State Historic Preservation Office (SHPO) of Iowa's Standing Structure Inventory was reviewed to identify any additional properties contained within SHPO's Iowa Inventory. Eighteen historic properties, including the two described above, are located within the vicinity of the Airport, as shown on **Figure 1.14**. Additionally, a list of structures and buildings on airport property and at least 40 years is provided in **Table 1.13**.

Table 1.13: Structures and Buildings on Airport Property

Building	Street Address	Floor Area (sq ft)	Year Built
Hangar East 1-16	10108 18th Street SW	18,096	1968
Hangar East 17-32	10108 18th Street SW	18,096	1968
Hangar East 33-47	10108 18th Street SW	19,712	1975
Hangar East 48-53	10108 18th Street SW	25,200	1975
Rental Building East	2802 Lippisch Place SW	2,625	1977
Rental Building West	2818 Lippisch Place SW	2,625	1979
Garage	18th St. & Wright B. Blvd	576	1972
Rental Dwelling w/Garage	1109 Wright Brothers BLVD, SW	1,950	1955
National Guard Armory Building	10400 18th Street, SW	51,367	1970
National Guard Storage Building #1	10400 18th Street, SW	7,860	1970
National Guard Storage Building #2	10400 18th Street, SW	16,272	1970
National Guard Storage Building #3	10400 18th Street, SW	18,236	1970
Rental Dwelling w/Garage	1113 Wright Brothers BLVD, SW	1,332	1952
Former Alliant Hangar Building	9410 Shepard Court SW	13,015	1981

Sources: Airport Base Map, Foth Infrastructure and Environment, LLC. (October 2021); Nearmap (accessed October 2021).

Figure 1.12: Farmland Rating



LEGEND

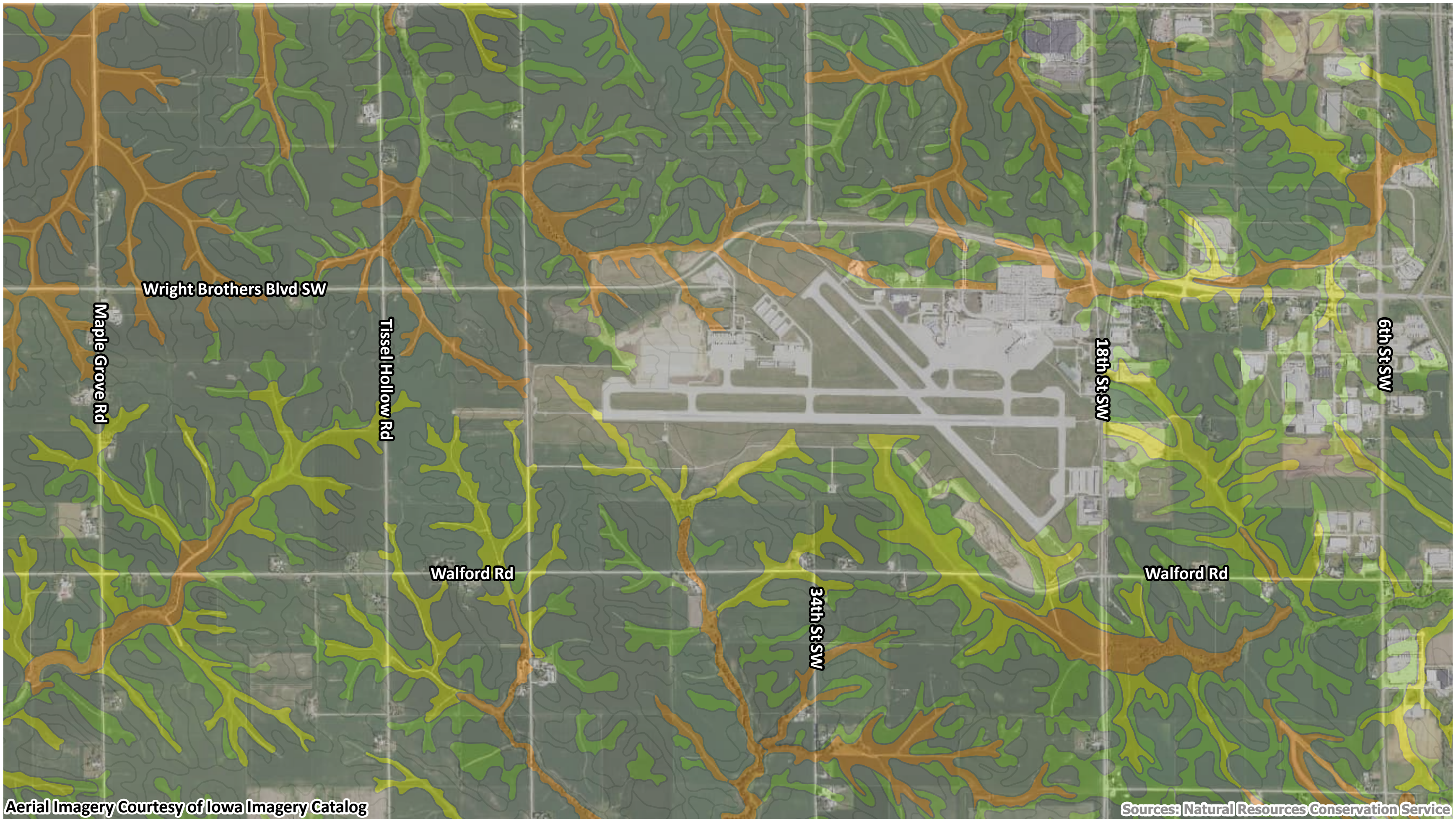
- Prime farmland
- Farmland of statewide importance
- Not prime farmland
- Prime farmland if drained
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

0 750 1500 3000 Feet

N

Prepared by: Kimley-Horn, 2021.

Figure 1.13: Hydric Soils



LEGEND

Hydric Soils Rating by Map Unit

- Hydric (100%)
- Hydric (66 - 99%)
- Hydric (33 - 65%)
- Hydric (1 - 32%)
- Not Hydric (0%)

0 750 1500 3000 Feet

N

Prepared by: Kimley-Horn, 2021.

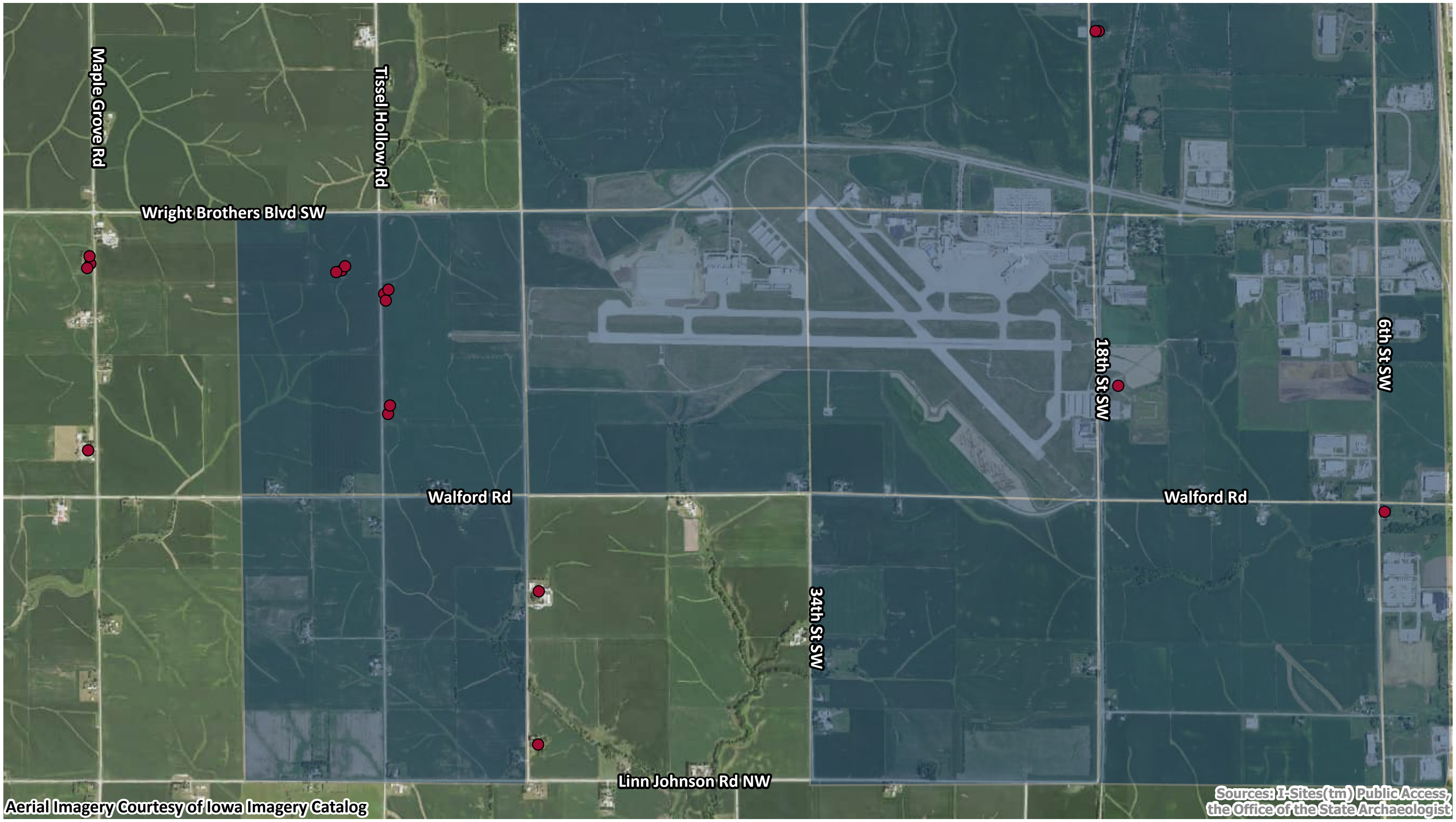
- ARCHAEOLOGICAL RESOURCES

Archeological resources on Airport property or in the vicinity were identified in a 2011 report by the Office of the State Archaeologist. Five previously identified archaeological resources were reported on airport property, including three Euro-American historic farm/residences, one Euro-American historic scatter, and one isolated Prehistoric find. Three additional previously identified Euro-American historic farm/residence archaeological sites were reported within the vicinity of the Airport.

In 2018, a Phase I Archeological Investigation was conducted for the Airport's west cargo apron expansion project. This investigation identified an additional historic archaeological site on airport property, the remnants of a late nineteenth-early twentieth century farmstead. The investigation concluded that the site does not appear to be historically significant.

Mapping from the Office of the State Archaeologist indicates that most sections in the vicinity of the Airport contain at least one archaeological site (see **Figure 1.14**). Additional archaeological studies should be undertaken prior to any proposed work.

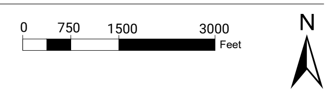
Figure 1.14: Historical Sites



LEGEND

Section Contains Archeological Sites Historic

Structures on the Iowa Inventory



Prepared by: Kimley-Horn, 2021.

1.10 SUSTAINABILITY EFFORTS

Sustainability is a concept that broadly means balancing economic, environmental, and social needs. Incorporating sustainability initiatives into airport operations helps save money and resources, meet community expectations, improve customer experience, and demonstrate leadership. Environmental stewardship is one of Eastern Iowa Airport's (CID) five core values. The Airport has been incorporating sustainability into its management and operation for years and has developed the Sustainable Master Plan with sustainability embedded throughout. The principles for sustainability at CID include:

- Engaging a range of stakeholders and perspectives
- Aligning with local sustainability initiatives where feasible and beneficial
- Building upon existing airport activities and initiatives
- Applying industry best practices and customizing them to CID's unique operating environment

The inventory of existing sustainability measures in place at CID are organized into four main categories:

Emissions and Energy

Water Use and Water Quality

Stakeholder Engagement

Recycling and Waste Management

This document provides the local sustainability context, aviation industry sustainability context, and summarizes existing initiatives at CID.

Local Sustainability

Sustainability is important to the Eastern Iowa region and the local governments, organizations, and communities. CID is located in Linn County, owned by the City of Cedar Rapids and operated by the Cedar Rapids Airport Commission. It neighbors Johnson and Benton County and serves the surrounding area, particularly Iowa City and the University of Iowa. These entities also have sustainability plans and initiatives in various stages of implementation. Key local sustainability initiatives are detailed in **Table 1.14**.[14]

[14] Note: This table was developed based on information available as of April 2022. The table is non-exhaustive and does not include all local sustainability activities.

Table 1.14: Local Sustainability Initiatives

COUNTY		
Linn County	**Johnson County**	**Benton County**
• Linn County 2020 Climate Resolution Resolution to develop climate and adaptation plans and projects, which prioritize participation of vulnerable communities. • Linn County Comprehensive Plan (2013) • County Sustainability Council • Grow Solar Program • 2010 Greenhouse Gas Inventory (Published 2021) • County Sustainability & Resiliency Advisory Committee	• Johnson County 2018 Comprehensive Plan The plan includes sustainability initiatives related to natural resource protection, climate resiliency, equity, affordable housing, energy efficiency and renewables, and green building and operations. • Stormwater management • Soil health program • Sustainability Working Group • Grow Solar Program • County-owned Solar arrays	• Recycling Ordinance
CITY/ UNIVERSITY		
City of Cedar Rapids	**Iowa City**	**University of Iowa**
• 2020 Climate Resolution (February 2020) The resolution sets an overall city goal for net zero carbon emissions by 2050. It requires development of a city-wide GHG inventory, sets various interim GHG emissions reduction goals, energy reduction and renewable energy, climate adaptation targets, climate justice, and green job development plans. • Community Climate Action Plan (September 2021) • IGreenCR Action Plan The IGreenCR Plan includes a number of goals related to GHG reductions, fuel use reductions, renewable energy, water quality, increasing greenspace, climate adaptation, affordable housing, and community quality of life. • Eastern Iowa Electric Vehicle Readiness Plan (June 2021)	• Climate Action and Adaptation Plan The plan sets an 80% reduction in GHG goal by 2050 and lays out a series of action categories for buildings, transportation, waste management, adaptation, and lifestyle to meet the goal. • Iowa City Community-wide Greenhouse Gas Emissions Report (June 2017) • Iowa City Municipal Greenhouse Gas Emissions (August 2017) • EcoCity Footprint Tool Pilot Summary Report (December 2017) • Accelerating Iowa City's Climate Actions (April 2020) • Climate Action Commission • Eastern Iowa Electric Vehicle Readiness Plan (June 2021)	• Office of Sustainability and the Environment 2022-2024 Strategic Plan Holistic plan that describes a series of sustainability goals related to curriculum, student life, research, diversity, equity and inclusion, community outreach, environment, and administration. • University of Iowa 2030 Sustainability Goals Goals include GHG reductions, increasing sustainability awareness among students and staff, becoming zero waste, improving water quality, and initiating sustainability reporting. • Campus initiatives, student initiatives, academic offerings, research initiatives related to sustainability

- Aviation Industry Sustainability

Sustainability is defined as meeting the needs of the present without compromising the ability of future generations to meet their own needs (a balance of economic, environmental, and social needs). The airport industry broadened the definition of sustainability to ensure a balance between economic viability, operational efficiency, natural resources, and social responsibility factors (the EONS definition). Operational efficiency is critical and unique to airport viability and sustainability.

Source: HMMH

Sustainability frameworks guiding the aviation industry include:

- Airports Council International (ACI) Europe and ACI World Sustainability Strategy
- United Nations Sustainable Development Goals (UNSDGs)
- Global Reporting Initiative (GRI) Airport Operator Sector Supplement

Additionally, the aviation industry is committed to reducing its impact on climate change and GHG emissions. Goals and carbon management schemes specific to the aviation industry include:

- U.S. Department of Transportation (USDOT) 2021 Aviation Climate Action Plan includes a goal of net-zero GHG emissions by 2050[15]
- International Civil Aviation Organization (ICAO) Committee on Aviation Environmental Protection (CAEP) Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)[16] and long-term aspirational goal (LTAG) for international civil aviation CO2 emissions reductions[17]
- ACI Airport Carbon Accreditation program[18]
- Aviation industry 2050 net-zero carbon goal from the Air Transport Action Group (coalition of airlines, airports, and manufacturers)[19]

[15] Source: FAA, *United States Aviation Climate Action Plan* (published November 2021).

[16] Source: ICAO, Environmental Protection, CORSIA (accessed April 2022).

[17] Source: ICAO, Environmental Protection, LTAG (accessed April 2022).

[18] Source: Airport Carbon Accreditation Website (accessed April 2022).

[19] Source: Air Transport Action Group, *Commitment to Fly Net Zero 2050* (published October 2021).

- CID Sustainability

Environmental stewardship is one of CID's five core values; the Airport seeks to promote and protect the safety and health of both passengers and the community.[20] CID recognizes that sustainability is an essential element of its current and future operations. Existing CID sustainability initiatives are categorized into the following:

- Greenhouse Gas (GHG) Emissions and Energy Use
- Water Use and Water Quality
- Stakeholder Engagement
- Waste Management

Existing initiatives will be built upon as part of the Sustainable Master Plan.

GHG Emissions and Energy Use

Prior Studies

CID has explored several opportunities for improving energy efficiency and installing renewable energy, as detailed below.

Level 1 Energy Efficiency and Sustainability Analysis (March 13, 2012) [21]

Appendix B of the 2014 Master Plan included an analysis to determine potential opportunities for enhancing energy efficiency and sustainability at CID. The 2014 Master Plan team completed an on-site walk through and high-level review of the terminal and other buildings at CID to observe heating, cooling, ventilation, lighting, and hot water systems. The information served as a baseline for determining future terminal upgrades and energy conservation opportunities.

Eastern Iowa Airport Facility Energy Assessment (January 23, 2017)[22]

The Facility Energy Assessment included an analysis of historic gas and electricity consumption. It also included on-site observation of existing infrastructure, such as HVAC systems and lighting systems to identify potential energy savings opportunities for both new projects and retrofits. The analysis focused on the four buildings with the highest energy consumption at CID: Passenger Terminal, Airport Maintenance Facility, Airport Administration Building, and the Aircraft Rescue and Fire Fighting Facility (ARFF). It also included a high-level analysis of potential sites for on-site solar production and installation. The report recommended installation of a 240-Kilowatt (kW) solar photovoltaic (PV) system on the passenger terminal and identified potential sources of funding from the Federal Aviation Administration (FAA).

Solar PV Phase 2 Project Design Development Report (May 21, 2021)[23]

Most recently, a report was completed to determine the feasibility and costs for installing solar PV systems on the Public Safety, Administration, Maintenance, Rental Car, and Revenue Control buildings. It included

[20] Source: FlyCID Website, PFAS, *CID's Commitment to Environmental Stewardship* (accessed April 2022).

[21] Source: Sustainable Engineering Group LLC, *Level 1 Energy Efficiency and Sustainability Analysis: Eastern Iowa Airport* (published March 2012).

[22] Source: Mead & Hunt and Sustainable Engineering Group LLC, *Eastern Iowa Airport Facility Energy Assessment* (published January 2017).

[23] Source: HGA, *Solar PV Phase 2 Project Design Development Report* (published May 2021).

potential designs for solar PV systems and recommendations related to PV production capability at each of the facilities. The systems were designed for maximum utility savings based on the expected usage and rate structure.

Renewable Energy

CID has had success incorporating solar and geothermal energy sources into new, existing, and renovated facilities.

Solar

In 2017, the airport received a $579,870 FAA Airport Improvement Program (AIP) grant to install a 240-kW solar PV system on the terminal's newly renovated holdroom area. A total of 738 solar panels were installed on the terminal roof. The installation was expected to reduce the Airport's electric grid demand by 268,000 kWh (kilowatt hours), providing enough electricity to power 19.9 households per year.[24]

Figure 1.15: Community Interactive Display

In 2021, the airport created a plan to finance and install roof-mounted solar systems on four airport buildings and one ground solar PV system for associated electrical infrastructure. The total project cost is $916,870, which is fully funded through CARES Act grants, with construction in 2022. Installations include:

- Public Safety Facility (ARFF) 125-kW (roof), 75 kW (ground)
- Administration Building (Office), 34-kW
- Administration Building (Garage), 20-kW
- Maintenance Facility, 145-kW[24]
- Rental Car Facility, 68-kW

To provide information to passengers about the impacts of the solar projects at the Airport, a Community Interactive Display in the pre-security public areas of the terminal shows real-time solar array generation statistics, as shown in **Figure 1.15**.

Geothermal

Phase 3 of the CID Terminal Modernization program included a 54,000 square foot addition, which is completely heated and cooled by a newly installed geothermal water sources heat pump system. The system features 135 wells to heat and cool the new and existing holdrooms. The Airport also installed geothermal heating when it replaced two sets of concrete steps from the parking lot to the terminal. The Airport previously installed geothermal heating and cooling for its $5 million public safety building (ARFF) that opened in September 2009.

[24] Source: Airport Records, *Environmental Stewardship Efforts Document* (accessed December 2021).

Energy Efficiency Measures and Initiatives

The Airport has been working to improve lighting efficiency through various lighting upgrades and the conversion of older incandescent lighting to energy-efficient LED lighting. In February 2011, the Airport completed an extensive interior and exterior lighting upgrade. The $208,500 project was estimated to reduce energy use by as much as 80 percent. The project included replacing metal halide lights installed in 1985 on the outside of the terminal with LED lighting. Older T12 fluorescent lights inside the terminal were replaced with more energy-efficient T8 lighting. The Airport received a grant of $84,615 from the Iowa Office of Energy Independence (now the Iowa Energy Office) and matched it with $123,885 of local funding to cover the cost of the project.[24]

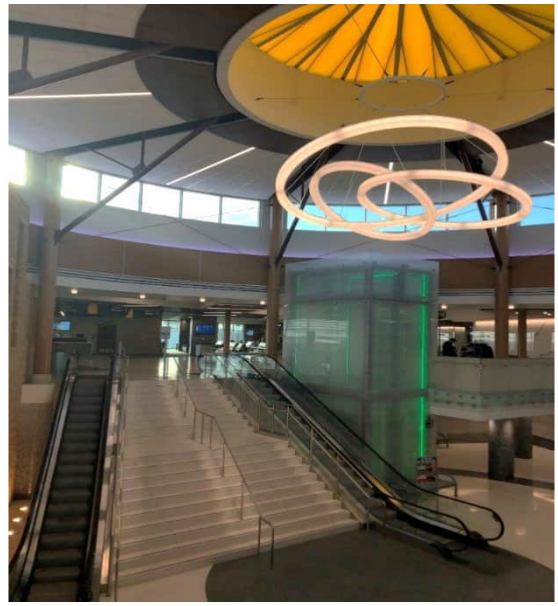


Figure 1.16: Terminal Skylights

The installation of skylights during Phase 2 of the Terminal Modernization Program has also reduced energy costs and improved visibility, as shown in **Figure 1.16**. Natural daylight allows the Airport to have minimal artificial interior lights on during the day.

CID is also working to improve its Electric Vehicle (EV) charging capacity. Four EV charging stations were installed in 2017. Two are located in the short-term parking lot and two in are located in the long-term parking lot. Vehicle owners only pay for parking and there is no additional fee for charging.

Utility Programs

Alliant Energy is the electric utility provider for the Airport. Alliant has corporate sustainability plans and environmental initiatives including the Sustainable Energy Plan[25], Clean Energy Blueprint[26], and Community Solar program[27]. The Alliant Sustainable Energy Plan includes a goal of net-zero CO2 emissions by 2050, with a focus on clean, renewable energy. Alliant also offers energy efficiency rebates, commercial energy audit services, and new renewable energy pilot programs. CID has taken advantage of rebates from Alliant for lighting upgrade projects, as well as commercial new construction energy modeling for the Terminal Modernization Program.

Water Use and Water Quality

Baseline Water Use

Baseline water use was estimated based on 2019 water bills. Water bills charge based on volume of water usage in centum cubic feet (CCF); consumption was summed by facility and converted to gallons. Based on this calculation, facilities at CID used approximately 8.58 million gallons of water in 2019.

[25] Source: Alliant Energy Website, *Our Sustainable Energy Plan* (accessed April 2022).

[26] Source: Alliant Energy Website, *Iowa Clean Energy Blueprint* (accessed April 2022).

[27] Source: Alliant Energy Website, *Alliant Energy Community Solar* (accessed April 2022).

Deicing

Since 2009, CID has worked with the City of Cedar Rapids and the Iowa Department of Natural Resources on water quality improvements, including the handling of aircraft and pavement deicing fluids. In 2012, the Airport constructed an outfall deicing basin to improve stormwater quality and it has contracted with an environmental engineering company for monitoring.

CID currently does not have a centralized deicing pad; the entire ramp is used for deicing. The City of Cedar Rapids currently processes the deicing wastewater. CID does not recycle glycol as the volumes are not sufficient to make the process cost-effective.

Wings2Water Program

CID founded the Wings2Water program, a 501(c)(3) non-profit program in partnership with Linn County Conservation and Johnson County, which helps fund water quality improvement projects in both counties through donations from airport customers, corporate partners, and the public. Donations can be made via the Wings2Water website, through the counties, purchases at concessionaires in the Airport, at parking meters, and at donation meters in the Airport, as shown in **Figure 1.17**. **Figure 1.17** also shows the Wings2Water promotional sign in the pre-security public area in the CID terminal intended to spark curiosity about the program and engage travelers. The non-profit has raised over $100,000 in corporate and individual donations. [28]

Figure 1.17: Wings2Water

(Left): Wings2Water promotional sign in the pre-security public area in the terminal.
(Right): Wings2Water informational sign and donation meter in the CID airport.

[28] Source: Iowa Environmental Council, *ICE Announces 2020 Pro H2O Award Winners* (published August 2020).

The Airport recognized the opportunity for commercial service airports to be leaders in improving water quality in their watersheds and hopes to expand the Wings2Water program to other states. Iowa is a major contributor of excess nutrients in the watershed and ultimately the Gulf of Mexico due to the heavy presence of the agriculture industry in the state. The program seeks to fund projects that result in nutrient runoff reductions and improvements to local water quality.[29]

Per- and Polyfluoroalkyl Substances (PFAS)

PFAS is a group of chemicals that are used in many consumer-based products and industries. PFAS are an emerging concern throughout the U.S. as they do not break down in the environment or the human body and exposure to these chemicals can lead to environmental degradation and adverse health impacts. PFAS contamination is a potential concern to airports and military installations across the U.S. as use of the chemicals in firefighting Aqueous Film-Forming Foam (AFFF) has been mandated by the FAA for decades. AFFF is the most effective fire suppressant for extinguishing flammable liquid-based fires. Although the FAA is currently researching non-fluorinated replacements for AFFF, to date none have been approved. Until a non-fluorinated replacement is approved, airports are still required to use AFFF.

The U.S. Environmental Protection Agency (USEPA) is actively researching these substances but the agency has not yet designated PFAS as a “hazardous substance” and there is no current enforceable limit for PFAS in drinking water.[30] In the meantime, states, such as Iowa, are developing their own action plans to address PFAS and minimize future release of the harmful chemicals to the environment.[31]

CID has developed a preliminary plan to proactively evaluate potential PFAS contamination at the Airport. CID approved multiple action items in April 2021 related to PFAS investigation, including research on historical use and storage, groundwater testing, and soil sampling. Additionally, CID replaced long chain AFFF with short chain AFFF and purchased a “no-foam dispensing system”, which eliminates the need to dispense AFFF when calibrating and testing fire suppression equipment. The Airport also supported private well testing efforts at 19 residences conducted by Linn County Public Health and University of Iowa Center for Health Effects and of Environmental Contamination (CHEEC) that took place from 2020-2021.[20] CID will continue to prioritize the safety of the community and will modify its approach as new information comes out and best practices and regulations are established.

Farmland Waterway Improvements

CID devotes capital improvement funding to make improvements to farmland waterways, including tile installation, reshaping, grading, and reseeding. **Table 1.15** provides an overview of CID farmland improvements completed from 2015 through 2019.

[29] Source: Wings2Water Website (accessed April 2022).

[30] Source: U.S. EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024* (published October 2021).

[31] Source: Iowa Department of Natural Resources, *PFAS Action Plan* (published January 2020).

Table 1.15: CID Farmland Improvements – Completed, Project Expenditures 2015-2019

Fiscal Year	Project	Contractor	Expenditure
2015	Waterway Tiling & Grading	Frank Springsteen Tiling, Inc.	$79,489
2016	Waterway Tiling & Grading	DY Tilling Inc.	$84,574
2016	Waterway Tree Clearing & Grubbing	Kloubec Earthworks	$14,000
2017	Waterway Tiling & Grading	DY Tiling Inc.	$86,344
2017	Waterway Tree Clearing & Grubbing	Kloubec Koi, LLC	$36,740
2019	Waterway Tree Clearing & Grubbing	Rathje Construction Co.	$18,426
2019	Waterway Wiling & Grading	Hammes Bulldozing, Inc.	$29,253
Total			**$348,827**

Source: Airport Records (published July 2020).

Sustainable Tenant Farming Practices

CID has been involved with several initiatives and partnerships regarding sustainable farming and watershed protection. CID is one of the largest farms in Linn County, with farmland accounting for nearly 2,000 of its 3,200 total acres. The farmland is leased and farmed by two local farmers. The land is located at the top of the watersheds for both the Cedar and Iowa rivers.

CID tenant farmers are required to adhere to sustainable farming practices, including planting cover crops, no till planting, and no fall fertilizer application. All of these techniques are intended to reduce fertilizer use and nutrient runoff into the local waterways. Excess nutrients in waterways result in harmful algae blooms and dead zones. In addition to the environmental benefits, it is in the farmers best economic interest to conserve inputs necessary for crop production, such as seeds and fertilizer, because they are expensive. Variable Rate Technology (VRT) is a technique used for spreading fertilizer that conserves resources. The farmers take grid samples so that they can apply fertilizer where it is needed and use only the amount that is needed.

Cover Crops

CID requires use of cover crops on all 2,000 acres of farmland. Cover crops are used to slow erosion, improve soil health, enhance water availability, smother weeds, help control pests and diseases, and increase biodiversity. [24]

No Till Planting

CID requires all crops to be no-till planted, as defined by the Linn County Natural Resources Conservation Service (NRCS) office. No-till farming decreases the amount of soil erosion tillage caused in certain soils. Other possible benefits include an increase in the amount of water that infiltrates into the soil, soil retention of organic matter, and nutrient cycling that improves the soil structure and reduces the amount of water needed to grow crops. [24] The longer that no-till farming is practiced, the more developed the soil profile will become but the process takes time. Tilling also results in burning diesel fuel.

No Fall Fertilizer Application

CID limits fertilizer application dates to the spring and summer only, as applications of fertilizer in the fall run the risk of nitrogen loss due to denitrification and leaching.[24]

Water Efficiency

Phase 3 of the CID Terminal Modernization Program included water efficiency measures. Sensor-operated flush valves on toilets and sensor-operated faucets were provided for restrooms. As shown in **Figure 1.18**, low flow sinks were installed in restrooms and an efficient water bottle refill station is available in the terminal. Low water use plumbing fixtures installed exceed the required plumbing code by 25%. The airport also installed drought resistant, native and adapted landscaping.

Figure 1.18: Water Efficient Fixtures

(Left): Low flow sinks in the renovated terminal restrooms.
(Right): Water bottle refill stations are available in the CID terminal.

Stakeholder Engagement

Partnerships

The Airport has actively sought partnerships with surrounding municipalities and organizations for pilot projects and sustainability initiatives. One example is the partnership between CID and Iowa State University's research team for STRIPS (Science-based Trials of Rowcrops Integrated with Prairie Strips), the City of Cedar Rapids, and Pheasants Forever on a pilot project to determine the potential environmental benefits of planting native prairie strips in traditional row crop fields. The project established a test field and a control field to obtain and compare runoff data. Along with potential nutrient runoff reduction improvements, reintroduction of prairie strips to the Iowa landscape also provides potential habitat benefits. Prairie strips provide habitat for a diverse community of beneficial pollinators, such as bees and butterflies, and several species of insect predators that can potentially reduce corn and soybean pests. The objective of the pilot was to inform airport decision-making related to managing nutrient runoff and improving biodiversity and has since concluded.

The Airport previously partnered with the University of Iowa (UI) and the City of Cedar Rapids on a pilot project to plant Miscanthus for the UI Biomass Fuel Project. Almost 70 acres of airport farmland were converted to grow Miscanthus. Miscanthus is a large perennial grass grown for energy production. It is a sterile, noninvasive variety of grass that produces a 12-foot-high crop annually for 15 to 20 years after it is planted. Miscanthus has low fertilizer and pesticide demands allowing it to produce more biomass per acre and per unit input than other types of grass or prairie, making it economically preferable. This project also aligned with the City of Cedar Rapids' efforts to improve water quality for communities downstream on the Cedar and Iowa Rivers. The project had to be halted as Miscanthus proved to be a wildlife attractant making it non-compatible on airport land.

Tenant Sustainability Initiatives

Tenants at CID include commercial airlines, cargo airlines, a Fixed-Base Operator, concessionaires, and tenant farmers. Some tenants have corporate-level sustainability goals such as recycling, water and energy efficiency targets, and fuel use reductions. These goals are considered in the development of future CID sustainability initiatives.

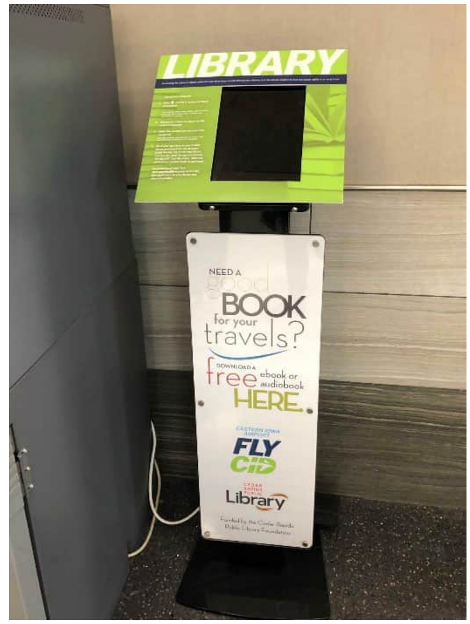


Figure 1.19: Library Kiosk

Community Engagement

CID seeks to represent the region and its communities as the gateway to Eastern Iowa and the surrounding regions. The Airport engages the traveling public through a variety of displays related to sustainability initiatives and other local cultural facets that contribute to a sense of place. For example, the terminal houses a kiosk that allows the public to download a free eBook or audiobook in partnership with the Cedar Rapids Public Library (see **Figure 1.19**). Other similar kiosks provide passengers the opportunity to print out short stories, poems, and essays. The terminal also includes a display of University of Iowa sports history and memorabilia along with a statue of the University's mascot, Herky the Hawk. These displays evolve over time to include new features. CID understands that education and engagement are critical to social sustainability.

Waste Management

CID provides recycling bins in the terminal for the traveling public. CID also recycles oil, scrap metal, and lighting, such as light bulbs and fluorescent lights. CID tenants have a variety of recycling and waste management practices. SSP America, the food and beverage concessions program, recycles cardboard, cooking oil, and bottles/cans from the main restaurant in the terminal. Signature Flight Support began a recycling program in 2021 for general waste. Waste from construction and demolition projects is recycled or disposed of directly by the contractors. Airlines currently do not have a comprehensive program in place at the Airport to separate and recycle deplaned waste.

Figure 1.20: Terminal Recycling Bins

Chapter Two

Aviation Forecasts

CHAPTER 2: AVIATION FORECASTS

2.1 INTRODUCTION

This chapter contains the methodologies and 20-year aviation forecasts for Eastern Iowa Airport. Forecasting is an essential part of the master planning process as it provides the basis for determining future facility requirements and justification for investment. It also serves to forecast revenues for certain aspects of the Airport's operation. Forecasting elements include passenger enplanements, aircraft operations (commercial, general aviation, air cargo, military), and air cargo tonnage, as well as activity peaking characteristics and a determination of the Airport's existing and future design aircraft.

The forecasts presented in this chapter represent a 20-year outlook using 2021 as the base year and 2041 as the ultimate horizon year (though some forecast methodologies utilize 2019 as a base year due to major activity fluctuations in 2020-2021 attributed to COVID-19[32]). Key planning periods analyzed in the forecast include five, ten, 15, and 20-year horizons. The forecast primarily utilized historical data from 2011 to 2019, though 2020 and 2021 data were considered in several methodologies to appropriately analyze the impacts on aviation activity resulting from the COVID-19 pandemic. The development of the forecasts considered historical trends, aviation industry trends, local socioeconomic information, and reference forecasts to capture factors that may influence future activity at CID.

Local aviation activity data were obtained from a variety of sources, including Airport records and FAA databases including the Terminal Area Forecast (TAF), Traffic Flow Management System Counts (TFMSC), and Operational Network (OPSNET). Socioeconomic data for Linn County and Johnson County were obtained from Woods and Poole, Inc.

2.2 FORECAST REFERENCES

The most recent local, state, and national aviation activity forecasts for CID were reviewed to inform the forecasts developed for this Airport Sustainable Master Plan. The forecasts for the 2014 CID Master Plan, the Iowa Aviation System Plan, and the FAA Terminal Area Forecast (TAF) are summarized in **Table 2.1**.

- 2014 MASTER PLAN FORECAST

Eastern Iowa Airport last completed a Master Plan in 2014, which included an aviation activity forecast from 2011 through 2031. The 2014 Master Plan Forecast explored a variety of forecasting methodologies, with a preferred forecast methodology for each element. Generally, the five- and ten-year enplanement forecasts developed for that plan were below actual activity, though the pandemic did result in a disruption of the trend. On the contrary, the projected commercial operations exceeded actual activity. The 2014 Master Plan projected strong growth for based aircraft and general aviation operations, neither of which has materialized to date.

[32] Note: The COVID-19 pandemic greatly impacted the global aviation sector that depends on commercial passenger activity. The impact to the U.S. airline passenger traffic began in February 2020. As of March 2022, the domestic leisure market has primarily recovered, though business and international air travel are lagging. More information regarding the impacts of the COVID-19 pandemic is presented in Section 2.3.

- IOWA AVIATION SYSTEM PLAN

A Statewide Aviation System Plan (SASP) was completed by the Iowa DOT Aviation Bureau in 2020 to support the state's ongoing planning process to ensure that the airport system continues to efficiently serve all facets of aviation. The SASP includes general aviation, commercial operations, enplanements, and air cargo projections for 2019 through 2039. The key takeaways from the SASP include[33]:

- Enplanements at Iowa airports were predicted to return to pre-pandemic levels in 2023.
- The SASP forecasted that enplanements at CID would grow 1.6 percent per year between 2019 and 2039.
- Commercial operations were projected to grow 0.7 percent per year between 2019 and 2039. Operations were projected to grow less than enplanements due to the shift to larger aircraft and higher load capacities.
- The preferred growth scenario selected for based aircraft projections assumed that based aircraft would grow at the same rate as the population of Linn County between 2019 and 2039.
- The preferred growth scenario selected for general aviation operations assumed that CID would maintain their market share of the total general aviation operations, which is expected to increase 0.29% per year across the state between 2019 and 2039.
- Statewide air cargo was projected to grow at 1.9 percent annually between 2019 and 2039.

- FAA TERMINAL AREA FORECAST

The TAF is a top-down forecast updated annually by the FAA Office of Aviation Policy and Plans for all airports in the National Plan of Integrated Airport Systems (NPIAS). The TAF is a demand driven forecast that is based on local and national economic conditions and industry trends. For approval of aviation forecasts by the FAA, the proposed forecast must be compared to the TAF. The 2021 TAF was issued in March 2022 and was used for comparison in this aviation forecasting effort.

[33] Source: Iowa Department of Transportation, *2020 Iowa Statewide Aviation System Plan* (published July 2021).

Table 2.1: Previous Planning Forecasts Summary for CID

	2014 CID Master Plan (a)	Iowa SASP (2020) (a)	2021 FAA TAF (a)
Enplanements			
2026	667,556	716,156	734,839
2031	730,925	800,002	811,574
2036	--	890,232	887,649
2041	--	--	958,371
Commercial and General Aviation Operations			
2026	62,001	57,594	51,530
2031	65,473	59,208	53,036
2036	--	60,898	55,936
2041	--	--	57,621
Based Aircraft			
2026	216	132	135
2031	249	136	141
2036	--	139	147
2041	--	--	152

(a) "—" indicates that the forecast did not include the given year.

Sources: 2014 Eastern Iowa Airport Master Plan; Statewide Aviation System Plan, Iowa DOT Bureau of Aviation, 2020 (published July 2021); 2021 FAA Terminal Area Forecast (issued March 2022).

2.3 INDUSTRY TRENDS AND COVID-19 IMPACTS

The COVID-19 pandemic greatly impacted the global aviation industry in 2020. The aviation industry saw its largest decline in activity since the jet era began in the late 1950s [34]. Each sector of the industry was impacted differently, with the largest impact seen in commercial enplanements.

Aviation activity began recovering in 2021, though levels at most airports had not reached pre-pandemic levels at the time this document was written. The Iowa SASP and the FAA Aerospace Forecast anticipated that the industry would recover by 2023 and 2024, respectively. CID has recovered steadily from the pandemic and 2021 enplanements reached about 90% of the 2019 enplanements level. Based on discussions with Airport staff, it was estimated that CID would experience pre-pandemic enplanement levels by 2023. As of March 2022, there is still some uncertainty regarding the path of aviation's recovery from the pandemic.

The pandemic impacted the forecasting process presented in this chapter. Traditional methodologies using 2021 as the base year were generally not effective due to the large anomalies in the data for 2020. A mix of methodologies using 2019 and 2021 as the base years are presented. When 2019 was used as the base year, consideration was given to the impacts of the pandemic and the potential recovery period in the near-term.

[34] Source: FAA Aerospace Forecast, Fiscal Years 2021 – 2041 (published July 2021).

- AIRLINE FLEET CHANGES

Airlines took advantage of lower demand during the COVID-19 pandemic to restructure their fleets around newer and more efficient aircraft. Airlines are shifting to using larger regional jets and selected narrow body aircraft to serve CID. Legacy carriers are shifting from operating CRJ-200s and ERJ 145s to the larger CRJ-700s and CRJ-900s, while low-cost carriers are upgrading to A319 and A320s. Airline staffing shortages have also contributed to the move to larger aircraft. This trend has resulted in a steady increase of the Airport's average number of seats per commercial operation. Anticipated fleet changes are discussed in greater detail in subsequent sections as it relates to its impact on commercial operations.

- LOW-COST CARRIERS

Allegiant and Frontier are low-cost carriers that currently operate at CID. Allegiant has expanded their service in recent years and as of Spring 2022 provides the most non-stop destinations of any airline at CID. Although low-cost carriers have less frequent service, lower airfares attract leisure travelers. Low-cost carriers at CID have historically had strong growth and high load factors, particularly during the spring break and holiday seasons. In the recovery of the pandemic, low-cost carriers' activity, serving the leisure market, has recovered significantly faster than the business travel demand. In 2021, two new low-cost carriers, Avelo and Breeze, entered the U.S. market. The opportunity for a new entrant at CID could result in lower fares to stimulate growth in passenger demand.

- CHARTER ACTIVITY

Charter flights are non-scheduled air service that utilizes an aircraft according to a client's request. Benefits of charter flights include flying when you want, choosing your travel companions, avoiding airport crowds, and unparalleled comfort. The COVID-19 pandemic has increased the demand for charter flights. Many companies and individuals opted for private flights to reduce the risks associated with traveling during a pandemic. The increase in charter activity as expected to influence the general aviation fleet mix with an increase in jets. There is uncertainty regarding whether this is a temporary change in behavior or a longer-term change to lifestyles.

2.4 MARKET AREA DISCUSSION

Iowa's Airport System consists of 114 public-use airports, eight of which provide commercial service. An Airport's market is defined by a variety of factors, such as the proximity of competing airports. Located in Cedar Rapids, Eastern Iowa Airport is well-positioned to serve Cedar Rapids, Iowa City, and the border regions of Illinois and Wisconsin. The market was assessed to determine how other airports serving a similar geographic area may impact CID's market share.

- CID COMPETING AIRPORTS

Aviation activity at CID is impacted by other commercial service airports in the region, which may draw passengers from the CID catchment area. All commercial service airports within a 100-mile radius of CID were considered as the Airport's competitive market which includes Waterloo Regional Airport (ALO), Dubuque Regional Airport (DBQ), Quad Cities International Airport (MLI), Southeast Iowa Regional Airport (BRL), and Des Moines International Airport (DSM). Summarized in **Table 2.2**, each of these airports has unique characteristics that impact the ability for each airport to compete with CID.

Table 2.2: Competing Commercial Service Airports

Airport	Distance from CID (miles)	Driving Time from CID (minutes)	2019 Annual Passengers	Number of Non-Stop Destinations	Number of Airlines
Eastern Iowa Airport (CID)	**--**	**--**	**1,342,736**	**17**	**5**
Waterloo Regional Airport (ALO)	50	67	48,698	1	1
Dubuque Regional Airport (DBQ)	52	77	76,722	1	1
Quad Cities International Airport (MLI)	60	78	712,830	10	4
Southeast Iowa Regional Airport (BRL)	73	96	16,544	2	1
Des Moines International Airport (DSM)	92	120	2,842,876	31	6

Sources: FltPlan.com (accessed November 2021); Google Maps (accessed November 2021); 2021 FAA Terminal Area Forecast (issued March 2022); Airport Websites (accessed November 2021).

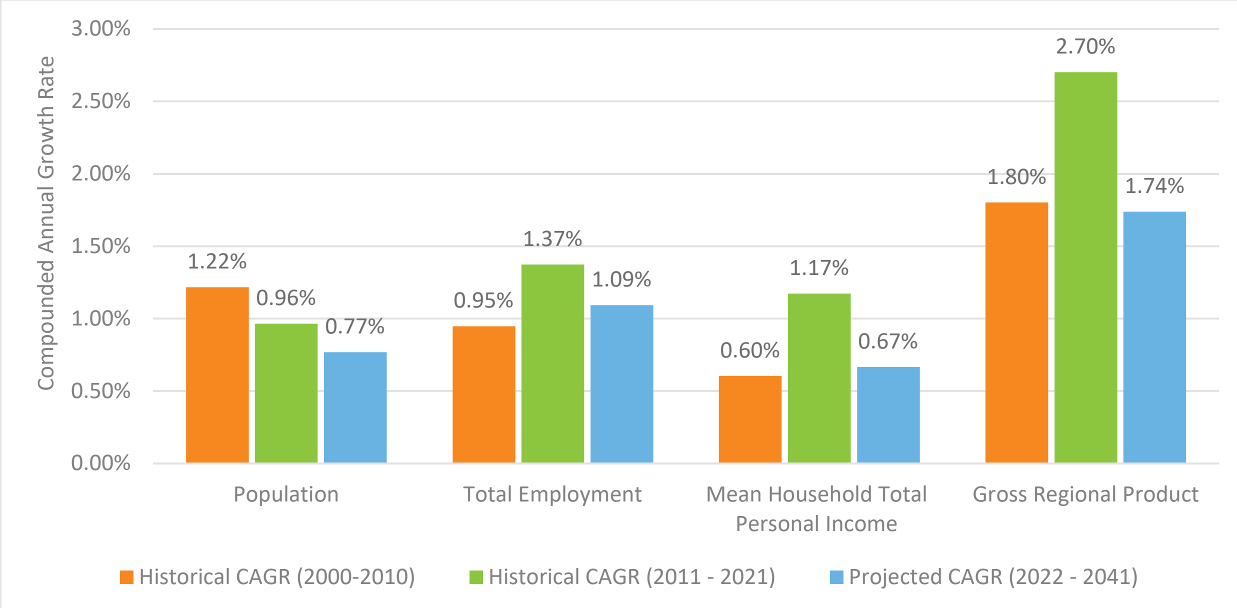
Eastern Iowa Airport competes primarily with Quad Cities International Airport and Des Moines International Airport based on destinations served and airlines operating at each airport. DSM offers service to more non-stop destinations, which may lend its ability to capture a portion of CID's market demand. Smaller airports in the market are under threat of losing commercial service within the planning horizon, which would likely increase the market share for CID.

Smaller, public general aviation airports were also considered for their impact on general aviation operations and based aircraft. All public airports within a 30-mile radius of CID were considered as the regional general aviation market. These airports are Iowa City Municipal Airport (IOW), Vinton Veterans Memorial Airpark (VTI), Mathews Memorial Airport (8C4), Belle Plaine Municipal Airport (TZT), and Monticello Aviation (MXO).

- CATCHMENT AREA SOCIOECONOMIC DATA

Socioeconomic data were considered in the aviation forecasts, as these factors can significantly influence aviation activity. The data were obtained from Woods & Poole for Linn and Johnson County, which includes historical and future projections for a variety of variables. These two counties were considered representative of the general catchment area for CID. Factors such as population, employment, and income may shape commercial and GA activity. This section summarizes the key trends for the socioeconomic variables that were evaluated for their impact on activity at CID. It should be noted that socioeconomic projections do not account for impacts stemming from COVID-19. Historical and projected compounded annual growth rates (CAGRs) are presented in **Figure 2.1** for the socioeconomic variables examined.

Figure 2.1: Socioeconomic Compounded Annual Growth Rates (Linn County and Johnson County)



Source: Woods and Poole, Inc. (accessed October 2021).

Population

Population growth is often correlated to the passenger activity at an airport. Between 2011 and 2021, population in the Airport's catchment area grew about one percent per year, from 347,703 to 382,730 people. Population is projected to continue to grow at a CAGR of approximately 0.77 percent per year through 2041, with the population growing at about twice the rate in Johnson County compared to Linn County.

Employment

Employment is an indicator of the economic stability of an area. Total employment of the Airport's catchment area grew from approximately 259,015 to 296,887 from 2011 to 2021. This translated to a CAGR of 1.37 percent per year. Employment is expected to grow to 369,948 by 2041, a CAGR of 1.09 percent. In addition to the total employment of the area, the employment of the management of companies' segment were analyzed due to their possible impact to general aviation. Management of companies' employment is expected to grow 2.89 percent per year, more than double the rate for total employment, but a decrease from the historic rate of 3.54 percent per year.

Gross Regional Product

Gross regional product (GRP) is the measurement of an area's market value of all goods and services produced within a given timeframe and may provide an indication of the health of an area's economy. Between 2011 and 2021, the GRP in Linn and Johnson counties saw a CAGR of 2.70 percent. Through 2041, the GRP is projected to grow at a rate of 1.74 percent per year.

Mean Household Income and Retail Sales

Mean household income grew at a CAGR of 1.17 percent between 2011 and 2021 from $126,010 to $141,585 (in 2021 dollars). Between 2022 and 2041, mean household income is anticipated to increase at a CAGR of 0.67 percent. Mean household income may be an indicator of a families' disposable income and thus their propensity to travel. Insight into the economy of the catchment area and the propensity to spend is also provided by total retail sales per household. A high propensity to spend may indicate more leisure traveling or increased general aviation activity. Total retail sales per household are projected to grow at a CAGR of 0.66% over the planning horizon.

2.5 FORECASTING ASSUMPTIONS

The following assumptions were made to guide the development of the aviation activity forecasts:

- Forecasts of aviation activity were unconstrained. It was assumed that appropriate facilities would be updated or expanded as needed to accommodate projected demand.
- The Airport would continue to pursue airlines and destinations to expand service at CID. Airlines would also increase capacity to accommodate demand growth.
- Growth of low-cost carriers would continue to expand the leisure market.
- Fluctuations in fuel prices would not significantly impact future airline operations.
- Future disruptors would not have the same magnitude of impact that the COVID-19 pandemic had on the air transportation industry.

As mentioned previously, based on discussions with Airport staff and the FAA, the forecasts presented in this paper explored methodologies using both 2019 and 2021 as the base year. Many traditional methodologies using 2021 as the base year are not presented due to the extreme anomalies in the data.

2.6 PASSENGER ENPLANEMENT FORECASTS

Enplanements, or the number of passengers departing the Airport, is an important measure to determine future airport infrastructure and terminal needs. Several methodologies were explored to determine what historical trends or future factors may influence the anticipated enplanements through the planning horizon. The following sections summarize methodologies used and key findings. Each section has a table to summarize the results for that methodology. Two CAGRs are provided for each forecast. The CAGR from 2019 to 2041 better represents an overall growth rate, whereas the CAGR from 2021 to 2041 provides more indication for how impactful the pandemic data were.

- PASSENGER ENPLANEMENTS - REGRESSION FORECAST

A series of regression analyses were performed to capture the relationships between passenger enplanements and predictor variables, such as socioeconomic factors. The primary variables that were included in the regression models include population, employment, household income, and GRP. A correlation analysis revealed that all the primary variables were highly correlated to one another, indicating that a single variable regression would provide more reliable and stable estimates of the regression coefficients than a multi-variable regression.

The two variables with the highest correlation to annual historical enplanements at CID were population and GRP. Population in Linn and Johnson County was projected to grow at 0.77 percent a year to reach a population of 446,506 in 2041. GRP was predicted to increase by 1.74 percent on a compounded annual basis, to approximately 48 billion dollars by 2041. A regression model was created for each of these variables and enplanement forecasts from these models are summarized in **Table 2.3** and graphically presented in **Figure 2.2**.

Regression models utilize 2019 as the base year for forecasts of passenger enplanements. Models utilizing 2021 as a base year are not presented because the anomalies in the data resulted in statistically insignificant model variables.

Table 2.3: Passenger Enplanements Forecast – Regression

	Regression Variable: Population	Regression Variable: GRP (c)
Historical		
2011	440,180	
2019	672,468	
2021	528,960	
Forecast (a)		
2022	703,100	694,700
2026	790,200	774,100
2031	898,300	874,600
2036	998,900	976,400
2041	1,091,100	1,070,900
CAGR (b)		
2011 – 2019	5.44%	
2011 – 2021	1.85%	
2019 – 2041	2.22%	2.14%
2021 – 2041	3.69%	3.59%

(a) Forecast values rounded to the nearest 100.
(b) CAGR = Compounded Annual Growth Rate
(c) GRP = Gross Regional Product

Sources: Kimley-Horn Analysis, January 2022; Airport Records (received October 2021); Woods and Poole, Inc. (accessed October 2021).

- PASSENGER ENPLANEMENTS – TIME SERIES FORECAST

Time series models are used to forecast future events based on historical data collected for regular time intervals. Time series forecasts assume that future activity will continue along historical trends. Two types of time series models were examined: linear time series model and an exponential smoothing model. A linear model is the most basic form of a time series model and assumes growth based on an average predicted change in the independent variable. An exponential smoothing model follows the same methodology as the linear model but uses weighted averages of past observations to give more importance to recent values in the series.

The linear time series model using data from 2011 to 2019 predicts a CAGR of 2.29 percent for 1,128,200 enplanements through 2041. The exponential smoothing model for the same time frame predicts a CAGR of 2.40 percent through 2041 for 1,156,300 enplanements by 2041. The exponential smoothing model resulted in a higher overall growth rate, which reflects the additional weight placed on more recent data points with higher growth rates. The projected values for the time series models are summarized in **Table 2.4** and graphically presented in **Figure 2.2**. The time series models using data from 2011 to 2021 are not presented because the significant drop in enplanements in 2020 and 2021 results in a minimal projected growth.

Table 2.4: Passenger Enplanements Forecast – Time Series

	Linear	Exponential Smoothing
Historical		
2011	440,180	
2019	672,468	
2021	528,960	
Forecast (a)		
2022	707,100	734,200
2026	795,800	823,100
2031	906,600	934,100
2036	1,017,400	1,045,200
2041	1,128,200	1,156,300
CAGR (b)		
2011 – 2019	5.44%	
2011 – 2021	1.85%	
2019 – 2041	2.38%	2.49%
2021 – 2041	3.86%	3.99%

(a) Forecast values are rounded to the nearest 100.
(b) CAGR = Compounded Annual Growth Rate

Sources: Kimley-Horn Analysis, January 2022; Airport Records (received October 2021).

- PASSENGER ENPLANEMENTS - MARKET SHARE FORECAST

An airport's market share measures the percent of the activity in comparison to other airports in the market. The market area for commercial activity, as discussed previously, includes ALO, DBQ, MLI, BRL, and DSM. The market share analysis evaluated the change in market share that CID may experience and the resulting activity as a function of the total forecast activity in the market. The activity data for the competing airports were obtained from the TAF for 2011 through 2019.

Initially, three forecasts were developed using a market share approach with 2019 as the base year: 2019 market share, a historical five-year market share analysis, and a historical eight-year market share analysis. The 2019 market share forecast assumed that the market share of CID passenger enplanements would remain at 26.7% through 2041. The five- and eight-year market analyses assumed an exponential time series growth, representative of the recent growth of CID's market share. The primary difference between the five- and eight- year analyses was the timeframe of historical data used. The historical five-year methodology utilized data from 2014 to 2019, while the eight-year methodology utilized data from 2011 to 2019.

The market share enplanement methodologies are dependent on TAF forecasts to determine the total size of the future market. Data from 2021 suggest that the CID market has recovered faster than was predicted in the 2021 TAF. As a result, the near-term forecasts using market share predicted a slight drop for 2022, which was not actually anticipated to occur. As a result, an adjusted five-year market share model was created, which assumed that CID would reach pre-pandemic enplanement levels by 2023. A CAGR of 12.75 percent was anticipated between 2021 and 2023. Between 2023 and 2026, a CAGR of 4.27 percent was projected, followed by a CAGR of 2.53 percent between 2026 and 2041.

Market share analyses utilizing 2021 as the base year were also performed. Prorated Bureau of Transportation Statistics (BTS) enplanement data were used for 2020 and 2021 for all airports in the market area, excluding CID. The smaller airports in the market were hit disproportionally hard by the COVID-19 pandemic and experienced a slower recovery rate compared to CID. As a result, the base market share for CID was artificially high when using 2021 data, which led to an unrealistically aggressive growth projection. Using 2021 as a base year for market share analysis assumed that the airports that lost market share during the pandemic would not be able to recover any of it. The historical five-year methodology utilized data from 2016 to 2021, while the ten-year methodology utilized data from 2011 to 2021.

Table 2.5 presents projected market enplanements and the CID market share for each analysis performed. The projected values for the market share forecasts are summarized in **Table 2.6** and graphically presented in **Figure 2.2**.

Table 2.5: CID Airport Market Share

Year	Airport Market Area Enplanements	2019 Market Share	2021 Market Share	5-Year Trend (2019 Base)	5 - Year Trend (2021 Base)	8-Year Trend (2019 Base)	10-Year Trend (2021 Base)
Historical (a)							
2019	2,521,303	26.67%					
2020	1,384,129	22.38%					
2021	1,819,377	29.07%					
Forecast (b)							
2022	2,040,486	26.67%	29.07%	26.90%	29.90%	27.16%	28.30%
2026	2,812,078	26.67%	29.07%	27.32%	33.35%	27.91%	29.70%
2031	3,157,097	26.67%	29.07%	27.84%	37.65%	28.85%	31.45%
2036	3,513,303	26.67%	29.07%	28.36%	41.95%	29.79%	33.20%
2041	3,867,321	26.67%	29.07%	28.88%	46.25%	30.72%	34.95%

(a) Market area enplanements from 2011 to 2019 were obtained from the 2021 TAF. Market area enplanements for 2020 and 2021 were estimated based on BTS data. 2021 data were only available through October 2021 so it was prorated.

(b) Market Area enplanements for 2022-2041 were estimated from the 2021 TAF.

Sources: Kimley-Horn Analysis, January 2022; Bureau of Transportation Statistics (accessed January 2022); 2021 FAA Terminal Area Forecast (issued March 2022).

Table 2.6: Passenger Enplanements Forecast – Market Share

	2019 Market Share	2021 Market Share	5-Year Trend (2019 Base)	Adjusted 5-Year Trend (2019 Base)	5-Year Trend (2021 Base)	8-Year Trend (2019 Base)	10-Year Trend (2021 Base)
Historical							
2011	440,180						
2019	672,468						
2021	528,960						
Forecast (a)							
2022	544,200	593,200	544,700	600,700	610,200	550,400	577,500
2026	750,000	817,600	762,300	762,300	937,700	779,300	835,300
2031	842,000	917,900	872,300	872,300	1,188,600	872,300	993,000
2036	937,000	1,021,500	988,900	988,900	1,473,900	988,900	1,166,500
2041	1,031,500	1,124,400	1,108,700	1,108,700	1,788,800	1,180,900	1,351,700
CAGR (b)							
2011 – 2019	5.44%						
2011 – 2021	1.85%						
2019 – 2041	1.96%	2.36%	2.30%	2.30%	4.55%	2.59%	3.22%
2021 – 2041	3.40%	3.84%	3.77%	3.77%	6.28%	4.10%	4.80%

(a) Forecast values rounded to the nearest 100.
(b) CAGR = Compounded Annual Growth Rate

Sources: Kimley-Horn Analysis, January 2022; Airport Records (received October 2021); 2021 FAA Terminal Area Forecast (issued March 2022).

- PASSENGER ENPLANEMENTS - FAA AEROSPACE FORECAST

The FAA Aerospace Forecast contains industry-wide projections for aviation-related activities in the United States. The forecast analyzed the economic environment and emerging trends in various segments of the industry. The report for Fiscal Years (FY) 2021 – 2041 also considered the status and impact of the COVID-19 pandemic.

Domestic passenger growth between 2021 and 2041 was expected to average 4.9 percent per year, with double-digit growth the three years following the pandemic and 2.3 percent per year thereafter. Annual domestic passenger levels were assumed to return to pre-pandemic levels by early 2024. The FAA Aerospace forecast was referenced to develop a top-down forecast by applying the industry-wide projections to CID, as shown in **Table 2.7**.

Table 2.7: Passenger Enplanements Forecast – FAA Aerospace Forecast

	FAA Aerospace Forecast
Historical	
2011	440,180
2019	672,468
2021	528,960
Forecast (a)	
2022	576,800
2026	703,800
2031	788,500
2036	883,400
2041	958,800
CAGR (b)	
2011 – 2019	5.44%
2011 – 2021	1.85%
2019 – 2041	1.77%
2021 – 2041	3.18%

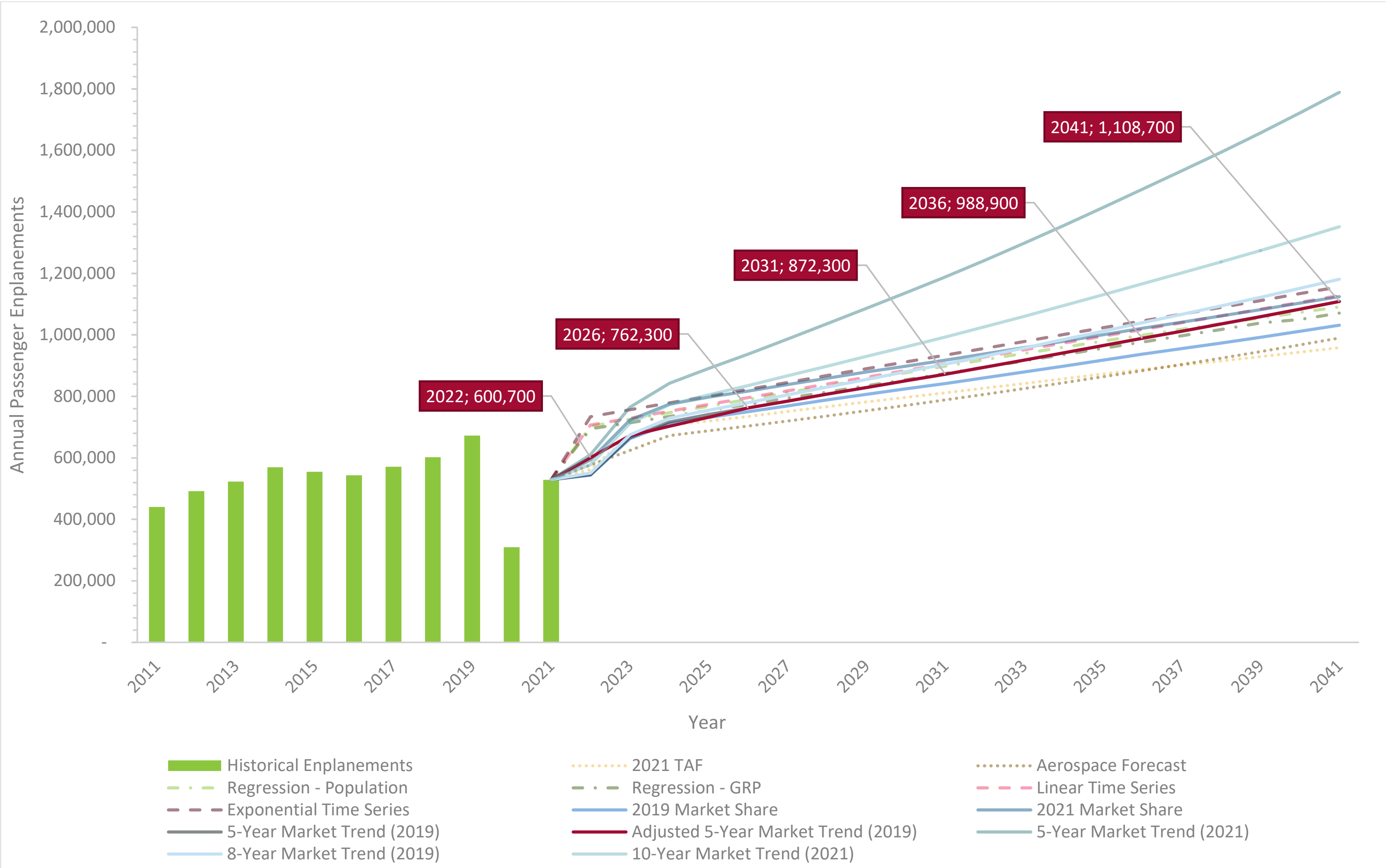
(a) Forecast values are rounded to the nearest 100.
(b) CAGR = Compounded Annual Growth Rate

Sources: Kimley-Horn Analysis, January 2022; Airport Records (received October 2021); FAA Aerospace Forecast, Fiscal Years 2021-2041 (published July 2021).

- PREFERRED COMMERCIAL ENPLANEMENT FORECAST

After consideration of each individual forecast alternative, the adjusted five-year market share trend methodology was selected as the preferred enplanement forecast. The combination of an aggressive air servicing campaign at CID and the potential loss of commercial service at smaller market airports suggests that CID is well-positioned to gain an additional 2-4% of the local market over the planning horizon. Near-term linear growth reflects a recovery from the pandemic consistent with current industry trends and discussions with Airport staff. The preferred forecast predicted that CID would return to 2019 enplanement levels by 2023 and growth would be steady following the recovery from the pandemic.

Figure 2.2: Passenger Enplanement Forecast



Sources: Kimley-Horn Analysis, January 2022, 2021 FAA Terminal Area Forecast (issued March 2022); Airport Records (received October 2021).

2.7 COMMERCIAL OPERATIONS FORECASTS

Commercial operations forecasts are important to determine facility needs pertaining to aircraft parking aprons, boarding gates, and passenger terminal facilities. The commercial operations forecast was based on the passenger enplanement forecast and assumptions about the future operational aircraft fleet mix and passenger load factors.

- COMMERCIAL AIRCRAFT FLEET MIX

The historical commercial aircraft fleet mix was developed using flight schedules and FAA TFMSC data. TFMSC data do not account for all the operations at the Airport but provides insight into the percentages of commercial aircraft operations by aircraft type and seat configuration. **Table 2.8** presents historical percentages of aircraft operations by seat range.

Table 2.8: Historical Fleet Mix by Seat Range

	Percent of Operations						
Seat Range	**0-69**	**70-89**	**90-109**	**110-129**	**130-149**	**150-169**	**170+**
2011	87.2%	7.1%	0.0%	0.0%	4.1%	1.5%	0.0%
2016	57.0%	17.8%	15.3%	3.1%	3.3%	3.4%	0.2%
2019	46.1%	19.6%	14.1%	7.7%	10.3%	1.2%	1.0%
2021	35.7%	20.0%	23.7%	5.0%	9.5%	6.0%	0.3%

Source: FAA TFMSC Database (accessed January 2022).

Based on trends presented in **Table 2.8** and insight from air service subject matter experts, the following observations and assumptions were made:

- Smaller regional jets (0-50 seats) will continue to be replaced by larger (70-90 seats), more efficient aircraft. An increase in aircraft operating costs has forced air carriers to utilize larger aircraft to minimize the operational cost per passenger. Some small regional jets, such as the CRJ-200 and CRJ-700, are no longer in production and CRJ-200s are expected to be phased out of operation at CID by approximately 2028.
- The aircraft fleet of low-cost carriers at CID, such as Allegiant and Frontier, will continue to consist primarily of A319 and A320 aircraft, or similar single-aisle models.
- Most commercial activity in the future is likely to occur on aircraft equipped with between 70 and 109 seats. As airlines transition to larger aircraft, service frequency for certain routes may decrease slightly.
- Historical operations on aircraft with 170+ seats were primarily attributed to irregular operations or diversions from larger airports, such as O'Hare International Airport. Forecasts of future fleet mix operations assumed that low-cost carriers may occasionally operate aircraft with over 170 seats during periods of high demand.

Accounting for these assumptions, as well as historical trends, the forecast fleet mix by seat range is presented in **Table 2.9**.

Table 2.9: Forecast Fleet Mix by Seat Range

	Percent of Operations						
Seat Range	0-69	70-89	90-109	110-129	130-149	150-169	170+
2026	10.2%	43.9%	24.5%	5.0%	9.5%	6.0%	1.0%
2031	0.0%	49.4%	27.0%	5.7%	9.5%	6.8%	1.6%
2036	0.0%	48.0%	27.0%	6.1%	9.5%	7.1%	2.3%
2041	0.0%	46.5%	27.0%	6.5%	9.5%	7.5%	3.0%

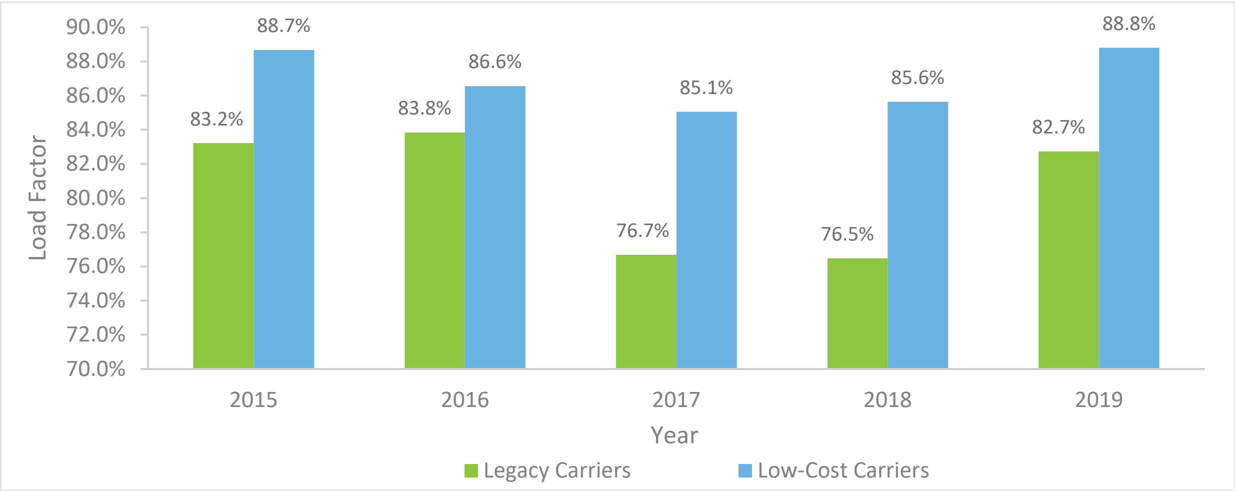
Sources: Kimley-Horn Analysis, January 2022; FAA TFMSC Database (accessed January 2022).

An average capacity per aircraft operation was calculated based on the forecast fleet distribution presented in **Table 2.9**. The results are summarized in **Table 2.10**. An initial sharp increase is expected in the average capacity per aircraft between 2019 and 2026 as the majority of the 0-69 seat aircraft are phased out. The forecast expected the growth in capacity to continue after 2026, but at a slower rate as smaller adjustments are made to airline fleets.

- LOAD FACTOR

Another metric used in the calculation of projected commercial operations is passenger load factor. The load factor is a measurement of occupied seats per flight. Monthly capacity data and actual enplanement data for 2016 to 2020 were obtained from the Airport's website. The Airport's average load factor in 2019 was 83.0%, a historical high for the time frame of data available. The Airport's average number of passengers per commercial operation also increased by almost 160% between 2011 and 2019. Load factors saw a drop in 2017 and 2018, attributed to the addition of new destinations, and in 2020 due to the pandemic. Load factors for individual airlines were obtained from the BTS database. These data, shown in **Figure 2.3,** suggest that low-cost carriers have had an average load factor of 86.9% between 2015 and 2019. Legacy carriers historically have a lower load factor, averaging 80.6%.

Figure 2.3: Historical Load Factors



Sources: Kimley-Horn Analysis, January 2022; Bureau of Transportation Statistics (accessed January 2022).

Both legacy and low-cost carriers were anticipated to reach a load factor ceiling based on operational characteristics. Through 2041, market load factors were anticipated to increase although legacy carriers will continue to operate with lower load factors compared to low-cost carriers. For both markets, an initial drop in load factor was anticipated through 2026 due to airline upgauging. As the market adjusts to the increased capacity, load factors were expected to increase steadily through 2041. An overall load factor was determined by calculating a weighted average load factor for legacy and low-cost carriers. **Table 2.10** presents the projected load factors through 2041.

An average passengers per operation forecast was determined by multiplying the average capacity per aircraft by the load factor. **Table 2.10** presents the anticipated capacity per aircraft, load factor, and resulting average passenger per aircraft for the planning horizon.

Table 2.10: Average Passengers Per Aircraft

	Passenger Load Factor	Capacity Per Aircraft	Average Passengers Per Aircraft
Historical			
2016	81.0%	71	58
2017	74.9%	73	55
2018	76.8%	81	62
2019	82.9%	79	66
2021	76.1%	86	66
Forecast			
2026	78.7%	94	74
2031	79.5%	99	79
2036	80.3%	100	81
2041	81.0%	101	82

Sources: Kimley-Horn Analysis, January 2022; Bureau of Transportation Statistics (accessed January 2022); FAA TFMSC Database (accessed January 2022).

- RECOMMENDED COMMERCIAL OPERATIONS FORECAST

The commercial operations forecast was developed by multiplying the annual passenger enplanement forecast by the average passengers per aircraft, then multiplying by two (to account for an equal number of deplaning passengers). Commercial operations are expected to grow at a lower rate than passenger enplanements as airlines operate larger aircraft and strive for higher load factors. The commercial operations forecast is presented in **Table 2.11**. **Figure 2.4** graphically illustrates the recommended forecast for commercial operations.

Table 2.11: Commercial Operations Forecast

	Annual Enplanements	Average Passengers Per Aircraft	Annual Commercial Operations
Historical			
2016	543,014	58	20,318
2017	571,157	55	20,880
2018	602,177	62	19,904
2019	672,468	66	21,162
2021	528,960	66	18,544
Forecast (a)			
2026	762,300	74	20,600
2031	872,300	79	22,100
2036	988,900	81	24,400
2041	1,108,700	82	27,000
CAGR (b)			
2016 - 2019	7.38%	4.40%	1.37%
2016 - 2021	-0.52%	2.62%	-1.81%
2019 - 2041	2.30%	0.99%	1.12%
2021 - 2041	3.77%	1.09%	1.97%

(a) Forecast enplanement values rounded to the nearest 100. Forecast operations values rounded to the nearest 50.
(b) CAGR = Compounded Annual Growth Rate

Sources: Kimley-Horn Analysis, January 2022; Bureau of Transportation Statistics (accessed January 2022); FAA TFMSC Database (accessed January 2022), Airport Records (received October 2021).

Figure 2.4: Recommended Commercial Operations Forecast

Sources: Kimley-Horn Analysis, January 2022; Airport Records (received October 2021).

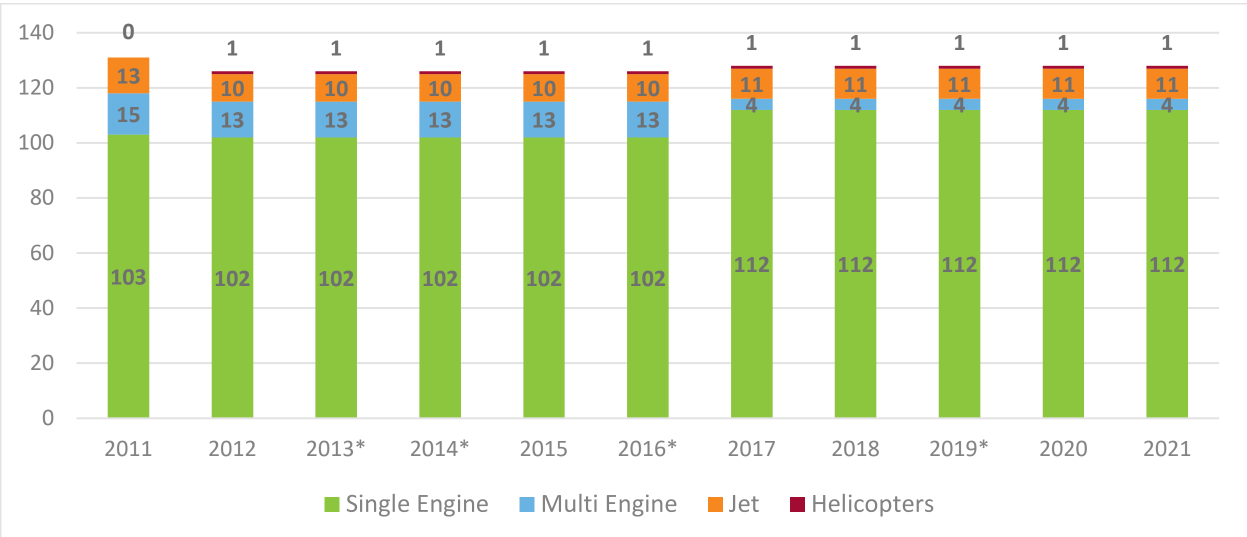
2.8 GENERAL AVIATION FORECASTS

General aviation (GA) includes all operations that are not associated with commercial, cargo, or military activity. This includes recreational flying, corporate aviation, and air sports. Methodologies consistent with those used for passenger enplanements were also applied to forecast based aircraft and GA operations. GA activity forecasts are important to determine future facility needs for aircraft hangars, FBOs, fueling infrastructure, and aircraft parking aprons.

- BASED AIRCRAFT

Historical data for based aircraft were provided by the Airport. The historical based aircraft fleet from 2011 through 2021 is presented in **Figure 2.5**. Overall, based aircraft at CID have remained consistent, falling slightly from 131 to 128 aircraft between 2011 to 2021.

Figure 2.5: Historical Based Aircraft Fleet



Note: Years marked with an asterisk indicate that data for those years was not available. It was assumed that there was no change in fleet mix from the year prior.

Source: Airport Records (received October 2021).

Forecasting methods consistent with those used for enplanements and general aviation operations were explored for the based aircraft forecast. Since the number of based aircraft was not impacted by the pandemic, 2021 was used as a base year for all based aircraft forecasts.

Based Aircraft – Regression Forecast

Several regression models were developed to forecast based aircraft; however, none were found to be statistically significant due to low correlation between the based aircraft data and socioeconomic factors. The socioeconomic variables included population and the management of companies' segment of the economy. Population in Linn and Johnson County was projected to grow at 0.77 percent a year to reach a population of 446,506 in 2041. Employment in the management of companies' sector were predicted to increase to 3,410 jobs by 2041, a CAGR of 2.89 percent. The results of the regression forecasts are summarized in **Table 2.12** and graphically presented in **Figure 2.6**.

Table 2.12: Based Aircraft Forecast – Regression

	Regression Variable: Population	Regression Variable: Management of Companies Employment
Historical		
2011	131	
2019	128	
2021	128	
Forecast		
2026	128	129
2031	128	129
2036	128	129
2041	129	130
CAGR (a)		
2011 – 2019	-0.29%	
2011 – 2021	-0.23%	
2019 – 2041	0.04%	0.07%
2021 – 2041	0.04%	0.08%

(a) CAGR = Compounded Annual Growth Rate

Sources: Kimley-Horn Analysis, January 2022; Airport Records (received October 2021); Woods and Poole, Inc. (accessed October 2021).

Based Aircraft – Time Series Forecast

A linear and exponential time series forecast was developed for based aircraft, utilizing 2021 as the base year. The results of the time series forecasts are summarized in **Table 2.13** and graphically presented in **Figure 2.6**.

Table 2.13: Based Aircraft Forecast – Time Series

	Linear	Exponential Smoothing
Historical		
2011	131	
2021	128	
Forecast		
2026	128	129
2031	129	129
2036	129	129
2041	129	129
CAGR (a)		
2011 – 2019	-0.29%	
2011 – 2021	-0.23%	
2019 - 2041	0.04%	0.04%
2021 – 2041	0.04%	0.04%

(a) CAGR = Compounded Annual Growth Rate

Sources: Kimley-Horn Analysis, January 2022; Airport Records (received October 2021).

Based Aircraft – Market Share Forecast

A market share analysis included public airports within 30 miles of CID and included Iowa City Municipal Airport (IOW), Vinton Veterans Memorial Airpark (VTI), Mathews Memorial Airport (8C4), Belle Plaine Municipal Airport (TZT), and Monticello Aviation (MXO). Between 2011 and 2021, CID saw a decline in based aircraft market share of approximately six percent.

Two market share methodologies were explored: constant 2021 market share and a ten-year historical trend analysis utilizing data from 2011 to 2021. **Table 2.14** presents the projected total based aircraft in the market and CID market share. The results of the market share forecasts are summarized in **Table 2.15** and graphically presented in **Figure 2.6**.

Table 2.14: CID Airport Market Share – Based Aircraft

	Airport Market Area Based Aircraft	2021 Market Share	10-Year Trend (2021 Base)
Historical (a)			
2011	264	49.6%	
2019	285	44.9%	
2021	285	44.9%	
Forecast (b)			
2026	294	44.9%	44.4%
2031	301	44.9%	43.9%
2036	309	44.9%	43.4%
2041	315	44.9%	42.9%

(a) Historical market area based aircraft for competing airports were estimated from the 2021 TAF.
(b) Market area based aircraft for 2022-2041 were estimated from the 2021 TAF.

Sources: Kimley-Horn Analysis, January 2022; Airport Records (received October 2021); 2021 FAA Terminal Area Forecast (issued March 2022).

Table 2.15: Based Aircraft Forecast – Market Share

	2021 Market Share	10-Year Trend (2021 Base)
Historical		
2011	131	
2019	128	
2021	128	
Forecast		
2026	133	131
2031	136	133
2036	139	135
2041	142	136
CAGR (a)		
2011 – 2019	-0.29%	
2011 – 2021	-0.23%	
2019 – 2041	0.47%	0.28%
2021 – 2041	0.52%	0.30%

(a) CAGR = Compounded Annual Growth Rate

Sources: Kimley-Horn Analysis, January 2022; Airport Records (received October 2021); 2021 FAA Terminal Area Forecast (issued March 2022).

Based Aircraft – FAA Aerospace Forecast

The top-down forecast referenced the FAA Aerospace Forecast and applied the industry-wide projections to CID. The FAA Aerospace Forecast anticipated that the general aviation sector has a promising future with the pandemic exposing a new interest in high-end business jet travel. The GA fleet was expected to increase slightly by 0.1 percent per year for the forecasting period, reflecting continued growth of turbine and rotorcraft fleets, and a decrease in fixed-wing piston aircraft. The results of the FAA Aerospace forecast are summarized in **Table 2.16** and graphically presented in **Figure 2.6**.

Table 2.16: Based Aircraft Forecast – FAA Aerospace Forecast

	FAA Aerospace Forecast
Historical	
2011	131
2019	128
2021	128
Forecast	
2026	129
2031	129
2036	130
2041	131
CAGR (a)	
2011 - 2019	-0.29%
2011 – 2021	-0.23%
2019 – 2041	0.09%
2021 – 2041	0.10%

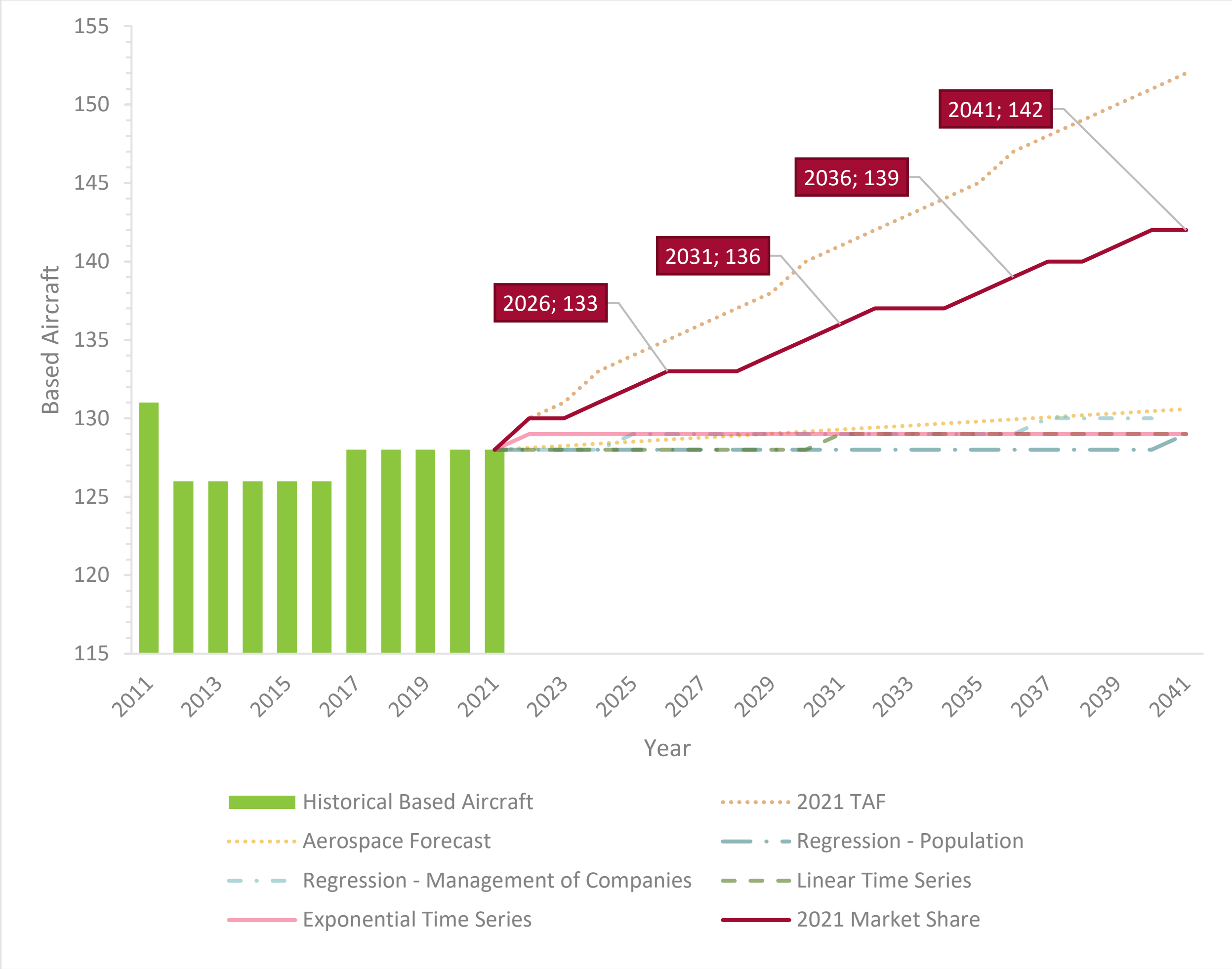
(a) CAGR = Compounded Annual Growth Rate

Sources: Kimley-Horn Analysis, January 2022; Airport Records (received October 2021); FAA Aerospace Forecast, Fiscal Years 2021-2041 (published July 2021).

Preferred Based Aircraft Forecast

The preferred forecast for CID is to maintain their 2021 market share in based aircraft. The forecast recognizes the overall decline in based aircraft since 2011 but anticipates modest growth based on national trends in the general aviation sector and the projected growth of based aircraft in the market. The preferred scenario, shown in **Figure 2.6**, anticipates a growth of 14 based aircraft over the 20-year planning horizon.

Figure 2.6: Based Aircraft Forecast



Sources: Kimley-Horn Analysis, January 2022; 2021 FAA Terminal Area Forecast (issued March 2022).

Based Aircraft Fleet Mix

Total based aircraft were also forecast by aircraft category. The based aircraft fleet mix categories include single-engine, multi-engine, jet, and helicopter. **Figure 2.5**, depicted previously, provides historical fleet mix information for CID. The based aircraft fleet mix at CID has remained relatively consistent in the past ten years, with slight variations in the number of single-engine, multi-engine, and jet aircraft. Based on industry trends, it was assumed that the future fleet mix would see slight increases in jet and multi-engine aircraft, as well as helicopters. The future fleet mix by percent of aircraft type is provided in **Table 2.17**.

Table 2.17: Based Aircraft Fleet Mix – Percentages

	Single-Engine	Multi-Engine	Jet	Helicopter
Historical				
2011	78.6%	11.5%	9.9%	0.0%
2019	87.5%	3.1%	8.6%	0.8%
2021	87.5 %	3.1%	8.6%	0.8%
Forecast				
2026	85.8%	3.5%	9.2%	1.5%
2031	84.9%	3.8%	9.8%	1.5%
2036	83.9%	4.2%	10.4%	1.5%
2041	83.0%	4.5%	11.0%	1.5%
Average				
2011 – 2021	83.7%	7.2%	8.4%	0.7%
2021 – 2041	85.0%	3.8%	9.8%	1.4%

Sources: Airport Records (received October 2021); Kimley-Horn Analysis, February 2022.

The based aircraft fleet mix forecast was determined by applying the percentages in the table above to the preferred based aircraft forecast (see **Table 2.18**).

Table 2.18: Based Aircraft Fleet Mix

	Single-Engine	Multi-Engine	Jet	Helicopter	Total
Historical					
2021	112	4	11	1	128
Forecast					
2026	114	5	12	2	133
2031	116	5	13	2	136
2036	117	6	14	2	139
2041	118	6	16	2	142

Sources: Airport Records (received October 2021); Kimley-Horn Analysis, February 2022.

- GENERAL AVIATION OPERATIONS

Total historical operations data were obtained from FAA's TFMSC database. Operations not directly attributed to commercial, cargo, or military activity were assumed to be general aviation operations. General aviation operations have experienced a decline between 2011 and 2021. However, the decline is not consistent year-over-year, as the data show positive and negative fluctuations. Like the enplanement forecasts, the general aviation methodologies utilize a mix of 2019 and 2021 as the base year.

GA Operations – Regression Forecast

Socioeconomic regression analyses, utilizing Woods & Poole, Inc. data, suggested that the socioeconomic factors that are most correlated to general aviation operations include population and total retail sales. The socioeconomic region that was used in the analysis includes Linn and Johnson County. Population was projected to grow at 0.77 percent a year to reach a population of 446,506 in 2041. Total retail sales per household were predicted to increase to 136,835 dollars per year by 2041, a CAGR of 0.66 percent. Neither regression suggested a strong fit to the GA operations data. The projected values for the regression models using 2021 as the base year are summarized in **Table 2.19** and graphically presented in **Figure 2.7**.

Table 2.19: GA Operations Forecast - Regression

	Regression Variable: Population	Regression Variable: Retail Sales
Historical		
2011	26,952	
2019	27,554	
2021	20,860	
Forecast (a)		
2026	21,500	22,500
2031	19,700	21,100
2036	18,050	19,500
2041	16,600	18,100
CAGR (b)		
2011 – 2019	0.28%	
2011 – 2021	-2.53%	
2019 – 2041	-2.29%	-1.90%
2021 – 2041	-1.15%	-0.71%

(a) Forecast values are rounded to the nearest 50.
(b) CAGR = Compounded Annual Growth Rate

Sources: Kimley-Horn Analysis, January 2022; Woods and Poole, Inc. (accessed October 2021); FAA OPSNET Database (accessed January 2022).

GA Operations – Time Series Forecast

Linear and exponential time series models projected a continued decline in general aviation operations when either 2019 or 2021 were used as base years for forecasting. Only the results from the time series models with a base year of 2019 are presented as 2021 base year forecasts resulted in a much more severe decline in operations due to the drop during the pandemic. The projected values for the time series models are summarized in **Table 2.20** and graphically presented in **Figure 2.7**.

Table 2.20: GA Operations Forecast – Time Series

	Linear	Exponential Smoothing
Historical		
2011	26,952	
2019	27,554	
2021	20,860	
Forecast (a)		
2026	23,650	23,900
2031	22,750	23,000
2036	21,900	22,100
2041	21,000	21,200
CAGR (b)		
2011 – 2019	0.28%	
2011 – 2021	-2.53%	
2019 – 2041	-1.22%	-1.18%
2021 – 2041	0.04%	0.09%

(a) Forecast values are rounded to the nearest 50.
(b) CAGR = Compounded Annual Growth Rate

Sources: Kimley-Horn Analysis, January 2022; FAA OPSNET Database (accessed January 2022).

GA Operations – Market Share Forecast

CID has maintained a relatively consistent market share for general aviation operations between 2011 and 2019, as shown in **Table 2.21**. Like the based aircraft market share analysis, the market for GA operations consists of all public airports within 30 miles of CID. A constant 2019 market share and 2021 market share methodology was developed, as well as five- and eight year market share trends for each base year.

Table 2.21: CID Airport Market Share – GA Operations

Year	Market Area GA Operations (a) (b)	2019 Market Share	2021 Market Share	5-Year Trend (2019 Base)	5-Year Trend (2021 Base)	8-Year Trend (2019 Base)
Historical						
2011	62,632	43.0%				
2019	63,234	43.6%				
2021	60,727	34.4%				
Forecast						
2026	66,116	43.6%	34.4%	45.9%	28.5%	40.2%
2031	66,164	43.6%	34.4%	48.3%	22.3%	39.4%
2036	66,212	43.6%	34.4%	50.7%	16.2%	38.6%
2041	66,260	43.6%	34.4%	53.1%	10.1%	37.7%

(a) Historical market area GA operations for competing airports were estimated from the 2021 TAF.
(b) Market area GA operations for 2022-2041 were estimated from the 2021 TAF.

Sources: Kimley-Horn Analysis, January 2022; 2021 FAA Terminal Area Forecast (issued March 2022).

Market share forecasts project a range between 6,650 to 35,200 annual GA operations in 2041. The projected values for the market share analysis are summarized in **Table 2.22** and graphically presented in **Figure 2.7**.

Table 2.22: GA Operations Forecast – Market Share

	2019 Market Share	2021 Market Share	5-Year Trend (2019 Base)	5-Year Trend (2021 Base)	8-Year Trend (2019 Base)
Historical					
2011			26,952		
2019			27,554		
2021			20,860		
Forecast (a)					
2026	28,800	22,700	30,350	18,800	26,550
2031	28,850	22,750	31,950	14,750	26,000
2036	28,850	22,750	33,550	10,700	25,550
2041	28,870	22,760	35,200	6,650	25,000
CAGR (b)					
2011 – 2019			0.28%		
2011 – 2021			-2.53%		
2019 – 2041	0.21%	-0.86%	1.12%	-6.25%	-0.44%
2021 – 2041	1.64%	0.44%	2.65%	-5.54%	0.91%

(a) Forecast values are rounded to the nearest 50.
(b) CAGR = Compounded Annual Growth Rate

Sources: Kimley-Horn Analysis, January 2022; FAA OPSNET Database (accessed January 2022).

GA Operations – FAA Aerospace Forecast

As with the enplanement and based aircraft forecasts presented, a top-down methodology was used for GA operations. The FAA Aerospace Forecast predicted that GA operations would increase 0.8 percent per year through 2041. Applying this growth rate to the operations at CID results in the forecast presented in **Table 2.23**.

Table 2.23: GA Operations Forecast – FAA Aerospace Forecast

	FAA Aerospace Forecast
Historical	
2011	26,952
2019	27,554
2021	20,860
Forecast (a)	
2026	21,700
2031	22,600
2036	23,500
2041	24,450
CAGR (b)	
2011 – 2019	0.28%
2011 – 2021	-2.53%
2019 – 2041	-0.54%
2021 – 2041	0.80%

(a) Forecast values are rounded to the nearest 50.
(b) CAGR = Compounded Annual Growth Rate

Sources: Kimley-Horn Analysis, January 2022; FAA Aerospace Forecast, Fiscal Years 2021-2041 (published July 2021); FAA OPSNET Database (accessed January 2022).

GA Operations – Operations Per Based Aircraft

In addition to the methodologies described above, an operations per based aircraft forecast was calculated utilizing the preferred forecast for based aircraft. Between 2011 and 2021, the Airport averaged 196 GA operations per based aircraft annually. It was assumed that this ratio would remain constant through the 20-year planning horizon and was applied to forecasts of based aircraft. The projected values for GA operations using the average operations per based aircraft are summarized in **Table 2.24** and graphically presented in **Figure 2.7**.

Table 2.24: GA Operations Forecast – Ops Per Based Aircraft

	Ops Per Based Aircraft
Historical	
2011	26,952
2019	27,554
2021	20,860
Forecast (a)	
2026	26,050
2031	26,650
2036	27,250
2041	27,850
CAGR (b)	
2011 – 2019	0.28%
2011 – 2021	-2.53%
2019 – 2041	0.05%
2021 – 2041	1.45%

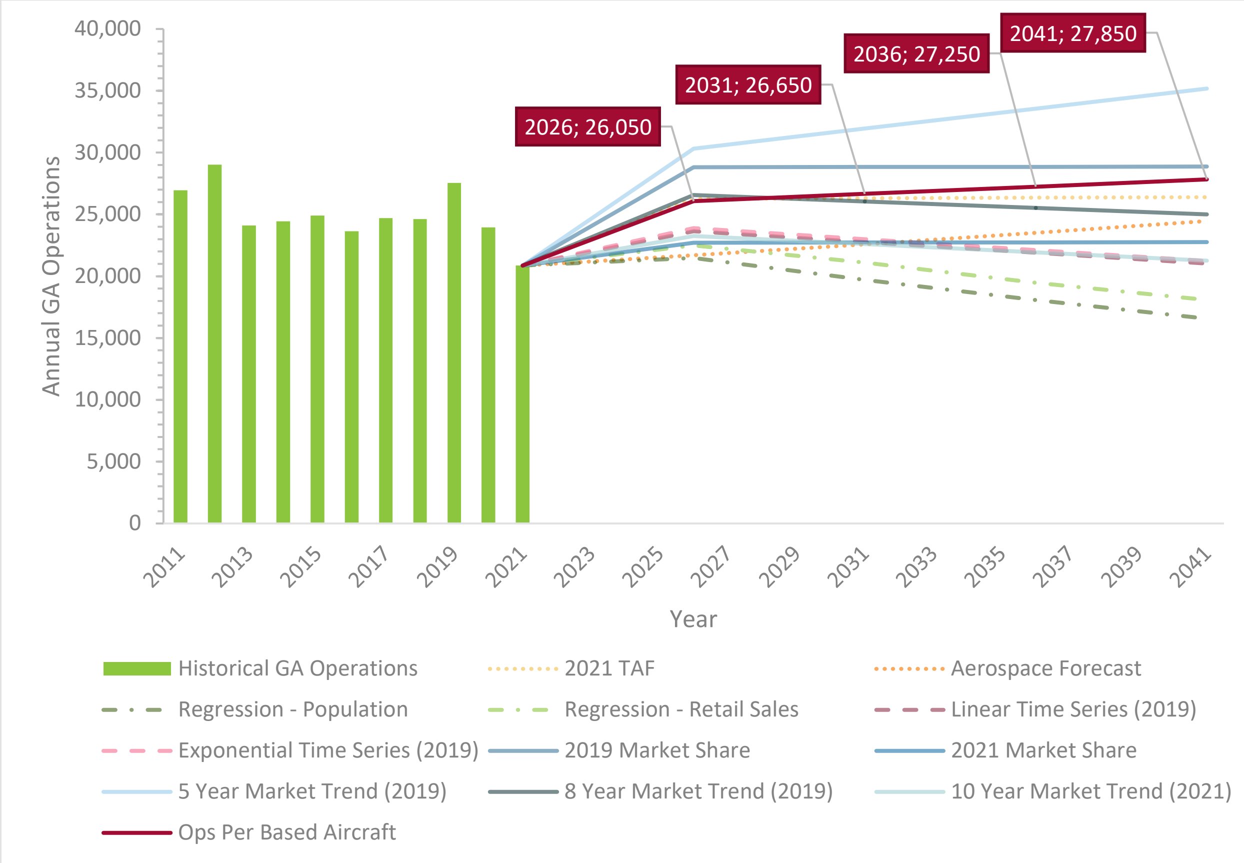
(a) Forecast values are rounded to the nearest 50.
(b) CAGR = Compounded Annual Growth Rate

Source: Kimley-Horn Analysis, January 2022; FAA OPSNET Database (accessed January 2022); Airport Records (received October 2021).

Preferred General Aviation Operations Forecast

The preferred forecast for GA operations is the operations per based aircraft methodology. The ratio of GA operations to based aircraft has remained relatively constant between 2011 and 2021, a trend that is expected to continue through the planning horizon. The preferred forecast shown in **Figure 2.7** anticipates that GA operations will continue to grow gradually through the planning horizon. Growth will be strongest in the near-term as the Airport continues to recover from temporary declines stemming from the COVID-19 pandemic.

Figure 2.7: General Aviation Operations Forecasts



Sources: Kimley-Horn Analysis, January 2022; 2021 FAA Terminal Area Forecast (issued March 2022).

General Aviation Local and Itinerant Operations Forecast

General aviation operations are classified as either local or itinerant. Local operations are those that stay within an airport's traffic pattern and also include "touch-and-go" activity. All other GA operations are considered itinerant. Over the past 10 years, itinerant operations have comprised of the majority of total GA operations, despite a steady decline. **Table 2.25** shows the historical and projected breakdown of itinerant versus local general aviation operations. Due to the fluctuations in activity in the past couple years, it was assumed that the future percent of itinerant and local operations will be consistent with the percentages observed in 2021.

Table 2.25: GA Local and Itinerant Operations Forecast

	Itinerant		Local	
Year	Percent of GA Operations	Number of Operations	Percent of GA Operations	Number of Operations
Historical				
2011	70.44%	18,022	29.56%	7,563
2012	64.70%	18,251	35.30%	9,956
2013	69.12%	16,165	30.88%	7,222
2014	66.99%	15,836	33.01%	7,802
2015	67.50%	16,088	32.50%	7,747
2016	65.20%	14,693	34.80%	7,844
2017	63.43%	15,057	36.57%	8,680
2018	58.24%	13,882	41.76%	9,954
2019	52.02%	13,819	47.98%	12,745
2020	55.94%	13,292	44.06%	10,469
2021	61.96%	12,531	38.04%	7,693
Forecast (a)				
2026	61.96%	16,150	38.04%	9,900
2031	61.96%	16,500	38.04%	10,150
2036	61.96%	16,900	38.04%	10,350
2041	61.96%	17,250	38.04%	10,600

(a) Forecast operations values rounded to the nearest 50.

Sources: Kimley-Horn Analysis, February 2022; FAA OPSNET Database (accessed January 2022).

2.9 MILITARY OPERATIONS FORECAST

CID experiences a limited amount of military activity. Between 2011 and 2021, military operations have ranged between 200 and 600 operations per year, accounting for less than 1 percent of total annual operations at the Airport. Military operations are not expected to significantly increase over the planning period, and it is difficult to forecast military activity as it is tied to factors often unrelated to the aviation industry as a whole. As such, it was assumed that the 267 military operations that occurred at CID in 2021 would remain constant through the 20-year planning horizon.

2.10 AIR CARGO FORECASTS

Air cargo activity is a strong economic contributor/driver for Eastern Iowa Airport. Air cargo is carried by both all-cargo freighter operators and passenger airlines, the latter referred to as belly cargo.

Air cargo forecasts provide forward-looking views of expected tonnage levels at CID and subsequent operational activity. The forecasts were developed based on CID's past air cargo experience, primary research in the form of interviews with key air cargo operators, and secondary research utilizing available industry data and information. Similar to previously presented forecasts, time series modeling and regression analysis methodologies were also assessed for air cargo tonnage forecasts. A base year of 2021 was used for the air cargo forecasts as activity during the COVID-19 pandemic experienced strong growth at the Airport.

- AIR CARGO TONNAGE FORECAST

Typically, air cargo activity at airports is measured in terms of total tonnage and it is widely considered a good indicator of facilities and infrastructure needs. Cargo tonnage data also allows for meaningful trend analysis and relative comparisons of airports as it is a commonly reported statistic available in the public realm. This section includes forecasts using regression and time series methodologies.

Air Cargo Tonnage - Regression Forecast

Regression analyses were performed to determine potential relationships between CID's historic air cargo tonnage and several independent variables. The independent variables for the Cedar Rapids Combined Statistical Area (CSA) assessed in the regression models included population, employment, personal income, retail sales, and gross regional product. Simple linear regression was used for each of the independent variables and, separately, multi-variable regression was used for different combinations of independent variables.

The output of the regression analyses showed poor results and no statistically significant relationship between CID's air cargo tonnage and the tested independent variables. Each regression model produced low R-squared values and, in the case of the multi-variable regression models, numerous instances of wrong signs for the independent variable coefficients. Prior assessments of regression analysis for airport-level air cargo forecasts suggest that the modeling is not appropriate due to factors such as:

- Air cargo industry dynamics where trucking to other (potentially distant) airports is common
- Lacking visibility of the true origins and destinations of air cargo shipments
- Lag effects where the drivers of air cargo activity may not match the usage of air cargo services in the same time periods

Despite the poor output of the regression models, the results are reported herein. The two variables with the highest correlations to annual air cargo tonnage at CID were personal income and retail sales. A regression model was created for each of these variables and the projected air cargo tonnage from these models are summarized in **Table 2.26.**

Table 2.26: Air Cargo Tonnage Forecast (metric tons) – Regression

	Regression Variable: Personal Income	Regression Variable: Retail Sales
Historical		
2011	23,090	
2019	30,546	
2021	33,934	
Forecast (a)		
2026	33,000	32,300
2031	36,200	34,300
2036	39,600	36,300
2041	43,100	38,300
CAGR (b)		
2011 - 2019	3.56%	
2011 – 2021	3.93%	
2019 – 2041	1.09%	0.55%
2021 – 2041	1.20%	0.61%

(a) Forecast values rounded to the nearest 100.
(b) CAGR = Compounded Annual Growth Rate

Sources: Hubpoint Analysis, February 2022; Airport Records (received October 2021).

Air Cargo Tonnage – Time Series Forecast

For air cargo forecasts at the individual airport level, it is important to explicitly consider past air cargo tonnage levels, particularly when air cargo operations at an airport have been relatively consistent over time. Further, recent trends at an airport should be weighted more heavily when those trends are expected to continue into the future. Time series models allow for these methods and, therefore, can produce reliable air cargo forecasts for individual airports. For the CID air cargo tonnage forecasts, time series modeling using data from 2006 to 2021 predicts a CAGR of 3.5 percent totaling 69,500 metric tons by 2041. Faster growth in the first five years of the forecast was expected as growth in e-commerce and supply chain challenges continue to generate high demand for air cargo services. This constitutes the baseline air cargo tonnage forecast where a status quo environment for air cargo is assumed at the Airport. This includes expectations that current cargo airlines will continue serving CID with similar operations as they have in the past and no new entrant cargo carriers initiate regular service at the Airport.

Notably, in contrast to depressed commercial air travel demand at CID (and globally) during the COVID-19 pandemic, air cargo demand did not experience a similar downturn. Therefore, the CID time series models considered 2020-2021 data as relevant and representative of important air cargo trends that are expected to continue. The projected values for the time series models are summarized in **Table 2.27** and graphically presented in **Figure 2.8**.

Table 2.27: Air Cargo Tonnage Forecast – Time Series

	Exponential Smoothing
Historical	
2011	23,090
2019	30,546
2021	33,934
Forecast (a)	
2026	45,000
2031	54,900
2036	62,400
2041	69,500
CAGR (b)	
2011 – 2019	3.56%
2011 – 2021	3.93%
2019 – 2041	3.80%
2021 – 2041	3.65%

(a) Forecast values are rounded to the nearest 100.

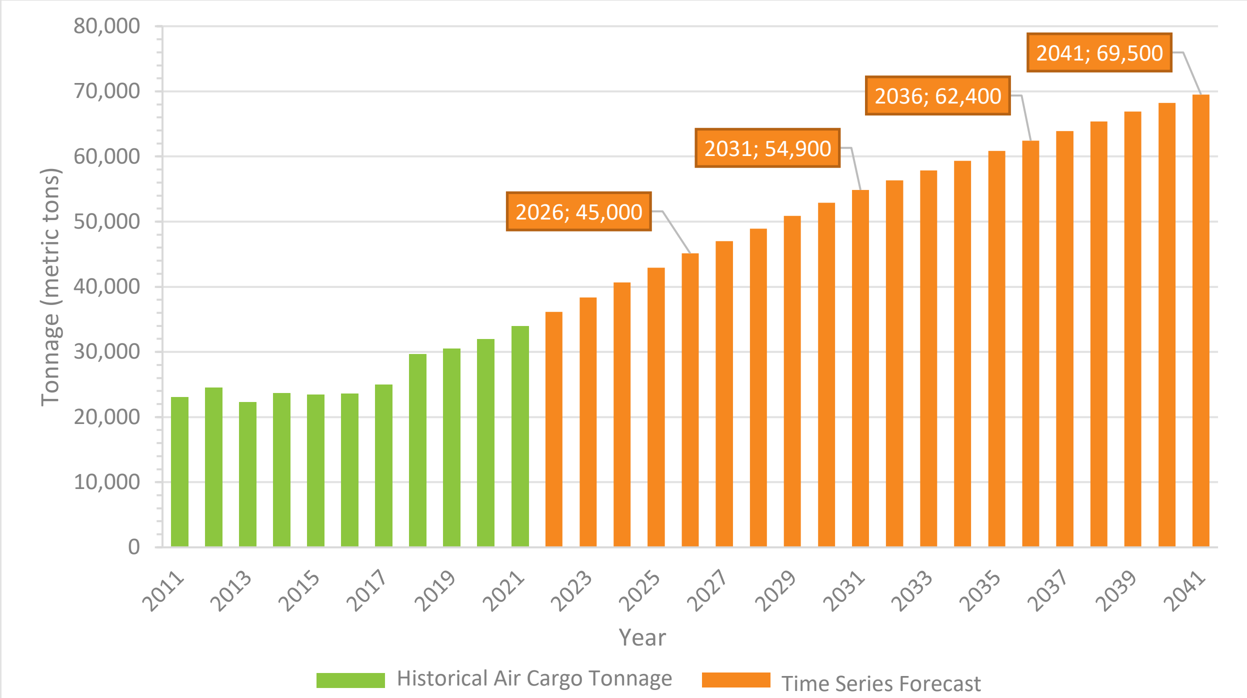
(b) CAGR = Compounded Annual Growth Rate

Sources: Hubpoint Analysis, February 2022; Airport Records (received October 2021).

Preferred Air Cargo Tonnage Forecast

After testing several iterations of the forecast model and applying professional judgment, a preferred baseline air cargo tonnage forecast was developed using the time series methodology. This forecast incorporated direct input from key air cargo stakeholders and intelligence regarding the outlook of the U.S. domestic air cargo market. A review of the tonnage forecast showed that expected growth rates are well within a reasonable range of historical growth rates at CID, albeit at higher levels of base tonnage. As mentioned, e-commerce is a major driver of CID's growing air cargo activity and this is expected to continue for the next several years. The region's business and manufacturing activity also contribute to air cargo growth with shipments comprised of industrial goods, pharmaceuticals, bio-tech and healthcare products.

Figure 2.8: Air Cargo Tonnage Forecast - Baseline



Sources: Hubpoint Analysis, February 2022; Airport Records (received October 2021).

- AIR CARGO OPERATIONS FORECAST

The air cargo operations forecast is based on the air cargo tonnage forecast and assumptions about future aircraft fleet mix and utilization rates measured in tons per movement.

Cargo Airline Fleet Mix and Utilization

In general, it is expected that the fleet mix will trend to larger aircraft (both mainline jets and turboprop feeders) during the forecast period. **Table 2.28** presents the cargo aircraft activity by type for 2017, 2019, and 2021.

Table 2.28: Historical Air Cargo Fleet Mix

	Percent of Operations				
	Airbus A300 Freighter (A300F)	Boeing 757 Freighter (B757F)	Boeing 767 Freighter (B767F)	Boeing 737 Freighter (B737F)	Avions de Transport Regional (ATR)
2017	34.1%	41.1%	0.9%	9.6%	14.3%
2019	4.0%	36.0%	23.9%	25.5%	10.5%
2021	1.0%	40.4%	23.6%	25.2%	9.9%

Sources: Hubpoint Analysis, February 2022; Airport Records (accessed October 2021).

Based on information gathered from current CID cargo operators (FedEx, UPS and DHL) and other industry research, the following observations and assumptions were made:

- While B757Fs comprise the largest fleet type for both FedEx and UPS, both cargo carriers are adding larger mainline jets, including B767Fs, B777Fs and B747-8Fs. The B757Fs will continue operating for many more years, but the trend toward larger aircraft is clear and addresses cargo volume growth and constrained resources such as pilots. As larger aircraft become available to FedEx and UPS, it is expected that B757Fs will be gradually displaced at CID, particularly by the B767F.
- Turboprop feeders are also expected to grow in size to accommodate containerized cargo leading to more efficient operations as volumes grow related to outstations. FedEx is taking deliveries of new ATR-72Fs and Cessna SkyCourier 408s.
- Although the feeder fleet make-up will change, the number of operations was not expected to grow materially during the forecast period. It was assumed that these feeders would serve the same outstation markets as they do currently and with similar frequencies.
- The air carriers contracted by DHL for U.S. operations are expected to continue utilizing the B737F at CID and with similar frequencies.

Utilization rates of cargo aircraft are also expected to increase over time at CID. This results in higher tonnage levels per aircraft movement. Importantly, this dynamic occurs not just between fleet types as larger aircraft replace smaller aircraft, but also within fleet types as capacity is optimized. During the forecast period, tons per movement within fleet types is estimated to grow by approximately 11.0 percent.

The forecast air cargo fleet distribution is presented in **Table 2.29**.

Table 2.29: Forecast Air Cargo Fleet Mix

	Percent of Operations				
	Airbus A300 Freighter (A300F)	Boeing 757 Freighter (B757F)	Boeing 767 Freighter (B767F)	Boeing 737 Freighter (B737F)	Avions de Transport Régional (ATR)
2026	2.3%	35.0%	25.8%	26.8%	10.0%
2031	2.9%	28.6%	32.0%	26.6%	10.0%
2036	3.9%	24.4%	36.5%	25.7%	9.5%
2041	4.1%	18.4%	41.3%	26.5%	9.8%

Source: Hubpoint Analysis, February 2022.

Recommended Air Cargo Operations Forecast

Forecast CID air cargo tonnage was converted to air cargo operations, by fleet type, by applying the assumptions outlined above. The results are shown in **Table 2.30** and **Figure 2.9**. Air cargo aircraft operations are relatively flat during the forecast period, generally remaining within a tight range of approximately 4,000 - 4,200 annual operations. Larger aircraft, along with higher utilization rates, are expected to enable significantly more air cargo to be handled at CID with only modest increases in air cargo aircraft operations.

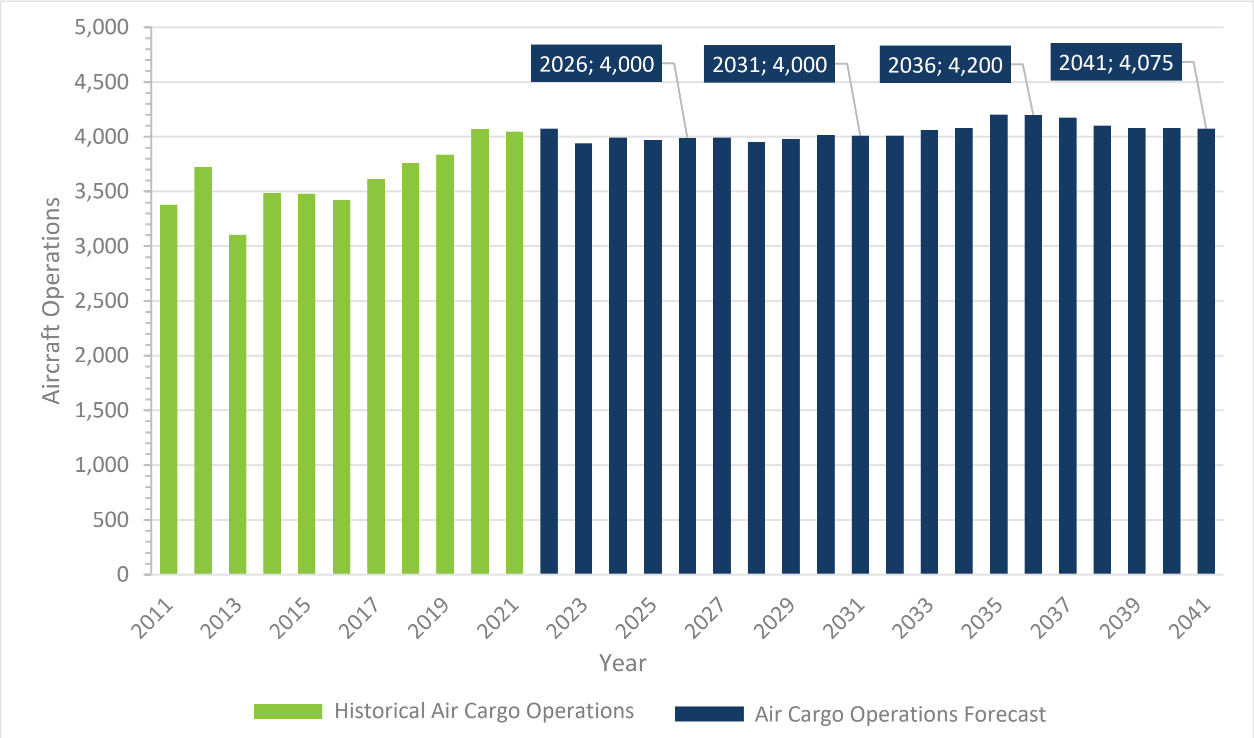
Table 2.30: Air Cargo Operations Forecast

	Annual Air Cargo Operations
Historical	
2011	3,378
2019	3,836
2021	4,049
Forecast (a)	
2026	4,000
2031	4,000
2036	4,200
2041	4,075
CAGR (b)	
2011 – 2019	0.10%
2011 – 2021	-1.87%
2019 – 2041	0.52%
2021 – 2041	1.56%

(a) Forecast values are rounded to the nearest 25.
(b) CAGR = Compounded Annual Growth Rate

Sources: Hubpoint Analysis, February 2022; Airport Records (received October 2021).

Figure 2.9: Recommended Air Cargo Operations Forecast - Baseline



Sources: Hubpoint Analysis, February 2022; Airport Records (received October 2021).

2.11 TOTAL OPERATIONS FORECASTS

A forecast of total Airport operations, including commercial, general aviation, cargo, and military are presented below in **Table 2.31**.

Table 2.31: Total Airport Operations Forecast

Year	Commercial/ Air Carrier (a)	General Aviation (a)		Cargo (b)	Military	Total Operations (a)
		Itinerant	Local			
2026	20,600	16,150	9,900	4,000	267	50,900
2031	22,100	16,500	10,150	4,000	267	53,000
2036	24,400	16,900	10,350	4,200	267	56,100
2041	27,000	17,250	10,600	4,075	267	59,200

(a) Forecast values rounded to the nearest 50.
(b) Forecast values rounded to the nearest 25.

Sources: Kimley-Horn Analysis, February 2022; Hubpoint Analysis, February 2022.

2.12 DEMAND PEAKING ANALYSIS

Preceding sections have identified passenger and aircraft operational demand levels on an annual basis. Since activity is not uniformly distributed throughout the year, identification of peak periods of activity is critical to ensure that airport facilities can accommodate demand. For example, an understanding of peak hour and peak seasonal demand is important input for terminal space planning. The following section presents peaking characteristics of enplanements and operations. The metrics used in this section include the following:

- **Peak Month** – The calendar month in which the highest percentage of activity occurs
- **Peak Month Average Day (PMAD)** – Total peak month activity divided by the number of days in the peak month
- **Design Day** – Representative day that reflects regularly occurring peak activity. The design day does not necessarily correspond to the PMAD
- **Design Hour** – Representative hour that reflects regularly occurring peak activity

PEAK PASSENGER ACTIVITY

Monthly passenger data from 2016 to 2019 were analyzed to determine the busiest month. Data from 2020 and 2021 were also reviewed but not considered in the peaking analysis due to the impacts of the COVID-19 pandemic and the irregularities in those data sets. Eastern Iowa Airport exhibits higher levels of enplanements during the summer months and spring break season, with the peak month typically occurring in July. Between 2017 and 2019, the percent of activity in July increased from 8.9 percent to 9.7 percent. For purposes of forecasting, it was assumed that peak month enplanement activity would grow to 10 percent of annual activity by 2041. This results in an increase of peak month activity from 64,900 enplanements in 2019 to 110,900 enplanements in 2041. Peak enplanement activity is summarized in **Table 2.32**.

To identify baseline peak day and peak hour estimates, the July 2019 flight schedule was utilized as it reflected pre-pandemic conditions. Average load factors were applied to the flight schedule to determine the number of passengers on each flight. While the busiest day in the peak month occurred on a Wednesday, a representative busy day in July was chosen for the design day. It was assumed that the design day and design hour grow proportionally with annual enplanements. The design day had about 2,215 enplanements in 2019 with a projected growth to 3,652 daily enplanements by 2041. The peak hour for enplanements, with 417 enplanements in 2019, occurred between 6:00 and 7:00 a.m.

Enplanement and deplanements for the July 2019 flight schedule were examined to determine total passenger peaking. Total passengers are defined as the sum of the enplanements and deplanements. Total passengers and enplanements were assumed to have the same design day. The peak hour for total passengers occurred between 4:45 and 5:45 p.m. in 2019 with 516 passengers. Total peak hour passengers are projected to increase to 852 passengers by 2041. Peak passenger activity is summarized in **Table 2.32**.

Table 2.32: Passenger Activity Peaking

	Annual (a)	Peak Month (a)	PMAD	Design Day	Design Hour
Enplanements					
2019	672,468	64,941	2,095	2,215	417
2026	762,300	94,400	2,400	2,511	473
2031	872,300	85,800	2,769	2,873	541
2036	988,900	98,100	3,165	3,257	613
2041	1,108,700	110,900	3,652	3,652	687
Total Passengers					
2019	1,322,736	132,934	4,288	4,437	516
2026	1,524,700	148,800	4,800	5,038	586
2031	1,744,600	171,700	5,537	5,765	670
2036	1,977,900	196,200	6,329	6,536	760
2041	2,217,400	221,800	7,153	7,327	852

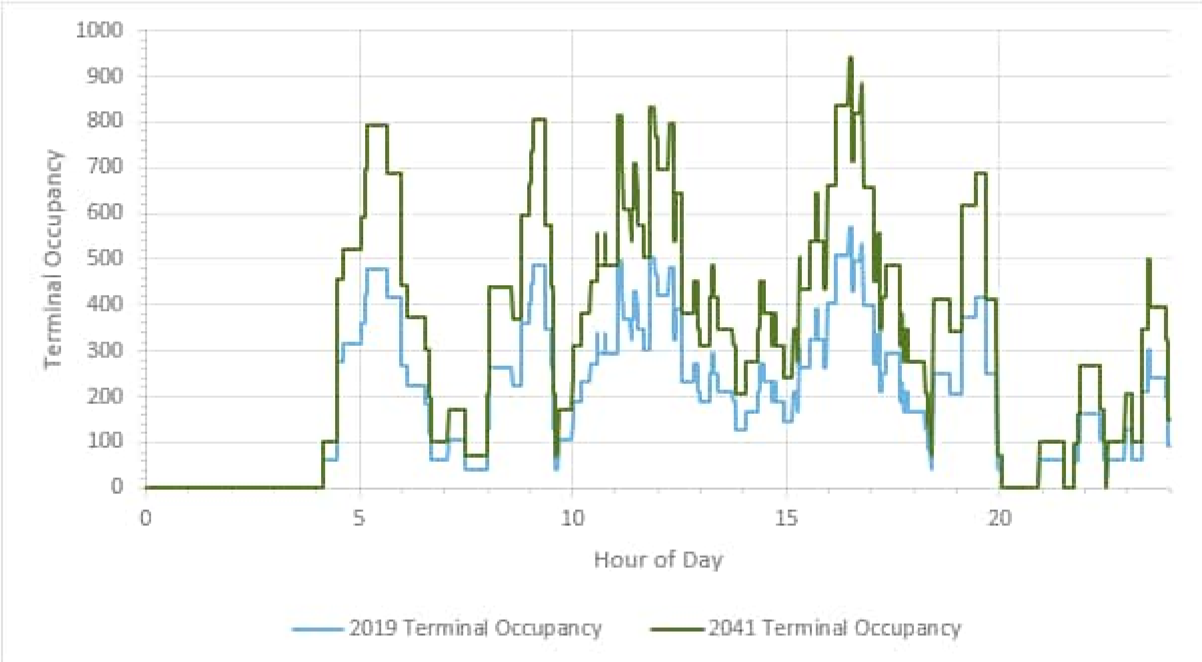
(a) Forecast values rounded to the nearest 100.

Sources: Kimley-Horn Analysis, February 2022; Airport Records (received October 2021); Ailevon Pacific Aviation Consulting (received February 2022)

Terminal Occupancy

While enplanements provide insight into terminal facility requirements such as ticket counters and security checkpoints, the total number of passengers in the terminal, or terminal occupancy, at any given time is also important. Using the design day flight schedule for 2019, the number of passengers in the terminal at any time was estimated. A dwell time of 1.5 hours was assumed for passengers arriving at the Airport for a departure flight, and a time of 35 minutes was assumed for arriving passengers from another airport to be processed through the Airport and exit the premises. The resulting passenger flow in the terminal is presented in **Figure 2.10**. Peak terminal occupancy (the time when the greatest number of arriving and departing passengers are present) typically occurs between 4:00 p.m. and 5:00 p.m. The peak terminal occupancy was 570 during the design day in 2019. It was assumed that peak periods of passenger activity would increase at the same rate as annual passengers, which forecasts a peak terminal occupancy of 941 passengers by 2041.

Figure 2.10: Design Day Terminal Occupancy



Sources: Kimley-Horn Analysis, February 2022; Ailevon Pacific Aviation Consulting (received February 2022).

- PEAK OPERATIONS

Table 2.33 provides peaking characteristics for the various operation types at CID. The following sections provide additional details for methodologies and findings.

Commercial Operations

The peak month for commercial operations in 2019 occurred in October. The peak month has varied year over year but consists of approximately 9.2 percent of annual operations. Peak month operations are projected to account for 9.5 percent of annual commercial operations by 2041. Peak month commercial operations are projected to increase from 1,984 operations in 2019 to 2,569 operations. Like with enplanements, a design day was chosen to represent a regularly occurring busy day. The design day for enplanements and commercial operations are not necessarily correlated to one another. In the peak month, Sundays had the greatest number of flights. The design day flight schedule suggests that the peak hour occurs between 5:00 p.m. and 6:00 p.m. with eight commercial operations. Design day and design hour operations are expected to grow proportionally to the annual commercial operations resulting in a 2041 design day with 84 commercial operations and design hour with 11 operations.

General Aviation Operations

The FAA's OPSNET database was consulted to identify peaking characteristics for GA operations. Typically, the peak month for GA activity occurs in June, July, or August and accounts for approximately 12 percent of annual GA operations. It was assumed that this percentage would remain constant over the planning horizon (see **Table 2.33**). The design day was determined as the 30th busiest day in 2019, a standard industry metric. Similarly, the design hour is the 50th busiest hour in 2019. In 2019, the design day and design hour had 156 and 36 GA operations, respectively. The design day and hours operations are projected to increase slightly to 158 design day operations and 37 design hour operations by 2041.

Military Operations

Military operations account for a very small portion of the total operations at CID. Military operations have historically been very inconsistent, with no clear indication of a peak month. The peak month in 2019 was October, which accounted for approximately 16 percent of annual operations. It was assumed that this percentage would remain constant through the planning horizon. Due to the low number of annual military operations, the peak percentage fluctuations from year-to-year will not have a significant impact on the peaking characteristics. The design day was determined to be equal to the PMAD with two operations in 2019. No change in peak hour military activity is anticipated between 2019 and 2041.

Cargo Operations

Air cargo operations activity was analyzed on a monthly basis at CID from 2013 to 2021 to determine the peak activity month. Between 2013 and 2020, December was consistently identified as the peak month for air cargo operations. In 2021, the peak month for air cargo operations was not in December, but rather it was in March. This was assumed to be an anomaly – perhaps due to the distribution of COVID-19 vaccines in the U.S., which was occurring in high volumes beginning in Spring 2021.

Between 2013 and 2020, the share of air cargo operations in December ranged from 9.4 percent to 10.7 percent. The weighted average share of cargo operations in December for the aggregate seven-year period was 10.0 percent. It was assumed that the peak month (December) for air cargo operations would grow to 11.0 percent of annual operations by 2041. The peak month will experience an increase in 96 cargo operations between 2021 and 2041.

Total Operations

The preceding sections provide insight into the peaking characteristics of each type of operation. However, peaking characteristics by activity type do not always occur concurrently. Historically, the peak month for total operations has aligned with the peak month for GA operations. Approximately 10.5 percent of total annual operations occur during the peak month. The peak month in 2019 was October with approximately 5,600 operations. As with passenger activity and commercial operations, a representative day in the peak month was chosen as the design day to determine peak day and peak hour activity. The design day in 2041 was projected to have 262 operations, an increase from 234 operations in 2019. On the design day, the peak hour occurred between 2:00 and 3:00 p.m. In 2041, the design hour will experience 62 operations.

Table 2.33: Operations Peaking

	Annual	Peak Month	PMAD	Design Day	Design Hour
Commercial Operations (a)					
2019	21,162	1,984	64	66	8
2026	20,600	1,915	62	65	8
2031	22,100	2,068	67	69	9
2036	24,400	2,303	74	76	10
2041	27,000	2,569	83	84	11
General Aviation Operations (a)					
2019	27,554	2,991	96	156	36
2026	26,050	3,128	101	148	35
2031	26,650	3,199	103	151	35
2036	27,250	3,269	105	155	36
2041	27,850	3,340	108	158	37
Military Operations					
2019	264	43	2	2	2
2026	267	44	2	2	2
2031	267	44	2	2	2
2036	267	44	2	2	2
2041	267	44	2	2	2
Cargo Operations (b)					
2021	3,936	352	--	--	--
2026	4,000	407	--	--	--
2031	4,000	420	--	--	--
2036	4,200	451	--	--	--
2041	4,075	448	--	--	--
Total Operations (a)					
2019	52,816	5,599	181	234	55
2026	50,900	5,345	172	226	53
2031	53,000	5,565	180	235	55
2036	56,100	5,891	190	249	58
2041	59,200	6,216	201	262	62

(a) Forecast annual values rounded to the nearest 50.
(b) Forecast annual values rounded to the nearest 25.

Sources: Kimley-Horn Analysis, February 2022; Hubpoint Analysis, February 2022; Airport Records (received October 2021); FAA OPSNET Database (accessed January 2022).

2.13 DESIGN AIRCRAFT

Airport design standards are based on the determination of design, or critical, aircraft. As described in *Chapter 1 – Inventory or Existing Conditions*, the design aircraft is the most demanding aircraft that conducts at least 500 operations per year at an airport, which is reflective of the demand that will regularly be placed on the airport's facilities. Recent TFMSC data were analyzed to determine the design aircraft. The design aircraft in 2021 was determined to be the Boeing 767-300F with 992 annual operations. Cargo activity is anticipated to drive the design aircraft through the planning horizon, indicating that the 2041 design aircraft is forecast to remain the Boeing 767-300F. With an increase in utilization of Boeing 767-300Fs by cargo operators, it is projected that the Boeing 767-300F will have 1,683 annual operations in 2041. *Chapter 3 – Facility Requirements* will discuss the impacts of the design aircraft on airfield design requirements.

2.14 FORECAST SUMMARY

Table 2.34 presents a summary of forecasts developed for the Airport Master Plan Update. Based on an analysis of historical trends, recovery from the COVID-19 pandemic, and other industry factors, all facets of aviation activity at CID are anticipated to experience growth over the 20-year planning horizon.

Table 2.34: Preferred Forecasts Summary

	Enplanements	Operations					Other	
	Passenger Enplanements (a)	Commercial (b)	General Aviation (b)	Military	Air Cargo (c)	Total Operations (b)	Based Aircraft	Cargo Volume (metric tons) (a)
Historical								
2011	440,180	21,816	26,952	238	3,378	52,384	131	23,090
2019	672,468	21,162	27,554	264	3,836	52,816	128	30,546
2021	528,960	18,544	20,860	267	4,049	43,372	128	33,934
Forecast								
2026	762,300	20,600	26,050	267	4,000	50,900	133	45,000
2031	872,300	22,100	26,650	267	4,000	53,000	136	54,900
2036	988,900	24,400	27,250	267	4,200	56,100	139	62,400
2041	1,108,700	27,000	27,850	267	4,075	59,200	142	69,500
CAGR								
2011 - 2019	5.44%	-0.38%	0.28%	1.30%	1.60%	0.10%	-0.23%	3.56%
2011 - 2021	1.85%	-1.61%	-2.53%	1.16%	1.83%	-1.87%	-0.23%	3.93%
2019 - 2041	2.30%	1.12%	0.05%	0.05%	0.28%	0.52%	0.52%	3.80%
2021 - 2041	3.77%	1.90%	1.45%	0.00%	0.03%	1.56%	0.52%	3.65%

(a) Forecast values rounded to the nearest 100.
(b) Forecast values rounded to the nearest 50.
(c) Forecast values rounded to the nearest 25.

Sources: Kimley-Horn Analysis, February 2022; Hubpoint Analysis, February 2022; Airport Records (received October 2021); FAA OPSNET Database (accessed January 2022).

2.15 FORECAST COMPARISON TO FAA TAF

The FAA Airports District Offices (ADOs) are responsible for approving master plan aviation forecasts to ensure acceptable forecasting methodologies were utilized. Based on FAA guidance, forecasts are consistent with the TAF if they differ within 10% at the five-year and 15% at the 10-year planning horizon[35]. The forecasts presented in this chapter were compared to the 2021 TAF. **Table 2.35** presents the 15-year comparison of the preferred airport forecasts developed in this chapter and the forecasts identified in the 2021 TAF, issued in March 2022. The table template was obtained from Appendix C of *Forecasting Aviation Activity by Airport*.

As presented in **Table 2.35**, the passenger enplanement forecast developed for CID satisfies the criteria for approval at the ADO level. Commercial operations fall outside the TAF tolerance. However, the TAF considers commercial and non-commercial air taxi operations, whereas the airport forecast only included air carrier and commercial air taxi operations. General aviation operations, military operations, and the resulting total operations forecasted at CID satisfies the criteria for approval. The based aircraft forecast falls within the acceptable range as well when compared to the 2021 TAF.

On April 25, 2022, the FAA Central Region Airports Division approved the Aviation Activity Forecasts for use in long-range planning at CID. **Figure 2.11** contains the forecast approval letter.

[35] Source: FAA Advisory Circular 150/5070-6B, Change 1, Airport Master Plans (published May 2007).

Table 2.35: TAF Comparison Summary

	Year	Airport Forecast (AF)	TAF (a)	AF/TAF (% Difference)
Passenger Enplanements (b)				
Base Year	2021	528,960	456,637	15.84%
Base Year + 5 Years	2026	762,300	734,839	3.74%
Base Year + 10 Years	2031	872,300	811,574	7.48%
Base Year + 15 Years	2036	988,900	887,649	12.25%
Commercial Operations (c) (d)				
Base Year	2021	18,544	25,281	-26.6%
Base Year + 5 Years	2026	20,600	26,739	-18.50%
Base Year + 10 Years	2031	22,100	29,591	-17.41%
Base Year + 15 Years	2036	24,400	31,228	-17.48%
General Aviation Operations (c)				
Base Year	2021	20,860	21,761	-4.14%
Base Year + 5 Years	2026	26,050	26,249	-0.69%
Base Year + 10 Years	2031	26,650	26,297	1.37%
Base Year + 15 Years	2036	27,250	26,345	3.41%
Military Operations				
Base Year	2021	267	275	-2.91%
Base Year + 5 Years	2026	267	275	-2.91%
Base Year + 10 Years	2031	267	275	-2.91%
Base Year + 15 Years	2036	267	275	-2.91%
Total Operations (c)				
Base Year	2021	43,372	43,194	0.41%
Base Year + 5 Years	2026	50,900	52,655	-3.33%
Base Year + 10 Years	2031	53,000	54,950	-3.55%
Base Year + 15 Years	2036	56,100	57,394	-2.25%
Based Aircraft				
Base Year	2021	128	129	-0.78%
Base Year + 5 Years	2026	133	133	-1.48%
Base Year + 10 Years	2031	136	136	-3.55%
Base Year + 15 Years	2036	139	139	-5.44%

(a) TAF data are on a U.S. government fiscal year basis (October through September).
(b) Airport forecast values rounded to the nearest 100.
(c) Airport forecast values rounded to the nearest 50.
(d) TAF forecast values for commercial operations include both air carrier and air taxi. Airport forecast differentiates commercial versus non-commercial air taxi operations.

Sources: Kimley-Horn Analysis, February 2022; 2021 FAA Terminal Area Forecast (issued March 2022); Appendix C of "Forecasting Aviation Activity by Airport", GRA Incorporated (published April 2001).

Figure 2.11: FAA Forecast Approval Letter

U.S. Department of Transportation
Federal Aviation Administration

Central Region
Iowa, Kansas
Missouri, Nebraska

901 Locust
Kansas City, Missouri 64106
(816) 329-2600

April 25, 2022

Mr. Marty Lenss
Airport Director
The Eastern Iowa Airport
2515 Arthur Collins Parkway SW
Cedar Rapids, IA 52404

Dear Mr. Lenss:

Forecast/Critical Design Aircraft Approval
The Eastern Iowa (CID), Cedar Rapids, IA
AIP No. 3-19-0012-071-2022

The submitted Aviation Demand Forecasts (Enplanements, Commercial Operations, Cargo Operations, GA Operations, Military Operations, and Operational Fleet Mixes) are **Approved**.

The proposed existing Critical Design Aircraft, **Boeing 767-300F**, is **Approved**. The proposed ultimate Critical Design Aircraft, **Boeing 767 family**, is **Approved**.

You may proceed with developing the remainder of the report and the Airport Layout Plan drawings. If you have any questions regarding this project, please call me at (816) 329-2637 or via email at jeff.deitering@faa.gov.

Sincerely,

Jeffrey D. Deitering, P.E.
Iowa State Planner

CC: Shane Wright, Iowa DOT Aviation Bureau
Tom Schnetzer, Kimley-Horn

Source: FAA Central Regional Airports Division, Received April 25, 2022.

Chapter Three

Facility Requirements

CHAPTER 3: FACILITY REQUIREMENTS

3.1 INTRODUCTION

This chapter identifies airside, landside, cargo, support, and passenger terminal facilities required at the Eastern Iowa Airport (CID) to accommodate future aviation activity forecasted in *Chapter 2 – Aviation Forecasts*. Required facilities are determined by user demand and the Federal Aviation Administration's (FAA) design standards. Guidance sourced to determine facility requirements include:

- FAA Advisory Circular (AC) 150/5300-13B, *Airport Design*
- AC 150/5060-5, *Airport Capacity and Delay*
- AC 150/5325-4B, *Runway Length Requirements for Airport Design*
- Order 5090.5, *Formulation of the National Plan of Integrated Airport Systems (NPIAS) and Airports Capital Improvement Plan (ACIP)*

The forecasts presented in the previous chapter were approved by the FAA on April 25, 2022 and results are summarized in **Table 3.1**. Forecasts of aviation demand were a main component in identifying facility requirements.

Table 3.1: Forecast Summary

Forecast Summary						
Year	Annual Enplanements	Annual Operations	Based Aircraft	Peak Month Operations	PMAD	Cargo Volume (Metric Tons)
2019	672,468	52,816	128	5,599	64	30,546
2021	528,960	43,372	128	-	-	33,934
2026	762,300	50,900	133	5,345	172	45,000
2031	872,300	53,000	136	5,565	180	54,900
2036	988,900	56,100	139	5,891	190	62,400
2041	1,108,700	59,200	142	6,216	201	69,500
CAGR 2021-2041	3.77%	1.56%	0.52%			3.65%

Source: Kimley-Horn Analysis, February 2022; Hubpoint Analysis, February 2022; Airport Records (received October 2021); FAA OPSNET Database (accessed January 2022)

3.2 AIRFIELD AND AIRSPACE

A key element of the airfield planning process is the analysis of airfield capacity, delay, and geometric standards. The following section addresses existing and future facility needs and CID's ability to accommodate demand within the planning period.

AIRFIELD DEMAND AND CAPACITY

Airfield capacity analysis assesses the maximum number of aircraft operations an airfield can accommodate during a specific time. Delay times between operations become longer as demand increases toward maximum airfield capacity. Though weather-related occurrences and airfield maintenance are unavoidable, optimizing airfield configuration is necessary to increase airfield traffic flow and reduce operational delays. Methodologies to study airfield demand and capacity were taken from FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*. The results of the methodologies are expressed through the following measurements:

- Hourly Capacity – The maximum amount of aircraft operations CID can accommodate safely within an hour time frame.
- Annual Service Volume (ASV) – The maximum amount of aircraft operations CID can accommodate annually without significant delays.
- Delay – The time required for an aircraft operation to occur without interference from other aircraft.

This section includes key operational factors at CID that influence calculations of airfield capacity and delay.

Meteorological Conditions

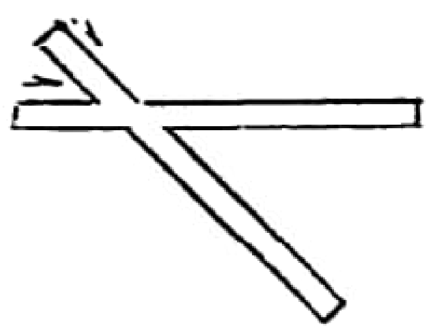
Variations in visibility minimums and wind speed/directions affect airfield capacity due to aircrafts requiring more separation during instrument meteorological conditions (IMC). According to the FAA Airport Data Information Portal (ADIP), 89.7 percent of weather conditions at CID are favorable for Visual Flight Rules (VFR), 10.3 percent require Instrument Flight Rules (IFR), and 1.4 percent are reported below CAT-I instrument approach minimums.

Runway Use Configurations

Runway use configurations identify the airport runways' number, orientation, and location during various operating conditions. Airfield configuration is dependent on weather conditions, the time of day, and a runway's approach procedures. AC 150/5060-5, *Airport Capacity and Delay* identifies a variety of diagrams that best represents an airport's runway configuration. CID has two intersecting runways, Runway 9/27 and Runway 13/31, which aligns with Diagram Number 9 of the Advisory Circular and is depicted in **Figure 3.1**.

Figure 3.1: Runway Use Configuration – Diagram 9

9.



Source: FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*

Aircraft Fleet Mix

The aircraft fleet mix is the percentage of each aircraft weight class operating at CID. Heavier aircraft require increased separation for approach and departure procedures to avoid wake turbulence. Though aircraft weight classes have a similar naming system, they are different from an airport's ARC. Identified in the FAA's AC 150/5060-5, Airport Capacity and Delay, the four classes of aircraft based on maximum certified takeoff weight (MTOW) includes:

- Class A – 12,500 lbs. or less, single engine
- Class B – 12,500 lbs. or less, multi-engine
- Class C – 12,500 to 300,000 lbs.
- Class D – over 300,000 lbs.

The mix index ratio formula that determines aircraft fleet mix for both runways is:

[Total Class C Aircraft + (3 x Total Class D Aircraft)] / Total Operations = Aircraft Fleet Index

The FAA's Traffic Flow Management System Counts (TFMSC) database was utilized to determine the number of Class C and D aircraft operating at CID. For base year 2021, 24,136 Class C aircraft and 1,032 Class D aircraft operations took place. When applied to the formula described above, 63 percent of the mix index ratio made up the 43,372 total operations.

Percentage of Touch and Go Operations

Touch-and-go operations occur when one aircraft lands and departs on the same runway without taxiing. Touch-and-go operations are often associated with training exercises. The airport traffic control tower (ATCT) has confirmed that approximately 20 percent of aircraft operations are touch-and-go.

Location of Taxiway Exits

AC 150/5060-5, *Airport Capacity and Delay* contains criteria for establishing taxiway exit factors accounting for the fleet mix index, percentage of aircraft arrivals, and an exit taxiway's distance from the landing threshold. Intersecting runways are not considered for taxiway exit factor calculations. **Table 3.2** shows the taxiway exit distances from the arrival runway.

Table 3.2: Taxiway Exit Locations

Runway	Taxiway Exits
9	A3 at 1,650'
	A6 at 3,850'
	A8 at 7,250'
	A10 at Runway End
27	A8 at 1000'
	A6 at 4,300'
	A3 at 6,500'*
	A1 at Runway End
13	A at 2,700'
	C at Runway End
31	**A at 3,500'**
	E1 at Runway End

Notes: Distances calculated from arrival threshold. **Bolded** taxiways represent useful exits.

*Taxiway A3 is a useful exit during VFR conditions only.

Sources: FAA, Airport Diagram, May 2022. Google Earth, Near-Map Satellite Imagery, Accessed May 2022

Peak Activity Characteristics

As noted in *Chapter 2 – Aviation Forecasts*, peak month activity for base year (2019) had 5,599 operations. Dividing the total operations by the number of days within the peak month (July) determines the Peak Month Average Day (PMAD). The PMAD at CID was 181 operations.

Percent of Arrivals

The operations peaking analysis from *Chapter 2 – Aviation Forecasts* show 181 operations for the PMAD at CID. Of the 181 operations, there were 37 touch-and-go operations, 72 arriving aircraft, and 72 departing aircraft. Using the information above, CID has 50 percent arrivals during the design hour. This percentage is not expected to change over the planning period.

Runway Hourly Capacity

The maximum number of aircraft operations a runway can accommodate in an hour is the airport's runway hourly capacity. The instructions in AC 150/5060-5, *Airport Capacity and Delay* on determining hourly capacities requires weather conditions and fleet mix index data. The runway hourly capacity equation is:

Runway Hourly Capacity = C* x T x E

Where:

- C* = Hourly Capacity Base
- T= Touch and Go Factor
- E = Exit Factor

Runways at CID hourly capacities for both IFR and VFR conditions are shown in **Table 3.3**.

Table 3.3: Runway Hourly Capacities

Runway in Use	Hourly Capacity	Runway in Use	Hourly Capacity
During Visual Flight Rules		During Instrument Flight Rules	
RWY 9	100	RWY 9	54
RWY 27	111	RWY 27	54
RWY 13	90	RWY 13	49
RWY 31	112	RWY 31	52

Sources: FAA, Airport Diagram, May 2022. Google Earth, Near-Map Satellite Imagery, Accessed May 2022

Annual Service Volume and Weighted Hourly Airfield Capacity

A reasonable estimate of an airport's annual capacity is represented by the Annual Service Volume (ASV). The ASV takes a variety of factors into account including runway configuration, weight class of an airport's fleet mix, touch-and-go operations, meteorological conditions, and runway exit locations. The three (3) variables needed to calculate the ASV are the weighted hourly capacity, the daily demand ratio, and the hourly demand ratio. The following equation from AC 150/5060-5, *Airport Capacity and Delay* is used to find the weighted hourly configuration:

$$C_w = \frac{(P_1 \times C_1 \times W_1) + (P_2 \times C_2 \times W_2) + \ldots + (P_n \times C_n \times W_n)}{(P_1 \times W_1) + (P_2 \times W_2) + \ldots + (P_n \times W_n)}$$

Where:

- C_w = weighted hourly configuration
- P_n = percent of time each runway-use configuration is utilized
- C_n = hourly capacity of each runway-use configuration
- W_n = ASV weighting factor for each runway-use configuration

Table 3.4 contains the components used to find the total weighted hour capacity, C_w.

Table 3.4: Weighted Hourly Capacities

Configuration	Description	Occurrence Rate	Hourly Capacity	Maximum Capacity
VFR 1	Dual Runway Use	63%	77	100%
VFR 2	Single Runway Use	27%	63	82%
IFR 1	Dual Runway Use	6%	56	73%
IFR 2	Single Runway Use	3%	56	73%
IFR 3	Below Arrival Minimums	1%	0	0%
			Weighted Hourly Capacity	72

Sources: FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*; Kimley-Horn Analysis, May 2022

Next, the ASV is determined using the following equation:

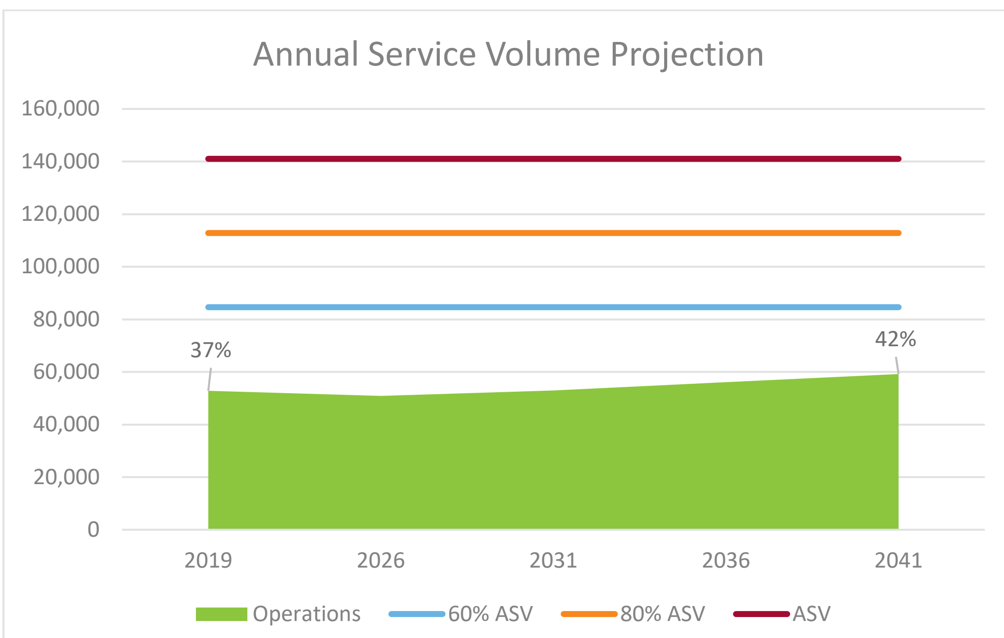
$$ASV = (C_w \times D \times H)$$

Where:

- C_w = weighted hourly capacity
  - 72 (from Table 3.4)
- D = Daily Demand Ratio, or the ratio of annual demand to average daily demand in the peak month
  - Using 2019 annual operations, 52,816, divided by peak month average day (PMAD), 181
  - D = 291.8
- H = Hourly Demand Ratio, or the ratio of average daily demand to average peak hour demand in the peak month
  - Using PMAD, 181, divided by a typical peak hour at CID of 27 operations
  - H = 6.7

The resulting ASV is 141,028 operations. If the airport's operational demand is at least 60 percent of ASV, it is recommended to begin planning to increase capacity. If demand is greater than 80 percent, design for capacity improvements is recommended. **Figure 3.2** shows current and forecasted demands in relation to ASV at CID. In 2019, annual aircraft operations accounted for 37 percent of the ASV and are expected to increase to 42 percent in 2041. Airfield capacity at CID is expected to accommodate future aircraft operations for the planning period and foreseeable future.

Figure 3.2: Annual Service Volume Projection

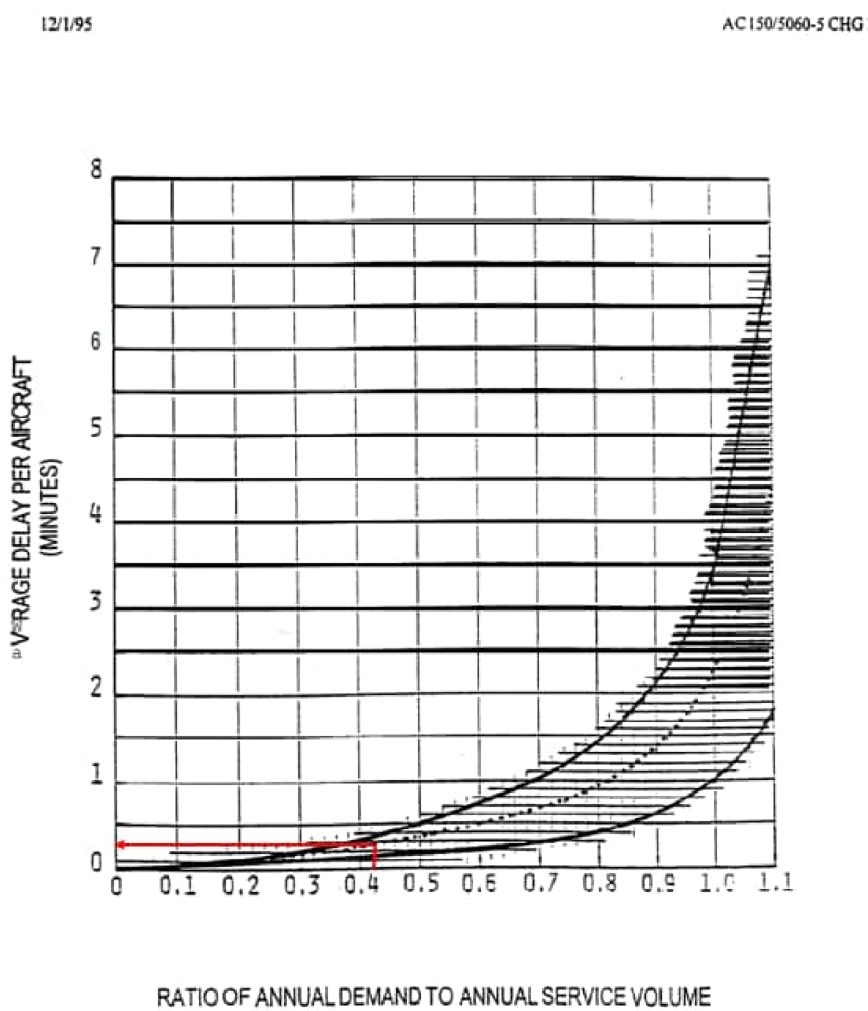


Sources: FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*; Kimley-Horn Analysis, May 2022

Aircraft Delay

Delays at the airport increase steadily as annual operations increase. AC 150/5060-5, *Airport Capacity and Delay* provides a graph labeled Average Aircraft Delay for Long Range Planning. This graph, depicted in **Figure 3.3**, is used to calculate average aircraft delay for long range planning. The upper exponential curve represents airports dominated by air carrier operations, the lower represents general aviation, and the middle represents a 50/50 split. CID is represented by this middle curve. As an airport's ratio of annual demand to annual service volume passes the 0.6 and 0.8 thresholds, delays per aircraft increase rapidly.

Figure 3.3: Average Aircraft Delay for Long Range Planning



Note: The red line reflects average aircraft delay at CID as projected for 2041

Sources: FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*; Kimley Horn Analysis, 2022

Total operations under both VFR and IFR conditions are considered for analysis. Results are presented in **Table 3.5** and show delay per aircraft increasing from 0.22 minutes in 2021 to 0.25 in 2041. The total annual delays increase from 194 hours in 2019 to 247 in 2041. Operational delays at the airport are expected to remain below levels justifying significant capacity improvements. Although significant capacity improvements are not required over the planning horizon, improvements and maintenance to airfield efficiency should be considered. These items include improvements to ground movements, occupancy time, and runways/taxiways.

Table 3.5: Delay Per Aircraft

Year	Average Delay Per Aircraft (Minutes)	Total Annual Delay (Hours)
2019	0.22	194
2026	0.20	170
2031	0.22	194
2036	0.24	224
2041	0.25	247

Sources: FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*; Kimley-Horn Analysis, May 2022

- DIMENSIONAL STANDARDS

Dimensional standards for airport design outlined in FAA Advisory Circular 150/5300-13B, *Airport Design,* are essential for developing facility requirements. These standards are determined by identifying the most demanding aircraft using the airport on a 'regular basis': 500 annual operations, excluding touch-and-go. With 1,002 annual operations, the Boeing 767-300F serves as the design aircraft for CID. It is expected to remain the most utilized cargo aircraft by UPS at CID within the 10- to 15-year timeframe. The 767-300F has a 156-foot wingspan and an approach speed of 140 knots. The corresponding Aircraft Approach Category (AAC) and Aircraft Design Group (ADG) for Runway 9/27 is C and IV, respectively.

As the "crosswind runway," Runway 13/31 should be designed to accommodate the most demanding aircraft when Runway 9/27 alone does not provide 95 percent wind coverage. **Table 3.6** shows both runways having wind coverage above 95 percent for aircraft with 16- and 20-knot crosswind components (accommodating aircraft with an AAC of C or greater and an ADG of III or greater). Based on guidance in AC 150/5300-13B, *Airport Design*, crosswind Runway 13/31 should be designed to accommodate AAC B and ADG II aircraft, respectively. However, at CID, ATCT staff regularly route commercial aircraft with AAC's of C and ADG's of III to operate on Runway 13/31 when crosswinds between 13 knots and 16 knots are present.

Although this does not align directly with FAA guidance, so long as Runway 13/31 has adequate length to accommodate these commercial aircraft, landings and takeoffs with the predominant winds provide a safety benefit compared to using Runway 9/27. As such, it is recommended that runway 13/31 be designed to accommodate aircraft with ARCs of C-III. It is acknowledged that the FAA's share of grant funding for maintenance and improvement projects to Runway 13/31 may only cover the portion that is justified based on a 13-knot crosswind component, however, that should not dissuade the airport from allowing aircraft with ARCs greater than B-II from using Runway 13/31 as a precautionary safety measure.

Table 3.6: All Weather Wind Analysis

All Weather				
Runway Designation	10.5 Knots	13 Knots	16 Knots	20 Knots
RDC	A-I and B-I	A-II and B-II	A-III, B-III, C-I to C-III D-I to D-III	A-IV and B-IV, C-IV to C-VI, D-IV to D-VI, E-I to E-VI
Runway 9/27	84.49%	91.31%	97.30%	99.41%
Runway 13/31	89.40%	94.20%	97.91%	99.45%
Combined	95.12%	97.95%	99.37%	99.90%

Sources: FAA Airport Data and Information Portal, April 2022

Design standards established in AC 150/5300-13B, *Airport Design* include runway dimensions, taxiway dimensions, separation distances from aircraft to various points on the airfield, and land use controls. These standards are applied using the Runway Design Code (RDC), which consists of the AAC, the ADG, and the runways' visibility minimums or Runway Visibility Range (RVR). **Table 3.7** includes the RVRs and corresponding visibility ranges.

Table 3.7: Runway Visibility Range

Runway Visibility Range (feet)	Flight Visibility Category (statute miles)
VIS	Visual approaches only
5,000'	Not lower than 1 mile
4,000'	Lower than 1 mile, but not lower than ¾ mile
2,400'	Lower than ¾ mile, but not lower than ½ mile
1,600'	Lower than ½ mile, but not lower than ¼ mile
1,200'	Lower than ¼ mile

Sources: Advisory Circular 150/5300-13B, *Airport Design*

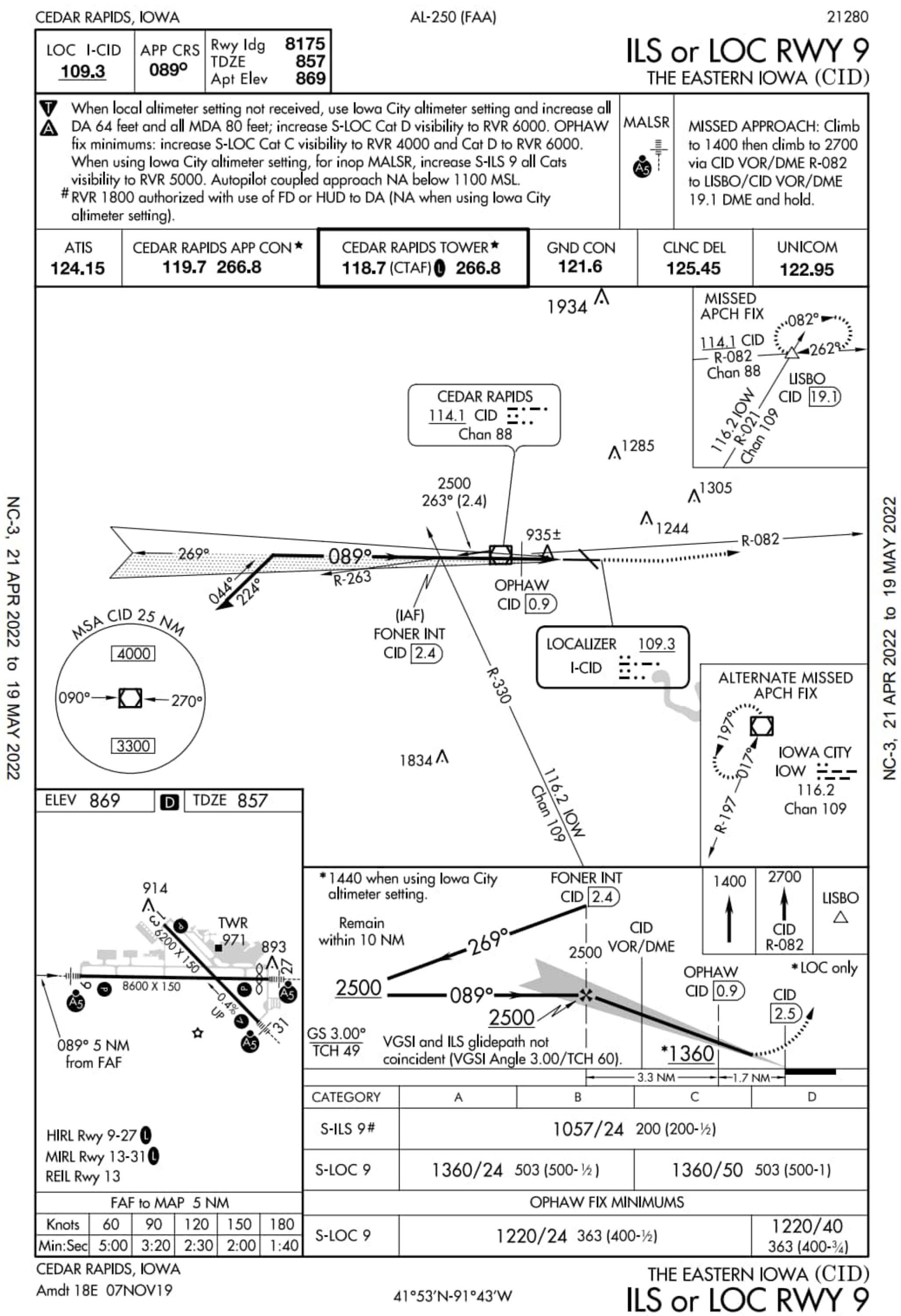
The FAA has published procedures for both Runways at CID. These include Instrument Landing System (ILS) or Localizer (LOC) and Area Navigation (RNAV (GPS)) for Runways 9 and 27, and RNAV (GPS) approaches for Runways 13 and 31. **Figure 3.4** and **Figure 3.5** show the ILS or LOC NAVAIDs for Runways 9 and 27 having visibility minimums of ½ miles corresponding with category 2,400' RVR. **Figure 3.6** and **Figure 3.7** show Runway 13 under RNAV (GPS) procedures with visibility minimums of one (1) mile and Runway 31 having visibility minimums of ½ miles, corresponding with RVRs of 5,000' and 2,400', respectively. **Table 3.8** presents the RDCs for each Runway.

Table 3.8: Runway Design Codes for CID

Runway	RDC	
	Current	Future
9-27	C-IV-2,400	
13	C-IV-5,000	
31	C-IV-2,400	

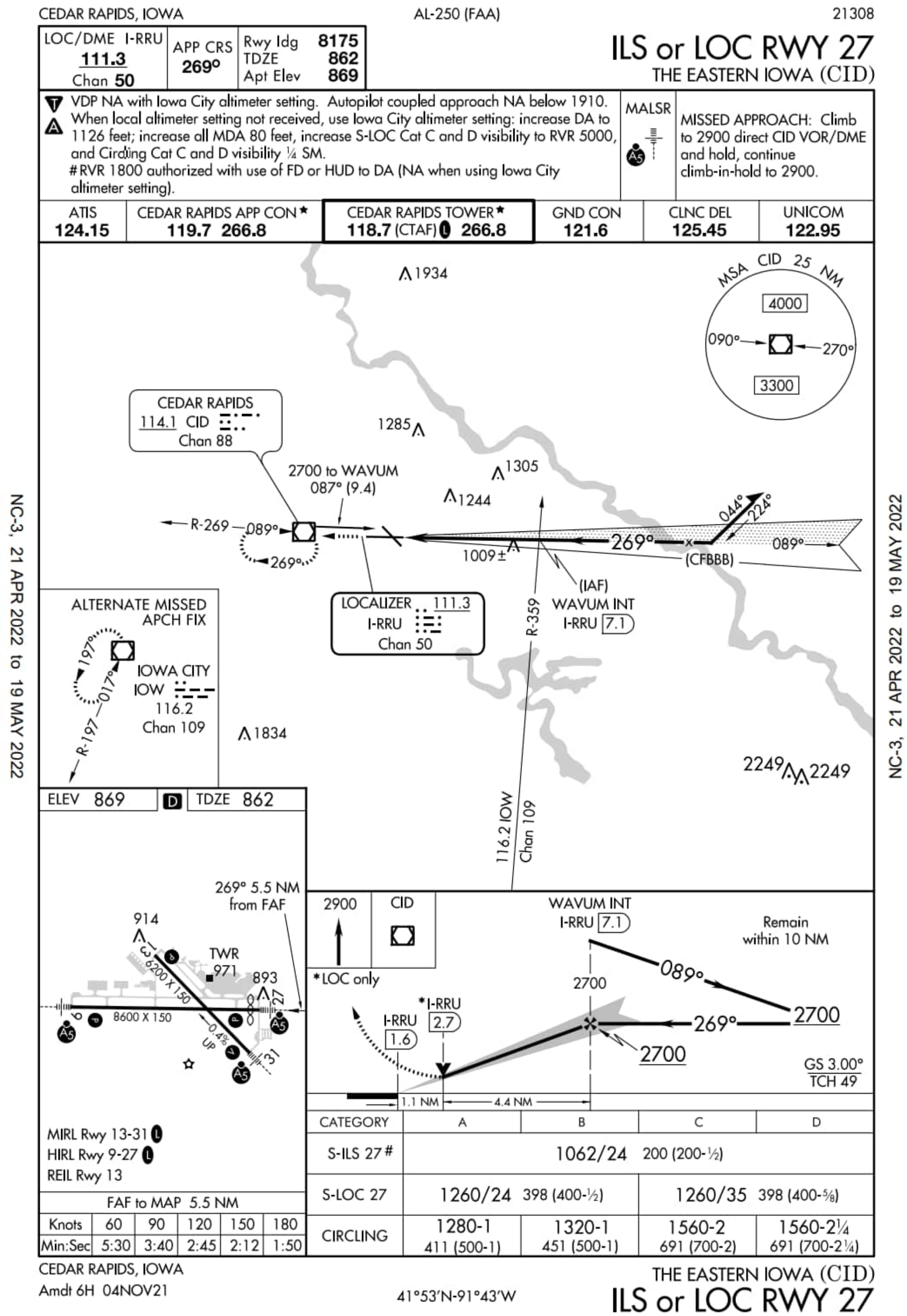
Sources: Advisory Circular 150/5300-13B, *Airport Design*, Kimley-Horn Analysis, May 2022

Figure 3.4: Runway 9 ILS or LOC Approach Procedures



Source: FAA Terminal Procedures, CID, effective April 21, 2022 – May 18, 2022.

Figure 3.5: Runway 27 ILS or LOC Approach Procedures

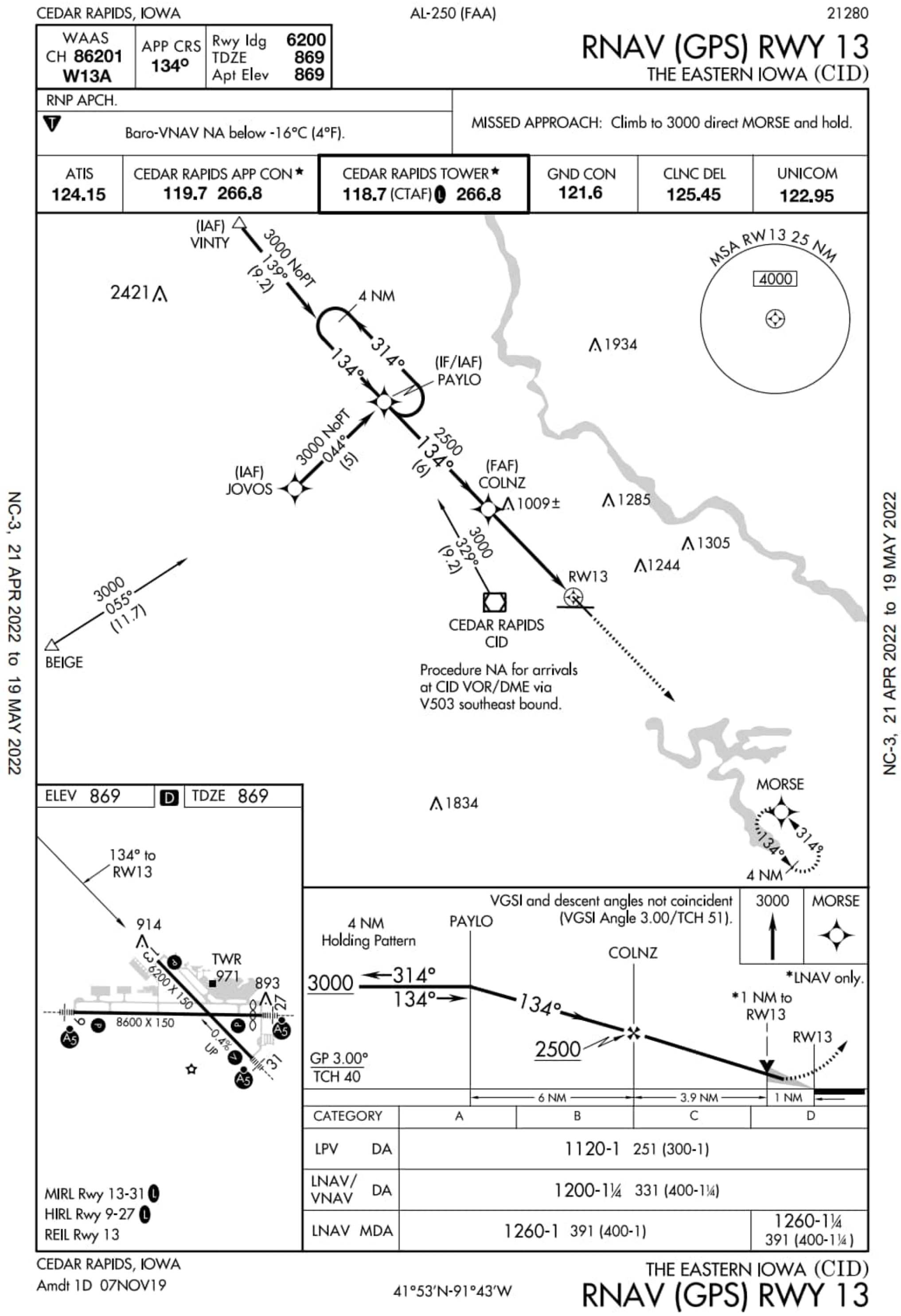


FAF to MAP 5.5 NM					
Knots	60	90	120	150	180
Min:Sec	5:30	3:40	2:45	2:12	1:50

CATEGORY	A	B	C	D
S-ILS 27#	1062/24 200 (200-½)			
S-LOC 27	1260/24 398 (400-½)		1260/35 398 (400-⅝)	
CIRCLING	1280-1 411 (500-1)	1320-1 451 (500-1)	1560-2 691 (700-2)	1560-2¼ 691 (700-2¼)

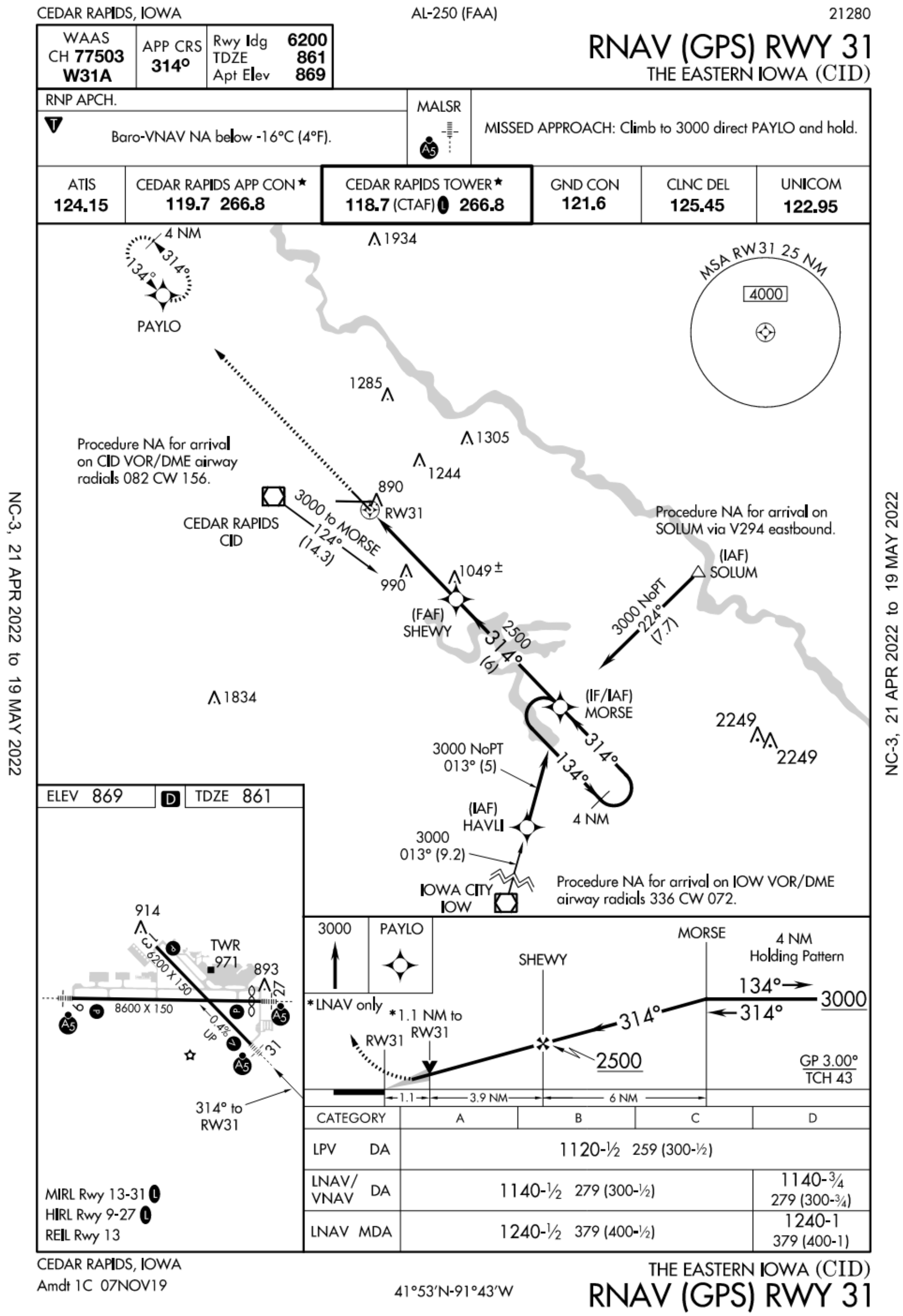
Source: FAA Terminal Procedures, CID, effective April 21, 2022 – May 18, 2022.

Figure 3.6: Runway 13 RNAV (GPS) Approach Procedures



Source: FAA Terminal Procedures, CID, effective April 21, 2022 – May 18 2022.

Figure 3.7: Runway 31 RNAV (GPS) Approach Procedures



Source: FAA Terminal Procedures, CID, effective April 21, 2022 – May 18 2022.

RUNWAYS

Table 3.9 compares the future ARC design standards with the existing conditions of Runway 9/27 and Runway 13/31 as described in AC 150/5300-13B, *Airport Design*.

Table 3.9: CID Dimensional Standards

Compliance with Dimensional Standards							
	C-IV-2400 (Lower than 3/4 mile)	Runway 9	Runway 27	C-III-2400 (Lower than 3/4 mile)	Runway 31	C-III-5000 (Not Lower than 1 mile)	Runway 13
Runway Design							
Runway Width	150	150	150	100	150	100	150
Shoulder Width	25	25	25	20	25	20	25
Blast Pad Width	200	200	200	140	200	140	200
Blast Pad Length	200	200	200	200	175	200	200
Runway Safety Area (RSA)							
Width	500	500	500	500	500	500	500
Length Beyond Departure End	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Length Prior to Threshold	600	600	600	600	600	600	600
Runway Object Free Area (ROFA)							
Width	800	800	800	800	800	800	800
Length Beyond Runway End	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Length Prior to Threshold	600	600	600	600	600	600	600
Runway Obstacle Free Zone (ROFZ)							
Width	400	400	400	400	400	400	400
Length Beyond Stop End	200	200	200	200	200	200	200
Precision Obstacle Free Zone (POFZ)							
Length	200	200	200	200	200	N/A	N/A
Width	800	800	800	800	800	N/A	N/A
Approach Runway Protection Zone (RPZ)							
Length	2,500	2,500	2,500	1,700	1,700	1,700	1,700
Inner Width	1,000	1,000	1,000	1,000	1,000	500	500
Outer Width	1,750	1,750	1,750	1,510	1,510	1,010	1,010
Departure Runway Protection Zone (RPZ)							
Length	1,700	1,700	1,700	1,700	1,700	1,700	1,700
Inner Width	500	500	500	500	500	500	500
Outer Width	1,010	1,010	1,010	1,010	1,010	1,010	1,010
Runway Separation							
Holding Position	250	260	260	250	260	250	260
Taxiway/Taxilane Centerline	400	500	500	400	N/A	400	400

Notes: Red – indicates non-standard condition; Black – indicates standard condition.
Sources: Advisory Circular 150/5300-13B, *Airport Design*, Kimley-Horn Analysis, May 2022

Blast Pad Length

AC 150/5300-13B, *Airport Design* requires a blast pad length of 200 feet to accommodate C-IV aircraft. The blast pad length for Runway End 31 is 175 feet, falling short of standard. It is recommended the blast pad length be extended 25 feet to meet the 200-foot requirement.

Navigational aids and Lighting

Navigational aids (NAVAIDs) are devices designed to safely assist pilots with landing, takeoff, and locating airports in various meteorological conditions. NAVAIDs do this by providing position data or point-to-point guidance to aircraft while in flight. CID is equipped with these NAVAIDs:

- Instrument Landing Systems (ILS)
- Precision Approach Identification Lights (PAPIs)
- Visual Approach Slope Indicator Lights (VASI)
- Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR)
- VHF omnidirectional ranger (VOR) with distance measuring equipment (DME)
- Rotating Beacon
- Automated Surface Observation Systems (ASOS)

Runway 9/27 is equipped with dual ILSs as well as touchdown and rollout Runway Visual Range (RVR) equipment serving each runway end. These RVR systems measure visibility to determine the distance pilots can see down a runway. Runways 9, 27, and 13 are equipped with a 4-light PAPI system while Runway 31 is equipped with a 4-box VASI system. The Airport's rotating beacon provides directional guidance for aircraft to and from CID. All NAVAIDs are in working condition as well as FAA owned and maintained.

The approach procedures for CID offer capabilities for various wind conditions and operational circumstances. The published instrument approach procedures are listed in **Table 3.10.**

Table 3.10: Instrument Approach Procedures

Instrument Approach Procedures				
Approach	Glideslope Angle	Visibility Minimum (Miles)	Threshold Crossing Height	Decision Height (AGL)
ILS or LOC Rwy 9	3.00°	1/2	49'	200'
ILS or LOC Rwy 27	3.00°	1/2	49'	200'
RNAV (GPS) Rwy 9	3.00°	1/2	49'	200'
RNAV (GPS) Rwy 13	3.00°	1	40'	300'
RNAV (GPS) Rwy 27	3.00°	1/2	49'	300'
RNAV (GPS) Rwy 31	3.00°	1/2	43'	300'
VOR/DME Rwy 9	2.92°	1/2	60'	400'
VOR Rwy 27	3.30°	1/2	46'	400'

Source: FAA Terminal Procedures, CID, effective May 19, 2022 – June 15, 2022

The existing lighting systems mentioned in *Chapter 1 – Existing Conditions* are functional and in good condition. This includes the High Intensity Runway Lights (HIRL) for both runways, the MALSR system for Runway Ends 9, 27, and 31, and the Runway End Identifier Lights on Runway End 13. Lighting systems should be maintained and updated with future updates to the airfield layout. Additionally, the markings for precision instrument Runway 9/27 and non-precision Runway 13/31 should be maintained and kept up to standard for the planning period.

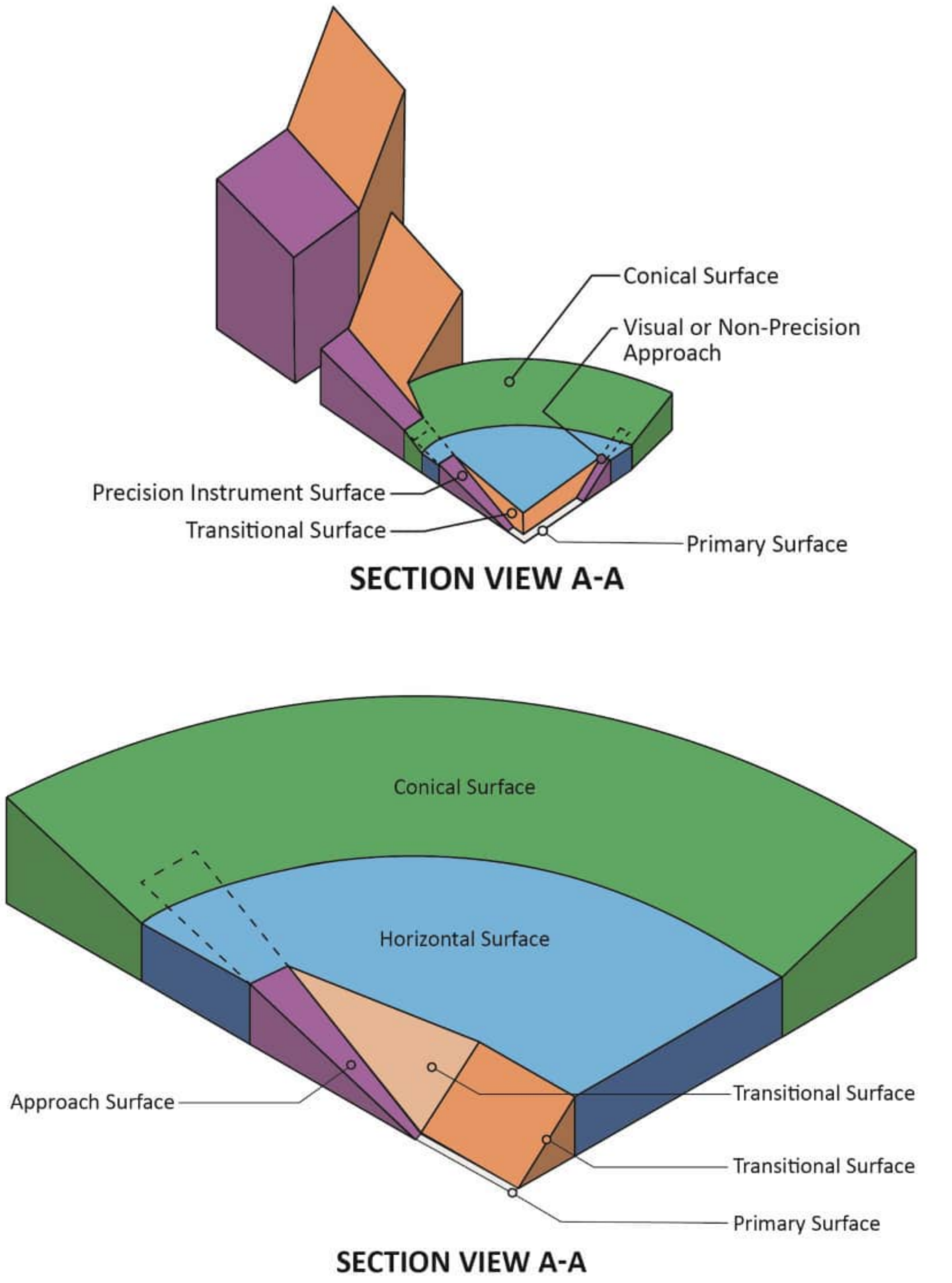
FAA Part 77 Surfaces

The FAA Part 77 analysis examines imaginary surfaces surrounding an airfield to identify potential hazards to air navigation. These surfaces help establish compatible land use and identifies potential aviation hazards on and surrounding CID. Each surface contains different sizes, slopes, and shapes and is determined by the available approach procedures. A graphical representation of Part 77 surfaces is shown below in **Figure 3.8**. The five Part 77 Surfaces are described below and presented in **Table 3.11**:

- Primary Surface – This surface is longitudinally centered on the runway. The elevation of any point on the runway centerline matches the elevation of the nearest point of the primary surface. The Primary surface extends 200 feet beyond each runway end and its width varies depending on approach procedures.
- Approach Surface – This surface is trapezoidal in shape with dimensions and slope dictated by each runway end's approach capabilities This surface begins at the end of the Primary Surface with its inner width equaling the width of the Primary Surface.
- Transitional Surface – This surface extended outward and upwards at a right angle to the runway centerline and at 7:1 slope from the sides of the primary and approach surfaces. This surface extends 5,000 feet horizontally from the sides of the approach surface. The width of the transitional surface is dependent on runway elevation in relation to the horizontal surfaces' elevation.
- Horizontal Surface – This surface is a flat plane that begins 150 feet above Airport elevation. This surface extends 10,000 feet from the ends of the Primary Surface for each Runway End.
- Conical Surface – This surface extends upward and outward from the outer limits of the Horizontal Surface with a slope of 20:1 for a horizontal distance of 4,000 feet.

Objects penetrating the Part 77 surfaces are identified as obstructions and are evaluated by the FAA. If the object cannot be removed, the FAA may require they be mitigated via marking or lighting. Unmitigated obstructions could negatively impact approach and departure minimums and other operations. The Part 77 surfaces will be reviewed using the new planimetric data acquired as part of this Sustainable Master Plan.

Figure 3.8: Part 77 Surfaces



Note: Diagram indicative of typical Part 77 surfaces. Dimensions are not specific to CID
Source: 14 CFR Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*, 2015.

Table 3.11: Part 77 Dimensional Standards

Item	RWY 9	RWY 27	RWY 13	RWY 31
Width of Primary Surface and Approach Surface/ Width at Inner End	1,000		500	1,000
Radius of Horizontal Surface	10,000			
Approach Surface Width at End	16,000		3,500	4,000
Approach Surface Length	50,000		10,000	
Approach Slope	50:1 first 10,000 feet 40:1 additional 40,000 feet		34:1	

Source: 14 CFR Part 77 - Safe, Efficient Use, and Preservation of the Navigable Airspace; Kimley Horn Analysis, May 2022

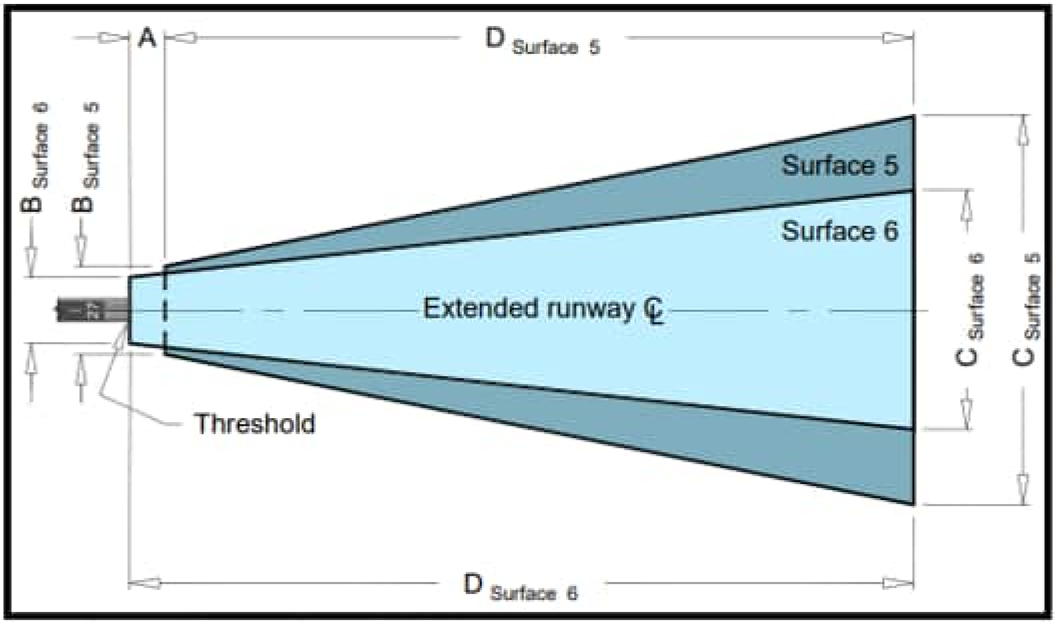
Approach/Departure Surfaces

According to AC 150/5300-13B, *Airport Design*, Approach Procedures with Vertical Guidance (APV) are "[a]n instrument approach based on navigation systems that provide course and glidepath deviation information but do not meet the precision approach standards of the International Civil Aviation Organization (ICAO) Annex 10" and a Precision Approach (PA) is "[a]n instrument approach based on a navigation system that provides course and glidepath deviation information meeting the precision standards of ICAO Annex 10".

Figure 3.9 shows approach surfaces for APV and PA instruments approaches. Surface 5 contains two potential dimensional standards based on visibility minimums while Surface 6 is applied regardless. Per AC 150/5300-13B, *Airport Design*, the approach surfaces at CID have the following characteristics:

- Runway 9/27: Surface 5, visibility minimum greater than or equal to ¾ mile = start beyond runway threshold = 200 feet, inner width = 400 feet, outer width = 3,400 feet, total length = 10,000 feet, slope = 20:1
- Runway 13/31: Surface 5, visibility minimum less than ¾ mile = start beyond runway threshold = 200 feet, inner width = 400 feet, outer width = 3,400 feet, total length = 10,000 feet, slope = 34:1
- Both Runways: Surface 6 = start beyond runway threshold = 0 feet, inner width = 350 feet, outer width = 1,520 feet, total length = 10,200 feet, slope = 30:1

Figure 3.9: Approach Procedure with Vertical Guidance (APV) and Precision Approach (PA) Instrument Runway Approach Surfaces

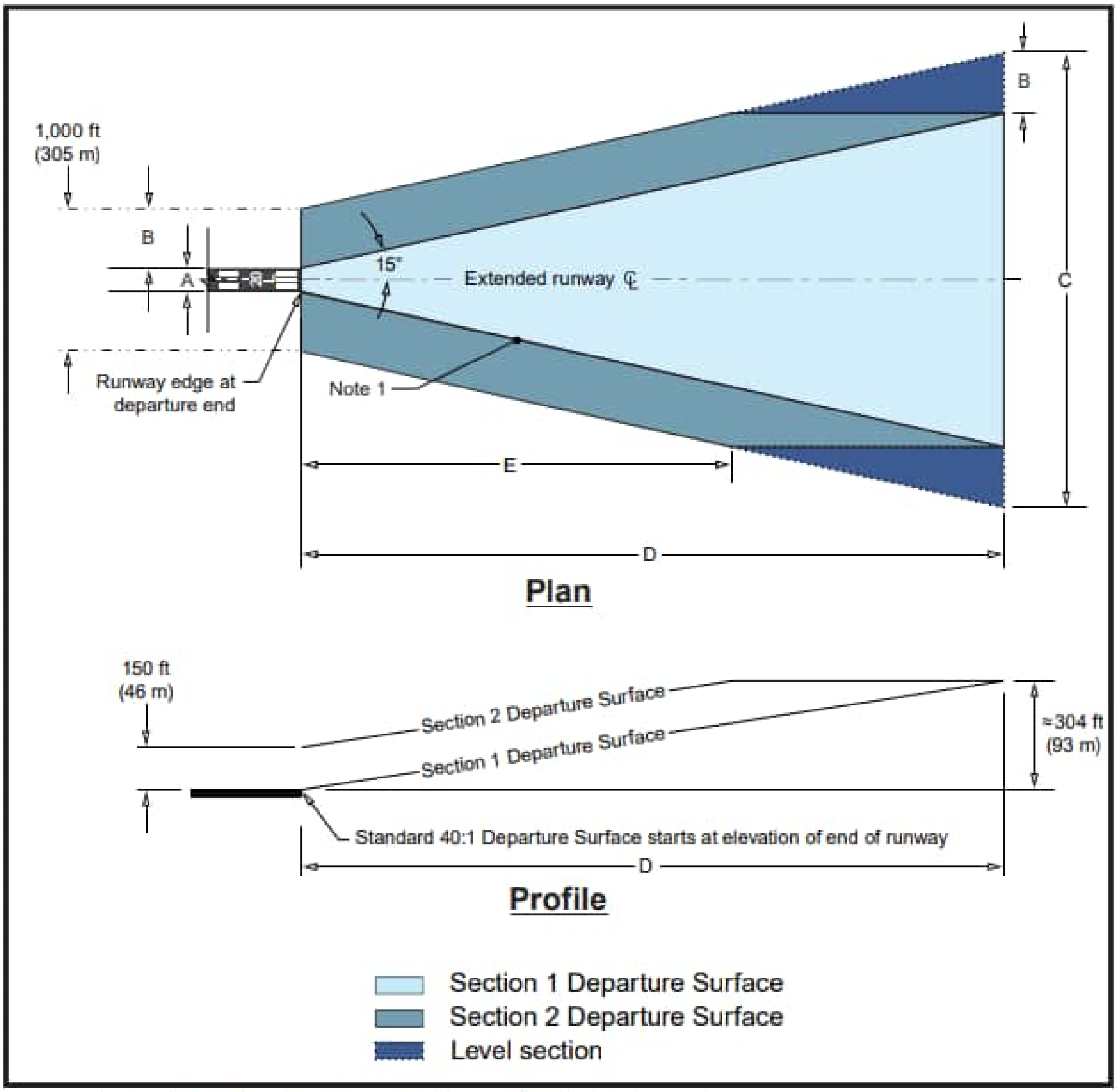


Sources: Advisory Circular 150/5300-13B, *Airport Design*

Clear departure surfaces utilizing standard instrument producers are published in the Terminal Procedures Publication (TPP) and referenced in AC 150/5300-13B, *Airport Design*. The instrument departure surface applies to all runways with instrument procedures. **Figure 3.10** presents a graphical depiction of the dimensions mentioned below. As both runways at CID have the same width, the dimensions standards are the same:

- Surface 7, inner width of Section 1 Departure Surface = 150 feet, runway edge at departure end to edge of Section 2 Departure Surface/outer width of level section = 425 feet, total outer width = 7,512 feet, total length = 12,152 feet, length of outer edge of Section 2 Departure Surface from departure end to beginning of Level Section = 6,152 feet, Section 2 Departure Surface Angle = 19.4°, Section 2 Traverse Slope = 2.83:1.

Figure 3.10: Instrument Departure Surface



Note 1: The half-width of Section 1 is calculated by the formula:
Section $1_{\text{Half Width}}$ = (1/2 RWY Width) + (Tan 15° × X), where X = distance from the departure end of the runway.

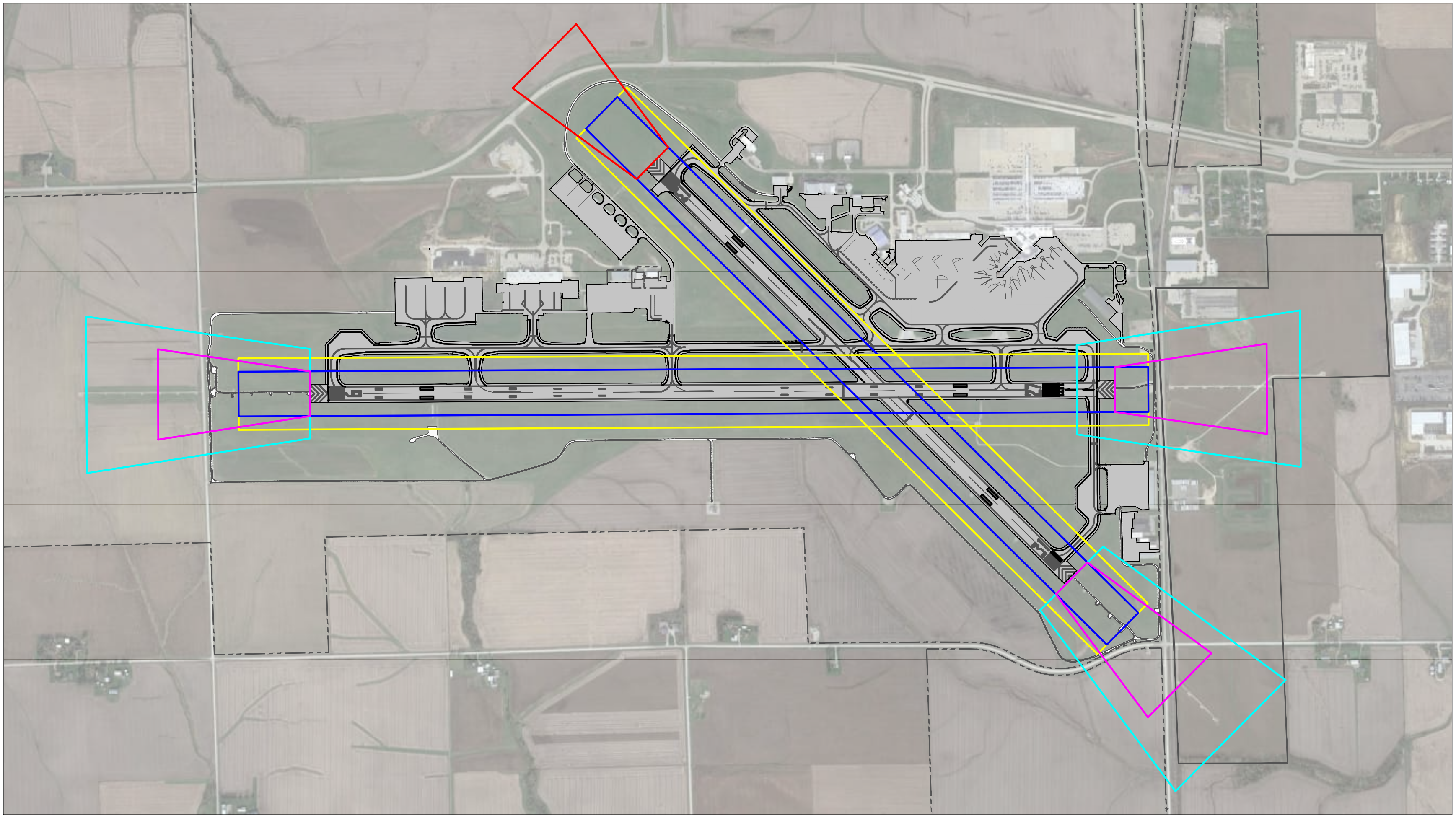
Sources: Advisory Circular 150/5300-13B, *Airport Design*

Runway Protection Zones

Runway Protection Zones (RPZs) are required by the FAA to protect people and property past the runway threshold. RPZs are typically controlled by the airport owner through a process of fee acquisition vis fee-simple acquisition, airspace easements, or use restrictions. RPZ areas are to be kept clear of incompatible land use activities such as churches or residential buildings.

Approach RPZs are aligned with the runway centerline, encompass a trapezoidal area, and begin 200 feet prior to the landing threshold. The Departure RPZs encompass the same area except for runways with displaced thresholds. In these cases, the Departure RPZ begins 200 feet from the end of runway pavement. At CID, Runway 27 is the only runway with a displaced threshold. The southeast corner of Runway 31's Approach RPZ includes 0.8 acres of unacquired land. All other RPZs are within airport property (see **Figure 3.11**) depicting the Runway Protection Areas.

Figure 3.11: Runway Protection Areas



LEGEND

- Approach/Departure Runway Protection Zone
- Approach Runway Protection Zone
- Departure Runway Protection Zone
- Airport Property Boundary
- Runway Safety Area
- Runway Object Free Area

0 450 900 1800 Feet

N

Prepared by: Kimley-Horn, 2022.

Runway 9/27 Length Analysis

The runway length analysis for primary Runway 9/27 was driven by the most demanding aircraft types that utilize the runway, which are cargo aircraft. Existing cargo aircraft route destinations were considered to make assumptions regarding fuel load and the overall weight of the aircraft during takeoff.

According to the aircraft planning manuals for the 757-200 and 767-300F, these aircraft require 8,200 feet and 10,000 feet of runway for departures at maximum takeoff weight (MTOW) when factoring for CID's elevation and mean maximum temperature during the hottest month, respectively. Based on an analysis of existing routes flown by these aircraft types, it was assumed that departures at MTOW occur on a very infrequent basis, if at all. The farthest destination regularly flown by cargo aircraft is Memphis International Airport (MEM), which is approximately 516 nautical miles from CID including a stopover at Des Moines International Airport.

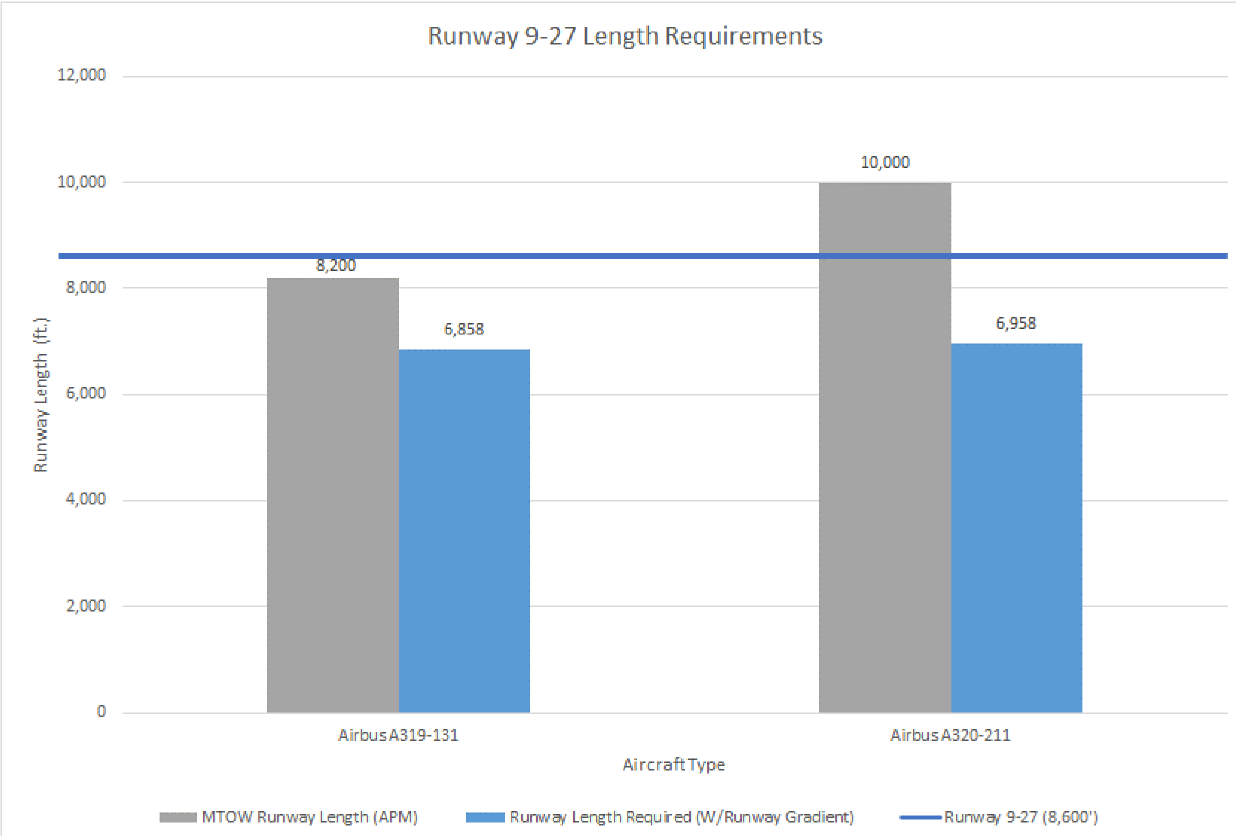
Table 3.12 and **Figure 3.12** show the longest runway length required for cargo aircraft being 6,958 feet. However, that length is based on existing routes serving CID. For the twenty-year planning horizon, consideration should be given to potential new routes or stop-overs for cargo aircraft as they shuttle back and forth between CID and SDF or MEM, as well as new routes that could be operated by new entrants to the air cargo market. The existing length of Runway 9/27 is sufficient to meet existing demand, however, the Airport may desire to protect for a runway up to 10,000' in length to accommodate potential route changes to the future design aircraft at or near MTOW. It is recommended that the ALP depict a potential extension to Runway 9/27 for ultimate (beyond 20-year) conditions.

Table 3.12: Runway 9/27 Length Analysis

Identifier	Flight Path	Distance (NM)	Engine	MTOW Runway Length (APM)	Adjusted Runway Length	Runway Length Required (W/Runway Gradient)
Boeing 757-200						
FX1500	MEM - DSM - CID	516	PW2040	8,200	5,600	5,658
FX1464	MEM - DSM - CID	516	RB211-535E4	8,000	5,600	5,658
FX1775	IND - CID	279	RB.211 SERIES	8,100	6,800	6,858
UPS572	RFD - CID	118	PW2040	8,200	6,000	6,058
FX1211	MEM - DSM - CID	516	PW2040	8,200	5,600	5,658
Boeing 767-300F/ER						
UPS513	SDF-DSM-CID	508	CF6-80 SERIES	10,000	6,600	6,658
UPS514	SDF-DSM-CID	508	CF6-80C2B6F	10,000	6,600	6,658
UPS834	SDF-CID	354	CF6-80C2B6F	10,000	6,900	6,958

Notes: 30% fuel reserves are considered in the calculations; MEM - Memphis International Airport; DSM – Des Moines International Airport; IND – Indianapolis International Airport; RFD – Chicago Rockford International Airport; SDF – Louisville Muhammad Ali International Airport
Sources: FlightAware live flight tracking data, 2022; FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*; Individual aircraft planning manuals for operating weights, MTOW, and fuel weights to determine useful load, Kimley-Horn, 2022

Figure 3.12: Runway 9/27 Length Analysis



Sources: FlightAware live flight tracking data, 2022
FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*
Individual aircraft planning manuals for operating weights, MTOW, and fuel weights to determine useful load, Kimley-Horn, 2022

Runway 13/31 Generalized Runway Length Analysis

As a requirement for airport projects receiving federal funding, the process outlined in AC 5325-4B was used to determine the Generalized Runway Length Analysis for Runway 13/31. As critical aircraft with MTOW's above 60,000 pounds are evaluated in the cargo and commercial analysis in the subsequent section, the Generalized Analysis focuses on the GA turbojet-powered fleet with 12,500- to 60,000-pound MTOWs that conduct over 500 annual operations.

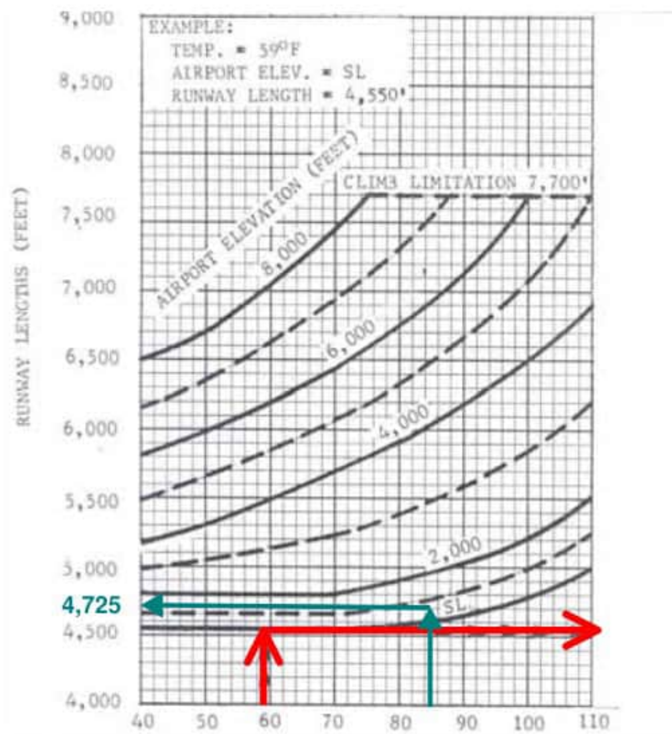
This analysis requires selection of 100 percent or 75 percent of fleet and either 60 percent or 90 percent useful load (per AC 5325-4B tables). Based on an assessment of TFMSC data, CID regularly experiences over 500 annual departures by aircraft identified in the "75 percent of fleet". Considering CID's geographical location, aircraft weighing between 12,500 and 60,000 pounds typically will not utilize 90 percent or higher useful loads. As such, the analysis utilized 75 percent of the fleet at 60 percent useful load. Applying the airport elevation and the NMT, the recommended runway length for generalized aviation activity is 4,725 feet (see **Figure 3.13**).

AC 5325-4B also requires that adjustments to runway length are made in consideration of effective runway gradient and wet and slippery conditions. Runway 13/31 has an elevation difference of 10 feet between the high and low points of the runway centerline. Therefore, a 100-foot adjustment must be added to the previously determined runway length of 4,725 feet. Additionally, runway length for turbojet-powered airplanes obtained from the "60 percent useful load" analysis is increased by 15 percent or up to 5,500, whichever is less, to account for wet and slippery conditions. It should be noted that the 100-foot adjustment to account for effective runway gradient is included in the wet and slippery conditions adjustment. The calculation to determine the final runway length recommendation is as follows:

- (4,725 feet) x (15%) = 708 feet
- (4,725 feet) + (708 feet) = 5,433 feet

The resultant future length of Runway 13/31 is 5,433 feet, rounded to the nearest 100' value puts it at 5,500'. Development options to address this runway length requirement will be explored in *Chapter 4 – Alternatives Development and Evaluation*.

Figure 3.13: Runway 13/31 Length Analysis – 75 Percent of Fleet at 60 Percent Useful Load



Sources: FAA Advisory Circular 150/5325-4B - Runway Length Requirements *for Airport Design*.
Kimley-Horn, 2022.

Notes: Red lines are example from the FAA Advisory Circular 150/5325-4B, *Runway Length Requirements for Airport Design* green lines are specific to CID.

Runway 13/31 Commercial Length Analysis

Crosswind Runway 13/31 is 6,200’ in length. With winds predominately coming from the north-northwest direction, combined runway utilization is necessary during poor meteorological conditions. According to the 2019 Engineer’s Report for a Runway 13/31 reconstruction project, it was identified that 25 percent of commercial operations are conducted on Runway 13/31. Using CID’s departure schedule, FlightAware data, and APMs, the average distance for each commercial aircraft departure were determined along with the adjusted Runway Length requirement.

Table 3.13 and **Figure 3.14** present runway length requirements at MTOW and adjusted for regular stage lengths for commercial aircraft that utilize crosswind Runway 13/31. As shown, the Bombardier CRJ-200 (CRJ2) requires the most runway length for takeoffs at 5,658 feet when adjusted for stage length, Airport elevation, and mean maximum temperature during the hottest month. However, as presented in *Chapter 2 – Aviation Forecasts*, regional aircraft are anticipated to be phased out of the operational fleet in favor of larger aircraft types including the Airbus A319 and A320. Additionally, the Airport is expected to continue to expand its air service in terms of routes and frequency.

Though the adjusted runway length requirement for these aircraft models (A319 and A320) is approximately 4,460’ and 5,160’ respectively, that is based on existing destinations. It is expected that future routes will have load factors that exceed existing conditions. As such, it is recommended that the Airport maintain the existing 6,200’ length of Runway 13/31 but continue to monitor commercial activity by aircraft type that utilizes the crosswind runway to determine if an extension may be justified in the future.

Table 3.13: Runway 13/31 Length Analysis

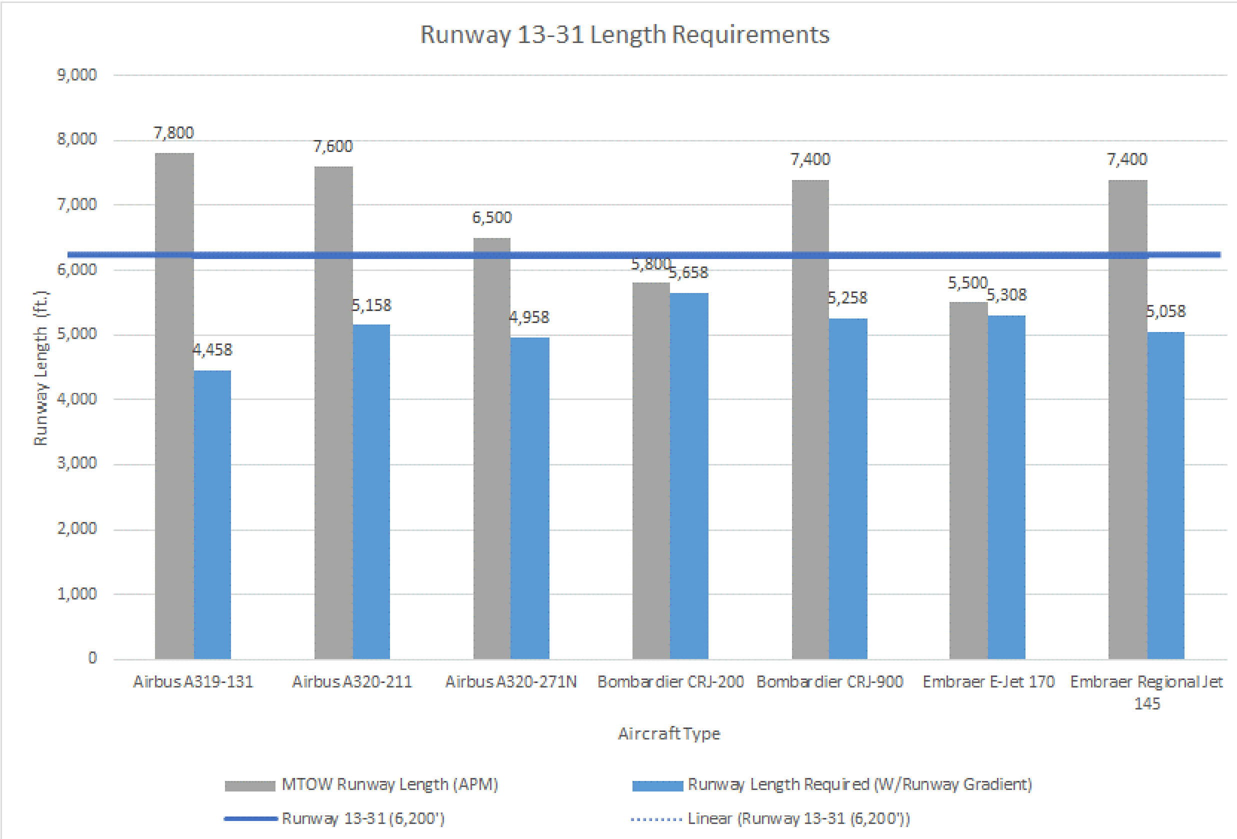
Aircraft	Annual Operations (Runway 13/31)	Average Distance (nm)	MTOW Runway Length (APM)	Adjusted Runway Length	Runway Length Required (W/Runway Gradient)
Airbus A319-131	156	850	7,800	4,400	4,458
Airbus A320-211	143	989	7,600	5,100	5,158
Airbus A320-271N	65	601	6,500	4,900	4,958
Bombardier CRJ-200	871	291	5,800	5,600	5,658
Bombardier CRJ-900	546	694	7,400	5,200	5,258
Embraer E-Jet 170	91	601	5,500	5,250	5,308
Embraer Regional Jet 145	273	170	7,400	5,000	5,058

Sources: FlightAware live flight tracking data, 2022

FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*

Individual aircraft planning manuals for operating weights, MTOW, and fuel weights to determine useful load, Kimley-Horn, 2022

Figure 3.14: Runway 13/31 Length Analysis



Sources: FlightAware live flight tracking data, 2022
FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*
Individual aircraft planning manuals for operating weights, MTOW, and fuel weights to determine useful load, Kimley-Horn, 2022

Runway Width and Shoulders

According to **Table 3.8**, both runways' widths are 150 feet, and shoulder widths are 25 feet. As this is satisfactory for C-III and C-IV design standards, it is suggested to maintain the current runway and shoulder widths.

Necessity for addition/removal of runways

The 2014 ALP depicted a future runway north of the passenger terminal building, marked 9L/27R. Runway 9L/27R was planned to accommodate D-IV-2,400 standards. Based on the airfield demand capacity analysis, operational activity within the 20-year planning horizon is not anticipated to require an additional runway. However, it is recommended the Airport preserve this area for potential airfield expansion or a new runway in the event that the role of the Airport changes in the future or a new user or tenant additional facilities. Such a change could be triggered by a substantial increase in cargo, military, or maintenance, repair, and overhaul (MRO) activity.

PAVEMENT STRENGTH

The Pavement Condition Index (PCI) presents a value scaled from 0 (failed) to 100 (excellent). PCI measures the condition of pavement and serves as an indicator for preventative maintenance or rehabilitation. PCI's above 70 without significant load-related distress may require maintenance, like crack sealing and surface treatments. PCIs between 40-70 require major rehabilitation like an overlay, and PCIs below 40 require reconstruction.

Figure 1.3 in *Chapter 1 – Existing Conditions* illustrates PCI values for runways, taxiways, taxilanes, and apron areas at CID, measured by Foth Infrastructure and Environment, LLC in 2021. Both runways and most taxiway areas have a PCI above 90 and are considered in good condition. Areas in need of maintenance, having PCI values in the 71-80 range, include the apron area surrounding the east cargo facility, taxilanes near the deicing storage facility, and the southern taxilanes connecting Taxiway C to the east hangars.

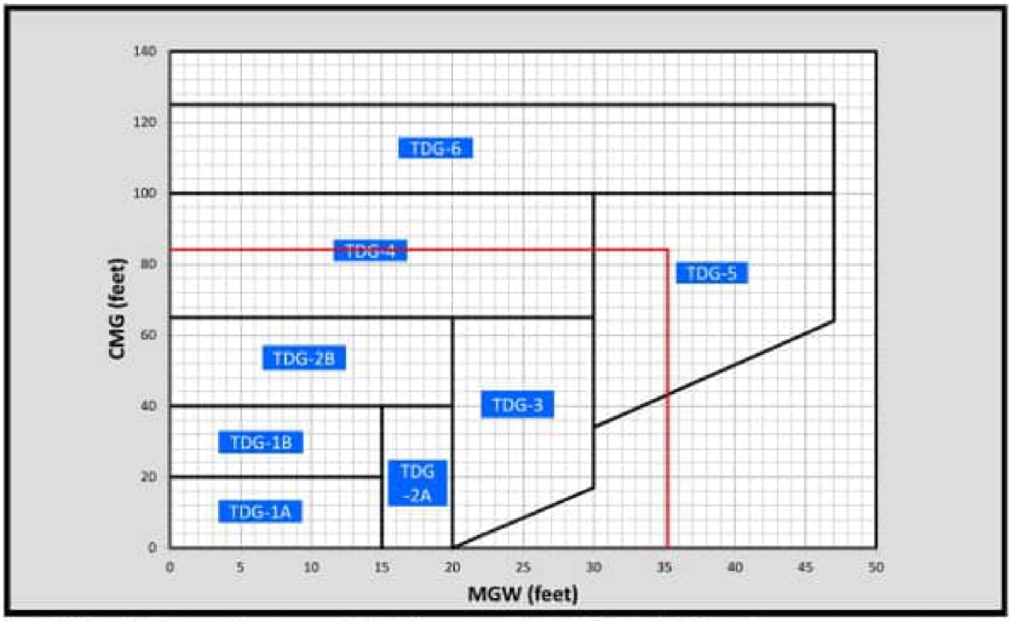
Pavement requiring major rehabilitation, PCIs between 40-70, include the majority of Taxiway D, a small portion of Taxiway C, taxilanes connecting the six T-hanger buildings to the west FBO facility, the north taxilane connecting Taxiway C to the east aprons, marginal portions of the main apron area, the majority of Runway 9/27's shoulder pavement, and the majority of Taxiway Alpha's shoulder pavement.

Pavement that requires reconstruction includes the pavement surround the hangars on the west FBO apron as well as Taxilane D from the Taxiway E 2 intersection to the Taxiway A 7 intersection. Additionally, a small eastern portion of Taxilane D north of Taxiway E 2 requires rehabilitation.

Taxiways

Taxiway design standards are determined by the ADG and Taxiway Design Group (TDG) of the design aircraft. The ADG is based on aircraft wingspan and tail height, while the TDG is based on the cockpit to main gear (CMG) distances and outer-to-outer main gear width (MGW). The ADG for the Boeing 767-300F is IV while the CMG is 82.17 and the MGW is 35.75 resulting in a TDG of 5, see **Figure 3.15** from AC 150/5300-13B, *Airport Design*. As CID taxiways must consider the design aircraft for the entire airfield, the TDG-5 standards are used for the entire Airport.

Figure 3.15: Taxiway Design Group



Note: Values in the graph are rounded to the nearest foot. 1 foot = 0.305 meters.

Sources: Advisory Circular 150/5300-13B, *Airport Design*; Kimley Horn Analysis, May 2022.

Parallel Taxiway Separation

Taxiway A serves as the parallel taxiway for Runway 9/27. Taxiway A is 75 feet wide and has a parallel taxiway centerline to runway centerline distance of 500 feet, meeting FAA separation design standards for C-IV-2400 aircraft. The partial parallel taxiway for Runway 13/31 is Taxiway E, which extends from Taxiway E1 to Taxiway A. Taxiway E is 75 feet wide and has a parallel taxiway centerline to runway centerline distance of 400 feet, meeting FAA separation standards for the recommended C-IV-2400 standards.

Taxiway and Taxilane Safety Areas

The taxiway/taxilane safety area (TSA) reduce the risk or damage to aircraft that deviate from the pavement. TSAs are a defined surface extending beyond the edges of a taxiway/taxilane. TSA surfaces are to be cleared, graded, and absent hazardous surface variations. The only objects the FAA allows in the TSA are because of function. There must be grading and drainage to avoid water accumulation and in dry conditions the area must be able to allow passage for occasional aircraft without causing structural damage. TSAs also support passage for firefighting (ARFF) and rescue equipment. Beginning at the centerline, the TSA width is defined by Table 4-1 of AC 5300/150-13B and equals the maximum wingspan of the ADG. As CID's ADG is IV the TSA standard is 171 feet wide, beginning at the centerline of the taxiways/taxilanes.

Using aerial imagery to review CID's taxiways and taxilanes, there are no penetrations to the TSAs. Though non-standard conditions are absent from the airfield, the airport should evaluate these areas to ensure the continued compliance of design standards.

Taxiway and Taxilane Object Free Area

Taxiway Object Free Areas (TOFA) are like TSAs as they are centered on taxiway/taxilane centerlines. They include both the TOFA and the Taxilane Object Free Area (TLOFA). The TLOFA is smaller due to lower speeds of aircraft. With an ADG of IV, CID's TOFA is 243 feet and the TLOFA is 224 feet.

Using aerial imagery to review CID's taxiways, there are no non-permissible object within CID's TOFA. Objects in the TOFA areas are by function and permissible by the FAA including taxiway lighting, PAPI-4, VASI-4, runway lighting, and aircraft directional signs. TLOFAs were also evaluated. Permissible objects existing in the TLOFAs include taxiway lighting and aircraft directional signage.

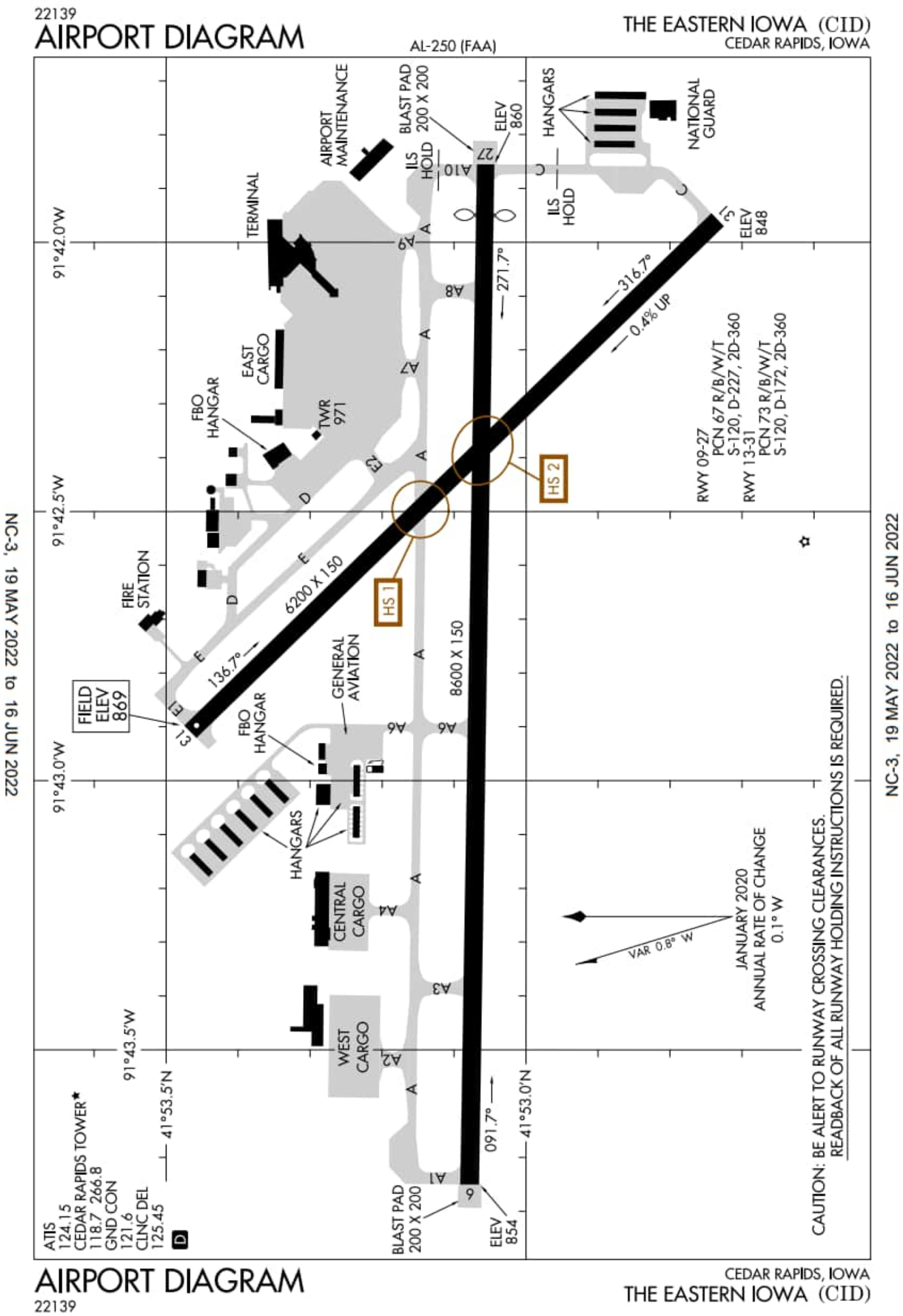
Additional taxiways or reconfiguration of taxiway networks for optimization of airfield circulation

AC 5300/150-13B provides research related to taxiway and taxilane design concepts and considerations. The FAA has determined specific characteristics in airfield geometry that contribute to potential surface incidents and runway incursions. Of these designs, runway access from the General Aviation Apron is of concern to CID as Taxiway A6 crosses parallel Taxiway A before reaching Runway 9/27. Solutions for this issue will be presented in *Chapter 4 – Alternatives Development and Evaluation*.

HOT SPOTS

There are two FAA designed hot spots at CID (see **Figure 3.16**). Hot Spot 1 is located at the intersection of Taxiway A and the mid span of Runway 13/31 and is noted for the high-speed accident potential for land and hold short (LAHSO) operations on Runway 13/31. Hot Spot 2 is just south at the intersection of Runway 9/27 and Runway 13/31 and is noted for the potential of a high-speed accident if both runways were used at the same time. CID has not experienced any recent incidents at these locations, suggesting the Hot Spot program is working by warning pilots of potentially hazardous situations.

Figure 3.16: CID Airport Diagram



Source: Federal Aviation Administration, May 2022

3.3 PASSENGER TERMINAL

The Passenger Terminal facility provides functions that allow the flow of passengers and their baggage onto and from commercial flights. Requirements were determined using a variety of resources including industry guidelines. This Sustainable Master Plan also leverages the terminal planning effort documented in the *CID Terminal Modernization Program Phase IV Report*.

Table 3.14 identifies general space projected alongside our analysis for the twenty-year planning horizon.

Table 3.14: Passenger Terminal Space Requirements

CID Terminal Facility Space Assessment			
	2022	2037	2041
Annual Enplaned Passengers	687,259	878,150	1,108,700
Peak Hour Enplaned Passengers	482	616	687
Security Checkpoint			
Number of Lanes	3	4	4
Passenger Screening and Composure (SF)	3,750	5,000	5,000
Checkpoint Queueing (SF)	1,350	1,800	1,800
Checkpoint Exit (SF)	1,200	1,600	1,600
Checkpoint Total (SF)	6,300	8,400	8,400
Terminal			
Circulation and Queuing (SF)	22,314	28,248	31,620
Bag Claims Carousels (SF)	2	3	3
Seating and Bag Claim (SF)	11,676	14,368	16,024
Public Restrooms (SF)	1,652	2,112	2,355
Concessions and Vending (SF)	3,545	4,534	5,057
Subtotal Public (SF)	39,187	49,262	55,056
(NP) Baggage Screening (SF)	3,484	4,456	4,970
(NP) Inbound/Outbound Baggage (SF)	7,900	10,000	11,153
(NP) Airline Areas (SF)	9,680	10,839	12,088
(NP) Car Rental Areas (SF)	1,700	1,700	1,700
(NP) Leased Space (SF)	5,237	4,346	4,847
(NP) Maintenance and Support Areas (SF)	3,610	4,615	5,147
(NP) Airport Admin and Conference Rooms (SF)	5,793	6,210	7,900
Subtotal Nonpublic (SF)	37,404	42,166	46,830
Terminal Total (SF)	76,591	91,428	101,886
Concourse			
Area A Gates	4	4	4
Area A Seating and Podiums (SF)	8,974	10,474	11,681
Area B + Future Gates	7	9	9
Area B + Future Seating & Podiums (SF)	10,624	13,624	15,194
Circulation (SF)	26,309	33,630	37,506
Restrooms (SF)	3,088	3,947	4,402
General Seating and Vending (SF)	4,027	5,150	5,744
Subtotal Public (SF)	53,022	66,825	74,527
(NP) Leased Space (SF)	3,133	4,007	4,469
Concourse Total (SF)	56,155	70,832	78,996
(NP) Building Utilities, Chases, Structure (SF)	39,491	47,045	52,467
Terminal Facility Total (SF)	178,537	217,705	241,749

Notes: Some numbers may not add due to rounding

Sources: 2037 CID Terminal Modernization Program Phase IV Report, 2018; 2041 Requirements: Kimley Horn Analysis, May 2022

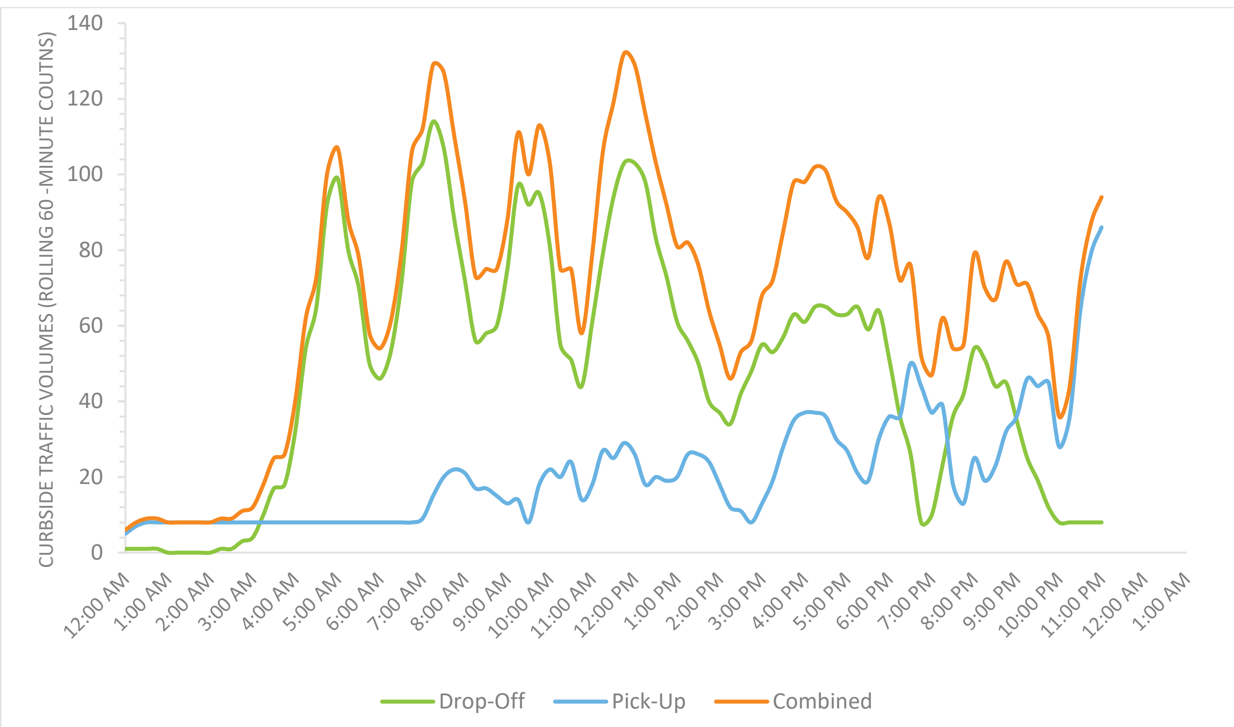
3.4 LANDSIDE ACCESS AND PARKING

- TERMINAL AREA ROADWAYS AND CURBSIDES

The existing curbside demand on a peak day in March 2022 was recorded using methodologies outlined in ACRP Report 40: *Airport Curbside and Terminal Area Roadway Operations*[36]. The curbside analysis emphasized the arrival (pick-up), departure (drop-off), and combined peak hours for the terminal area roadway and curbside areas. For planning purposes, ACRP Report 40 recommends that curbside facilities provide a level of service (LOS) "C" or better during the design hour. The design hour was determined as the peak hour on a typically busy day during the Spring Break season.

Terminal curbside traffic volumes were based on traffic counts generated from airport security videos for March 16, 2022. Drop-off traffic generally used the 330 linear feet on the west side of the terminal. Pick-up traffic generally used the 270 linear feet of curb at the east end of the terminal. The 60-minute rolling traffic volumes at the terminal curbside are illustrated in **Figure 3.17**. Terminal roadway traffic volumes typically peak at midday associated with a combination of drop-off and pick-up activity. Departures traffic volumes peak in the morning, whereas the arrivals traffic volumes peak in the late evening.

Figure 3.17: Rolling 60-Minute Terminal Curbside Traffic Volumes



Sources: Kimley-Horn Analysis, May 2022; Airport Records (accessed April 2022).

[36] Source: Airport Cooperative Research Program (ACRP) Report 40: *Airport Curbside and Terminal Area Roadway Operations*, 2010.

The existing peak hour departures and arrivals traffic volumes were grown at the rate of future design hour enplanements and deplanements, respectively, to project future traffic volumes. The ACRP Quick Analysis Tool for Airport Roadways (QATAR) was used to determine the curbside length requirements. The QATAR analysis assumed the following:

- Three approach lanes and one dedicated curbing lane for a total of four curbside lanes
- Target LOS is "C"
- Double parking is allowed at the curbside (threshold for curb utilization rate is 1.3 for LOS "C")
- Approximately 96% of activity on the Departures curbside is private vehicle, taxi, Transportation Network Company (TNCs, i.e., Uber/Lyft), or limo drop-offs; the remaining 4% is accounted for by shuttle and bus drop-offs
- Only private vehicle pick-ups occur on the Arrivals curbside; all commercial modes pick-up on the commercial curbside
- A crosswalk adjustment factor of 90%
- Dwell times as indicated in **Table 3.15**
- Vehicle lengths as indicated in **Table 3.15**

Table 3.15: QATAR Analysis Assumptions

Mode	Drop-Off Dwell Time (min)	Pick-Up Dwell Time (min)	Vehicle Length (feet)
Private Vehicle	2.5	6.0	25
TNC/Limo[(a)]	2.0	2.0	25
Taxi	2.0	2.0	25
Shuttle	3.5	5.0	30
Bus	1.0	5.0	50

(a) QATAR does not provide default dwell times for TNCs. TNC dwell times were assumed to be equal to the dwell times for a taxi.

Sources: Kimley-Horn Analysis, May 2022; QATAR Tool (accessed May 2022).

The requirements are presented in **Table 3.16** and **Table 3.17** and for the Departures and Arrivals curbside, respectively.

Table 3.16: Departures Curbside Requirements

	Design Hour Enplanements	Peak Hour Curb Volume (veh/hr)	Minimum Required Linear Feet of Curb Space (feet)	Surplus/(Deficit) (a)
Base Year				
Existing	417	125	165	165
Forecast Year				
2026	473	142	195	135
2031	541	162	220	110
2036	613	184	250	80
2041	687	206	270	60

(a) Assumes existing supply of 330 feet of Departures curbside.

Sources: Kimley-Horn Analysis, May 2022; Airport Records (accessed April 2022); QATAR Tool (accessed May 2022).

Table 3.17: Arrivals Curbside Requirements

	Design Hour Deplanements	Peak Hour Curb Volume (veh/hr)	Minimum Required Linear Feet of Curb Space (feet)	Surplus/(Deficit) (a)
Base Year				
Existing	242	87	260	(10)
Forecast Year				
2026	274	99	290	(20)
2031	314	113	340	(70)
2036	356	128	365	(95)
2041	399	143	415	(145)

(a) Assumes existing supply of 270 feet of Arrivals curbside.

Sources: Kimley-Horn Analysis, May 2022; Airport Records (accessed April 2022); QATAR Tool (accessed May 2022).

- GROUND TRANSPORTATION (GT)

The ground transportation area east of the terminal serves limos, TNCs (Uber/Lyft), taxis, hotel shuttles, and charter buses. All GT modes have dedicated positions at the commercial curb to utilize for passenger pick-up activity, though only taxis and charter buses utilize the dedicated positions. Other modes were observed to load/unload at the closest open position to the terminal exit. Since the GT area is located after the Departures and Arrivals curbsides, it was observed that private vehicle drivers unable to find an Arrivals curbside position also utilized the GT area. The requirements analysis for the GT area did not account for unauthorized private vehicles using the GT area for loading and unloading.

The demand for GT providers was calculated using volumes generated from Airport security footage for March 16, 2022. March represents a month of relatively low commercial ground transportation activity. GT activity at CID historically peaks in October, with about 50% more activity than in March. A seasonal inflation factor of 150 percent was utilized to account for the seasonal GT activity variation. An additional peaking surge factor of 1.5 was also used to account for peaking characteristics within the peak activity period.

The observed peak 15-minute volumes, dwell times, and surge factors were used to calculate the number of positions required for each GT mode. Vehicle lengths were used to convert the number of positions to a total linear footage of curbing needed for commercial vehicle functions. Pick-up dwell times and vehicle lengths are consistent with those presented in **Table 3.15**. The demand for taxis, TNCs, limos, and shuttles was increased relative to the growth in peak hour deplanements. No new bus routes have been identified to suggest an increase in bus positions. The results are presented in **Table 3.18** and **Table 3.19** for the number of positions and the length of curb needed, respectively.

Table 3.18: GT Area Requirements – Number of Positions

	TNC/Limo	Taxi	Shuttle	Bus (a)
Base Year				
Existing	2	2	2	2
Forecast Year				
2026	3	3	3	2
2031	3	3	3	2
2036	3	3	3	2
2041	4	4	4	2

(a) This requirement includes the position required for the public transit route servicing the Airport. The transit route currently loads and unloads on the Departures curbside.

Source: Kimley-Horn Analysis, May 2022.

Table 3.19: GT Area Requirements - Curb Length (feet)

	GT Requirement (feet)	Surplus/(Deficit) (a)
Base Year		
Existing	260	525
Forecast Year		
2026	340	445
2031	340	445
2036	340	445
2041	340	445

(a) Assumes an existing supply of 785 feet of commercial curb.

Source: Kimley-Horn Analysis, May 2022.

- PARKING FACILITIES

The Airport provides a variety of parking options while traveling or conducting business. These options include short-term parking, long-term parking, a cell phone lot, and employee parking. All existing parking products are located within walking distance of the passenger terminal building.

The following terms will be referred to throughout the parking analysis:

- **Absolute Peak Day** is the day of the year with the highest parking occupancy.
- **Accumulation** is the percent change in occupied parking stalls between the overnight occupancy and the peak/midday occupancy.
- **Design Day** is the day with the 20th highest parking occupancy during the year. The design day is an industry metric to represent a busy day.
- **Peak/Midday Occupancy** is when the parking occupancy at the Airport is the highest. Peak occupancy generally occurs in the early afternoon, after the morning flights depart and before the late evening flights arrive.
- **Overnight Occupancy** is the parking occupancy at the end of the day when air travel activity has ceased. The overnight occupancy is typically the lowest parking occupancy for a given day.

- **Parking Demand** is the observed historical parking occupancy used as a basis for determining parking requirements.
- **Parking Requirement** is the number of parking stalls needed at the Airport to ensure that parking spaces are available to satisfy the customer demand at specific planning periods.
- **Service Factor** is a parking occupancy inflation factor to account for parking inefficiencies, including vehicle circulation and vehicles parking in multiple stalls.

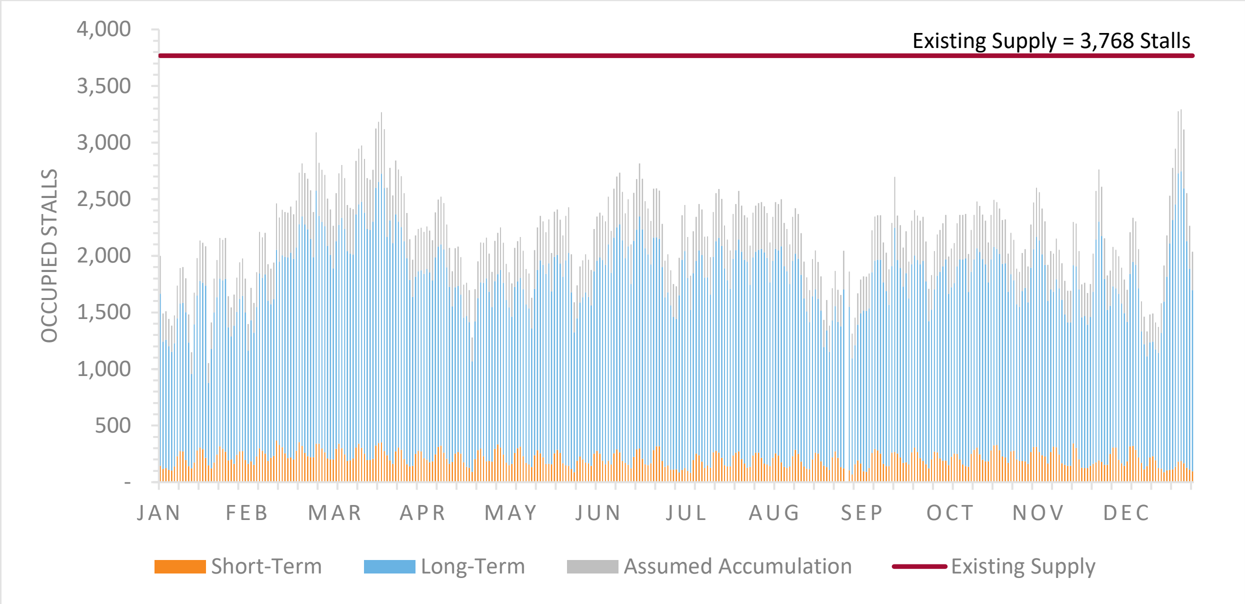
Public Parking

The Airport provided overnight parking occupancy data for each day in 2019 for the Short-term and Long-term Lots. This data was utilized to calculate the parking demand during the design and peak day. Projected parking demand was compared to the existing supply to estimate future parking deficiencies.

CID parking occupancy peaks around the Spring Break season and around Christmas/New Years. Parking occupancy peaking occurs in the Long-term Lot, while the Short-term Lot utilization is relatively consistent throughout the year, as illustrated in **Figure 3.18**. Short duration parking is typically defined as a parking transaction of four hours or less. Vehicles remaining in the Short-term Lot overnight are indicative of long duration parkers that are willing to pay more for premium parking. Therefore, the actual short duration parking demand is lower than the occupancy data suggests.

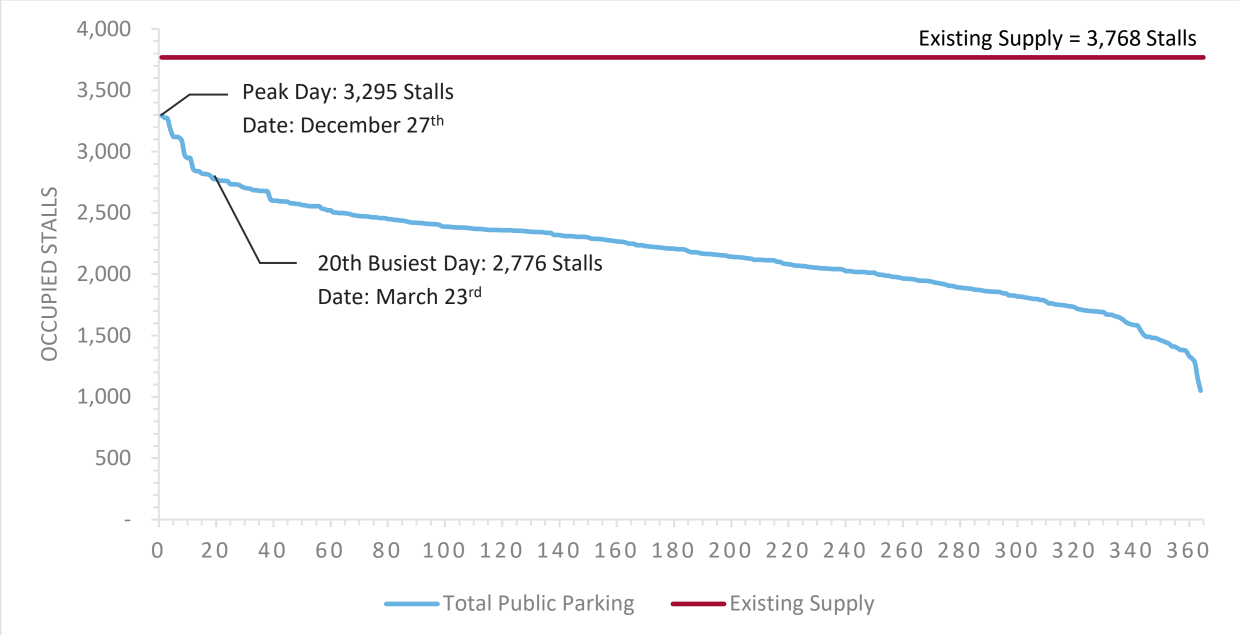
Midday occupancy data was not available. Based on industry observations and trends, an accumulation factor of 20 percent was used to estimate the midday occupancy. The 2019 flight schedule and records for the number of tickets issued each day were used to verify that CID had accumulation factors consistent with industry trends. Estimated midday occupancies are illustrated in **Figure 3.18** and **Figure 3.19.**

Figure 3.18: Estimated Midday Occupancy – Chronological (2019)



Sources: Kimley-Horn Analysis, May 2022; Airport Records (received February 2022).

Figure 3.19: Estimated Midday Occupancy – Sorted Highest to Lowest (2019)



Sources: Kimley-Horn Analysis, May 2022; Airport Records (received February 2022).

The future parking requirement was determined as a function of base year design day demand, annual passenger activity, and a service factor. A service factor of 10 percent was used to account for operational inefficiencies associated with a surface lot without a parking guidance system. **Table 3.20** presents the parking requirements for the design day at each key planning year.

Table 3.20: Public Parking Requirements

Year	Annual Enplanements	Public Parking Stall Requirement (a)	Stall Surplus/(Deficit) (b)
Base Year			
2019	672,468	3,050	720
Forecast Year			
2026	762,300	3,460	310
2031	872,300	3,960	(190)
2036	988,900	4,490	(720)
2041	1,108,700	5,040	(1,270)

(a) Rounded to the nearest 10 stalls.
(b) Assumes existing supply of 3,768 stalls.

Source: Kimley-Horn Analysis, May 2022.

Employee Parking

Occupancy counts for the Employee Lot were provided by the Airport for October 20, 2021 to October 27, 2021. Counts were taken at 5:30 a.m., 9:00 a.m., 11:30 a.m., 1:00 p.m., 4:00 p.m., 10:00 p.m., and 1:30 a.m. for each day. The peak occupancy observed was 98 vehicles at 11:30 a.m. on Wednesday, October 20, 2021. The peak occupancy was increased by a service factor of 15 percent to account for parking inefficiencies and to account for enhanced parking demand during shift changes, when employees for the next shift arrive before the prior shift leaves.

Projected employee parking demand was calculated by growing the demand relative to the growth in commercial operations. Operations, rather than passenger enplanements, were used to capture the growth in aircraft activity that would require an increase of gate agents, ticketing agents, and ground service staff. Existing and projected employee parking requirements are presented in **Table 3.21**. Requirements may see a one-time increase when the terminal expansion is completed, and additional concessionaire employees begin parking at the Airport.

Table 3.21: Employee Parking Requirements

Year	Annual Commercial Operations	Employee Parking Stall Requirement (a)	Stall Surplus/(Deficit) (a)(b)
Base Year			
2021	18,544	115	75
Forecast Year			
2026	20,604	125	65
2031	22,083	135	55
2036	24,418	150	40
2041	27,041	165	25

(a) Rounded to the nearest 5 stalls.
(b) Assumes existing supply of 189 stalls.

Sources: Kimley-Horn Analysis, May 2022; Airport Records (received February 2022).

Cell Phone Lot

Occupancy data was not available for the cell phone lot. Observations suggest that the cell phone lot is currently underutilized. ACRP Synthesis 62: *Cell Phone Lots at Airports*[37] suggests that there is no direct correlation between cell phone lot sizing and the number of annual passengers. A benchmarking study conducted as part of ACRP, Synthesis 62 indicated that the majority of the small hub surveyed have a cell phone lot with less than 30 stalls. ACRP Synthesis 62 used a metric for the ratio of cell phone lot stalls to total parking spaces to compare airports around the country. Typically, cell phone lots are sized to account for 0.5% to 1.0% of the total parking spaces at the airport. Given a parking requirement of 5,040 stalls in 2041, the cell phone lot should include approximately 25 to 50 stalls.

- RENTAL CARS

The airport's rental car facilities include customer service counters, located near the baggage claim area inside the terminal, parking spaces east of the passenger terminal building serving pick-up of ready cars and drop-off returns of rental cars, and a quick turnaround (QTA) service facility east of the airport maintenance facility across 18th Street SW.

[37] Source: Airport Cooperative Research Program (ACRP) Synthesis 62: *Cell Phone Lots at Airports*, 2015.

Rental car data, provided by the Airport, gave insight into the total number of rental days and total receipts per month in 2019. The data was processed following the steps outlined below to determine the peak hour rentals and returns:

- **Step 1:** Using total receipts, rental days, and an average rental duration of three days, the number of returns and rentals for each month was calculated.
- **Step 2:** The peak month was determined to be July with an average of approximately 400 rentals and 400 returns per day.
- **Step 3:** The July 2019 flight schedule information was used to estimate the percent of activity occurring in the peak hour for enplanements (correlated to returns) and deplanements (correlated to rentals).
- **Step 4:** To account for the difference between the flight schedule and actual customer behavior, the percent of activity was adjusted. Peak deplanements typically occur late at night and is driven by leisure travelers, who are less likely to utilize rental cars. As such, a modification factor of 25% was utilized for rentals to account for the increase in business travelers during the day. The modification factor was determined by analyzing the mode choice of arriving passengers throughout the day. To account for the distribution of passengers arriving at the Airport for their flight, a normal distribution was assumed with a 3-hour window. The peak hour for returns was expected to include one standard deviation, or approximately 68 percent, of the peak hour enplanements.
- **Step 5:** Peak hour rentals and returns were grown at the same rate as forecasted annual enplanements. The peak hour rentals and returns are presented in **Table 3.22.**

Table 3.22: Peak Hour Rentals and Returns

	Peak Hour Rentals	Peak Hour Returns
Base Year		
2019	54	51
Forecast Year		
2026	62	58
2031	70	67
2036	80	75
2041	90	85

Source: Kimley-Horn Analysis, May 2022; Airport Records (received February 2022).

Rental car facility requirements were identified for the following rental car facility components: customer service counters, ready and return vehicle positions, fueling positions, carwash positions, and QTA storage positions. Facility requirements were determined using peak hour rentals and returns and industry-standard surge factors, sizing factors, and transaction times.

Customer Service Counters

Based on industry standards, the average time at the counter to complete a transaction was assumed to be 8 minutes. A standard surge factor of 1.25 was applied to the demand for customer counters to accommodate peaking characteristics. Due to current operations, no customers were assumed to bypass the counters.

Applying the transaction time and surge factor to peak hour rentals provides the requirements, as shown in **Table 3.23**.

Table 3.23: Customer Service Counter Requirements

Year	Customer Service Counter Requirement	Counter Surplus/(Deficit) (a)
Base Year		
2019	9	0
Forecast Year		
2026	10	(1)
2031	12	(3)
2036	13	(4)
2041	15	(6)

(a) Assumes existing supply of nine counters.

Source: Kimley-Horn Analysis, May 2022.

Ready/Return Vehicle Positions

It is a common industry standard that the number of parking spaces in the ready/return area be sized to accommodate two times the peak hour rental activity plus 1.5 times the peak hour returns. Using this formula, the projected requirements are included in **Table 3.24.**

Table 3.24: Ready/Return Stall Requirements

Year	Ready and Return Stalls Requirement (a)	Stall Surplus/(Deficit) (a)(b)
Base Year		
2019	185	50
Forecast Year		
2026	210	25
2031	240	(5)
2036	275	(40)
2041	305	(70)

(a) Rounded to the nearest 5 stalls.
(b) Assumes existing supply of 235 ready/return stalls.

Source: Kimley-Horn Analysis, May 2022.

Quick Turnaround (QTA) Facility

The QTA facility consists of the fueling positions, car wash bays, and vehicle storage. Each fueling position can accommodate four returns per hour, and each wash bay can accommodate the vehicles from four to six fueling positions, depending on orientation. Since there is a service time associated with shuttling the return vehicles between the terminal and QTA, it was assumed that only one standard deviation (approximately 68 percent) of the peak hour returns are serviced at the QTA during the peak hour. Generally, vehicle storage at the QTA is sized to hold a minimum of four times the peak hour returns for vehicle processing. **Table 3.25**, **Table 3.26**, and **Table 3.27** present the QTA requirements for fueling, wash bays, and storage positions, respectively.

Table 3.25: QTA Fueling Position Requirements

Year	Fueling Position Requirement (a)	Fueling Position Surplus/(Deficit) (b)
Base Year		
2019	11	(3)
Forecast Year		
2026	12	(4)
2031	14	(6)
2036	16	(8)
2041	18	(10)

(a) Assumes an existing supply of 8 fueling positions.

Source: Kimley-Horn Analysis, May 2022.

Table 3.26: QTA Wash Bay Requirements

Year	Wash Bay Requirement (a)	Wash Bay Surplus/(Deficit) (b)
Base Year		
2019	3	(1)
Forecast Year		
2026	3	(1)
2031	4	(2)
2036	4	(2)
2041	5	(3)

(a) Assumes an existing supply of 2 wash bays.

Source: Kimley-Horn Analysis, May 2022.

Table 3.27: QTA Vehicle Storage Positions Requirements

Year	Vehicle Storage Positions Requirement (a)	Position Surplus/(Deficit) (a)(b)
Base Year		
2019	205	315
Forecast Year		
2026	235	280
2031	265	250
2036	300	215
2041	340	175

(a) Rounded to the nearest 5 stalls.
(b) Assumes an existing supply of 517 vehicle storage positions.

Source: Kimley-Horn Analysis, May 2022.

Although not analyzed as part of the Sustainable Master Plan, the adoption of electric vehicles (EV) by rental car agencies will impact the facility requirements for fueling positions. EV adoption by rental cars is likely to occur within the planning period and at a faster rate than the general public fleet. A future study can analyze EV charging needs for the rental car facilities and should be considered prior to any improvements to the existing facilities.

3.5 AIR CARGO

In recent years, shipping trends have led to structural changes in the air cargo industry which, in turn, have long-term implications for U.S. airports. Prior to and during the COVID-19 pandemic, rapid e-commerce growth brought increased activity and new entrant air cargo carriers to many airports. Pandemic-related supply chain disruptions have added other complex dynamics for the cargo community, including the use of passenger aircraft for cargo-only flights and congestion at traditional cargo gateway airports.

Notably, during this time, smaller, non-traditional airports for cargo have handled much of the new e-commerce volumes and have provided viable alternatives to improve the movement of goods in support of the U.S. economy and life-critical supplies. While other trends will surely arise in the future, the role of these types of airports in the air cargo eco-system appears sustainable. They provide needed capacity and close proximity to markets as well as lower costs and efficiencies not found at larger airports. Given this situation, non-traditional cargo airports, like the Eastern Iowa Airport, must be prepared for levels of cargo activity that may not follow historic norms and that may involve different sources of cargo. From a planning perspective, this translates to CID fully considering facility requirements related not just to the approved Sustainable Master Plan Forecast, but also the real potential of new entrant freighter operators and increased belly cargo from passenger airlines.

- AIR CARGO FACILITY REQUIREMENTS

Requirements for air cargo facilities were determined to: 1) meet the approved Sustainable Master Plan Forecast; and 2) evaluate the facility implications of a future demand scenario that involves a substantial increase in air cargo activity beyond what is forecast. As stated in *Chapter 2 – Aviation Forecasts*, the Baseline air cargo tonnage forecast assumes a status quo environment for air cargo at the Airport. This includes expectations that current cargo airlines will continue serving CID with similar operations as they have in the past and that no new entrant cargo carriers initiate regular service at the Airport.

In developing the Baseline cargo forecast, the capacity and types of operations of CID's three legacy air cargo carriers (UPS, FedEx and DHL) were explicitly analyzed. However, the tonnage forecast was developed in the aggregate for the Airport and not at an individual carrier level. A traditional approach for determining air cargo facilities requirements would assess CID's total existing cargo warehouse capacity (square footage) along with the expected total cargo volume (tonnage) in the end year of the forecast period – 2041. Based on standard industry throughput metrics (i.e., annual tons handled per square foot), the expected shortfall or excess of cargo facility capacity can be derived. The output of this simple analysis indicates that in 2041, CID requires approximately 83,000 square feet of air cargo building and has existing total air cargo building of 93,580 square feet.[38]

An interpretation of this analysis may suggest that CID requires no additional cargo facilities during the forecast period because the existing warehouse capacity exceeds the calculated needs in 2041. However, given the specific nature of cargo operations at CID as well as the industry trends discussed above, an alternative interpretation should be considered.

- DEDICATED CARGO FACILITIES AT CID

At CID, the three integrated express carriers (FedEx, UPS and DHL) operate from three separate, stand-alone cargo facilities. The entirety of each facility is dedicated to the respective operations of each carrier. While it is common for these types of carriers to have their own independent facilities at airports, it is less common for there to also be no other cargo facilities for handling other cargo carriers and belly cargo from passenger airlines. This is precisely the situation at CID. FedEx and UPS operate from two large, modern facilities located in CID's West Cargo Area while DHL operates from a smaller, older facility located near CID's passenger terminal. Beyond these three buildings, no other cargo facilities exist at the Airport.

Further, each of the current CID cargo carriers operates under a long-term lease in their respective facility and the buildings are designed to accommodate their specific needs. Because the three cargo facilities are not usable by other potential carriers and no alternative cargo facilities exist at CID, the Airport effectively has no capacity for cargo growth and activity outside of the existing carriers.

To further illustrate the point, it is helpful to describe the three independent cargo facilities:

- UPS operates from a brand new 53,800 square foot facility (with core warehouse space of 28,530 square feet) that was custom designed by UPS. The building opened in July 2021, so it is anticipated to have adequate capacity to accommodate long-term UPS growth at CID. Importantly, UPS Corporate has an ongoing moratorium on new capital spending at airports, making the CID facility an even more valuable asset to the company. Given the overall growth of air cargo and the lack of UPS airport facilities coming online, it is foreseeable that UPS's new CID facility could be utilized for regional consolidation as UPS facilities at other airports in the area reach maximum capacity.
- FedEx operates the largest facility at CID and is experiencing increasing demand from a variety of customers including a large local e-commerce business. The FedEx facility is over 90,000 square feet (with core warehouse space of 52,800 square feet). Even with the large facility, FedEx is challenged by lack of truck parking and overall heavy use of the facility in conjunction other FedEx operations in the region.
- DHL is benefiting from international e-commerce shipments and population growth in the Cedar Rapids area. The DHL facility is approximately 20,000 square feet (with core warehouse space of 12,250 square feet). The building is adequate for current volumes, but increased trucking activity may require more parking. As a company, DHL is aggressively expanding globally and has ordered many new aircraft as it grows its fleet of owned aircraft which complement the use of aircraft operated by partner carriers in the U.S.

[38] ACRP Report 143, *Guidebook for Air Cargo Facility Planning and Development*, 2015 - estimated throughput for Integrated Express Carriers in a Domestic air cargo warehouse is 0.92 annual short tons per square foot.

- FACILITY IMPLICATIONS OF A FUTURE DEMAND SCENARIO

Due to the overarching trends in the air cargo industry related to smaller airports, the Eastern Iowa Airport would be considered a legitimate candidate for additional air cargo activity. By a wide margin, CID is the largest airport in Iowa for air cargo tonnage and further volume growth is facilitated by its proximity and access to the interstate highway system, developable land, and labor supply. These factors along with growing manufacturing and e-commerce operations in the Cedar Rapids area provide a foundation for significant growth in air cargo at CID, potentially with a new entrant carrier.

Based on modeling by the Sustainable Master Plan consulting team, a wide range of facilities may be required to accommodate the additional demand, including the associated tonnage and aircraft activity. During the forecast period, it was assumed that a new entrant initiating CID service would utilize an ATR-72F turboprop freighter in 2024 and transition to a B737-800F in 2032 after experiencing steady growth with the smaller freighters. For this scenario, it was estimated that a net additional 16,400 short tons by 2041 would be carried on 1,460 annual flights with B737-800F aircraft.

A new entrant cargo operation of this kind at U.S. airports currently requires 20,000 – 30,000 square feet of air cargo facility space. Further, to accommodate modern air cargo activity, including e-commerce sorts, cargo buildings are getting deeper. Currently, many cargo buildings are 100-110 feet deep, but the trend is moving to 120-140 feet deep. Fast-paced, high volume cargo activity associated with e-commerce operations at U.S. airports also increases the need for additional employee and truck parking, exceeding traditional standards.

Beyond the potential of a new entrant cargo carrier at CID, it is also reasonable to expect increases in belly cargo during the forecast period due to narrowbody aircraft operations by passenger airlines. During the pandemic, passenger airlines fully realized the impact of air cargo on route profitability. Many airlines have vowed to maintain their focus on air cargo even after the pandemic passes. Currently, the modest cargo volumes carried by regional jets at CID are handled without the need of major cargo facilities. However, as narrowbody activity increases and potential new passenger airlines operate at the Airport, a facility to handle belly cargo will be needed.

- SUMMARY

Having established the need to plan for additional cargo facilities at the Eastern Iowa Airport, it is important to further define the required characteristics of those facilities. While this will be formally addressed in the Alternatives Development and Evaluation phase of the Sustainable Master Plan, the following issues may be considered:

- Additional cargo facilities should be located in the established West Cargo Area of the Airport to leverage efficiencies from contiguous cargo apron space, existing taxiways, airport access roads, truck parking and staging areas, and adequate separation from commercial passenger airline activities.
- A multi-tenant cargo facility should be evaluated which accommodates, under one roof and in sub-divided space, the activities of several cargo-related operators (e.g., cargo airlines, belly cargo operations of passenger airlines and cargo ground handlers). Further, in the case of CID, such a facility may be an ideal option for relocating DHL from its current building. Multi-tenant facilities

often produce efficiencies due to shared development costs and mitigate risks with diversified portfolios of tenants.

- Decisions on the timing for development of additional cargo facilities should include a cost-benefit analysis related to potential air cargo growth opportunities. The ongoing rapid pace of air cargo growth has led many operators (including new entrant air cargo carriers) to make accelerated network planning decisions. Airports that have "flex" cargo capacity available on short notice or are prepared to develop facilities relatively quickly are best positioned to seize air cargo opportunities and better serve stakeholders in their region. In recent years, many U.S. airports that pro-actively planned for development of additional cargo facilities were able to attract new cargo carriers.
- Alternatives planning should consider the following facilities:
  - Relocated DHL: 30,000 SF
  - New cargo entrant: 30,000 SF
  - Unassigned cargo space/ground handler: 20,000 SF

How these issues are ultimately addressed can have major implications on the Eastern Iowa Airport's ability to accommodate future air cargo demand and, by extension, facilitate regional economic development. Through careful study and understanding of the core issues, appropriate plans will be determined. The Sustainable Master Plan serves as a critical input to the Airport's future air cargo development process and can help to ensure successful outcomes for all interested parties.

3.6 GENERAL AVIATION

- BASED AIRCRAFT

As mentioned in *Chapter 1 – Existing Conditions*, CID has two groupings of hangar facilities. One large facility north of the west FBO facility and another in the southeast portion of the airfield, north of the old Iowa National Guard site. The forecast for CID shows an increase of five (5) based aircraft for the five-year planning horizon and 14 in the twenty-year planning horizon. The old hangars in the southwest portion of the General Aviation apron are planned to be demolished, sixteen units in total. North of the west General Aviation apron two T-Hangars are being developed, each with ten units. Total, there will be a net loss of four (4) hangar spaces.

As CID is at occupancy with their hangars, it is recommended new hangars be developed. The new T-Hangar facility accounts for roughly 1,650 square feet per based aircraft. With nine (9) additional units needed in the five-year planning horizon, it is recommended 14,850 square feet of additional hangar space be developed.

3.7 AIRPORT SUPPORT

The facility requirements for airport support facilities includes the aircraft rescue and firefighting facilities, administration facilities, the airport traffic control tower, deicing facilities, and the aircraft maintenance storage building.

- AIRCRAFT RESCUE AND FIREFIGHTING (ARFF) FACILITIES

According to Code of Federal Regulations (CFR) Part 139.315-317, *Aircraft Rescue and Firefighting*, ARFF facilities, staffing, and equipment is dependent on length of the air carrier aircraft that serves the airport with an average of five or more daily departures. **Table 3.28** shows the index for the most demanding commercial aircraft serving CID. The ARFF Index at CID is currently at a B classification, adequately accommodating the existing airfield system and airline schedule.

Table 3.28: Aircraft Length and ARFF Index

Commercial	Length (Feet)	ARFF Index
A319	111.0	B
A320	123.3	B
A320neo	123.3	B
CRJ-200	87.8	A
CRJ-900	118.9	B
E-175	103.9	B
ERJ-145	98.0	B

Sources: FAR Part 139 Certification and Operations: Land Airports Serving CAB-Certified Scheduled Air Carriers Operating Large Aircraft (Other Than Helicopters). FAA Advisory Circular 150/5300-13B, *Airport Design*; Kimley Horn Analysis, May 2022

- AIRPORT ADMINISTRATION FACILITIES

The airport administration building, located northwest of the terminal along Arthur Collins Parkway SW, meets the needs of the administrative staff; however, there is a desire to be closer to the passengers and have space for admin functions inside the terminal building. If that were to happen, the existing admin building would likely be reused for another function important to the Airport's long-term vision.

Past reviews of administrative office needs have settled on around 5,000 SF of space to house private offices, conference rooms, a reception area, and a break room. As of May 2022, the Airport is having office space designed as part of the next phase of terminal expansion. In addition to the approximate 5,000-square-feet of space that had previously been identified as a requirement, the Airport may opt to build in more space (potentially an additional 2,500-square-feet) to accommodate future growth.

- AIRPORT TRAFFIC CONTROL TOWER

The Technical Operations Center and Airport Traffic Control Tower are both in good condition. For Runway 13/31, line-of-sight standards require any two points five feet above the runway centerline be mutually visible for the entire length of runway. With a full-length parallel taxiway, Primary Runway 9/27 requires any point five feet above the runway centerline have an unobstructed line of sight up to another point five feet about the runway centerline for a distance equal to half the runway length. The ATCT has clear sight lines for all airfield operations. No deficiencies with the ATCT structure have been reported.

Any future runway or taxiway improvements or expansions will require examination to ensure compliance of this standard is maintained.

- AIRCRAFT FUEL STORAGE AND DELIVERY SYSTEMS

A fuel facility assessment was completed by Argus Consulting in March 2020 to evaluate the existing fuel facilities and determine necessary long-term improvements. Replacing the existing facility is recommended to bring the facilities to compliance with local codes and standards while providing additional storage capacity to meet future needs. Fueling facilities must meet the International Fire Code and the National Fire

Protection Association code to minimize safety and environmental hazards. The fuel facilities should be designed to have a useful life of 30 to 40 years. CID fuel facilities should provide sufficient storage to maintain four to six days of reserve fuel. To provide adequate storage, up to six 50,000-gallon JET-A fuel tanks are needed. Additional storage tanks should support AVGAS, 100LL, Diesel, and MOGAS.

- DEICING FACILITIES

Aircraft deicing at the Airport occurs on portions of a large expanse (116 acres) of pavement/impervious surface. The deicing fluids, along with the stormwater/melted snow, are conveyed off-airport for treatment by the City of Cedar Rapids. This situation will be substantially improved from an environmental perspective with a dedicated deicing pad that would mix in significantly less volumes of water. The deicing pad would be sized to accommodate three aircraft simultaneously and be equipped with drainage slots and diverter valves to allow for the collection of deicing fluids. This deicing pad would be approximately 10 acres in size.

The next chapter of the Sustainable Master Plan, *Chapter 4 – Alternatives Development and Evaluation*, will address the locations for dedicated deicing pads. The ideal site for a dedicated deicing pad near the passenger terminal will require the relocation of the Airport's Snow Removal Equipment Building. In addition to a dedicated deicing pad near the passenger terminal, a second one near the end of Runway 9 should be planned to aid aircraft whose deicing fluid effective time has expired.

- AIRPORT SNOW REMOVAL EQUIPMENT BUILDING

As mentioned in the previous section, the airport's existing Snow Removal Equipment (SRE) Building will likely be displaced due to needed expansion of the commercial apron and development of a dedicated deicing facility. A facility at least equal in size will be required to replicate the functionality of this facility.

Chapter Four

Alternatives Development and Evaluation

CHAPTER 4: ALTERNATIVES DEVELOPMENT AND EVALUATION

4.1 INTRODUCTION

This chapter documents the process of developing and evaluating alternatives to address facility requirements and meet forecast demand at the Airport over the 20-year planning horizon. The alternatives analysis began with the consultant team reviewing various facility needs and brainstorming how future facilities could be integrated within different functional areas of the Airport. Existing planning documents to support the Airport's near-term Capital Improvement Plan (CIP) were also consulted. The consultant team and airport staff then participated in a work session to review the preliminary alternatives, determine benefits and challenges of each, and develop additional alternatives as needed.

Summary of Facility Requirements and Evaluation Process

Based on findings in *Chapter 3 – Facility Requirements*, facility needs necessary to accommodate future demand at the Airport are summarized below. These facility needs guide the alternatives analysis within this chapter.

- Airfield and Airspace
  - Extend Runway 9/27 to 10,000 feet
  - Fix the non-standard taxiway geometry at the intersection of Taxiway A6 and Taxiway A
  - Identify locations for new air cargo facilities and related aprons/parking/landside access
  - Identify location for additional General Aviation (GA) facilities
  - Identify location for new Snow Removal Equipment (SRE)/Maintenance Building
  - Investigate ground run-up enclosures to suppress aircraft noise during long-term engine testing (may be required if a maintenance and repair facility is built at the Airport)
  - Investigate eliminating displaced threshold for Runway End 27
- Landside Facilities
  - Extend private vehicle curbside and identify locations for commercial ground transportation relocation
  - Identify locations for parking (public, employee, and Cell Phone Lot) expansion
  - Identify location for additional Rental Car Ready/Return and Quick Turnaround (QTA) facilities

Evaluation Process

The following evaluation criteria were developed to compare proposed alternates and select a preferred alternative for each facility:

- **Safety and Function**: The degree to which a certain alternative satisfies safety requirements, including FAA design criteria and operational functionality.
- **Feasibility and Cost**: Relative costs based on magnitude of capital improvement.
- **Environmental Impacts**: Unusual or challenging environmental impacts.
- **Implementation Feasibility**: Are there complicated processes required to make an alternative successful?

4.2 AIRFIELD AND AIRSPACE

Airfield and airspace alternatives were developed considering requirements of the projected aircraft fleet. The alternatives were evaluated for their effectiveness in meeting the Airport's goals as well as phasing considerations.

- RUNWAY IMPROVEMENT ALTERNATIVES

This section provides the alternatives available for a runway extension to the Airport's primary runway. As noted in *Chapter 3 – Facility Requirements*, the recommended length for Runway 9/27 is 10,000 feet, which would accommodate the maximum takeoff weight (MTOW) for the Airport's critical design aircraft, the Boeing 767-300F. Alternatives to achieve the desired 10,000-foot runway length are presented in the following sections.

Runway 9/27 Runway Extension Alternative 1

Runway 9/27 Extension Alternative 1 involves extending the Runway 9 end and parallel Taxiway A 1,400 feet west (see **Figure 4.1**). A portion of Cherry Valley Road would be closed in between Wright Brothers Boulevard W and Walford Road SW. The MALSR and threshold bar lights would also require a relocation 1,400 feet west as well. Tissel Hallow Road could be realigned around the Runway Protection Zone (RPZ).

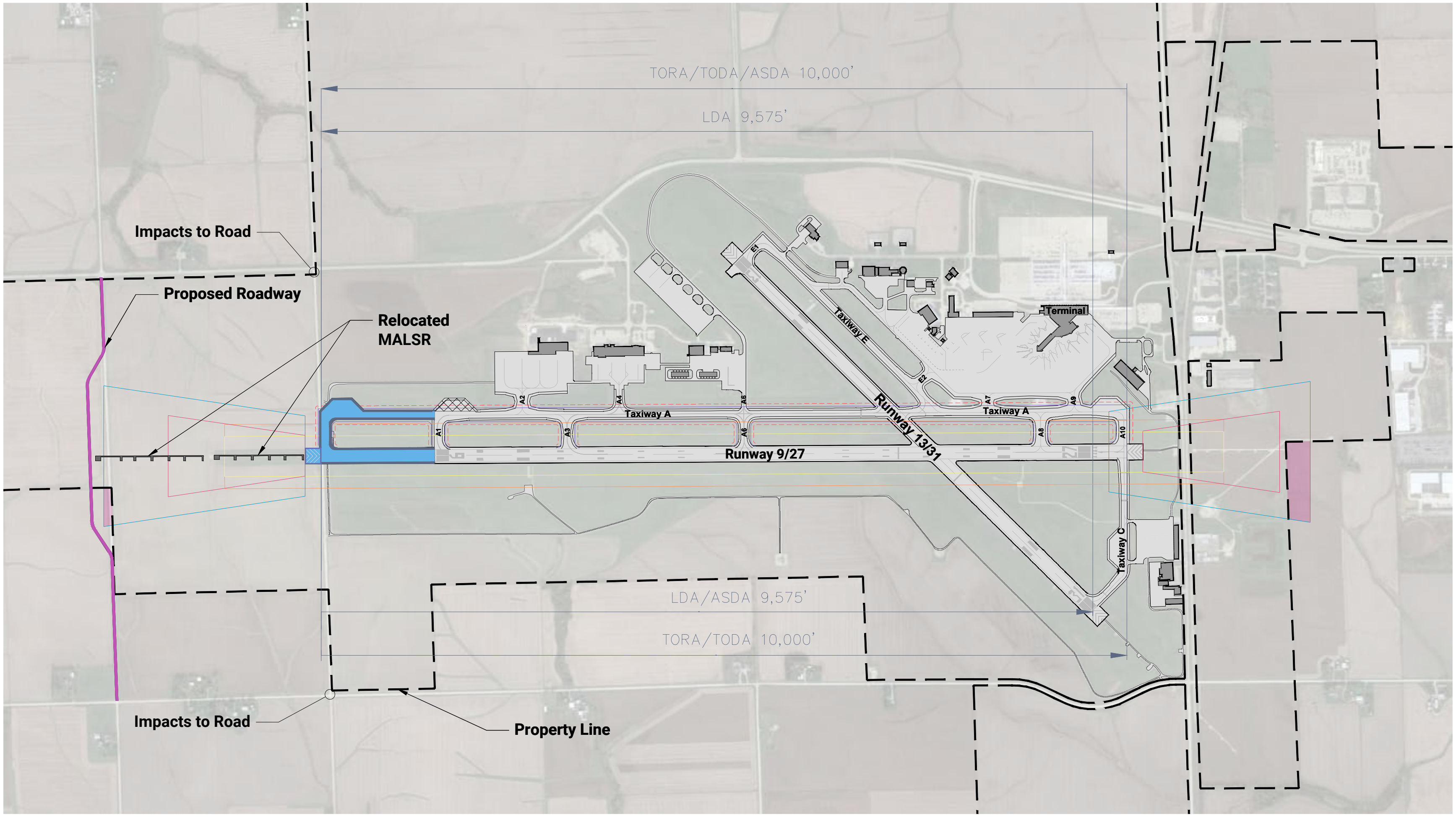
Runway 9/27 Runway Extension Alternative 2

Runway 9/27 Extension Alternative 2 extends the Runway 27 end and parallel Taxiway A 1,400 feet east (see **Figure 4.2**). This alternative results in impacts to 18th Street SW and the parallel railroad—two important pieces of infrastructure that would be difficult to relocate. The MALSR and threshold bar lights would require relocation 1,400 feet to the east. The Airport would need to acquire approximately 55 acres of land to control the RPZ.

Recommended Runway 9/27 Extension Alternative

Runway 9/27 Extension Alternative 1, which places the extension on the west end of the runway, is the preferred alternative. The primary reason for choosing Alternative 1 is that extending the runway east, as shown in **Figure 4.2**, would cause significant disruptions to 18th Street SW and the railroad. Particularly, the railroad would be very challenging and costly to relocate, thus making implementation of Alternative 2 difficult.

Figure 4.1: 9/27 Runway Extension Alternative 1



LEGEND

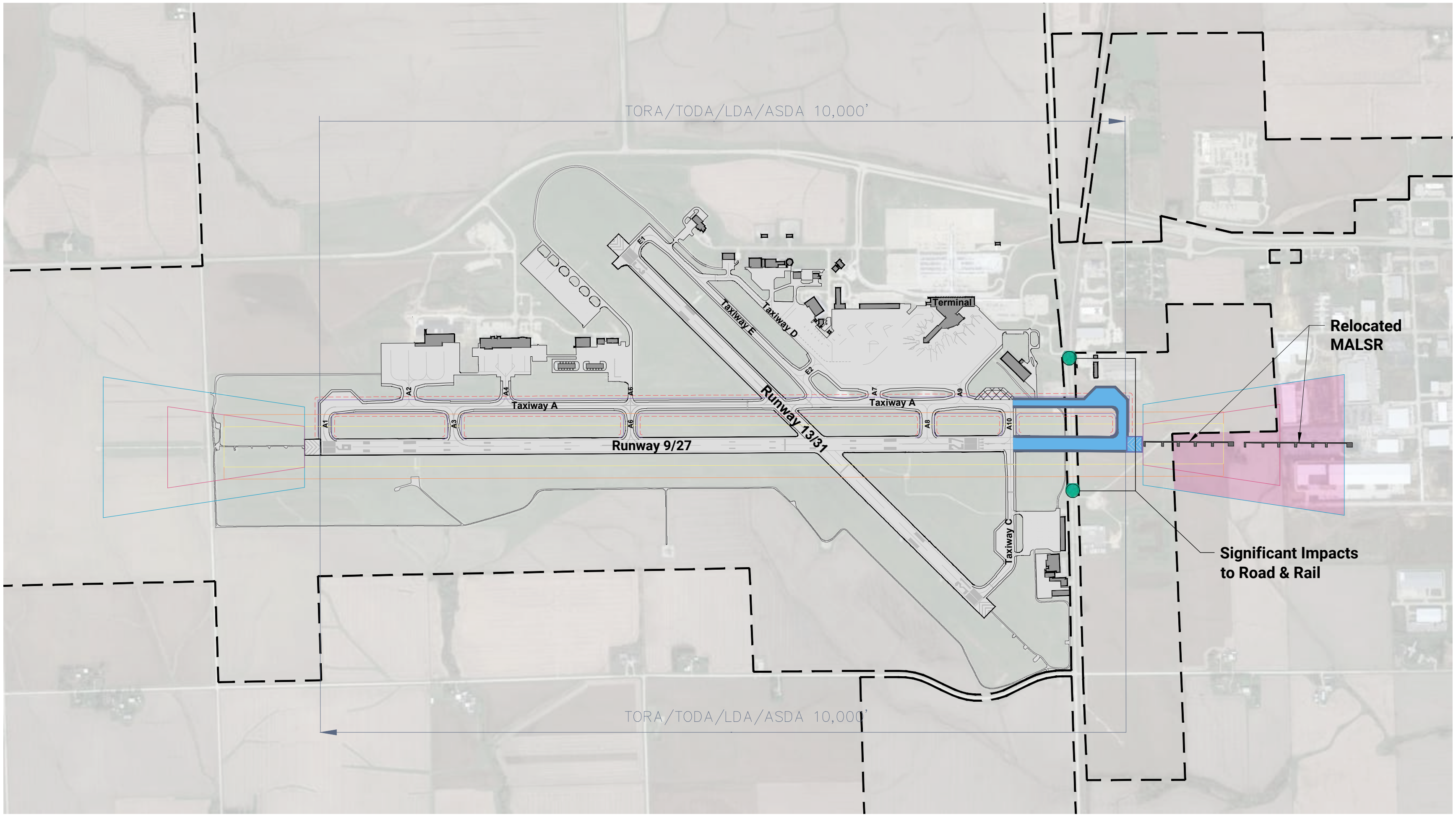
- Existing Airfield Pavement
- Existing Airport Buildings
- Proposed Airfield Pavement
- Proposed Roadway
- Proposed Demo
- Property To Be Acquired
- Approach Runway Protection Zone (ARPZ)
- Departure Runway Protection Zone (DRPZ)
- Runway Object Free Area (ROFA)
- Runway Safety Area (RSA)
- Taxiway Object Free Area (TOFA)
- Taxiway Safety Area (TSA)
- Property Line

0 500 1000 2000 Feet

N

Prepared by: Kimley-Horn, 2022.

Figure 4.2: 9/27 Runway Extension Alternative 2



LEGEND

- Existing Airfield Pavement
- Existing Airport Buildings
- Proposed Airfield Pavement
- Proposed Demo
- Property To Be Acquired
- Approach Runway Protection Zone (ARPZ)
- Departure Runway Protection Zone (DRPZ)
- Runway Object Free Area (ROFA)
- Runway Safety Area (RSA)
- Taxiway Object Free Area (TOFA)
- Taxiway Safety Area (TSA)
- Property Line

Prepared by: Kimley-Horn, 2022.

- CONNECTOR TAXIWAY A6 IMPROVEMENT ALTERNATIVES

The alternatives presented below describe improvements intended to reduce potential runway incursions at the intersection of Taxiway A and connector Taxiway A6. The issue to be resolved is direct runway access, which is contrary to FAA design standards. The following alternatives (see **Figure 4.3**) propose a relocation of Taxiway A6 *or* the taxilane north of Taxiway A.

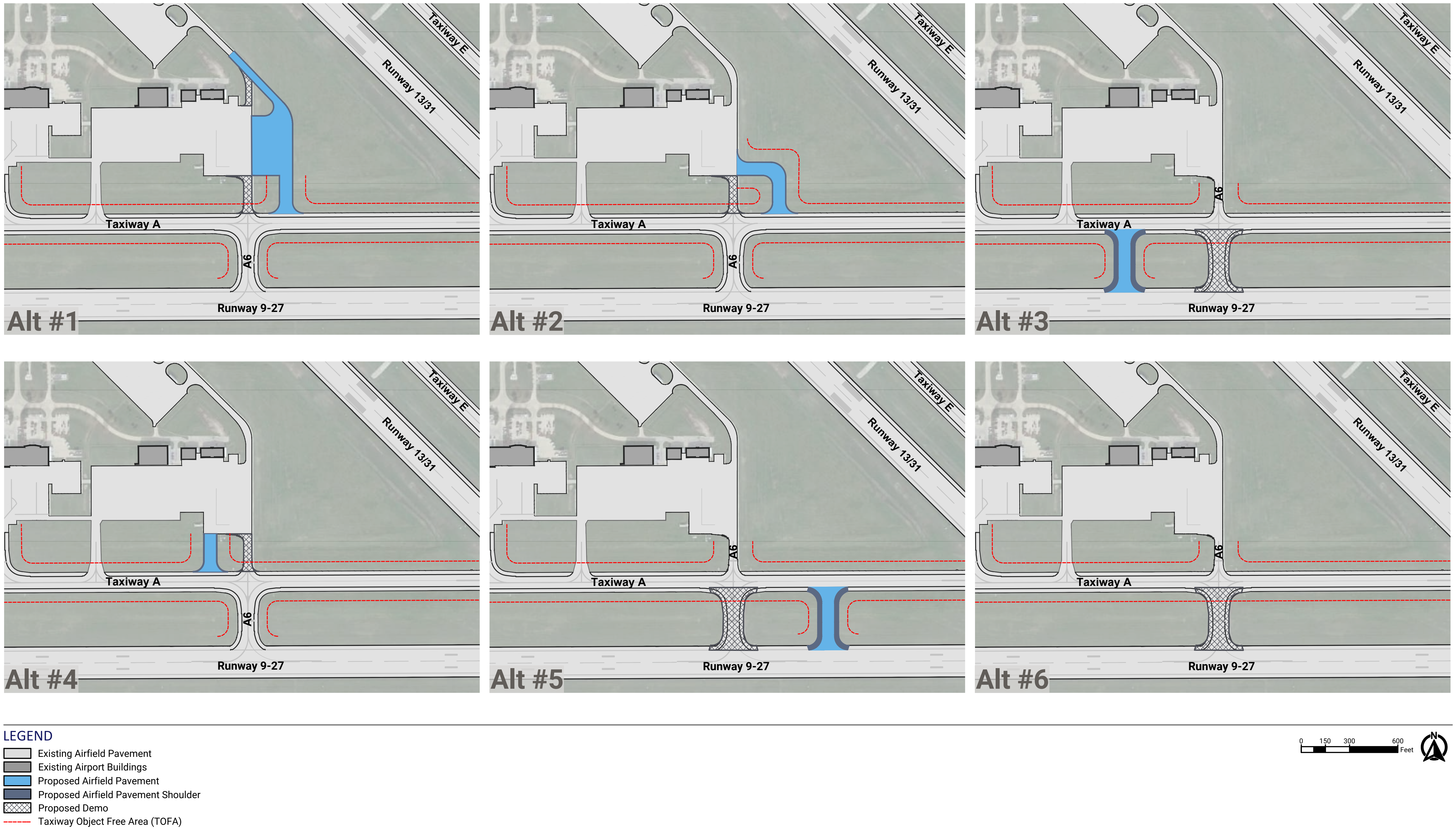
- **Connector Taxiway A6 Alternative 1** expands the GA apron east and relocates the taxiway to the eastern portion of the apron.
- **Connector Taxiway A6 Alternative 2** adds a taxiway leading from the GA apron and makes a 90-degree turn prior to connecting with Taxiway A.
- **Connector Taxiway A6 Alternative 3** relocates the portion of Taxiway A6 between the primary runway and Taxiway A westward.
- **Connector Taxiway A6 Alternative 4** relocates the portion of Taxiway A6 between Taxiway Alpha and the GA apron westward. Alternative 4 requires relocating the fuel farm in the southwest section of the apron.
- **Connector Taxiway A6 Alternative 5** relocates the portion of Taxiway A6 between the primary runway and parallel taxiway eastward.
- **Connector Taxiway A6 Alternative 6** removes the Taxiway A6 connector.

These alternatives were discussed during the work session and the following factors were considered in the evaluation:

- It is more expensive to replace connector Taxiway A6 than the taxilanes north of Taxiway A (taxilanes are narrower and contain less pavement to relocate)
- Aircraft movements in the various GA areas were a strong consideration in assessing flexibility and utility
- Alternative 4 has the added complexity of requiring relocation of a fuel farm
- Alternatives 1 and 2 provide additional opportunities and benefits, including the ability to increase aircraft flow from the new GA hangar area to the north and the airfield.
- Alternative 6 mitigates direct runway access, however, it requires significant additional taxiing of departing and landing GA aircraft. Some taxiing movements may entail crossing an active runway.

Alternative 1 is the preferred alternative for relocating the connector because it mitigates direct runway access through the use of taxilane standards (less costly) and sets up the GA area for greater movement capabilities to and from the airfield.

Figure 4.3: Connector Taxiway A6 Alternatives



Prepared by: Kimley-Horn, 2022.

4.3 SUPPORT FACILITIES

Alternatives were developed in consideration of the various support facilities at the Airport. The alternatives were evaluated for their effectiveness in accommodating aircraft demand anticipated throughout the planning period. Facilities considered include air cargo, GA, the airport traffic control tower, fuel farm, snow removal equipment, and ground run-up enclosures.

- AIR CARGO FACILITIES

The planning process for future air cargo facilities was approached from several perspectives. One perspective relates to satisfying the air cargo needs during the Master Plan's 20-year planning period—there are currently no facilities for new air cargo entrants at the Airport. Air Cargo Alternative 1 (see **Figure 4.4**) satisfies the requirements for the 20-year planning period by expanding the existing west cargo apron with a multi-tenant facility constructed on the north side of the apron and parking facilities accessible via Beech Way SW.

Another perspective on planning for air cargo facilities references a demand scenario beyond what is projected. In that scenario, a major cargo development would take place. Air Cargo Alternative 2 (see **Figure 4.5**) continues the expansion of the existing air cargo area beyond what is shown in Alternative 1, providing significant capacity for air cargo transfer facilities, including buildings, auto and truck parking, and aircraft parking apron.

The following factors were considered in evaluating the air cargo alternatives:

- Both alternatives represent logical expansion of the established air cargo area. Recent investments in apron and other infrastructure were made with the expectation that air cargo development would continue in a pattern focused on this area.
- Alternative 1 is a logical extension of the existing air cargo area and makes sense from a capacity and phasing perspective to meet the projected needs through the Master Plan's 20-year planning period.
- Alternative 2 is a logical location for a more expansive air cargo development if actual demand exceeds projections.
- Traffic patterns at the intersection of Wright Brothers Boulevard and Cherry Valley Road would need to be studied to accommodate landside cargo operations for Air Cargo Alternative 2.

It was concluded that Alternative 1 should be implemented throughout the planning period and Alternative 2 be considered if demand exceeds projections.

- GENERAL AVIATION

The alternatives analysis reviewed several areas to accommodate future aircraft storage hangars. As a first step, areas of the Airport were reviewed where GA facilities currently exist. Second, potential areas for new GA development were identified (see **Figure 4.6**).

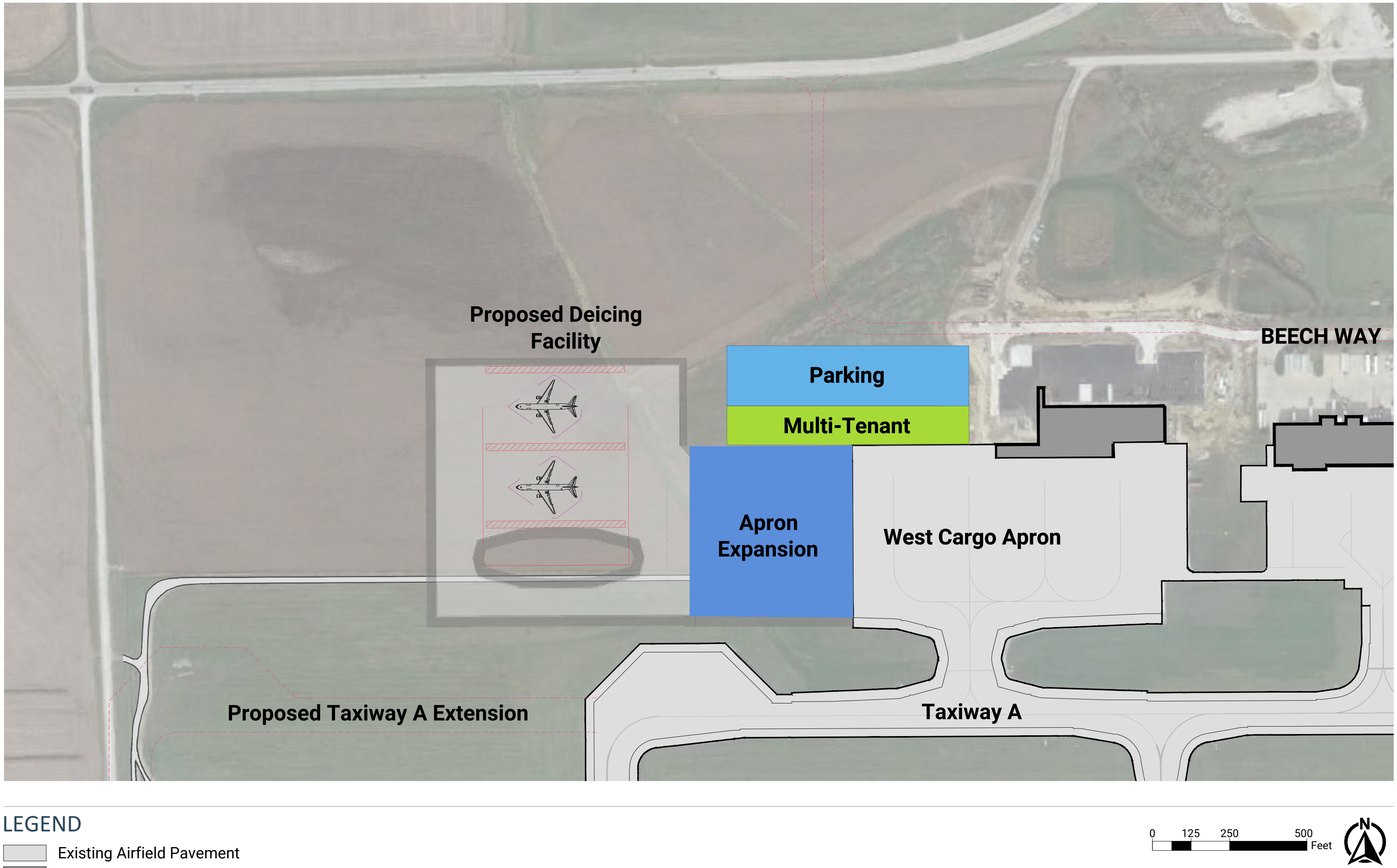
- **GA Alternative 1** identifies the undeveloped area north of the ARFF facility.
- **GA Alternative 2** makes use of land located west of the Runway 31 end.
- **GA Alternative 3** is an area of recent T-Hangar expansion north of the FBO apron.
- **GA Alternative 4** proposes building new hangars in the previous National Guard site in the southeast portion of the airfield.

The following factors were considered in evaluating GA alternatives:

- GA Alternative 1 is an area that offers flexibility if developed. It is also an area that the Airport wants to improve in the future.
- GA Alternative 2 is depicted on the current ALP and would require construction of a parallel taxiway to Runway 13/31.
- GA Alternative 3 is the location where replacement T-hangars were built in 2022. Further expansion in this area is limited but it could accommodate several more T-hangars.
- GA Alternative 4 is not an ideal location for GA hangars for several reasons: 1) The site itself is limited and would allow construction of a few hangars only; 2) The site has limits due to Part 77 surfaces that cannot be penetrated.
- GA Alternative 2 and 4 are not as centrally located in regard to efficient runway access, making them less ideal from an operational standpoint.

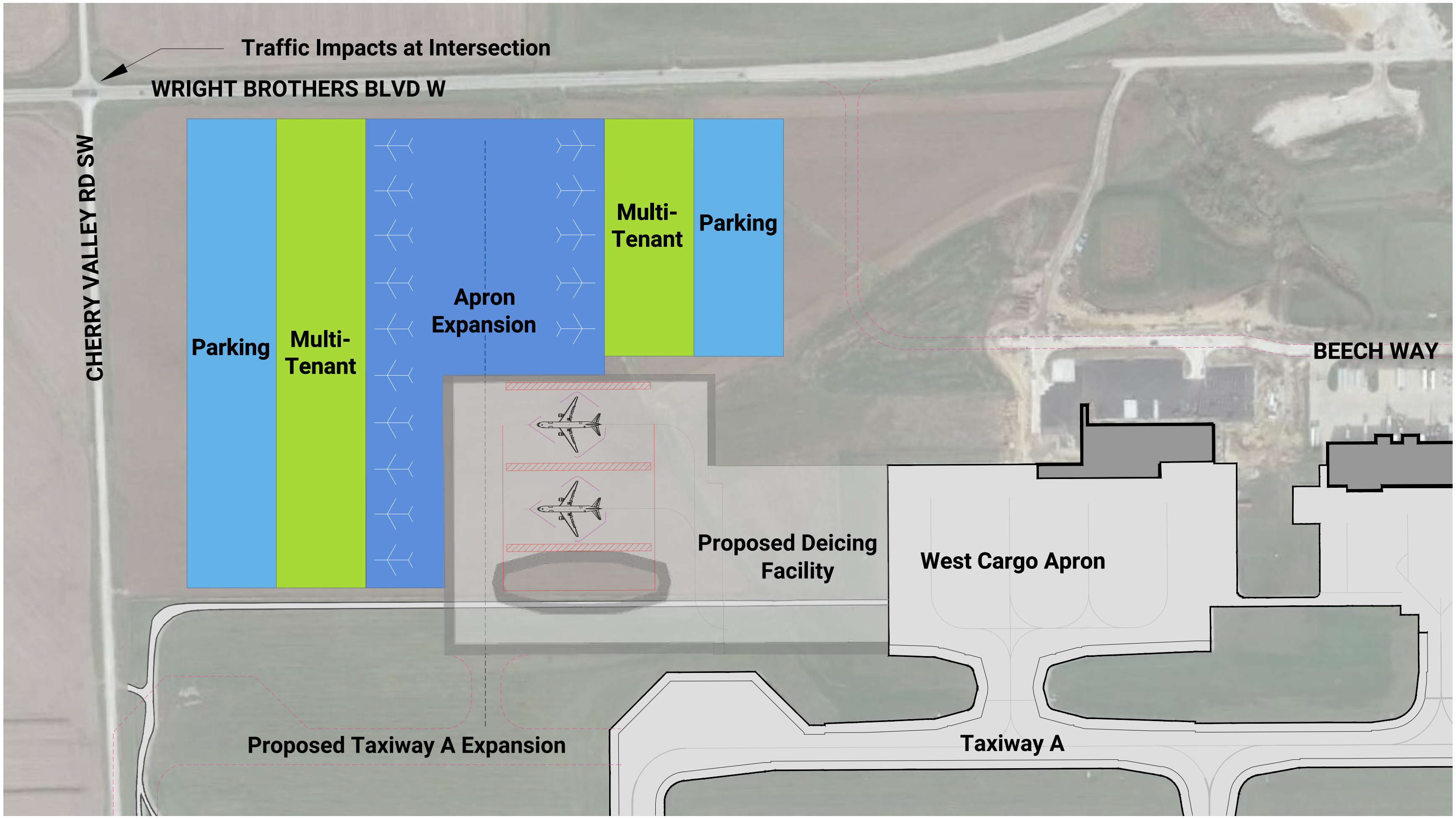
It was concluded in the evaluation that multiple GA expansion areas would continue to be considered for future projects. However, GA Alternative 1 is expected to be a strong area of focus given its central location. GA Alternative 4 will likely not be preserved for future GA use.

Figure 4.4: Air Cargo Alternative 1



Prepared by: Kimley-Horn, 2022.

Figure 4.5: Air Cargo Alternative 2

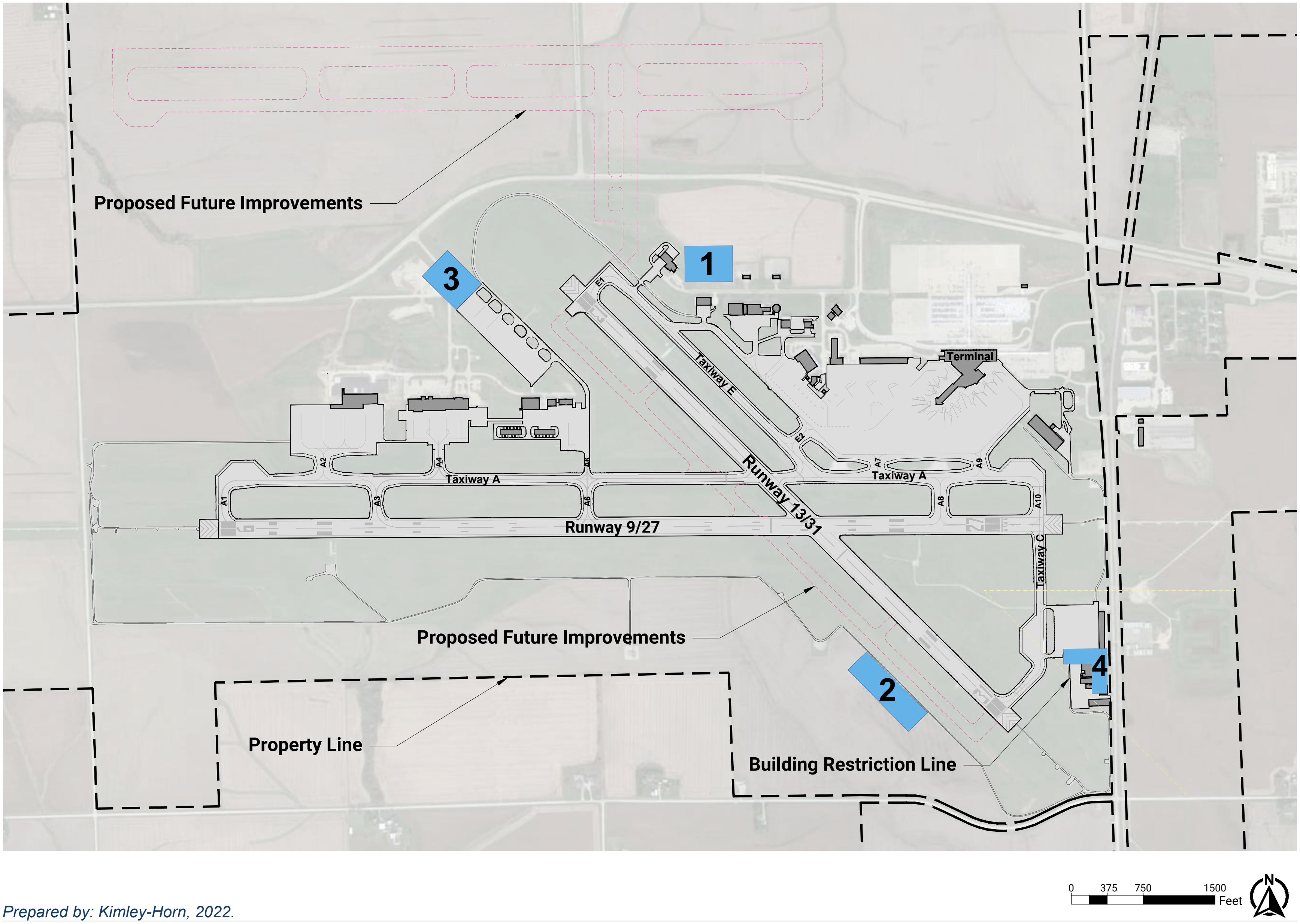


LEGEND

- Existing Airfield Pavement
- Existing Airport Buildings
- Proposed Expanded Apron
- Proposed Building
- Proposed Parking
- Proposed Airfield Pavement

Prepared by: Kimley-Horn, 2022.

Figure 4.6: Alternative General Aviation Expansion Areas



Prepared by: Kimley-Horn, 2022.

- AIRPORT TRAFFIC CONTROL TOWER (ATCT)

The existing ATCT is located west of the terminal building and currently does not have any line of sight (LOS) issues based on existing development. A preliminary LOS analysis for the proposed future Runway 9 end resulted in no LOS issues. Should a 9L/27R parallel runway be constructed beyond the 20-year planning horizon, it will be necessary to research maximum building heights between the two parallel runways. **Figure 4.7** shows the approximate potential development area that will need to be analyzed to avoid LOS issues.

- CENTRALIZED DEICING FACILITY

Three alternatives were considered for a new deicing facility at CID. Each of them is laid out to accommodate multiple commercial aircraft, including the Airport's design aircraft, the Boeing 767.

Centralized Deicing Alternative 1

Centralized Deicing Alternative 1 is located in proximity to the passenger terminal and is sized to accommodate up to three ADG III aircraft, or one ADG III aircraft and one ADG IV aircraft (see **Figure 4.8**). From an operational perspective, this location is ideal as aircraft can deice shortly after pushing back from the gate. These spaces would serve as remain overnight (RON) parking stalls when not in use for deicing.

Centralized Deicing Alternate 2

Centralized Deicing Alternate 2 is located near the west end of primary Runway 9/27, west of the UPS cargo facility (see **Figure 4.9**). The deicing pads can accommodate up to three ADG III aircraft or two ADG III and one ADG IV aircraft. These deicing pads would primarily be used by cargo aircraft. Commercial passenger aircraft departing on Runway 9 may also utilize this deicing area if the glycol time limit has been exceeded from initial deicing in the terminal area.

Centralized Deicing Alternative 3

Centralized Deicing Alternative 3 is also located near the end of Runway 9 near the cargo area (see **Figure 4.10**). It is similar to Centralized Deicing Alternative 2 but has a more compact layout that can accommodate two simultaneous ADG IV aircraft.

In evaluating the deicing facility alternatives, the following factors were considered:

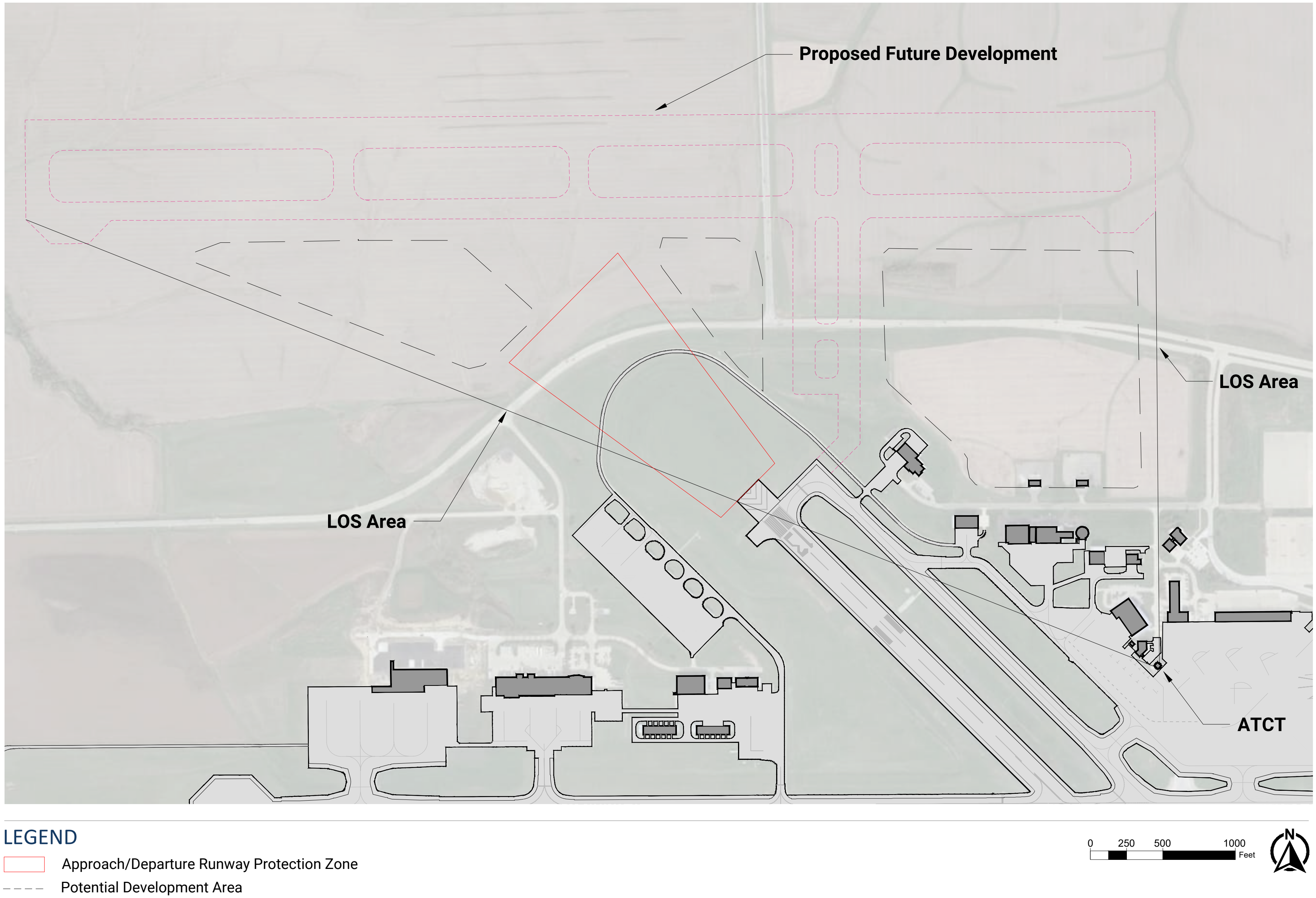
- Having a centralized deicing facility is highly desirable for the Airport as it would allow for more efficient deicing of the aircraft in an organized manner and reduce the hazardous condition of surface contamination within the gate area where operations personnel work. Additionally, it would reduce the area in which glycol and snow mix down to a smaller number of acres, resulting in significant reductions in glycol-contaminated runoff.
- Having five available deicing pads would support peak operations during heavy morning traffic.
- Deicing bulk storage facilities and refilling stations would need to be close to the deicing pads. This favors Centralized Deicing Alternative 1, which has an area ready to accommodate that function (adjacent to the current fuel farm).

The preferred alternative is the construction of both Alternatives 1 *and* 3 deicing facilities as they will support traffic flow on both sides of the airfield and include positions for two ADG IV aircraft on the west side of the airfield.

- FUEL FARM

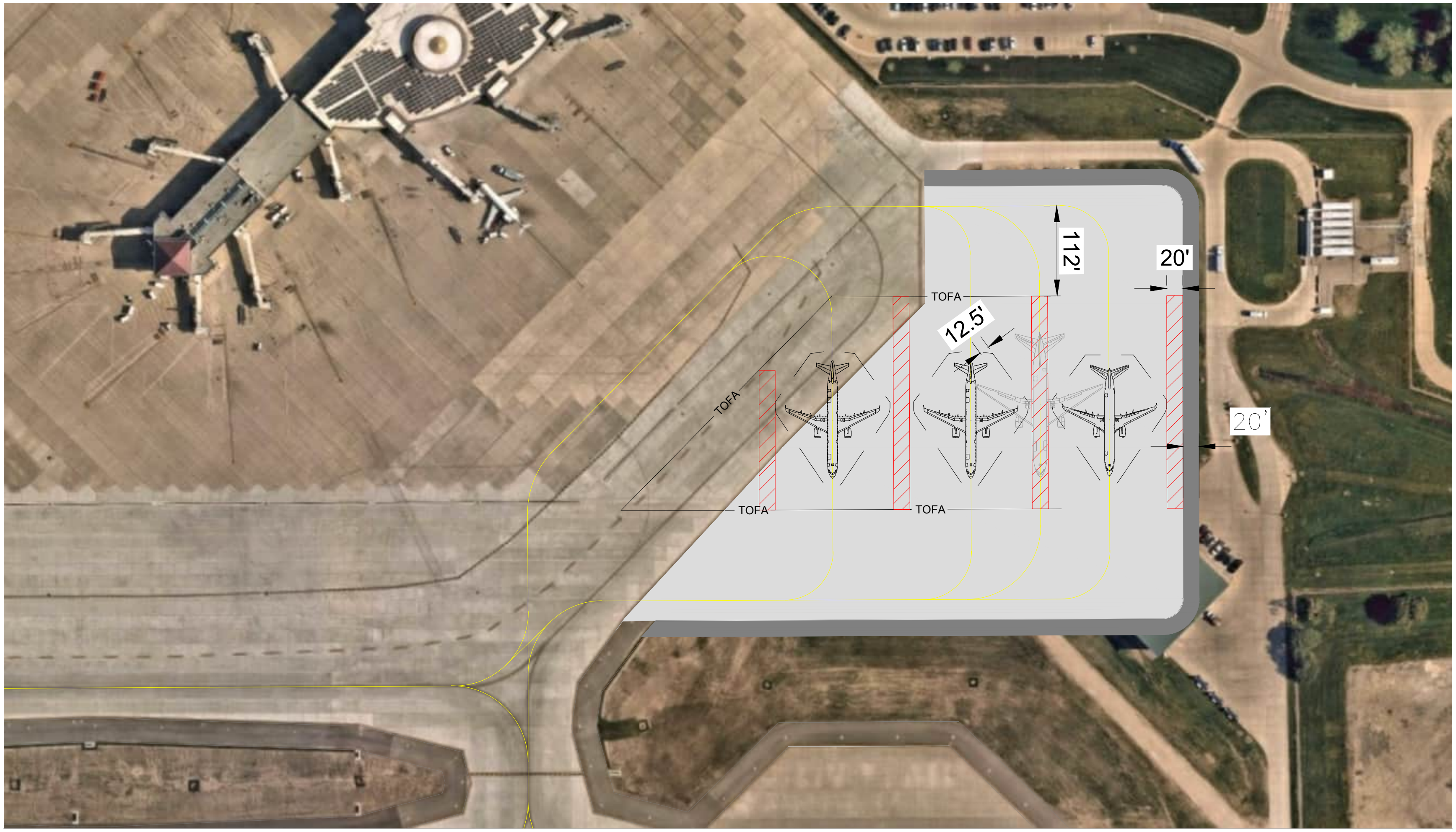
As discussed in *Chapter 1 – Existing Conditions*, a new fuel farm has been designed to replace the existing east fuel farm. This new facility includes eight tanks with a total capacity of 300,000 gallons of Jet A fuel. **Figure 4.11** presents the planned fuel farm layout with landside access from 18th Street SW and airside access from the east portion of the airfield.

Figure 4.7: ATCT Line of Sight Area to Proposed North Parallel Runway



Prepared by: Kimley-Horn, 2022.

Figure 4.8: Centralized Deicing Alternative 1 - East



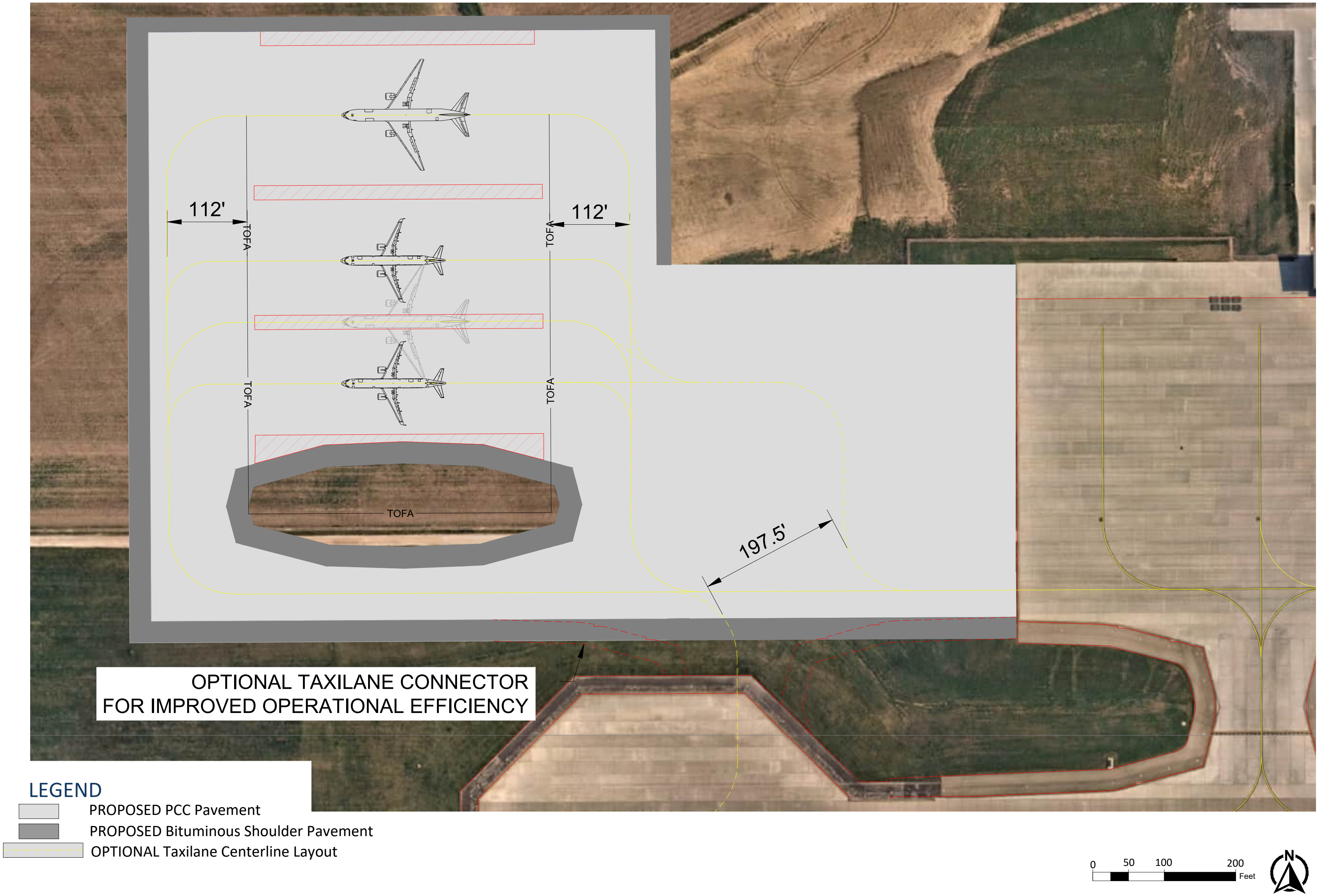
LEGEND

PROPOSED PCC Pavement

PROPOSED Bituminous Shoulder Pavement

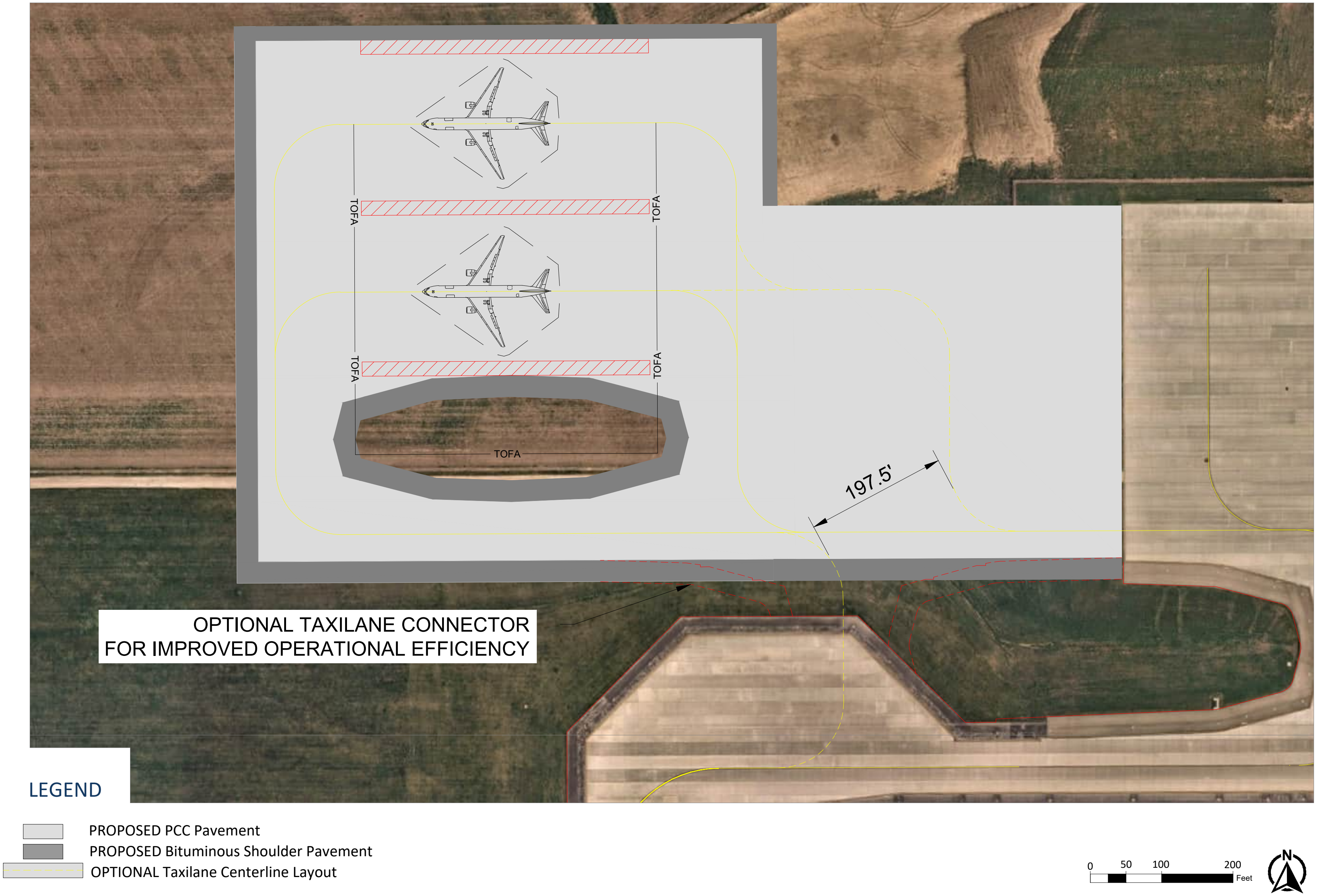
Prepared by: FOTH, 2022; Kimley-Horn, 2022.

Figure 4.9: Centralized Deicing Alternative 2 - West



Prepared by: Kimley-Horn, 2022.

Figure 4.10: Centralized Deicing Alternative 3 - West



Prepared by: Kimley-Horn, 2022.

Figure 4.11: Fuel Farm Location

LEGEND

- Existing Airfield Pavement
- Existing Airport Buildings
- Roadway Access
- Fueling Area
- Fuel Tanks
- Property Line

Prepared by: Kimley-Horn, 2022.

- SNOW REMOVAL EQUIPMENT (SRE)/MAINTENANCE FACILITY

The current SRE/maintenance building is located adjacent to the main terminal apron expansion area, in the area the new deicing pads would be constructed. A facility at least equal in size was considered for construction in four alternative areas (see **Figure 4.12**). Area 1 identifies the undeveloped area north of the ARFF facility. Area 2 is within the old National Guard site and the limits of the building restriction line (BRL). Area 3 is east of the old National Guard site, across 18th Street SW and the railroad. Area 4 is located north of the FedEx and UPS cargo facilities.

Area 1 was selected as the preferred area due to convenient access to the airfield and support facilities.

- GROUND RUN-UP ENCLOSURES

Airport leadership has indicated a desire to recruit a maintenance, repair, and overhaul operation (MRO) at CID. An MRO would likely conduct high-power, long-duration aircraft engine tests. It is common in these situations to install a ground run-up enclosure—an open-top facility with three sides designed to accommodate high-power engine run-up testing—to limit noise emissions. **Figure 4.13** shows examples of two different types of ground run-up enclosures: a 20-foot tall, curved jet blast deflector that shields the operations building from noise produced during full-power engine testing; and a 21-foot U-Series deflector which is commonly used by MROs and aircraft manufacturers for engine testing. The type of ground run-up enclosure that is built to support an MRO at CID will be highly dependent upon the type of aircraft maintenance being conducted.

The following should be considered in determining the size and location of a ground run-up enclosure:

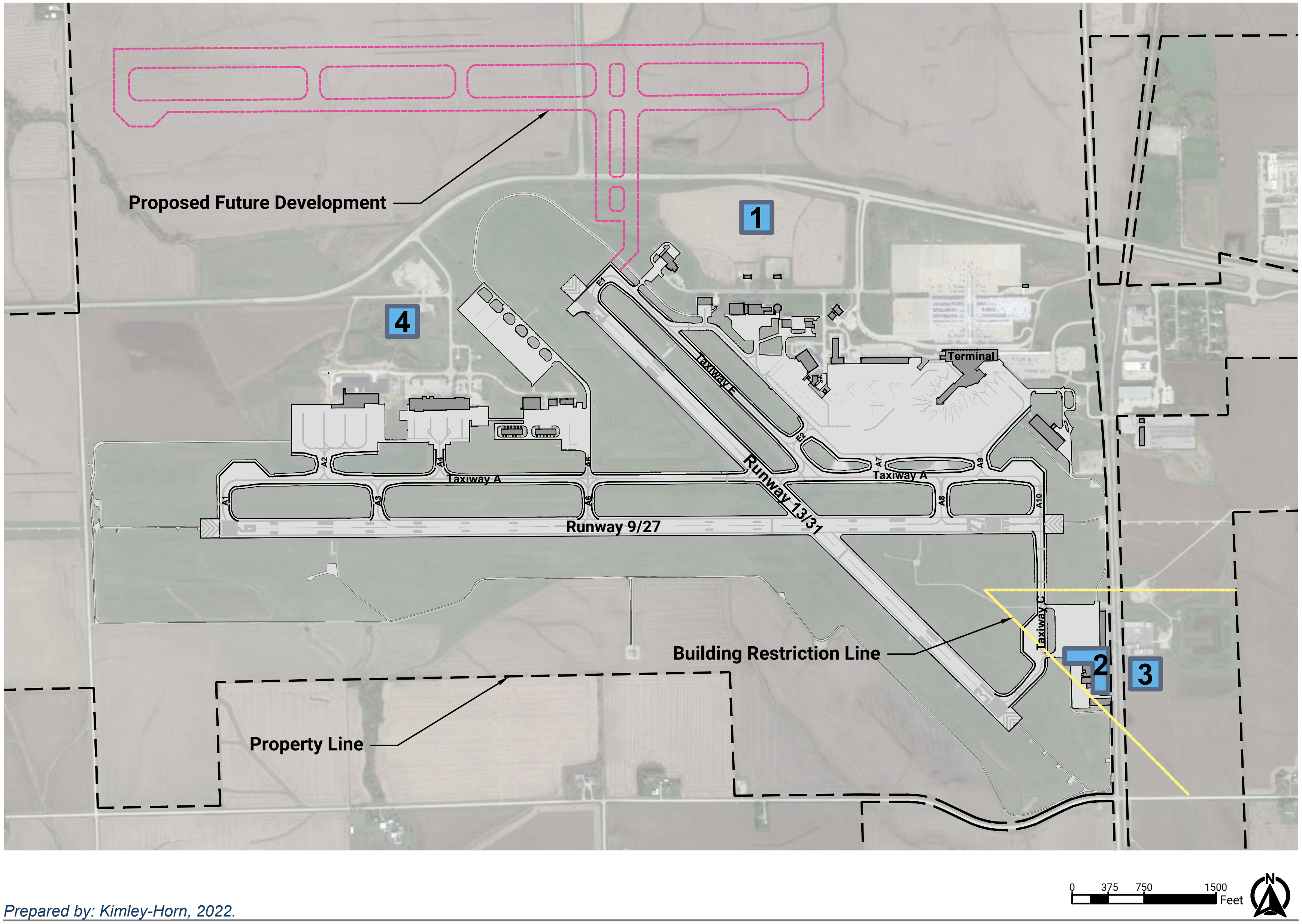
- MROs prefer ground run-up enclosures be located near their maintenance hangars.
- The location of sensitive land uses around the Airport should be considered when citing and orientating the ground run-up enclosure.
- Different aircraft will have different needs that could affect the sizing and complexity of the ground run-up enclosure.

- RUNWAY END 27 DISPLACED THRESHOLD

The Airport Master Record from December, 2022 identifies a 425-foot displaced threshold on the Runway 27 End. The controlling object listed is the railroad, located approximately 740 feet east of the runway end. 14 CFR Part 77 notes that obstacle heights from a railroad traverse way are increased by 23 feet to account for mobile rails. This requirement causes the railroad traverseway to penetrate the Part 77 approach surface by 14 feet. This penetration is also identified in the approved 2014 Airport Layout Plan.

Additionally, the sequenced flashing lights associated with the MASLRs do not have the required 2,400-foot separation distance from the runway end. To resolve this issue, the property east of the MALSR lighting system would have to be acquired to accommodate the additional 425 feet needed to shift the lighting system east. As relocating a railroad is too feasibly burdensome, no alternatives are recommended to eliminate the displaced threshold.

Figure 4.12: SRE/Maintenance Building Alternatives



Prepared by: Kimley-Horn, 2022.

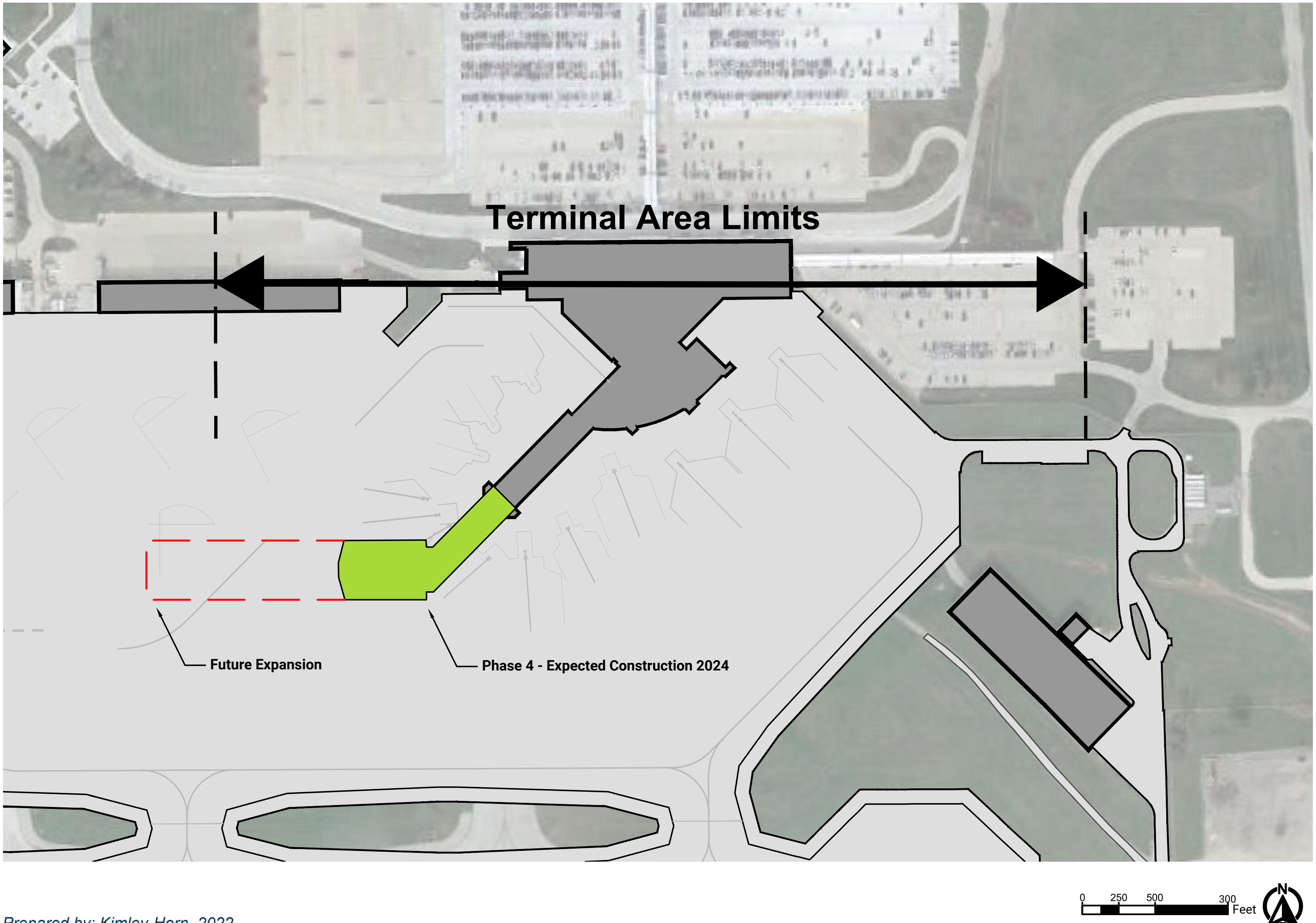
Figure 4.13: Ground Run-Up Enclosures

Source: BDI (https://www.blastdeflectors.com)

4.4 PASSENGER TERMINAL

The Airport's passenger terminal has undergone major functional expansion and modernization over the past decade. As outlined in the *CID Terminal Modernization Program Phase IV*, the final phase of the program, Phase IV, is scheduled to be completed around 2024. Phase IV will add two additional gates, administration space, support space, and room for future expansion should demand increase beyond the forecast. Additional expansion area is shown in **Figure 4.14**. It is also recommended to preserve the area surrounding the terminal building—to the east and west—for long-term terminal expansion.

Figure 4.14: Terminal Area Limits



Prepared by: Kimley-Horn, 2022.

4.5 LANDSIDE ACCESS AND PARKING FACILITIES

Landside facility alternatives are intended to address the deficiencies identified in *Chapter 3 – Facility Requirements*. Landside alternatives were evaluated based on five primary criteria:

- **Meet Demand –** Each alternative was evaluated on its ability to meet the projected facility requirements for the 20-year planning horizon. Meeting the customer demand for landside facilities is critical for minimizing congestion and providing a good experience for the customers and operators. Unless otherwise noted, all alternatives presented meet the projected requirements.

- **Customer Experience –** The landside customer experience is most closely related to the comfortable, safe, and convenient flow of passengers. For many landside facilities, the access and proximity to the terminal strongly impacts the user's satisfaction. The landside facilities should also provide American with Disabilities Act (ADA) accommodations to ensure a positive experience for passengers of all abilities.

- **Flexibility –** The preferred solution for landside facilities will necessitate the ability for phased construction to maintain operations during construction. The alternatives should not preclude future development or different user group functions so the facilities can easily adapt to changing market conditions.

- **Cost and Revenue Potential –** Landside facilities provide the Airport with significant revenue potential. The preferred alternatives should ensure the financial health and viability of the Airport.

- **Regional Access –** The Airport is an essential economic engine for the region and strives to serve the local community, visitors, businesses, and governmental units, among others. The preferred landside alternative should accommodate multiple modes of transportation to improve the Airport's access for passengers from around the region.

- TERMINAL CURBSIDE/COMMERCIAL GROUND TRANSPORTATION

The terminal and ground transportation curbside concepts are presented as cohesive alternatives due to their proximity and resulting impact on one another. The Arrivals curbside is projected to be inadequate for 2041 traffic volumes. The Departures curbside and the ground transportation curbside are adequately sized for the 2041 traffic volumes. The ground transportation alternatives are illustrated in **Figure 4.15.**

Terminal Curbside and Ground Transportation Alternative 1 – Arrivals and Ground Transportation East Extension

Alternative 1 extends the Arrivals curb to the east. The ground transportation curbside shifts to the east to accommodate the Arrivals curbside extension. Operationally, this alternative is very similar to the existing condition, with the exception that the taxis are proposed to move to the northside of the covered walkway with the other ground transportation operators. The ground transportation curbside would connect back to the outbound roadway. Further extension of the Arrivals curbside would be difficult due to the roadway geometry. A derivative alternative could continue to the east, connecting back to 18th Street rather than the outbound roadway.

Terminal Curbside and Ground Transportation Alternative 2 – Departures West Extension

Alternative 2 extends the Departures curb to the west to allow the Arrivals curb to occupy part of the existing Departures curb area. The advantage of Alternative 2 is that the ground transportation curbside can remain in its existing location. Though this alternative increases the total curbside length, the effective Arrivals curbside length is not improved. This is due to the additional curbside located such that it will be difficult to draw vehicles to use the curb.

Terminal Curbside and Ground Transportation Alternative 3 – Ground Transportation Loop

Similar to Alternative 1, Alternative 3 extends the Arrivals curb to the east. All ground transportation functions move to a commercial vehicle loop, located to the south of the existing covered walkway. A benefit of this alternative is that most of the commercial vehicle traffic is separated from the private vehicles. This would resolve the existing issue of private vehicles using the ground transportation curb space. However, due to turn radii constraints, large transit and charter buses would need to remain on the main terminal curbside.

Terminal Curbside and Ground Transportation Alternative 4 – Terminal Front Ground Transportation Curb

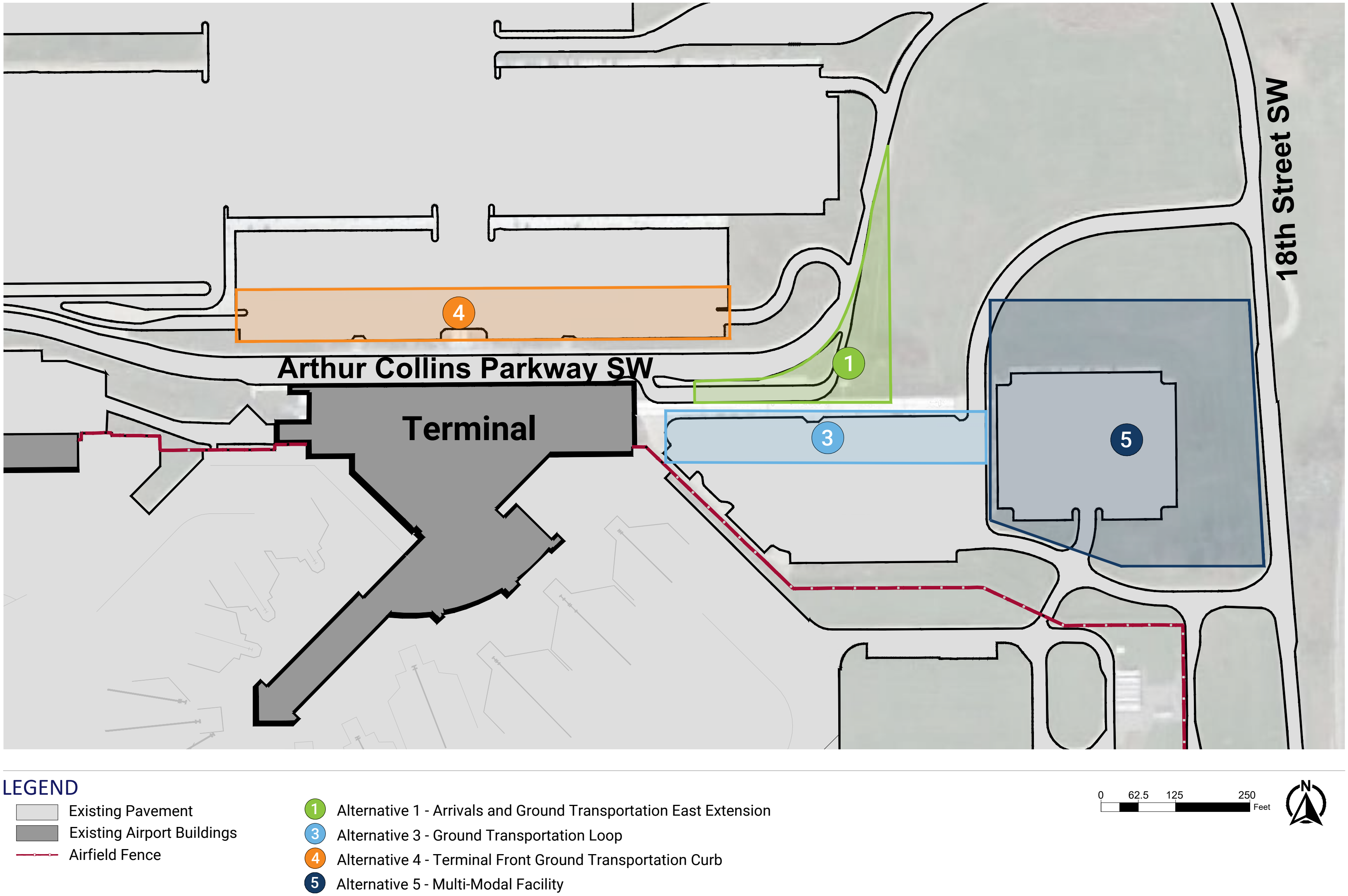
Alternative 4 proposed a commercial curb along the south side of the existing Short-Term parking lot. This provides a similar benefit to Alternative 3 by separating private and commercial vehicle traffic. A challenge with this alternative is that public parking stalls are lost, and the frequency of pedestrian/vehicle conflicts increases.

Terminal Curbside and Ground Transportation Alternative 5 – Multi-Modal Facility

Alternative 5 proposes an east extension of the Arrivals curb with a relocation of the outbound roadway. This allows the Airport to maximize the amount of curbside available parallel to the terminal face. Commercial vehicles are consolidated at a Multi-Modal Facility, located to the east of the existing Rental Car Ready/Return. Locating the Multi-Modal Facility near the railroad provides a potential future train station connection. Commercial vehicle traffic would be separated from private vehicle pickups and bus activity would be completely removed from the front terminal curb. This alternative significantly increases the walking distance for Multi-Modal Facility users, so a covered walkway to the terminal would be recommended to maintain a high level of customer service. Alternative 5 limits the compatible alternatives for parking and rental car facilities due to the location and larger footprint.

Alternative 5 was selected as the preferred curbside and ground transportation concept because it provides additional private vehicle curbside length, while preserving flexibility for the evolving needs of other modes, such as ride share vehicles, shuttles, and a possible future rail connection.

Figure 4.15: Commercial Ground Transportation Alternatives



Prepared by: Kimley-Horn, 2022.

- PARKING FACILITIES

Public Parking

Airport activity growth is projected to result in public parking deficiencies by 2031. Through 2041, a demand for an additional 1,270 public parking spaces is projected. Historical utilization of the Short- and Long-Term Lots suggest that the lower turnover rate in the Long-Term Lot, a consequence of longer average length of stays, results in a higher average occupancy. The existing public parking area is constrained by the roadway network so the available land to develop additional parking near the terminal is limited. The public parking alternatives are illustrated in **Figure 4.16.**

Public Parking Alternative 1 – Structured Parking

Public Parking Alternative 1 accommodates the projected demand by the construction of a new parking structure located directly in front of the terminal building within the existing parking lot footprint. The structure is proposed as three supported levels of parking. The structure would occupy the existing Short-Term Lot footprint, which would temporarily need to be closed during construction. Pedestrian access to the terminal could be provided with the existing tunnel access or through a new elevated skyway connection.

Public Parking Alternative 1 enhances the customer experience by providing more parking in close proximity to the terminal, in addition to providing covered parking. Higher parking rates could be charged for the enhanced amenity, increasing the Airport's parking revenue. The new parking garage would be able to utilize the existing entry and exit plazas, reducing overall parking access and revenue control (PARCS) infrastructure and maintenance costs. Expanding vertically on land already allocated to parking also makes the most of limited space and does not encroach on other potential land uses at the Airport.

A challenge of Public Parking Alternative 1 is that a three structured level garage would likely obstruct the view of the terminal from Wright Brothers Boulevard. Given the recent investment in the aesthetic modernization of the terminal, obstructing its view may be a consideration. Structured parking also requires the largest capital investment, estimated at $45,000 per stall in 2022 dollars.

Public Parking Alternative 2 – Additional Surface Lots

Public Parking Alternative 2 involves the at-grade expansion of the existing surface parking area. The expansion of the lots would include an eastward development of both Short- and Long-Term parking. Expanding the surface lots would require the relocation of the exit plaza to the western side of the lot. Relocating the exit plaza would result in the better utilization of the Admiral Boland Way exit, while reducing traffic volumes along 18th Street. The outbound terminal roadway would also need to be relocated and shifted towards the south to accommodate the parking expansion. The redundant vehicular access points to parking from either side of the terminal would be eliminated.

As a surface lot, Public Parking Alternative 2 would come at a much lower development cost than a structured option and as such, is easier to redevelop or relocate in the future. However, if growth exceeds the projections, additional parking will be very difficult to accommodate within the terminal area footprint without expanding vertically. Alternative 2 also displaces an existing detention pond on the northeast side of the existing lot footprint, which would have to be mitigated elsewhere.

A surface lot expansion will increase the average walking distance for parking patrons, which is not favorable from a customer service perspective. Industry standards suggest a walking distance of 1,050 feet through a surface lot provides a level of service "C". The proposed extension would increase walking distances to a maximum of approximately 2,000 feet. Alternative 2 also limits the development possible on the east side of the terminal for other landside functions and eliminates the option of maintaining the existing outbound roadway alignment.

Public Parking Alternative 3 – Remote Surface Lot

Public Parking Alternative 3 provides a new remote surface lot on Airport property, directly north of Wright Brothers Boulevard. Alternative 3 provides the Airport an opportunity to provide an economy parking product to cater towards cost-conscious travelers. The site for Public Parking Alternative 3 allows for easy further expansion of the lot to the north or west to accommodate a high growth scenario. The remote lot is currently greenfield so the impacts to existing operations during construction would be negligible.

The challenge with Public Parking Alternative 3 is the limited revenue generating potential of a remote surface lot. Parking is an important source of non-aeronautical revenue for the Airport. To encourage customers to park in remote surface lots, these lots are priced lower than lots within walking distance of the terminal. The cost of shuttling (vehicles, labor, fuel, vehicle maintenance, etc.) is a continuous expense over the life of the remote lot operation. In many cases the cost of operating the shuttle exceeds the revenue generated by the lot, particularly when a remote lot is a significant distance from the passenger terminal.

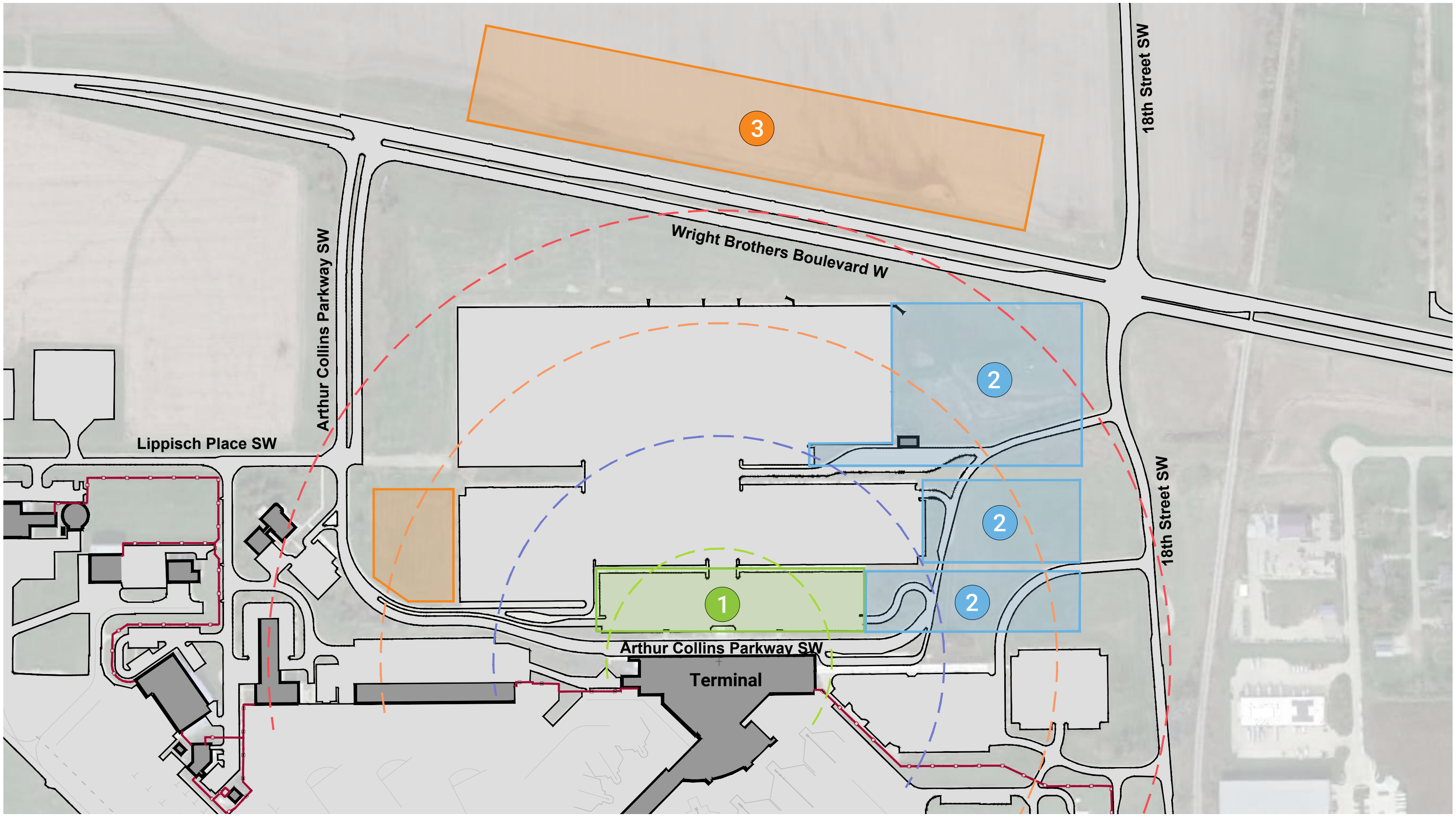
Other Public Parking Alternatives

Additional alternatives were explored but are not presented in detail as part of this chapter. Refer to **Appendix G** for figures illustrating the following alternatives:

- **Two Structured Level Garage** – This alternative proposed a new two supported level parking structure in front of the terminal. The footprint would extend across the existing Short-Term Lot and part of the Long-Term Lot. Public Parking Alternative 1 was deemed a preferred structured options due to the efficiencies of occupying only the existing Short-Term Lot.
- **Additional Surface Parking to the West –** This alternative extends the existing surface parking footprint primarily to the west. The expansion would consist of three distinct, unconnected expansions to the Long-Term Lot. Compared to Public Parking Alternative 2 presented above, this alternative would result in greater walking distances, further impacting the customer experience.
- **Lippisch Place SW Remote Parking –** This alternative involves the construction of a new remote surface lot located northwest of the Lippisch Place and Arthur Collins Parkway intersection. This site was also explored as a site for future GA development. As such, this alternative would limit potential airside development and remote parking would not be the highest and best use of the space.

The recommended parking developments are based on Alternative 2, with various modification to improve vehicular circulation and access/egress. Refer to *Chapter 5 – Recommended Development Plan and Financial Feasibility Analysis* for more details.

Figure 4.16: Public Parking Alternatives



LEGEND

- Existing Pavement
- Existing Airport Buildings
- Airfield Fence
- 1 Alternative 1 - Structured Parking
- 2 Alternative 2 - Additional Surface Lots
- 3 Alternative 3 - Remote Parking Lot
- Walking Level of Service A: 350'
- Walking Level of Service B: 700'
- Walking Level of Service C: 1050'
- Walking Level of Service D: 1400'

Prepared by: Kimley-Horn, 2022.

Employee Parking

The existing Employee Lot is adequate through the planning horizon. Employee Lot alternatives are presented in response to the potential relocation of the lot due to the rental car and ground transportation alternatives presented in the following sections. The employee parking alternatives are illustrated in **Figure 4.17**.

Employee Parking Alternative 1 – East Shift

Employee Parking Alternative 1 explores the option of shifting the existing lot to the east. This relocation would be in response to QTA Alternative 2. The existing lot size could be maintained but access to the lot may need to be reevaluated.

Employee Parking Alternative 2 – North Shift

Employee Parking Alternative 2 explores the option of shifting the existing lot to the north. This relocation would be in response to Rental Car Ready/Return Alternative 3. The existing lot size could be maintained but access to the lot may need to be reevaluated.

Employee Parking Alternative 3 – West Long-Term Lot

Employee Parking Alternative 3 proposed a surface Employee Lot located to the west of the Long-Term Lot and south of Lippisch Place. Employee Parking Alternative 3 responds to Ground Transportation Alternative 5. The Employee Lot would have a separate access point from public parking. A challenge with this alternative is that the walking distance for employees would increase from the existing condition. The addition of a covered walkway to the terminal would be recommended.

Employee Parking – Other Alternatives

Additional alternatives were explored but are not presented in detail as part of this chapter. Refer to **Appendix G** for figures illustrating the following alternatives:

- **West Terminal Lot –** This alternative proposed using the lot serving the former UPS building. This alternative was deemed infeasible because the space is needed for truck turning movements to access the Terminal loading dock and for snow storage in the winter.
- **Lippisch Place SW Lot –** This alternative involves the construction of a new surface lot located northwest of the Lippisch Place and Arthur Collins Parkway intersection. This site was also explored as a site for future GA development. As such, this alternative would limit potential airside development. Additionally, this location would result in a long walking distance for terminal employees.

Alternative 3 is the recommended alternative. The Employee Lot is proposed to be relocated west of the Long-Term Lot in response to the development of a multi-modal facility at the site of the existing employee lot.

Cell Phone Lot

While currently underutilized, the demand for the Cell Phone Lot is anticipated to increase as curbside capacity becomes more constrained. The Cell Phone Lot parking alternatives are illustrated in **Figure 4.18**.

Cell Phone Lot Alternative 1 – Existing Location Expansion

Cell Phone Lot Alternative 1 dedicates the whole existing Administration Building parking lot to the Cell Phone Lot. The existing location has direct access to the inbound roadway and customers are already aquatinted with the existing location. A challenge with this alternative is that a new parking lot would need to be constructed for the new tenants of the Administration Building. The lot's proximity to the terminal also opens the door to customers potentially using the Cell Phone Lot as a free Short-Term parking product. If this becomes a common issue, the Cell Phone Lot should be enforced to minimize lost parking revenue.

Cell Phone Lot Alternative 2 – Wright Brothers Blvd Lot

This alternative proposes a new cell phone lot on the north side of Wright Brothers Boulevard. This location would allow for easy expansion in the future, as needed. However, Airport stakeholders have indicated a preference for not locating a cell phone lot at such a distant location.

Cell Phone Lot Alternative 3 – Lippisch Place SW Lot

This alternative involves constructing a cell phone lot on the northwest corner of the Lippisch Place and Arthur Collins Parkway intersection. This site was also explored as a site for future GA development. As such, this alternative would limit potential airside development.

To preserve unused landside areas for potential future airside developments, the Cell Phone Lot is recommended to remain in its existing location. The move of the Administration Building allows the Cell Phone Lot to increase its capacity without any additional infrastructure.

Figure 4.17: Employee Parking Alternatives

LEGEND

- Existing Pavement
- Existing Airport Buildings
- Airfield Fence
- 1 Alternative 1 - East Shift
- 2 Alternative 1 - North Shift
- 3 Alternative 3 - West Long-Term Lot
- Walking Level of Service A: 350'
- Walking Level of Service B: 700'
- Walking Level of Service C: 1050'
- Walking Level of Service D: 1400'

0 125 250 500 Feet

N

Prepared by: Kimley-Horn, 2022.

Figure 4.18: Cell Phone Lot Alternatives

LEGEND

- Existing Pavement
- Existing Airport Buildings
- Airfield Fence
- 1 Alternative 1 - Existing Location Expansion
- 2 Alternative 2 - Wright Brothers Blvd Lot
- 3 Alternative 3 - Lippisch Place SW Lot

Prepared by: Kimley-Horn, 2022.

- RENTAL CAR FACILITIES

Ready and Return Lot

The Ready/Return Lot is currently located in an ideal location for arriving customers and provides convenient access to the QTA for vehicle shuttlers. A deficit of approximately 70 stalls is anticipated in 2041. Improvements to the Ready/Return will have impacts on the existing Employee Lot and GT area. The Rental Car Ready/Return Lot alternatives are illustrated in **Figure 4.19**.

Ready/Return Lot Alternative 1 – Operational Changes

Rental/Ready Lot Alternative 1 proposed no action to increase the size of the Ready/Return. Despite an anticipated deficit by 2041, this alternative relies on minor operational changes where the QTA also serves as storage space for vehicles. The existing QTA has stacking space, but it is underutilized due to the existing Ready/Return being large enough to provide the majority of rental car vehicle storage needed during peak operations.

Ready/Return Lot Alternative 2 – East Expansion

Rental/Ready Lot Alternative 2 involves the expansion of the existing Ready/Return to the east to meet the projected future demand. Alternative 2 would require the relocation of the Employee Lot as an enabling project. Rental/Ready Lot Alternative 2 limits the ability for ground transportation to be located east or south of the existing location.

Ready/Return Lot Alternative 3 – South Expansion

Rental/Ready Lot Alternative 3 involves the expansion of the existing Ready/Return to the east and a shift to the south. Alternative 3 accommodates Terminal Curbside and GT Alternative 3 but results in longer walking distances for rental car customers. Access to the Ready/Return would need to be reevaluated. Like Rental/Ready Lot Alternative 2, relocation of the Employee Lot is an enabling project for this alternative.

Ready/Return Lot – Other Alternatives

Additional alternatives were explored but are not presented in detail as part of this chapter. Refer to **Appendix G** for figures illustrating the following alternatives:

- **East Short-Term Lot –** This alternative proposes relocating the Ready/Return to the east part of the Short-Term Lot. Access could be provided via the secondary Short-Term Lot parking entry. This alternative is not preferred due to the impact to the public parking supply and provides no distinct advantages over the existing Ready/Return location.
- **Parking Structure Ground Level –** This alternative proposed relocating the Ready/Return to the Ground Level of a proposed public parking garage. Like the East Short-Term Lot alternative, this alternative is not preferred due to the impact to the public parking supply and provides no distinct advantages over the existing Ready/Return location.

Given the convenient location and sufficient space of the existing Ready/Return area, it is recommended the Ready/Return remain in its existing location. The rental car agencies may need to make minor operational changes to their vehicle storage practices as demand grows.

Quick Turnaround (QTA) Facility

The Rental Car QTA has a deficiency of fueling positions and car wash bays, which will continue to grow throughout the planning horizon. The Rental Car QTA alternatives are illustrated in **Figure 4.20**.

QTA Alternative 1 – Existing Footprint Reconfiguration

QTA Alternative 1 involves relocating the fueling positions and car wash bays to the east side of the existing QTA site. Maintenance bays and the rental car administration space would remain in the existing location. Phasing can allow the existing facilities to remain functional during construction of the new facilities. Locating the facilities further to the east also allows the agencies more operational flexibility and effective stacking space. Alternative 1 does not impact the wetland area in the southwest corner of the site.

QTA Alternative 2 – Consolidated Rental Car Center

QTA Alternative 2 involves placement of the QTA facilities to the south of the existing outbound terminal roadway. This alternative consolidates rental car operations, which is operationally efficient for rental car operators and provides a high level of customer service to rental car customers. QTA Alternative 2 requires thoughtful consideration to dedicating land near the terminal for non-customer facing rental car functions.

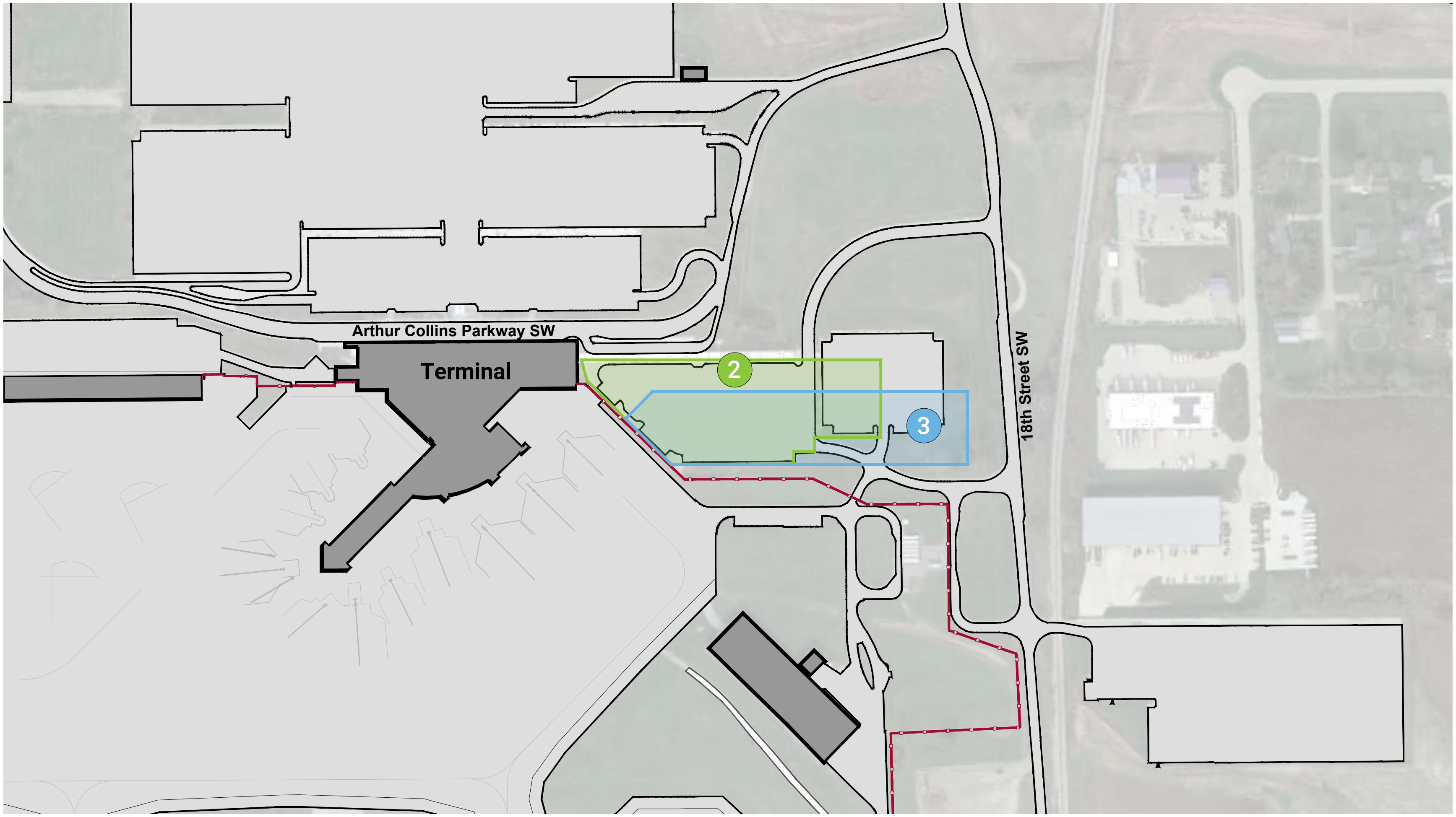
QTA – Other Alternatives

Additional alternatives were explored but are not presented in detail as part of this chapter. Refer to **Appendix G** for figures illustrating the following alternatives:

- **South Facility Expansion –** This alternative maintains the same operational model as the existing QTA. The footprint is slightly increased to add additional fueling and car wash bays to the south of the existing infrastructure. This alternative preserves the existing facilities in-place but displaces the existing stormwater area in the southwest corner of the existing QTA. Due to the environmental challenges with relocating the wetland, this alternative was not considered feasible.
- **Remote Consolidated Rental Car Center –** This alternative proposes developing a new consolidated rental car facility to the north of Lippisch Place SW. This alternative was eliminated as a preferred concept due to the high costs of a shuttling operating, the negative impact on the customer experience, and the impediment to potential future airside development.

The existing proximity of the QTA relative to the Ready/Return facility allows for efficient rental car operations while maintaining the terminal landside area for customer-facing functions. As such, Alternative 1 is the preferred QTA concept. Reconfiguration of the site will allow the Airport to maintain operations while replacing aging infrastructure and improve overall flexibility of the site.

Figure 4.19: Rental Car Ready and Return Alternatives



LEGEND

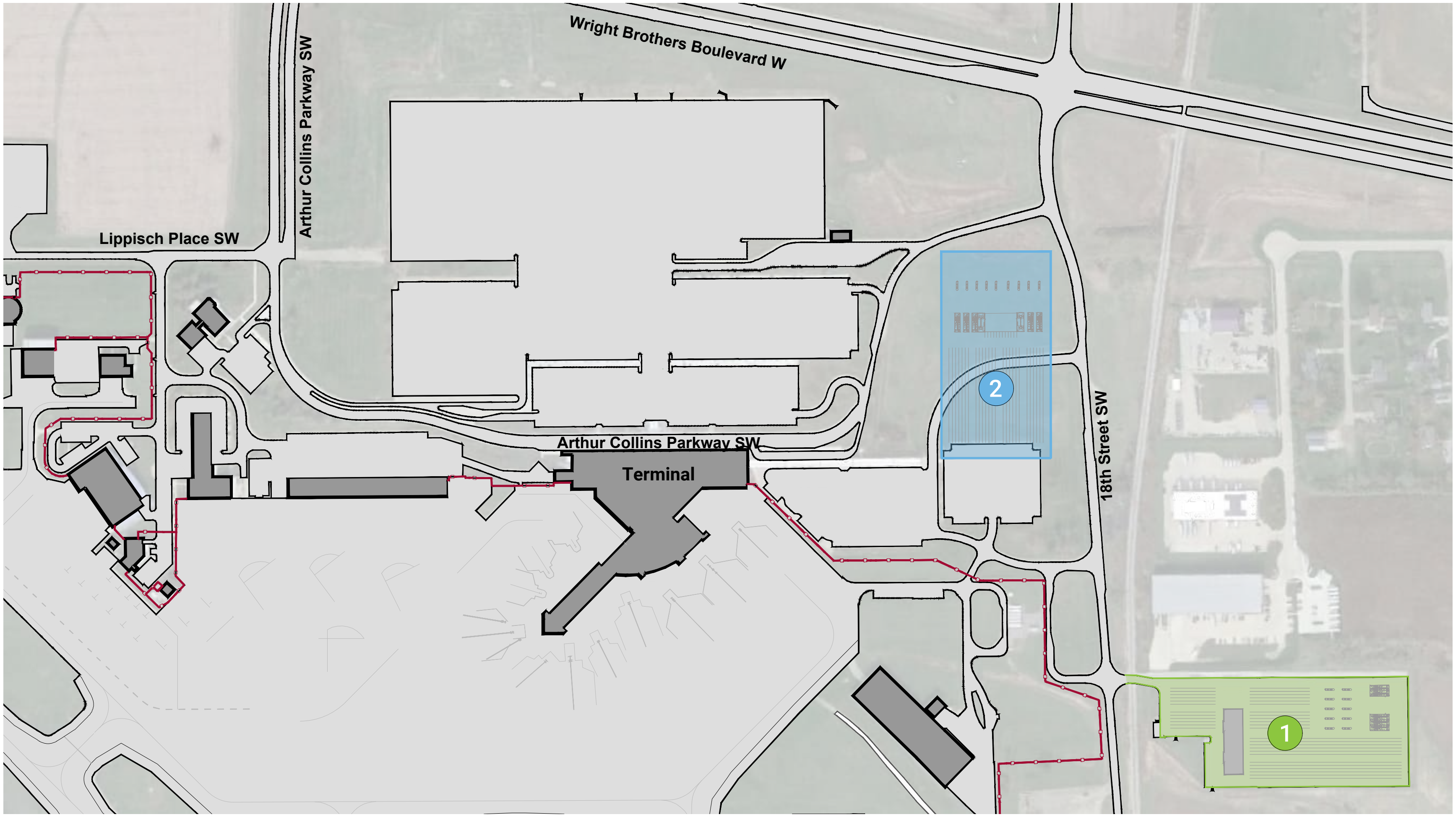
- Existing Pavement
- Existing Airport Buildings
- Airfield Fence
- 2 Alternative 2 - East Expansion
- 3 Alternative 3 - South Expansion

0 100 200 400 Feet

N

Prepared by: Kimley-Horn, 2022.

Figure 4.20: Rental Car QTA Alternatives



LEGEND

- Existing Pavement
- Existing Airport Buildings
- Airfield Fence
- 1 Existing Footprint Reconfiguration
- 2 Consolidated Rental Car Center

Prepared by: Kimley-Horn, 2022.

Chapter Five

Recommended Development Plan and Financial Feasibility Analysis

CHAPTER 5: RECOMMENDED DEVELOPMENT PLAN AND FINANCIAL FEASIBILITY ANALYSIS

This chapter combines the preferred airfield, terminal, and landside alternatives into a single 20-year Recommended Development Plan (RDP) at the Eastern Iowa Airport. This plan is implemented gradually to ensure capacities are "balanced" with demand, is compatible with environmental constraints, considers the needs of existing and potential tenants and stakeholders, and is consistent with the financing capabilities of the Airport.

To test financial feasibility, this chapter analyzes key financial metrics such as cost per enplaned passenger (CPE) and cash balances compared to minimum requirements, and reevaluates these metrics through the implementation of RDP projects over a five-year projection period from 2024-2028. Near-term financial feasibility is considered more critical for affordability, as the Airport will have the ability to manage intermediate- and long-term projects to align with demand and funding availability.

Infrastructure improvements identified in these preferred alternatives will also be depicted on the Airport Layout Plan (ALP). The RDP is presented in **Figure 5.1**. This chapter is organized in the following sections:

- Recommended Development Plan
- Capital Improvement Plan
- Financial Framework
- Funding Sources
- Financial Metrics
- Key Financial Assumptions
- Financial Feasibility

5.1 RECOMMENDED DEVELOPMENT PLAN

Chapter 4 – Alternatives Development and Evaluation analyzed potential alternatives intended to address facility improvements over the next 20 years at the Airport. Some proposed improvements involve straightforward, logical solutions while other cases explore multiple solutions with their respective advantages and disadvantages. Discussions among Airport management and stakeholders resulted in the RDP, described below.

- RUNWAY 9/27 EXTENSION

The extension of Runway 9/27 to 10,000 feet accommodates the runway length required for the Airport's critical design aircraft, the Boeing 767-300F. The preferred option for implementation includes new pavement on the west end of Runway 9 and parallel Taxiway A. This alternative requires constructing an additional connecting taxiway and relocating the blast pad, MALSR, and REILs 1,400 feet west beyond the new Runway 9 end.

Runway 9/27 NAVAID Improvements

As outlined in FAA Order 2400.12, Financial Manual, the Airport meets the criteria to secure FAA-Facilities and Equipment (FAA-F&E) funding to install CAT II NAVAIDs on both ends of Runway 9/27, an upgrade from the Airport's current ILS instruments. Installation of these NAVAIDs will take place in 2026.

- GENERAL AVIATION

Multiple general aviation aircraft storage hangar areas are identified on the Airport. They will be developed based on customer needs and priority of location. The development options along the crosswind Runway 13/31 would require the construction of a parallel taxiway before it could be developed.

- TAXILANE A6 IMPROVEMENT

Taxilane A6, north of Taxiway A, provides a new location that addresses taxilane standards outlined in AC 150/5300-13B, Airport Design, and solves potential Runway Incursion Mitigation (RIM) issues. The new taxilane connector will also continue to serve the General Aviation apron area.

- AIR CARGO FACILITIES

Two air cargo facilities are recommended. The first satisfies air cargo demand for the planning horizon, which includes a multi-tenant facility on the west side of the airfield. The second facility is planned in the event a new air cargo opportunity beyond forecast operations arises. This cargo expansion would occur adjacent to the existing air cargo area and includes new structures, apron pavement, and aircraft and vehicle parking.

- CENTRALIZED DEICING FACILITIES

Two centralized deicing facilities are recommended: one near the passenger terminal building and the other near the west end of Runway 9/27. Both facilities are sized to accommodate up to Airplane Design Group (ADG) IV aircraft. The deicing facility in the passenger terminal area provides convenient Remain Overnight (RON) parking positions during the warmer seasons. The deicing facility located near the west end of Runway 9/27 provides convenient access to cargo aircraft as well as to aircraft that had been previously deiced but have exceeded the time limit and require another deicing application.

- FUEL FARM

A new fuel farm will replace the existing one on the east side of the airfield. This new facility is comprised of eight fuel tanks and has a capacity of 300,000 gallons of Jet A Fuel. The fuel farm will be accessible from 18th Street SW for landside traffic.

- SRE/MAINTENANCE BUILDING

An area in the north-central portion of the airfield was selected for the new Snow Removal Equipment (SRE) and Maintenance facility due to its proximity to the airfield and other support facilities. This project also includes the construction of a new taxilane.

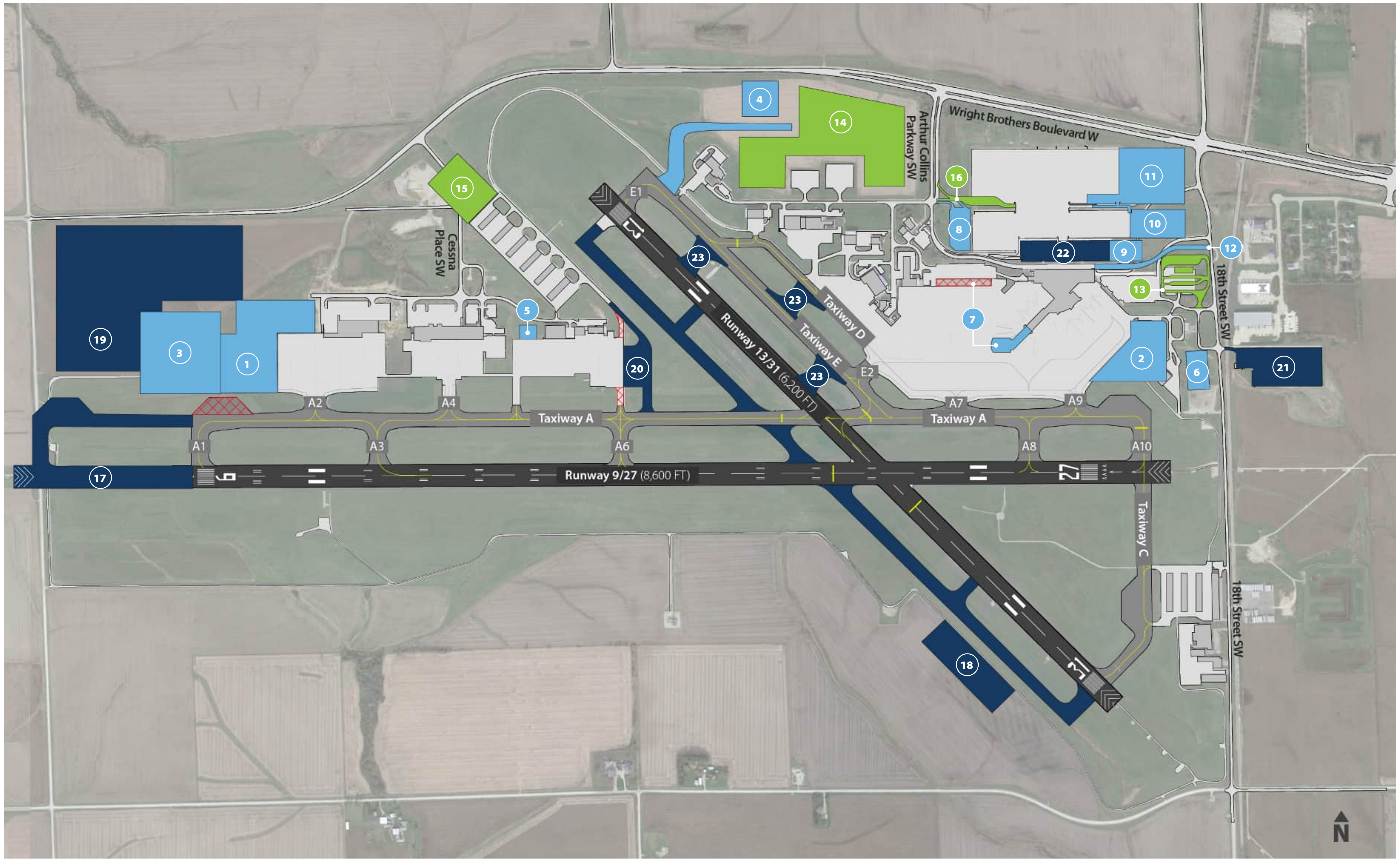
- LANDSIDE

While each landside element performs a unique function individually, a successful terminal requires that all elements function as a cohesive landside system to successfully serve a diverse set of customer needs. The recommended landside concept leverages existing Airport landside facilities to the greatest extent possible and preserve adjacent land for future development.

Terminal Curbside and Commercial Ground Transportation

The recommended landside concept incorporates a multi-modal facility to create a centralized area to serve ground transportation functions, such as taxis, TNCs, shuttles, and buses. The multi-modal facility, positioned along 18th Street SW, provides the flexibility for a future rail connection. The eastern location also allows for the separation of commercial and private vehicle traffic, reducing congestions on the curbside.

Figure 5.1: Recommended Development Plan



SHORT-TERM (2023 - 2028)

1. West Cargo Expansion
2. East Consolidated Deicing Facility
3. West Consolidated Deicing Facility
4. Snow Removal Equipment, Maintenance Facility, and Taxilane
5. New FBO
6. Fuel Farm
7. Terminal Expansion/ Belly Cargo Demolition
8. Employee Parking
9. Short-Term Parking Lot Expansion
10. Long-Term Parking Lot, Phase 1
11. Long-Term Parking Lot, Phase 2
12. Arrivals Curbside and Roadway Improvement

INTERMEDIATE-TERM (2029 - 2033)

13. Multi-Modal Facility
14. Future Hangars
15. Aircraft Hangar Expansion
16. Future Exit Plaza and Parking

LONG-TERM (2034 - 2043)

17. Runway 9/27 and Associated Taxiway Extension
18. Aircraft Hangars and Parallel Taxiway
19. West Cargo Expansion, Phase 2
20. New Taxilane A6 Connector
21. New Fueling and Car Wash Facilities
22. Potential Parking Structure Footprint
23. Taxiway E Connectors

LEGEND

- Existing Airfield Pavement
- Existing Airport Buildings
- Proposed Demolition

The outbound roadway is proposed to be realigned, which will provide additional linear curbside space for private vehicle pick-up operations. The extension provides more curbside than required for the program, which allows for future flexibility to accommodate additional growth. The area south of the extended arrivals curbside should be preserved for future terminal expansion to accommodate additional baggage claim devices.

Parking

The preferred landside concept expands the existing Long-Term and Short-Term surface lots to the east. To improve traffic management and maximize the amount of surface parking available, the exit plaza is relocated to the west side of the lots. Surface lot expansion requires the relocation of the existing parking lot stormwater detention pond. Additional impervious surface will also require additional stormwater mitigation measures. The preferred parking concept also maintains the flexibility to construct structured parking in the future. Structured parking is kept as an alternative due to the space-saving benefits it provides, despite the higher capital investment.

Employee parking is recommended to relocate to the west of the existing Long-Term Lot. This employee lot location was selected to accommodate the multi-modal facility, while avoiding an employee shuttle operation and preserving access to the landside terminal loading dock.

The existing Admin/Cell Phone Lot should be dedicated for the Cell Phone Lot function.

Rental Cars

The Ready/Return is proposed to remain in the existing location. The existing lot is conveniently located for rental car customers and is appropriately sized. The Quick Turnaround (QTA) is also recommended to remain in the existing location, with a reconfiguration of the lot use and the installation of new fueling and car wash facilities. The QTA location allows for a quick shuttling operation for the rental car agencies, while preserving the areas directly adjacent to the terminal for customer-facing facilities.

The opinions of probable construction costs (OPCCs) for each RDP project are shown in Table 5.1 and presented in the next section. The cost estimates are based in current year dollars and include direct construction costs, soft costs for engineering, construction administration, and contingencies.

Multi-Modal Facility

The recommended plan includes a new multi-modal facility that will serve taxis, rideshare services, shuttles, and buses, with built-in flexibility for a future rail connection. This project would further reduce congestion in front of the terminal during periods of peak activity.

- ADDITIONAL PROJECTS OUTSIDE THE SUSTAINABLE MASTER PLAN TIMEFRAME

Future Parallel Runway 9L/27R

The ALP that accompanies this Sustainable Master Plan includes the future parallel runway, marked 9L/27R, north of the passenger terminal area. Although demand is not anticipated to warrant the construction of 9L/27R during the 20-year Sustainable Master Plan horizon, it is important to depict it to protect the Airport's options for accommodating demands that are currently not known.

5.2 CAPITAL IMPROVEMENT PROGRAM

In January of each year, the Commission prepares an annual budget for the upcoming financial year, which commences July 1. This budget includes sections on revenues, expenses, cash and investment balances, financial statements, and a 5-year Capital Improvement Program (CIP). The CIP identifies projects planned to be completed in the coming years and includes cost estimates and potential funding sources.

The Commission regularly updates the CIP based on immediate facility requirements, available funding sources, changing demand patterns, revised cost estimates, and other factors. Subsequent to the release of the 2024 budget, the Commission revised the anticipated funding sources for several projects (including Phase 4 of the terminal), while adjusting the anticipated commencement date and costs estimates for other planned projects.

This financial feasibility analysis incorporates projects from the RDP along with the latest CIP as provided by the Commission in mid-April 2023. **Table 5.1** shows the estimated cost for each project and the anticipated funding source. The combined 5-year CIP and RDP projects are estimated to cost a total of $208 million through 2028, with $88.5 million of funding planned from federal sources, a further $35.3 million from state funds, and $84.5 million from Commission funds. **Table 5.2** presents CIP and RDP projects by funding source by year.

Table 5.1: 5-year CIP and Recommended Development Plan Projects and Funding Source

Year	RDP #	Description	Project Cost	Federal	State	Commission
2024	12	Extend Terminal Arrivals Curbside & Realign Exit Drive	1,613,200	-	-	1,613,200
	12	Terminal Arrivals Curbside Overhead Signs	350,000	-	-	350,000
	10	Expand Long Term Lot, Phase 1	2,524,450	-	-	2,524,450
		Farmland Conservation	305,000	-	-	305,000
	6	Construct Fuel Farm Improvements	4,850,400	-	-	4,850,400
		Construct Taxilane D	5,132,000	4,041,000	-	1,091,000
		Replace RCF South Bay Car Wash	233,450	-	-	233,450
		Demolish Old Armory Facility	500,000	-	400,000	100,000

Table continues on next page.

Year	RDP #	Description	Project Cost	Federal	State	Commission
	7	Terminal Modernization Phase 4 C Concourse	36,061,300	15,940,396	18,858,760	1,262,144
	5	Construct West GA FBO Building, Phase 1	5,313,600	-	-	5,313,600
	4	Construct SRE & Maintenance Facility	2,777,778	1,800,000	-	977,778
		Construct Corporate Hangar Parking Lot	734,000	-	-	734,000
	4	Construct Taxiway/Taxilane Expansion (SRE/MF)	7,435,026	7,231,464	-	203,562
		Replace ALCMS	150,000	135,000	-	15,000
		Construct 2 Executive Hangars and Pavement, Year 1	1,000,000	-	441,749	558,251
2025		Farmland Conservation	245,000	-	-	245,000
		Rehabilitate East T-Hangars Phase 1	435,000	-	-	435,000
		Airfield Pavement Joints Replacement	300,000	-	-	300,000
		Airport Circulation Road	2,707,700	-	1,353,850	1,353,850
		Shepard Court Pavement Repair	632,500	-	-	632,500
	7	Terminal Modernization Phase 4 C Concourse	27,045,900	-	8,229,986	18,815,914

Year	RDP #	Description	Project Cost	Federal	State	Commission
	4	Construct SRE & Maintenance Facility	20,992,131	16,758,447	435,000	3,798,684
		Construct 2 Executive Hangars and Pavement, Year 2	1,000,000	-	-	1,000,000
	9	Expand Short Term Parking Lot	1,536,000	-	-	1,536,000
	8	Relocate Employee Parking	1,857,000	-	-	1,857,000
		Land Acquisition	750,000	-	-	750,000
2026	1	Construct Cargo Apron	7,508,000	6,757,200	-	750,800
		Farmland Conservation	270,000	-	-	270,000
		Rehabilitate East T-Hangars, Phase 2	375,000	-	-	375,000
		Airport Circulation Road	752,500	-	376,250	376,250
	2	Construct East Deicing Facilities	13,838,111	12,454,200	325,000	1,058,911
		Relocate RCB & Realign Exit	4,674,500	-	-	4,674,500
		Land Acquisition	750,000	-	-	750,000
2027		Construct West Joint-Use Cargo Building	10,433,000	-	435,000	9,998,000
		Construct Beech Way Extension	6,292,000	-	3,146,000	3,146,000
		Pavement Marking Improvements	195,000	-	165,750	29,250
		Farmland Conservation	100,000	-	-	100,000
		Rehabilitate East T-Hangars, Phase 3	375,000	-	375,000	-
		Airfield Pavement Joints Replacement	300,000	-	-	300,000
	3	Construct West Deicing Facilities	2,000,000	1,800,000	-	200,000
		Land Acquisition	750,000	-	-	750,000
2028		Farmland Conservation	100,000	-	-	100,000
		Rehabilitate East T-Hangars, Phase 4	375,000	-	-	375,000
	3	Construct West Deicing Facilities	21,680,000	19,512,000	740,000	1,428,000
		Construct Taxilane Connector - West Cargo	2,317,200	2,085,480	-	231,720
	11	Expand Long Term Parking Lot, Phase 2	8,008,000	-	-	8,008,000
		Land Acquisition	750,000	-	-	750,000
		Total Through 2028	**208,324,746**	**88,515,187**	**35,282,345**	**84,527,214**
2029+	13	Construct Multi-Modal Facility - Deferred	15,913,000	-	-	15,913,000
	20	New Fueling and Car Wash Facilities	3,972,650	-	-	3,972,650
	16	Runway 9/27 and Associated Taxiway Ext. (1,000 ft.)	24,000,000	16,800,000	-	7,200,000
	22	Taxiway E2 D1 E3 Connectors & Runway 13/31 N	5,420,000	4,878,000	-	542,000
	17	Construct Taxiway B & Runway 13/31 N	10,040,000	9,036,000	-	1,004,000
	14	Aircraft Hangar Expansion	TBD	-	-	-
	15	Future Exit Plaza and Parking	TBD	-	-	-
	18	West Cargo Expansion, Phase 2	TBD	-	-	-
	19	New Taxilane A6 Connector	TBD	-	-	-
	21	Potential Parking Structure Footprint	TBD	-	-	-
Total			**267,670,396**	**119,229,187**	**35,282,345**	**113,158,864**

Table 5.2: 5-year CIP and Recommended Development Plan Projects by Funding Source by Year

	2024-28 Total	2024	2025	2026	2027	2028	2029+
Funding Source							
FAA Entitlements	22,157,166	4,176,000	-	10,349,464	1,800,000	5,831,702	19,386,000
FAA Discretionary	27,675,822	7,231,464	-	4,678,580	-	15,765,778	24,865,500
FAA BIL (AIG and ATP)	38,682,199	17,740,396	16,758,447	4,183,356	-	-	-
State Grants	35,282,345	19,700,509	10,018,836	701,250	4,121,750	740,000	1,267,687
Commission Funds	84,527,214	20,131,835	30,723,948	8,255,461	14,523,250	10,892,720	41,684,396
Total	**208,324,746**	**68,980,204**	**57,501,231**	**28,168,111**	**20,445,000**	**33,230,200**	**87,316,583**

5.3 FINANCIAL FRAMEWORK

- AIRPORT GOVERNANCE

The Airport is owned by the City of Cedar Rapids and operated by the Cedar Rapids Airport Commission. The Commission is the policy-making body for the Airport and oversees the Airport's management. Five Commissioners are appointed to three-year terms by the Mayor of Cedar Rapids with appointments approved by the City Council. The City approves the Airport's operating budget.

The Airport does not publish its own annual financial report, with financial details being included in the Comprehensive Annual Financial Report of the City of Cedar Rapids. The accounting and financial reporting policies of the Commission conform to accounting principles for local government units as set forth by the Governmental Accounting Standards Board. The Airport is self-sufficient in that it does not rely on local government tax revenues to fund expenses related to operations, maintenance, or capital improvements.

- BOND RESOLUTIONS OR INDENTURES

The Airport has no current outstanding debt in the form of bonds.

- AIRLINE AGREEMENTS

The Commission has previously entered into Signatory Airline Use and Lease (SAUL) Agreements with legacy passenger carriers American Airlines, Delta Air Lines, and United Airlines (as well as their code share/regional affiliate airlines) and ULCC carriers Allegiant Airlines and Frontier Airlines. Cargo carriers UPS and FedEx also operate under the SAUL.

The term of the SAUL has been extended multiple times since the initial inception date of July 1, 2011, and was most recently extended in 2021 through June 2024.The SAUL includes a compensatory rate-setting methodology for the terminal, where the Airport recovers the operating and net capital costs of the facilities occupied by the airlines, and for any direct services provided. The airfield operates on a residual compensatory rate-setting basis, with the landing fee set to recover estimated costs. The Commission performs a year-end adjustment of rates and charges, with any deficit or credit being applied to airline balances.

The financial feasibility analysis does not anticipate significant changes to the existing methodology throughout the projection period.

- OTHER RELEVANT DOCUMENTS AND LAWS

The Airport functions as an operating unit of the City and is governed or influenced by the following:

- Concession agreements, leases, contracts, and permits with various tenants, users, and providers of services at the Airport.
- The Federal Aviation Administration's (FAA's) Aviation Safety and Capacity Expansion Act of 1990 provides approval to collect Passenger Facility Charges (PFCs).
- Federal statutory and constitutional provisions, including the Aviation and Transportation Security Act, the Anti-Head Tax Act of 1973, the Airport and Airways Improvement Act of 1982, the Interstate Commerce Clause, and the PFC Act of 1990.
- U.S. Department of Transportation policies mandated by the FAA Act of 1994, related to airport rates and charges, rules for resolving disputes, and revenue diversion.
- Generally accepted accounting principles.
- Various policies adopted by the Commission.

5.4 FUNDING SOURCES

- FEDERAL AIRPORT IMPROVEMENT PROGRAM GRANTS

Airport Improvement Program (AIP) Grants are provided by the federal government to fund eligible projects at airports included in the National Plan of Integrated Airport Systems (NPIAS). The Airport is classified as a small-hub airport by the FAA, which means the grant typically covers up to 90 percent of eligible costs based on statutory requirements. Eligible projects are those serving to develop and improve the Airport in areas of safety, capacity, and noise compatibility. Revenue-producing facilities are not eligible for AIP funding at CID.

There are two main categories of AIP funds: entitlement and discretionary. The FAA has established formulas for the allocation of AIP entitlement funding to airports based on passenger enplanements and cargo volumes. In addition, airports may receive discretionary AIP funding, typically awarded based on the project's priority compared to other eligible projects at airports throughout the system.

Entitlement Grants

Based upon the FAA formula for AIP entitlement grants and current traffic activity forecasts, the Airport expects to receive approximately $3.5 million annually from passenger entitlements, and a further $200,000 from cargo entitlements for use on eligible projects. Over the last 15 years, the Commission has received more than $53 million in entitlement funds or approximately $3.55 million per year. It is assumed that the AIP program will continue to be funded throughout the projection period, the apportionment formula will be unchanged, and activity levels at the Airport will not be dissimilar to nationwide trends. Therefore, the Airport is projected to continue to receive these grants at a level comparable to historical receipts.

AIP Discretionary Funds

The FAA awards grants, including discretionary grants for projects based upon national priority to the aviation system. The Airport anticipates needing discretionary funds to fund significant portions of the construction of Taxiway H and the taxi-lane adjacent to the SRE facility and both the east and west de-icing facilities. Over the last 15 years, the Commission has received more than $52 million in discretionary funds, or approximately $3.48 million per year. While there is no guarantee of future availability of discretionary funds beyond existing FAA authorized amounts, airports across the country anticipate this key funding source will continue to be available for critical projects and maintain ongoing discussions with local FAA representatives on upcoming projects.

Should discretionary funds not be available for planned projects based on FAA priorities, the Commission would likely have the ability to delay or defer the implementation of these projects.

Bipartisan Infrastructure Law (BIL)

The Infrastructure Investment and Jobs Act of 2021 (BIL) provides $25 billion for the National Aerospace System (NAS) via the U.S Treasury's General Fund. $20 billion will be allocated to airports over 5 years. Airport Infrastructure Grants (AIG) of up to $14.5 billion will be awarded using an allocation formula similar to that of entitlement grants. In addition, $970 million to be awarded annually for competitive Airport Terminal Program (ATP) grants.

The Commission received a grant of $20.4 million BIL/ATP in July 2022, which will be utilized for components of Phase 4 of the terminal modernization program commencing in the spring of 2023 with a duration of 18-24 months. This project includes additional aircraft parking gates, new and expanded restrooms, an outdoor patio, relocation of the Airport administration offices, and an expansion of the Airports geothermal heating/cooling system. The Commission has programed $20.9 million BIL/AIG across 2025 and 2026 to assist with construction of the SRE facility and the east deicing pad and containment facility.

COVID-19 Relief Funds

Federal funds have been made available under several programs including the Coronavirus Aid, Relief, and Economic Security (CARES) Act from 2020, the American Rescue Plan Act (ARPA) from 2021, and the Coronavirus Response and Relief Supplemental Appropriation Act (CRRSA) from 2020. These grants provided funding to airports for a combination of capital projects, reimbursement of airport operating expenses, and financial relief for airport concessionaires and tenants. The Commission plans to use the remaining available CARES funds towards a portion of the fuel farm improvements in 2024 and to off-set a portion of airport operating expenses in 2024 and 2025.

- STATE FUNDS – IOWA DEPARTMENT OF TRANSPORTATION (DOT)

The DOT has several programs available to assist with capital projects, and the Commission has included approximately $40 million of state grants in the 5-year CIP. In June of 2022, the State announced a $28.4 million grant to the Airport through the Iowa Commercial Aviation Infrastructure Fund (ICIAF). These funds will also be used for components of Phase 4 of the terminal modernization through 2025. The Revitalize Iowa's Sound Economy (RISE) program provides funding for the establishment, construction, and improvement of roads and streets. These funds are available to support industrial, warehousing, manufacturing, and distribution developments, and the Commission plans to utilize approximately $4.7 million of these funds for construction and expansion of Airport Circulation Rd and the extension of Beech Way.

The Commercial Service Vertical Instructure (CSVI) program provides funding for landside development and renovation of terminals, hangars, maintenance buildings, and fuel facilities. The Commissions plans to utilize approximately $3.4 million of these funds through 2028 to fund hangars, maintenance, and deicing projects.

- PASSENGER FACILITY CHARGES

The PFC program allows the collection of a PFC up to $4.50 for each eligible enplaned passenger, which is used to fund FAA-approved projects at the Airport. Eligible projects preserve or enhance the capacity, safety, or security of the air transportation system, reduce noise or mitigate noise effects, or enhance airline competition at the Airport.

The Commission has collected PFCs at the Airport since 1995 and has FAA approval to collect a cumulative amount of $60.87 million following its last application that was approved in 2014. The current authorization expires in 2025 and allows the Commission to collect a $4.50 fee per enplaned passenger, less a $0.11 handling fee retained by the airlines. Certain passengers are exempt from paying the PFC, such as those on frequent flier award tickets, non-revenue passengers, or those flying on a third or subsequent flight segment through the Airport. Over the last 5 years, PFCs have been remitted by an average of 92% of enplaned passengers. This level is assumed to continue throughout the projection period.

Historically, the Commission has used its own funds to pay for PFC eligible projects and reimburses itself from PFC revenues as they are received. The Commission currently has approximately $7 million of reimbursements that it is owed from the PFC fund for PFC #6 and anticipates commencing an application process for PFC #7 in the near future, which could include $13.6 million of eligible projects previously funded by the Commission. Therefore, PFCs are assumed to flow to Commission revenues/cash reserves throughout the projection period.

- CUSTOMER FACILITY CHARGES

The Airport was one of the first in the country to introduce a Customer Facility Charge (CFC) on rental car transactions, and since 1995 has imposed this fee on a cost-recovery basis. The CFC fee is currently $2.40 per transaction day and adjusted annually to be set at a level that recovers the annual operating and maintenance cost as well as the annualized amortization cost of rental car facilities.

- COMMISSION RESERVE FUNDS AND RETAINED SURPLUSES

The Commission generates revenues from terminal concessions, airline rents and fees, car parking, rental cars, land and buildings, and other sources, and any net revenues can be applied to capital projects or retained as reserves. The Commission is required to maintain a minimum cash reserve balance equal to 25 percent of the total of: 12 months' O&M expenses; budgeted capital outlay; budgeted cash transfers required to fund the CIP in the upcoming year; and one year of depreciation.

The Commission projects the minimum cash requirements to range from approximately $8 million to $13.5 million through the projection period. The Commission projects to have approximately $53.7 million of cash on hand at the conclusion of fiscal 2023.

5.5 FINANCIAL METRICS

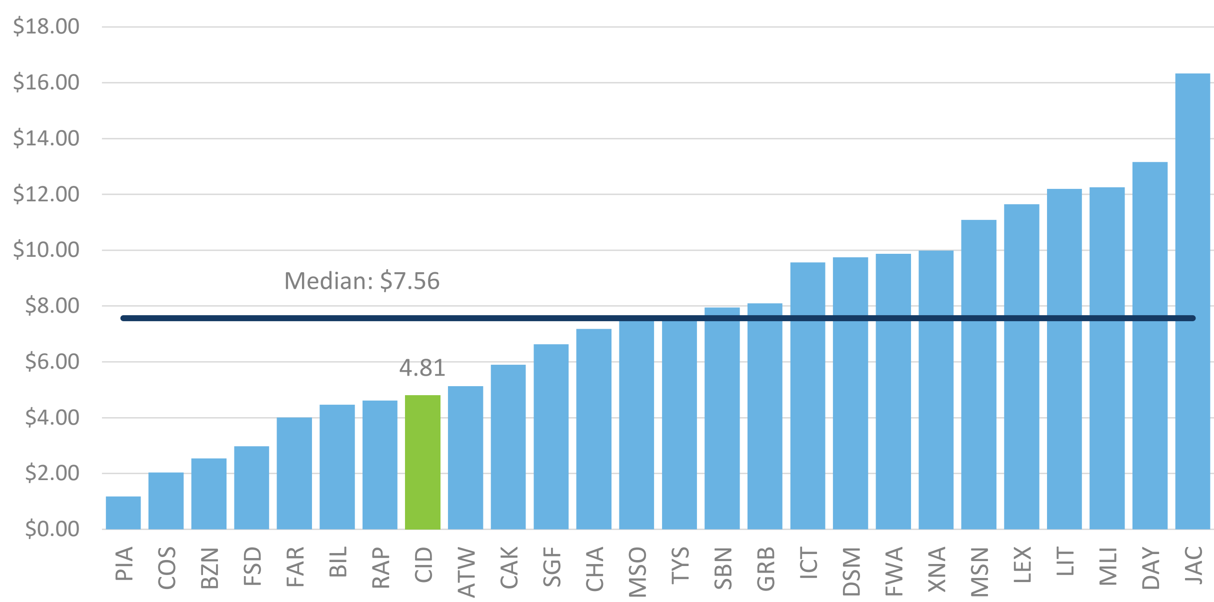
- COST PER ENPLANED PASSENGER

Cost per Enplaned Passenger (CPE) is the average airline payment per enplaned passenger at a given airport. It is calculated by adding all airport charges paid by passenger airlines for landing fees, terminal rents, apron fees, terminal services, etc. and dividing by total airport enplanements. This provides a relative measure of the cost of utilizing an airport's facilities and reflects the level of operating and capital costs of running the airport. An excessive CPE could have some impact on airline decisions to serve or grow in certain markets.

CPE is not a perfect method for comparing airports as it does not consider the level of services or facilities offered by an airport, the stage an airport is at in terms of facility lifecycle, or short-term changes in activity levels. nor does it consider any facilities funded directly by airlines or from sources other than the airport. However, CPE can be used as a guide for affordability and planning purposes and the Commission currently would like to maintain a CPE below $7.00.

Figure 5.2 shows the CPE for peer airports in the central United States with enplanements ranging from 250,000 to 1.4m. The Airport shows a 2022 CPE of $4.81, below the peer median of $7.56. The Commission has been able to maintain a lower CPE in recent years by applying Covid-19 relief funds to certain airport expenses during periods of lower activity caused by the pandemic. As the remaining relief funds are utilized in 2024 and 2025, the CPE is projected to increase above $6.00.

Figure 5.2: Cost Per Enplaned Passenger



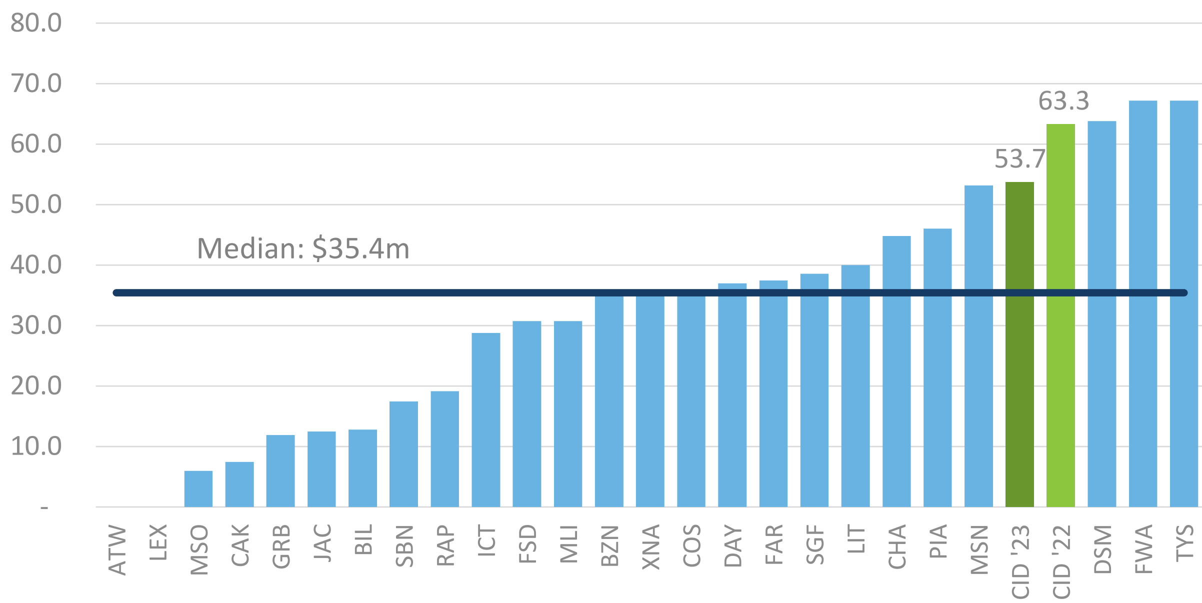
Sources 2021/2022 FAA CATS Form 127 data.

- Cash and Investments

Most airports have covenants or minimum requirements for cash on hand stated in governing documents or bond indentures. These reserves can provide a buffer for bond holders and other stakeholders during significant disruptions to airport operations, the loss of a major tenant, or unexpected expenses or capital repairs. The Commission had $63.3 million of cash and investments at the end of FY2022 which is projected to reduce to approximately $53.7 million at the end of FY2023 as cash reserves are utilized to fund ongoing capital projects during the current year such as the construction of the new FBO, land acquisitions, and expansion of parking facilities.

The Commission does not have any outstanding Airport debt and does not anticipate issuing debt to fund the 5-year CIP.

Figure 5.3: Cash and Investments



Sources: 2021/2022 FAA CATS Form 127 data.

5.6 KEY FINANCIAL ASSUMPTIONS

- ACTIVITY LEVELS

To evaluate financial feasibility, the projected activity levels utilize the most currently available information. The Commission is projecting approximately 640,000 enplanements for FY2023 and 630,000 for FY2024. These are slightly below the levels anticipated during the development of the Master Plan forecast. Enplanements in 2022 were 9 percent below 2019 levels, but the Commission estimates that 2023 and 2024 will be similar to the 2019 total. Future growth rates beyond 2024 and in line with the Master Plan forecast.

Passenger landed weight is projected to decrease from historical levels in the coming year as airlines replace smaller regional jet services with larger aircraft, resulting in fewer flights conducted on larger aircraft. Cargo landed weight is projected to see a slight decrease due to recent changes in the equipment utilized by cargo airlines at the Airport.

Table 5.3: Activity Levels for Financial Feasibility

(a) Forecast values rounded to the nearest 1,000.

Sources: Kimley-Horn/BJSA Analysis, April 2023; Airport Records (received January 2023).

	2022	2023 Est.	2024 Budget	2025	2026	2027	2028
Historical And Projected Activity (a)							
Enplaned Passengers	611,000	640,000	630,000	657,000	684,000	704,000	724,000
Passenger Landed Weight	722,000	743,000	687,000	687,000	702,000	718,000	734,000
Cargo Landed Weight	376,000	374,000	346,000	355,000	364,000	373,000	382,000
Projected Growth Rates							
Enplaned Passengers		4.75%	-1.6%	4.3%	4.1%	2.9%	2.7%
Passenger Landed Weight		2.79%	-7.50%	0.00%	2.25%	2.25%	2.25%
Cargo Landed Weight		-0.53%	-7.50%	2.50%	2.50%	2.50%	2.5%

- OPERATING EXPENSES

The Commission's 2024 budget projects total operating expenses of $12.3 million and a further $1.2 million for capital outlay projects. Given the current inflationary pressures on prices due to staffing costs, materials and supply chain issues, and rising interest rates, 2025 expenses are projected to grow at 5 percent, and then 3 percent from 2026. The Commission anticipates purchasing a snow melter in 2024, which is expected to reduce the cost of snow removal costs by as much as $600,000 annually.

Before allocating expenses to cost centers, the Commission applies various credits and off-sets to operating expenses such as CARES/CRRSA/ARPA funds, PFCs utilized to fund capital outlay projects, air service development grants to off-set marketing costs, fuel sales credits, and direct billings to tenants for airport services.

The SAUL provides the methodology for allocating Airport costs to seven cost centers. There are five direct costs centers—Airfield, Air Cargo Ramp, Terminal, General Aviation, and Other/Cargo—and two indirect Safety/Security and Administration. Safety/Security expenses are allocated based on a fixed formula, and administration expenses allocated based on percentage of direct expenses.

Even though total expenses are projected to decrease in 2025 due to the snow removal cost savings, as the CARES/CRRSA/ARPA funds are fully utilized, the total credits applied decreases, leading to projected increases in total expenses allocated to cost centers.

Table 5.4: Operating Expenses

	2022 Budget	2023 Budget	2024 Budget	Projection 2025	2026	2027	2028
Estimated Airport Operating Expenses ($000)							
Personal Services	4,991	5,476	6,193	6,503	6,698	6,899	7,106
Purchased Services	4,029	4,730	4,271	3,885	4,020	4,158	4,301
Supplies and Materials	1,244	1,404	1,623	1,704	1,755	1,808	1,862
Capital Outlay	128	1,267	1,165	700	150	150	150
Other Expenditures	137	182	198	208	214	221	227
Total	**10,529**	**13,059**	**13,451**	**13,000**	**12,837**	**13,236**	**13,646**
Adjustments for Rates and Charges							
CARES/CRRSA/ARPA	-4,139	-4,121	-2,500	-940	0	0	0
PFCs	0	-791	-704	-500	-120	-120	-120
Other	410	-416	-750	-750	-741	-764	-787
Total Adjustments	**-3,729**	**-5,328**	**-3,954**	**-2,190**	**-861**	**-884**	**-907**
Allocated Expenses for Rates and Charges							
Airfield Area	1,768	1,714	1,810	1,670	1,898	2,011	2,097
Air Cargo Ramp Area	289	232	284	347	446	393	405
Terminal Building	3,090	3,275	4,535	5,534	6,152	6,262	6,445
General Aviation Area	287	306	366	446	464	505	520
Other Areas & Cargo	1,365	2,205	2,302	2,811	3,016	3,181	3,273
Total	**6,799**	**7,731**	**9,297**	**10,810**	**11,977**	**12,352**	**12,739**
YOY % change		*14%*	*20%*	*16%*	*11%*	*3%*	*3%*

Sources: Budget - CRAC, Projection - Kimley-Horn/BJSA

- AIRPORT REVENUES

Airport revenues for 2024 are projected at $24.6 million based on the Commission's budget, the latest activity projections, and amortization to be recovered from capital projects completed in 2023. Future revenues from passenger-related commercial sources such as parking, rental cars, and terminal concessions are projected to increase with inflation and enplaned passengers. Revenues from land and buildings are projected to grow with inflation in addition to the development of new leasable facilities.

Future revenues from airlines are projected based on a cost-recovery basis for the terminal and airfield, with airlines paying for the operating cost and the Commission funded capital cost of the facilities utilized. As the Commission anticipates utilizing federal and state grants to fund significant portions of terminal and airfield projects, as well as PFCs, there are minimal charges for amortization that impact airlines rates. By 2028, the annual charge for amortization for all 5-year CIP projects and the RDP is projected to be less than $100,000 for the terminal cost center and less than $300,000 for the airfield cost center.

Landing fees are projected to reach approximately $2.20 per 1,000 lbs by 2028, and the terminal rental rate projected to reach approximately $30.00 per sq. ft. Due to the rising net expenses used to calculate airline rates and charges, at projected activity levels, the estimated CPE may approach or slightly exceed the Commission's preferred level of $7.00. In order to manage airline changes, the Commission may seek to evaluate the timing or magnitude of expenses and capital projects that impact rates or charges or may apply a “discretionary credit” when calculating future landing fees or terminal rental rates. The Commission is projected to produce net revenues of $12 million to $14 million throughout the projection period, and a discretionary credit of $100,000 to $400,000 may be sufficient to maintain a CPE at preferred levels.

Table 5.5: Airport Rates and Charges, Net Revenues, and CPE

	Budget 2022	Budget 2023	Projection 2024	2025	2026	2027	2028
Estimated Signatory Airline Rates and Charges							
Landing Fee	1.67	1.67	1.95	1.91	2.01	2.13	2.20
Terminal Rental Rate	15.90	15.89	24.95	26.31	29.26	29.76	30.65
Estimated Airport Net Revenues ($000)							
Passenger Airline Revenues	2,921	3,127	4,044	4,593	4,967	5,161	5,355
Less Discretionary Credit			0	-100	-300	-320	-400
Cargo Airline Revenues	878	914	959	1,025	1,177	1,187	1,245
Non-airline Revenues	15,749	20,411	15,931	15,721	16,751	17,488	18,253
PFCs	1,970	2,580	2,625	2,652	2,761	2,842	2,924
CFCs	487	638	623	623	623	623	623
Non-Operating Revenues	139	160	446	0	0	0	0
Total	**22,143**	**27,830**	**24,629**	**24,515**	**25,979**	**26,982**	**28,001**
Less Operating Expenses	-10,401	-11,792	-12,086	-12,300	-12,687	-13,086	-13,496
Less Debt Service	0	0	0	0	0	0	0
Less Capital Outlay	0	-1,267	-1,165	-700	-150	-150	-150
Projected Annual Net Revenues	**11,742**	**14,771**	**11,377**	**11,515**	**13,141**	**13,746**	**14,354**
Projected CPE with Credits	**$ 4.81**	**$ 4.83**	**$6.42**	**$6.84**	**$ 6.83**	**$6.88**	**$ 6.85**

Sources: Budget - CRAC, Projection - Kimley-Horn/BJSA

5.7 FINANCIAL FEASIBILITY

The financial feasibility of the 5-year CIP and the RDP projects was determined using the 2024 budget from the Commission, the latest traffic and activity projections, the terms and conditions of existing leases and agreements, the eligibility of AIP grants and PFCs to funds capital projects, and general assumptions about the future operations of the Airport.

Table 5.6 shows the Commission’s projected opening cash position for each year and adds Airport revenues, subtracts operating expenses and capital outlay and Commission funded capital projects to arrive at the ending cash position.

Table 5.6: Feasibility Analysis and Cash Position

	Estimate 2023	Projection 2024	2025	2026	2027	2028
Feasibility Analysis						
Estimated Opening Cash Position		53,680	44,926	25,717	30,603	29,825
Add Airport Operating Revenues		24,629	24,515	25,979	26,982	28,001
Less O&M Expenses and Capital Outlay		-13,251	-13,000	-12,837	-13,236	-13,646
Less Debt Service		0	0	0	0	0
Less Commission Funded Capital Projects		-20,132	-30,724	-8,255	-14,523	-10,893
Estimated Ending Cash Position	**53,680**	**44,926**	**25,717**	**30,603**	**29,825**	**33,287**

Sources: Estimate - CRAC, Projection - Kimley-Horn/BJSA

Even after funding significant portions of the CIP and RDP with internal cash reserves and no debt, the Commission is still anticipated to maintain a cash position above $25 million, which is well above the projected minimum required levels estimated by the Commission.

Based on the assumptions contained in this working paper, which have been discussed with Commission staff, the resulting financial metrics following implementation of the planned capital projects indicate that the CIP and RDP are financially feasible. However, these projections rely on future assumptions for activity levels, revenues, expenses, construction costs, and other factors, and unanticipated events will occur that will result in differences from these projections, and these differences may be material.

Chapter Six

Environmental Overview

CHAPTER 6: ENVIRONMENTAL OVERVIEW

6.1 INTRODUCTION

As highlighted in **Figure 5.1** in *Chapter 5 – Recommended Development Plan and Financial Feasibility Analysis*, the Airport's RDP combines the preferred airfield, terminal, and landside alternatives into a single concept phased over a 20-year period. This chapter provides a high-level review of the Airport's RDP to screen the projects and provide opinions of potential adverse environmental impacts. The review evaluates proposed improvements against the environmental constraints identified in *Chapter 1 – Existing Conditions*. Specifically, Federal Aviation Administration (FAA) National Environmental Policy Act (NEPA) guidance has been reviewed to identify what type of NEPA class of action documentation may be required for each of the proposed projects. Ultimately, the NEPA class of action is determined by the lead federal agency.

- NATIONAL ENVIRONMENTAL POLICY ACT

NEPA is a federal law that requires federal agencies to assess the environmental effects of proposed actions prior to making decisions and to inform the public about their decision making. The FAA is required to comply with NEPA for actions directly undertaken by the FAA and for actions undertaken by a non-federal entity where the FAA has authority to condition a permit, license, or approval. To meet NEPA requirements, agencies such as the FAA require documents that address environmental issues and ensure compliance with appropriate environmental regulations. There are three options for documenting environmental impacts, referred to as classes of action:

- **Environmental Impact Statement (EIS)** – An EIS is a detailed analysis that is prepared for major federal actions that would have significant environmental impacts. It details the process through which a project was developed, includes consideration of a range of reasonable alternatives, analyzes the potential impacts resulting from the alternatives, and demonstrates compliance with other applicable environmental laws and executive orders. An EIS is typically required for a new airport or a major project such as a new runway. High levels of controversy can also elevate environmental documentation requirements to an EIS. The outcome of an EIS is a Record of Decision.
- **Environmental Assessment (EA)** – An EA is a concise document that is prepared when it is unknown if a federal action would have significant environmental impacts. If during the preparation of an EA it is determined that the action would cause significant impacts, an EIS should be prepared instead. The FAA has developed options with this class of action, including a short form EA, for simple projects that do not have many adverse impacts. The typical outcome of an EA is a Finding of No Significant Impact (FONSI).
- **Categorical Exclusion (CatEx)** – A CatEx is prepared when environmental impacts of a federal action are not expected to be significant. A CatEx can be as simple as a two-page checklist of the environmental impact categories the FAA requires to be addressed. The form simply requires the user to check a box indicating that a project does not have any impact of the environmental category. In some cases, a documented CatEx may be required if there is an issue that requires more detailed analysis to be performed to justify a declaration of no impact. The lead federal agency determines the class of action and is responsible for NEPA compliance, so it is important for the Cedar Rapids Airport Commission to discuss environmental documentation options with the FAA prior to beginning environmental review of proposed improvements.

6.2 ENVIRONMENTAL IMPACT CATEGORIES

The FAA provides guidance on steps to take to determine the appropriate level of NEPA review. Key to this process is identifying the potential for environmental impacts early in project development. FAA Order 1050.1F defines 14 environmental impact categories that the FAA has identified as relevant to determining the class of action. Regardless of the class of action, each impact category should be considered independently as NEPA does not take the place of other approvals or permits that may be required for a proposed project.

Environmental resources for this analysis were compiled using available datasets such as:

- U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC)
- National Wetlands Inventory (NWI)
- U.S. Department of Agriculture (USDA) Web Soil Survey
- National Register of Historic Places (NRHP)
- Federal Emergency Management Agency (FEMA) Flood Map Service Center
- Iowa Department of Natural Resources (DNR) wetlands, waterways, and species data
- State Historic Preservation Office (SHPO) Iowa Standing Structure Inventory
- Iowa Office of the State Archaeologist known archaeological resources dataset
- Previous environmental reviews provided by the Cedar Rapids Airport Commission

The environmental resources identified are described in *Chapter 1 – Existing Conditions*.

ENVIRONMENTAL CATEGORIES WITH NO EXPECTED EFFECTS

This chapter examines only those categories that may be affected by the Recommended Development Plan. Remaining FAA environmental categories are listed below for context. The following resources are either not found within the project area or are anticipated to have no or negligible effects due to the Recommended Development Plan.

- **Biological resources (including fish, wildlife, and plants):** Federal or state listed species may exist within the vicinity of the Airport; however, no critical habitats are located within the Airport and native habitat has been mostly eliminated by previous grading and alterations. The properties adjacent to the Airport have been long-established for agricultural use. Any remaining native habitat likely resides adjacent to the mapped streams and wetlands (and will be addressed in the Water Resources section below). Review by the DNR and/or consultation with the USFWS may be needed under Section 7 of the Endangered Species Act.
- **Coastal resources:** There are no coastal resources within or adjacent to the Airport.
- **Socioeconomics, environmental justice, and children’s environmental health and safety:** Based on the scope of the Recommended Development Plan, it is unlikely that there will be socioeconomic impacts, as defined in Order 1050.1F (e.g., induced economic growth, disruption of the physical arrangement of an established community, etc.). Based on the US Environmental Protection Agency’s (EPA’s) Environmental Justice Screening and Mapping Tool, there are no minority or low-income communities around the project site. Additionally, there are no schools, parks, childcare facilities, or other facilities serving children in the project area, so the Recommended Development

Plan is not anticipated to have the potential to lead to a disproportionate health or safety risk to children.

- **Visual effects (including light emissions):** According to the FAA's 1050.1F Desk Reference, visual effects "deal broadly with the extent to which the proposed action or alternative(s) would either: 1) produce light emissions that create annoyance or interfere with activities; or 2) contrast with, or detract from, the visual resources and/or the visual character of the existing environment." The FAA also notes that aerospace actions do not commonly result in adverse visual effects. Consideration for light emissions account for airport-related lighting facilities and activities that could visually affect surrounding residents and other nearby light-sensitive areas such as homes, parks, or recreational areas. Due to the predominantly rural nature of the surrounding area and the consistency of the Recommended Development Plan with existing development on the Airport site, visual effects are not anticipated. Any potential visual effects associated with historical, architectural, archaeological, and cultural resources will be addressed within that section.
- **Noise and noise-compatible land use:** The FAA's 1050.1F Desk Reference notes that noise sensitive areas include residential, educational, health, and religious structures, and parks, recreational areas, areas with wilderness characteristics, wildlife refuges, and cultural and historical sites. While some of these types of land uses and sites are located near the Airport, none are located within the existing 65 Day Night Average Sound Level (DNL) contour (see Figure 3-1 of the December 2022 Noise Technical Report) or within the 20-year (2041) forecasted 65 DNL contour (see Figure 3-2 of the December 2022 Noise Technical Report). Further, the scope of the Recommended Development Plan is not anticipated to result in substantial changes to operational noise levels. With that being said, recent real estate development patterns may pose a future scenario that has more residential along the approach and departure flight paths. The Airport is working to manage incompatible land uses for the future and to stem this trend. In summary, because there are no noise sensitive land uses within the existing or forecasted 65 DNL contour and there are no incompatible land uses currently planned, adverse effects in this environmental impact category are not anticipated. A noise study may be needed to verify if impacts could occur, especially if noise incompatible land uses encroach on the forecasted 65 DNL contour. In addition, airport construction or demolition activities may need to be assessed, but impacts to noise sensitive resources are not anticipated.

- ENVIRONMENTAL CATEGORIES WITH POTENTIAL EFFECTS

Below is a description of the environmental impact categories that may be affected by the Recommended Development Plan.

Air Quality

A project's impact on air quality is assessed based on whether it would cause or contribute to a new NAAQS violation. The Airport is located in a county that is currently in attainment with the Clean Air Act National Ambient Air Quality Standards. The construction and operation of the Recommended Development Plan would be expected to produce emissions of criteria pollutants. Temporary emissions would be expected from site preparation, building construction, materials delivery, and construction employee commutes. Once completed, ongoing operational emissions related to the projects may be expected from aircraft, ground support equipment, passenger surface traffic vehicles, parking, or stationary equipment. Since there are expected temporary and ongoing air quality impacts, this environmental category may be affected by the Recommended Development Plan.

Climate

This environmental category relates to greenhouse gas (GHG) emissions that contribute to climate change. Projects in the Recommended Development Plan will need to be evaluated to determine whether potential incremental change in GHG emissions would result from the proposed project compared to a no action alternative. Since the Recommended Development Plan may change GHG emissions, this environmental category may be affected.

It is worth noting that as part of the Sustainable Master Plan, the Airport has developed a GHG baseline that can be used to measure future improvements against.

Department of Transportation Act, Section 4(f)

Section 4(f) resources include park and recreation lands, wildlife and waterfowl refuges, and historic sites listed on or eligible for the National Register of Historic Places. There are no park and recreation lands or wildlife and waterfowl refuges in the Airport vicinity. However, there are historic sites that are listed on or eligible for the National Register of Historic Places near the Airport (these resources are also addressed in the historical, architectural, archaeological, and cultural resources section). Since there are identified Section 4(f) resources within the site, the Recommended Development Plan may affect this environmental category.

Farmlands

The Airport is surrounded by important farmland. This includes prime farmland and farmland of statewide importance as defined by the USDA and certified by the NRCS State Conservationist, which is defined as land that includes areas of soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Federal projects that involve the conversion of farmland to non-agricultural use must comply with the Farmland Protection Policy Act (FPPA), which is administered by the USDA Natural Resources Conservation Service (NRCS). The Airport is in an area that is subject to FPPA requirements. Since the Recommended Development Plan would convert designated farmland to non-agricultural use, this environmental category may be affected.

Hazardous Materials, Solid Waste, and Pollution Prevention

Hazardous releases have been identified within or adjacent to the Airport by the EPA and the Iowa DNR. The Recommended Development Plan may affect these sites.

Historical, Architectural, Archaeological, and Cultural Resources

There are historic and archaeological resources on Airport property or in the vicinity that may be affected by the Recommended Development Plan. Two historic resources eligible for the National Register of Historic Places (NRHP) are located southwest of the Airport, and the SHPO’s Standing Structure Inventory includes 18 historic properties within the vicinity. Mapping from the Office of the State Archaeologist indicates that most sections in the vicinity of the Airport contain at least one archaeological site. Additional studies should be undertaken prior to any proposed work, as the Recommended Development Plan may affect these resources.

Land Use

Some of the Recommended Development Plan may include property acquisition (either fee simple or easement), and properties around the existing airport site are zoned and guided for land uses that may be incompatible with the Recommended Development Plan (e.g., agricultural uses, residential uses). The Airport is active in improving land use management tools to help avoid incompatible uses in the future.

Natural Resources and Energy Supply

This environmental category evaluates whether airport development actions have the potential to change energy requirements or use consumable natural resources. Projects should be evaluated based on their potential to increase demand directly or indirectly for resources and energy supply from: utilities, water sources, fuel consumption, or other consumable materials. The Recommended Development Plan may directly or indirectly increase demand for these resources, so there are potential effects in this environmental impact category.

Water Resources (including Wetlands, Floodplains, Surface Waters, Groundwater, Wild and Scenic Rivers)

Construction and operation of the Recommended Development Plan may impact water resources. There are 100-year floodplains adjacent to and within some areas of the Airport property. There are also hydric soils surrounding the Airport property, which could indicate the presence of a wetland. A wetland evaluation would need to be completed prior to construction of any Recommended Development Plan to confirm the presence of wetlands. There are also a few streams near the property, but there are no designated Wild and Scenic Rivers within or near the project site.

6.3 RECOMMENDED DEVELOPMENT PLAN AND POTENTIAL ENVIRONMENTAL EFFECTS

This section describes potential environmental issues associated with proposed capital projects and indicates the anticipated NEPA class of action for each project. This list of projects is separated into airfield and landside projects. Further details about each project and maps of the Recommended Development Plan are included in *Chapter 5 – Recommended Development Plan and Financial Feasibility Analysis*. Environmental impact categories with potential effects were reviewed for each project. Only categories that were determined to have potential effects are included in the discussion below for each project.

The following information applies to all projects included in the Recommended Development Plan and are not repeated in the following discussions for each project. Additional information on these environmental categories is included in the following discussions where applicable.

- **Air quality:** Construction may result in temporary impacts to local air quality that will need to be evaluated for each project.
- **Climate:** Construction would likely result in temporary increases of GHG emissions that will need to be evaluated for each project.
- **Historical, architectural, archaeological, and cultural resources:** There are known archaeological resources on Airport property and in the vicinity. Further archaeological study will be needed to determine whether archaeological resources will be impacted by the proposed projects.
- **Department of Transportation, Section 4(f):** The archaeological resources mentioned above may be protected by Section 4(f) of the Department of Transportation Act if they are listed on or eligible for the National Register of Historic Places and warrant preservation in place. Potential for Section 4(f) use will need to be evaluated for each project.

- AIRFIELD

Runway 9/27 Extension Project

This project involves the extension of Runway 9/27 from 8,600 feet to 10,000 feet and includes new pavement on the west end of Runway 9 End and parallel Taxiway A. This extension requires constructing an additional connecting taxiway and relocating the blast pad, Medium-Intensity Approach Light System with Runway Approach Indicator Lights (MALSR), and Runway End Identifier Lights (REILs) 1,400 feet west beyond the new Runway 9 End.

This project has impacts on existing roads. A portion of Cherry Valley Road in between Wright Brothers Boulevard W and Walford Road SW would need to be closed. Tissel Hollow Road would need a potential realignment to accommodate the RPZ. Additionally, the new RPZ dimensions published in Advisory Circular 150/5300-13B, Airport Design would require land acquisition efforts within RPZ's for both Runway Ends 9 and 27.

Potential Environmental Issues:

- **Air quality:** The ongoing, operational impacts of the project would likely not change local air quality because the project is intended to improve operations for existing service rather than to increase operations.
- **Farmland:** The proposed project would impact an area on the existing Airport property that is designated as prime farmland and farmland of statewide importance. In addition, the required acquisition is in an area designated as farmland.
- **Historical, architectural, archaeological, and cultural resources:** The proposed relocated MALSR and REILs to the west of the runway and the proposed relocation of Tissel Hollow Road may impact structures near Tissel Hollow Road that are included on the State Historic Preservation Office of Iowa's (SHPO's) Standing Structure Inventory.
- **Department of Transportation, Section 4(f):** The historic resources discussed above may be subject to Section 4(f) if they are determined eligible for the National Register of Historic Places. Potential for Section 4(f) use will need to be evaluated.
- **Land use:** The proposed project would impact an area zoned for agricultural use and with a future land use classification of Urban Low Intensity (i.e., low-density residential and commercial uses). This project would likely require rezoning of adjacent parcels but would not likely be a significant impact to surrounding land uses.
- **Natural resources and energy supply:** The airside expansion elements proposed in this project are likely to impact natural resources and energy supply.

NEPA Category of Action

Major runway extensions are identified by the FAA as actions normally requiring an EIS (FAA Order 1050.1F, Paragraph 3-1.3). An EIS is required when one or more environmental impacts would be significant and mitigation measures cannot reduce the impact(s) below significant levels. Based on the information currently available, significant adverse impacts are not anticipated. As this project advances, the potential to significantly affect the environment will be considered in coordination with FAA to determine if an EIS is required or if an EA would be appropriate for this project. It is likely an EA would be appropriate for this project.

General Aviation Expansion

This project involves the construction of new general aviation aircraft storage hangars on existing Airport property in multiple locations.

Potential Environmental Issues:

- **Air quality:** The ongoing, operational impacts of the project may also affect air quality because the purpose of the project is to allow for increased service operations.
- **Climate:** The ongoing, operational impacts of this project may increase GHG emissions.
- **Farmland:** The proposed project would impact an area on the existing Airport property that is designated as prime farmland and farmland of statewide importance. While this land is already within the Airport property, the project will need to be reviewed for farmland impacts.
- **Hazardous materials, solid waste, and pollution prevention:** One of the GA development areas (shown as GE Alternative 1 in Chapter 4) is near two contaminated sites on the Airport property (leaking underground storage tanks). The Recommended Development Plan may affect these sites.
- **Natural resources and energy supply:** General aviation hangar development is likely to impact natural resources and energy supply during the construction phase.
- **Water resources:** One of the GA development areas (GA Alternative 1 in Chapter 4) is located on hydric soil, which can indicate the presence of a wetland. A wetland evaluation would need to be completed prior to construction to confirm the presence of wetlands. Biological resources (including fish, wildlife, and plants) that may be present in a wetland should be reviewed as part of this evaluation.

NEPA Category of Action

This project would likely require a CatEx because, based on the types of proposed improvements, environmental impacts are not anticipated to be significant (FAA Order 1050.1F, Paragraph 5-6.4.f).

Taxiway A6 Improvement

This project involves the relocation of an existing taxiway connector. The recommended plan includes removing the portion of Taxilane A6 north of Taxiway A and constructs a new taxilane connector east of the General Aviation apron, with a 90° turn south before connecting with Taxiway A.

Potential Environmental Issues:

- **Air quality:** The ongoing, operational impacts of the project would likely not change air quality compared to current operations.

- **Hazardous materials, solid waste, and pollution prevention:** The proposed alternative is near one identified contaminated site on the Airport property (a spill incident). Further study is needed to determine if the project would impact this site.

NEPA Category of Action

This project would likely require a CatEx because, based on the types of proposed improvements, environmental impacts are not anticipated to be significant (FAA Order 1050.1F, Paragraph 5-5.4.e).

Air Cargo Facilities

This project involves the expansion of the Airport's west cargo apron and the construction of new cargo buildings and parking facilities.

Potential Environmental Issues:

- **Air quality:** The ongoing, operational impacts of the project would likely increase air pollution because of the larger volume of cargo operations at the Airport.
- **Climate:** The ongoing, operational impacts of the project may increase GHG emissions.
- **Farmland:** The proposed project would impact an area on the existing Airport property that is designated as prime farmland and farmland of statewide importance. While this land is already within the Airport property, the project will need to be reviewed for farmland impacts.
- **Hazardous materials, solid waste, and pollution prevention:** The west cargo apron that would be expanded as part of this project is one of the Airport's hazardous material storage sites, as identified in the Airport Certification Manual.
- **Natural resources and energy supply:** Expansion of air cargo facilities is likely to impact natural resources and energy supply.

NEPA Category of Action

Near-term air cargo expansion would likely require a CatEx because, based on the types of proposed improvements, environmental impacts are not anticipated to be significant (FAA Order 1050.1F, Paragraph 5-6.4.e).

However, the longer term expansion would need to be evaluated to determine whether it qualifies as a "substantial expansion" of these facilities. If so, the actions might not be categorically exempt, and an EA may be required. Coordination with FAA will be needed to determine whether this project "substantially expands" the facility. It is plausible that the longer term area is expanded in small chunks.

Centralized Deicing Facilities

This project would construct centralized deicing facilities in two locations on the Airport – one near the passenger terminal and one near the Runway 9 end. The centralized deicing facilities serve to provide a measure of safety to departing aircraft during periods of inclement weather. For the centralized deicing pad near the passenger terminal, the resulting deicing pad would reduce the amount of pavement (nearly 90 acres) upon which contaminated runoff collects, to a much smaller area where the deicing fluid would be collected.

Potential Environmental Issues:

- **Air quality:** The ongoing, operational impacts of the project would likely improve air quality in the long-term if the centralized facility reduces the time spent deicing idling planes.
- **Climate:** The ongoing, operational impacts of this project may result in a decrease in GHG emissions if this facility reduces the time spent deicing idling planes.
- **Farmland:** The proposed project would impact an area on the existing Airport property that is designated as prime farmland and farmland of statewide importance. While this land is already within the Airport property, the project will need to be reviewed for farmland impacts.
- **Natural resources and energy supply:** The airside expansion proposed in this project is likely to impact natural resources and energy supply during construction.
- **Water resources:** This project will result in a significant reduction in water quality impacts due to the massive reduction in pavement where deicing currently occurs and the collection of deicing fluids that is planned.

NEPA Category of Action

This project would likely require a CatEx because, based on the types of proposed improvements, environmental impacts are not anticipated to be significant (FAA Order 1050.1F, Paragraph 5-6-4.d).

Snow Removal Equipment/Maintenance Building

This project involves the construction of a new Snow Removal Equipment (SRE)/Maintenance building.

Potential Environmental Issues:

- **Air quality:** The ongoing, operational impacts of the project would likely not affect air quality compared to current operations.
- **Climate:** The ongoing, operational impacts of this project may affect GHG emissions.
- **Farmland:** The proposed project would impact an area of the existing Airport property that is designated as prime farmland and farmland of statewide importance. While this land is already within the Airport property, the project will need to be reviewed for farmland impacts.
- **Hazardous materials, solid waste, and pollution prevention:** The proposed building would be located near two areas that have been identified as having leaking underground storage tanks and may affect these sites.
- **Natural resources and energy supply:** The airside expansion proposed in this project is likely to impact natural resources and energy supply.
- **Water resources:** Alternative 1 of the proposed project is located on hydric soil, which can indicate the presence of a wetland. A wetland evaluation would need to be completed prior to construction to confirm the presence of wetlands. Biological resources (including fish, wildlife, and plants) that may be present in a wetland should be reviewed as part of this evaluation.

NEPA Category of Action

This project would likely require a CatEx because, based on the types of proposed improvements, environmental impacts are not anticipated to be significant (FAA Order 1050.1F, Paragraph 5-6.4.f).

- LANDSIDE

Terminal Curbside and Commercial Ground Transportation

The preferred landside concept incorporates the construction of a multi-modal facility, an extension of the Arrivals curbside, and a realignment of the outbound roadway.

The multimodal facility would be a centralized area to serve ground transportation functions, such as taxis, TNCs, shuttles, buses, and rail. The multi-modal facility, positioned along 18th Street SW, provides the flexibility for a future rail connection. The eastern location also allows for the separation of commercial and private vehicle traffic, reducing congestions on the curbside.

The outbound roadway is proposed to be realigned, which will provide additional linear curbside space for private vehicle pick-up operations.

Potential Environmental Issues:

- **Air quality:** The ongoing, operational impacts of the project will potentially improve air quality in the long-term if the project reduces congestion and promotes multi-modal trips to the Airport.
- **Climate:** The ongoing, operational impacts of the project may potentially reduce emissions if the project reduces idling from congestion and promotes multi-modal trips to the Airport.
- **Farmland:** The proposed project would impact an area on the existing Airport property that is designated as prime farmland. While this land is already within the Airport property, the project will need to be reviewed for farmland impacts.
- **Natural resources and energy supply:** The landside expansion, new and moved roadways, and construction proposed in this project are likely to impact natural resources and energy supply.
- **Water resources:** The proposed project is located on hydric soil (1-32% hydric), which can indicate the presence of a wetland. A wetland evaluation would need to be completed prior to construction to confirm the presence of wetlands. Biological resources (including fish, wildlife, and plants) that may be present in a wetland should be reviewed as part of this evaluation.

NEPA Category of Action

This project would likely require a CatEx because, based on the types of proposed improvements, environmental impacts are not anticipated to be significant (FAA Order 1050.1F, Paragraph 5-6.4).

Automobile Parking

The proposed automobile parking improvements include the expansion of three parking lots and the relocation of two lots. The preferred parking concept expands the existing Long-Term and Short-Term surface lots to the east. To improve traffic management and maximize the amount of surface parking available, the exit plaza is relocated to the west side of the lots. Surface lot expansion requires the relocation of the existing parking lot stormwater detention pond. Additional impervious surface will also require additional stormwater mitigation measures. The preferred parking concept also offers a structured parking option.

Employee parking is recommended to relocate to the west of the existing Long-Term Lot. This employee lot location was selected to accommodate the multi-modal facility, while avoiding an employee shuttle operation and preserving access to the landside terminal loading dock.

Potential Environmental Issues:

- **Air quality:** The ongoing, operational impacts of the project may affect air quality due to the increase in surface transportation vehicles.
- **Climate:** The ongoing, operational impacts of the project may affect GHG emissions due to the increase in surface transportation vehicles.
- **Farmland:** The proposed project would impact an area on the existing Airport property that is designated as prime farmland. While this land is already within the Airport property and is not currently used as farmland, the project will need to be reviewed for farmland impacts.
- **Natural resources and energy supply:** The landside expansion proposed in this project is likely to impact natural resources and energy supply.
- **Water resources:** The proposed parking expansions are adjacent to Hoosier Creek. Some elements of the proposed project are also located on hydric soil (most of which is 66-99% hydric), which can indicate the presence of a wetland. A wetland evaluation would need to be completed prior to construction to confirm the presence of wetlands. Biological resources (including fish, wildlife, and plants) that may be present in a wetland should be reviewed as part of this evaluation.

NEPA Category of Action

This project would likely require a CatEx because, based on the types of proposed improvements, environmental impacts are not anticipated to be significant (FAA Order 1050.1F, Paragraph 5-6.4.h).

Rental Car Facility

This project involves the expansion of fueling and car wash facilities at the Airport's rental car quick turnaround (QTA) facility.

Potential Environmental Issues:

- **Air quality:** The ongoing, operational impacts of the project may affect air quality due to the increase in surface transportation vehicles.
- **Climate:** The ongoing, operational impacts of the project may affect GHG emissions due to the increase in surface transportation vehicles.
- **Farmland:** The proposed project would impact an area on the existing Airport property that is designated as prime farmland. While this land is already within the Airport property, the project will need to be reviewed for farmland impacts.
- **Natural resources and energy supply:** The landside expansion proposed in this project is likely to impact natural resources and energy supply.

NEPA Category of Action

This project would likely require a CatEx because, based on the types of proposed improvements, environmental impacts are not anticipated to be significant (FAA Order 1050.1F, Paragraph 5-6.4.h).

Appendix A

Airport Layout Plan

Airport Layout Plan to be inserted upon FAA approval.

Appendix B-1

Greenhouse Gas & Energy Baseline Inventory

Greenhouse Gas & Energy Baseline Inventory

1.1 INTRODUCTION

Eastern Iowa Airport seeks to promote and protect the safety and health of both passengers and the community – and Environmental Stewardship is one of CID's five core values.[1] CID recognizes that sustainability is an essential element of its current and future operations and is leveraging the Master Plan effort to identify and evaluate ways to improve the Airport's performance. Existing sustainability measures in place at CID are organized into four main categories:

- Emissions and Energy
- Water Use and Water Quality
- Stakeholder Engagement
- Recycling and Waste Management

To understand baseline emissions and energy use at CID, the CID Master Plan includes a Greenhouse gas (GHG) and energy use inventory, specific to the Airport.

This report documents the carbon footprint for CID's Scope 1 and 2 GHG emissions[2], including the data gathered, assumptions, and methodologies used. To align with CID's future sustainability goal setting exercise, the Airport's current focus is on understanding the baseline for Scope 1 and 2 emissions due to the Airport's level of control and influence over these sources. Due to the COVID-19 pandemic and associated decline in air travel in 2020, calendar year 2019 was chosen as the representative baseline year for the GHG and energy use inventory. The baseline can be used to evaluate progress in reducing future GHG emissions and energy use.

1.2 BACKGROUND

Sustainability and GHG management are priorities for both CID and the City of Cedar Rapids. The Cedar Rapids City Council passed a resolution on February 25th, 2020, which called for the creation of a community-wide sustainability plan, including:

- Multiple climate change mitigation targets, including achieving net zero carbon emissions[3] by 2050, with an interim goal of a 45% reduction in GGs from 2010 levels by 2030.

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[1] Source: Eastern Iowa Airport. *CID's Commitment to Environmental Stewardship.* Accessed April 2022. https://flycid.com/planning-and-development/pfas/.

[2] Scope 1 refers to direct GHG emissions from sources that are owned and controlled by the reporting entity (in this case, the Airport) such as stationary sources (generators and boilers for example) and airport-owned fleet motor vehicles. Scope 2 refers to indirect GHG emissions from purchased utilities, including emissions associated with the generation of electricity consumed on-site but generated off-site at public utilities.

[3] Source: According to the World Resources Institute (WRI), "Net-zero emissions will be achieved when all GHG emissions released by human activities are counterbalanced by removing GHGs from the atmosphere in a process

- A goal to increase the City's use of renewable energy to account for 70-100% of electricity production by 2050.[4]
- The City of Cedar Rapids completed an internal GHG existing conditions inventory for the year 2010 for municipally owned facilities, as required by the resolution.[5]

In September 2021, the Cedar Rapids Community Climate Action Plan was approved and identifies actions to achieve the targets set forth in the resolution. The actions intend to advance the city towards its vision for a carbon-free, resilient, and accessible community for all residents.[6]

The Airport also plans to focus on GHG and energy use reduction and management, along with renewable energy production. CID has renewable energy production on-site with solar arrays, added to the Airport in 2020, and periodically evaluates additional opportunities to add additional renewable assets. As part of the Master Plan, CID developed a GHG emissions inventory using industry-accepted methodologies and tools (described in detail in Section 3). This report establishes a baseline of current GHG emissions from which to evaluate projects in the future and determine opportunities for reducing emissions. The results of the GHG emissions and energy use inventory will contribute to the airport's sustainability plan and goal setting. .

1.3 METHODOLOGY

The methodology used for CID's baseline GHG inventory is based on guidance from the Airport Carbon Accreditation (*ACA) Application Manual*[7], *ACA Verifier Manual*[8], ACI Guidance Manual on Airport Greenhouse Gas Emissions Management[9], ACERT Version 6.0 (the most recent version available at the time of reporting)[10], ACRP Report 11: Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories,[11] and the GHG Protocol.[12]

The ACERT tool includes a methodology that accounts for GHGs regulated under the Kyoto Protocol, including carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Emissions of each gas are accounted

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known as carbon removal." Source: WRI. *What Does "Net-Zero Emissions" Mean? 8 Common Questions, Answered*. September 17, 2019. Accessed April 2022. https://www.wri.org/insights/net-zero-ghg-emissions-questions-answered

[4] Source: The City Council of the City of Cedar Rapids, Iowa. *Resolution No. 0307-02-20.* February 25, 2020. Accessed April 2022. https://cms8.revize.com/revize/cedarrapids/Sustainability/CM001-20-Sustainability_Climate%20Action_R%20(004).pdf.

[5] Source: The City of Cedar Rapids. *Greenhouse Gas (GHG) Mitigation Existing Conditions.* 2021. *Accessed* April 2022. https://cms8.revize.com/revize/cedarrapids/Sustainability/CCAP%20Existing%20Conditions%20-%20GHG.pdf.

[6] Source: The City of Cedar Rapids. *Community Climate Action Plan.* Accessed April 2022. https://www.cedar-rapids.org/local_government/sustainability/community_climate_plan.php

[7] Source: ACI. Airport Carbon Accreditation Application Manual (Issue 12). November 2020. Accessed March 2022. https://www.airportcarbonaccreditation.org/airport/technical-documents.html

[8] Source: ACI. Airport Carbon Accreditation Verifier Manual (Issue 1). November 2020. Accessed March 2022. https://www.airportcarbonaccreditation.org/airport/technical-documents.html.

[9] Source: ACI. Guidance Manual: Airport Greenhouse Gas Emissions Management. 2009. Accessed March 2022. https://store.aci.aero/product/guidance-manual-airport-greenhouse-gas-emissions-management/.

[10] Source: ACI. ACERT Version 6.0. April 2020. Accessed March 2022. https://store.aci.aero/form/acert/.

[11] Source: National Academies of Sciences, Engineering, and Medicine. 2009. *Guidebook on Preparing Airport Greenhouse Gas Emissions Inventories.* Washington, DC: The National Academies Press. Accessed March 2022. https://doi.org/10.17226/14225.

[12] Source: WRI. The GHG Protocol Corporate Accounting and Reporting Standard. Accessed March 2022. https://ghgprotocol.org/corporate-standard.

for separately and reported in metric tons (MT) of CO_2 equivalent (CO_2e). Calculations for CO_2e utilize GHG Protocol values for Global Warming Potential (GWP)[13] of each GHG emitted at the Airport, as summarized in Table 1.[14] These values are derived from the Fifth Assessment Report (AR5) from the International Panel on Climate Change (IPCC) and account for GWP according to this standard.

Table 1: Global Warming Potentials of CO_2, CH_4, and N_2O in CO_2e

Greenhouse Gas (GHG)	Global Warming Potential (GWP) in CO_2E
CO_2	1
CH_4	28
N_2O	265

Source: United Nations, 2014.

To calculate a GHG footprint, emissions are categorized into three scopes based on ownership and level of control. Scope 1 encompasses direct emissions under the control of the Airport, which includes emissions from stationary combustion sources (such as from generators or boilers), mobile sources (such as motor vehicles), Airport processes (such as deicing), and other direct emissions, including fire suppression CO_2 and de-icing chemicals (under airport control). Scope 2 emissions include indirect emissions under the control of the Airport, such as those from purchased electricity. This includes GHG emissions associated with the generation of electricity consumed on-site but generated off-site at public utilities. This GHG baseline inventory documents emissions sources over which CID has control and is therefore limited to Scope 1 and 2 carbon emissions.[15] Scope 3 emissions are indirect emissions that are the result of activities from assets not owned or controlled by CID, but that CID indirectly impacts. Scope 3 may include, but is not limited to, emissions from aircraft operations and passenger travel to the airport (downstream) or employee commuting [upstream].[16]

Figure 1 provides an example overview of GHG scopes across a value chain, including both upstream and downstream.

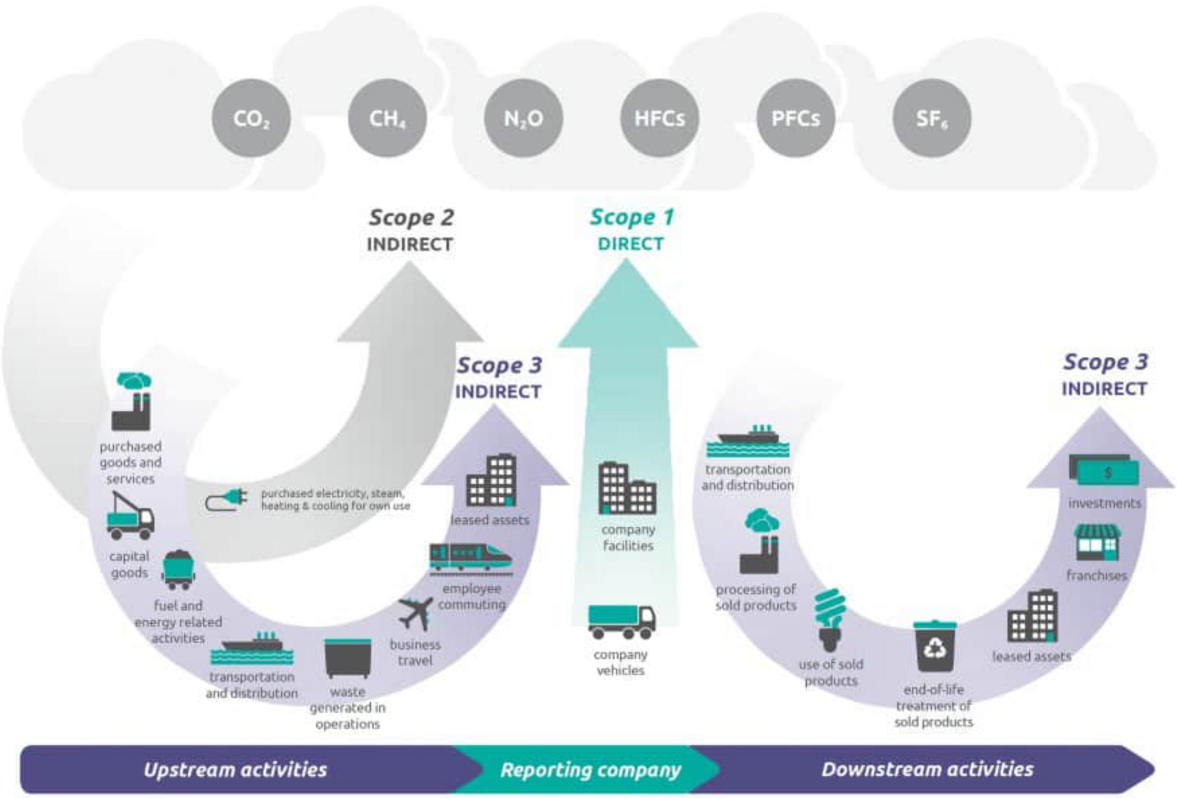
[13] Source: GWP is an emission metric that "can be used to quantify and communicate the relative and absolute contributions … of emissions of different substances" from various sources and countries to climate change. Source: Myhre, G., D. Shindell, F.-M. Bréon, W. Collins, J. Fuglestvedt, J. Huang, D. Koch, J.-F. Lamarque, D. Lee, B. Mendoza, T. Nakajima, A. Robock, G. Stephens, T. Takemura and H. Zhang, 2013: Anthropogenic and Natural Radiative Forcing. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Accessed April 2022.
https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter08_FINAL.pdf

[14] Source: GHG Protocol. Global Warming Potential Values. Accessed March 2022.
https://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf

[15] Source: According to the ACA Application Manual, "[f]or the development of the carbon footprint at level 1 and 2, the airport shall calculate its Scope 1 and 2 emissions, from sources over which it has control." ACI. ACA Application Manual Issue 12. November 2020. Accessed March 2022.
https://www.airportcarbonaccreditation.org/airport/technical-documents.html.

[16] Source: EPA. EPA Center for Corporate Climate Leadership: Scope 3 Inventory Guidance.
https://www.epa.gov/climateleadership/scope-3-inventory-guidance

Figure 1: Overview of GHG Protocol Scopes and Emissions Across the Value Chain



Source: WRI/WBCSD GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard
https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf

Boundary Setting

Consistent with *ACA Application Manual* guidance, organizational boundaries were set based on the operational control approach outlined in the GHG Protocol. Therefore, where CID has operational control over a source of emissions (Scopes 1 and 2), 100 percent of those emissions are accounted for in this inventory. For purposes of this inventory, emissions were categorized as “Control,” “Guide,” or “Influence” based on operational boundaries. These terms are defined as follows:

1. Control: Facilities, services, activities, and equipment for which the Airport has ownership/control.
2. Guide: Facilities, services, activities, and equipment owned/controlled by subcontractors, close partners, and suppliers for which the Airport can provide guidance.
3. Influence: Facilities, services, activities, and equipment owned/controlled by loose partners, tenants, customers, government agencies, etc. which the Airport can only influence.

Figure 2 provides an overview of scopes and emissions sources at airports.

Figure 2: Overview of Scopes and Emissions Sources at Airports

Source: ACA Application Manual, Issue 12, November 2020.

Table 2 provides the emissions sources for CID's baseline inventory based on the operational control approach, which included airport owned vehicles, equipment and shuttles, and stationary sources (Scope 1), as well as airport purchased electricity (Scope 2). Emissions sources were not included in the 2019 inventory if (1) the source did not exist at CID, so there were no potential CID-controlled emissions, or (2) the source did exist at CID, but there was no fuel or other material used in 2019 and therefore, there were no emissions attributed to that source in 2019.

Table 2: GHG Sources and Exclusions within CID's Operational Control and ACERT Input Data Summary, 2019

Scope	Source	Department	ACERT Section	Description	Fuel Type	ACERT Input
Scope 1	Mobile	Maintenance	2.1	Fuel used in vehicles	Diesel	90,616 L
					Gasoline	36,352 L
	Fire training	Safety	2.2	Propane usage	Propane	838 Kg
	Stationary	Maintenance	2.3	Generator fuel	Diesel	6,549 L
	Utility	Administration	3.1	Heating	Natural gas	55,500 m3
Scope 2	Utility	Administration	4.1	electricity	Electricity	6,727,635 kWh
Scope 1	Deicing Chemical	Administration	6.3	Deicing chemicals	Formate	32,006 kg

The determining factor for whether emissions are accounted for as Scope 1, Scope 2 or Scope 3 is the sufficiency of documentation to demonstrate an operational control boundary and formal chargeback mechanism. Where sufficient documentation is unavailable to reasonably draw defined and replicable boundaries around tenant electric use, but operation of the facility is under partial control of CID, 100 percent of emissions are accounted for as Scope 2, regardless of CID's actual degree of control over those emissions.

Sufficient documentation is unavailable to reasonably draw defined and replicable boundaries around tenant electric and natural gas use at CID, so all tenant electricity and natural gas use is included in the inventory as the Airport's Scope 1 and 2 emissions (no emissions are considered as Scope 3 in this analysis). Sufficient documentation demonstrating a formal chargeback mechanism includes lease agreements, rental or utility bills, or similar sources of data. Based on airline rates and charges recalculations provided by CID, HMMH was unable to parse Scope 3 emissions from the utility bills. All emissions stemming from natural gas utility bills provided are considered under Scope 1 and all emissions stemming from electric utility bills provided are considered under Scope 2.

Operational Boundaries

Included Facilities and Processes

CID has organizational and operational control over the facilities and processes outlined below. For all processes, CID has operational control over fuel and other resources and materials used. For all facilities CID maintains operational control over the use of utilities for building heating and power supply.

- Airport Operations and Maintenance
- Process Equipment and Mobile Sources
- Vehicle fleet including light duty trucks, heavy duty trucks, passenger shuttles, airfield equipment and machinery, grounds maintenance equipment and machinery, etc.
- Stationary emergency power generation
- Deicing
- Fire Training exercises

Office Buildings and Other Facilities:

- Administration
- Deicing Facility
- Fuel Farm
- Field Maintenance
- Public Safety Center
- Terminal

Lighting:

- Traffic Lights
- Streetlights
- Parking Facilities
- Airfield Operations

Data Collection

The HMMH team worked closely with CID staff to collect data and information for the carbon emissions inventory. The data collection process included inputs from the following departments:

- Maintenance
- Safety
- Administration

Table 2 above includes a description of the data sources collected and included for the baseline inventory, including responsible departments. Data sources are documented in the appendix volume and throughout the sections that follow, including descriptions of data management and storage practices, where applicable. The HMMH team processed the data and calculated emissions based on airport data.

Data Processing

Appendix A.1 includes mobile fuel data and Appendix A.2 includes generator fuel usage.

Appendix B.1 includes MidAmerican natural gas usage and Appendix B.2 includes Constellation natural gas usage (combined with MidAmerican usage for a grand total usage).

Appendix C.1 includes Alliant electricity usage data and Appendix C.2 includes the GHG Emissions Rates sheet.

Appendix D.1 includes deicing quantity calculations, Appendix D.2 includes deicing invoices, and Appendix D.3 is the deicer safety data sheet (SDS).

Detailed calculations are included in the ACERT v6.0 workbook included as Appendix E.

Calculations utilized for developing ACERT inputs, including conversion factors, are included as Appendix F, and summarized in Section 1.4. **Table 2** also provides a summary of final values that were used as inputs to the ACERT workbook, including a column which identifies the designated ACERT section.

ADJUSTMENTS AND SOURCES OF UNCERTAINTY

No adjustments were made to ACERT, or the data provided, other than the detailed calculations contained in Appendix F. This includes conversion factors between English and metric units for natural gas, fuel usage, and deicing chemicals. The HMMH team made every effort to ensure this inventory accurately reflected sources controlled by CID.

A potential source of uncertainty includes errors due to rounding and estimates for emissions. Other than uncertainties typical to self-reported emissions inventories[17] and inherent issues with the complexity of concepts like global warming potential (GWP),[18] there were no other evident concerns regarding the accuracy of data used for this inventory.

Though possible sources of uncertainty and error exist, the methodology used to complete this inventory is replicable and to the best knowledge of its preparers, the results are accurate. It meets the identified purpose of the report, to establish a baseline GHG inventory at CID against which CID will be able to evaluate progress from carbon reduction efforts in the future.

1.4 ACERT INPUTS

The tables in the sections that follow provide the final input values that were used in the ACERT workbook provided as Appendix E. Information on scope, source, responsible parties and departments, and data management were also provided, where applicable.

ACERT STEP 1 – GENERAL AIRPORT INFORMATION

ACERT Section 1– General Airport Information

Airport	Eastern Iowa Airport
Airport Operator	Cedar Rapids Airport Commission
Country	USA
ACI Region	North America
Passenger Movements	1,344,936
Aircraft Movements	52,816
Cargo (t)	35,696

[17] Source: Gurney, K.R., Liang, J., Roest, G. et al. Under-reporting of greenhouse gas emissions in U.S. cities. Nat Commun 12, 553 (2021). Accessed March 2022. https://doi.org/10.1038/s41467-020-20871-0.
[18] Source: Smith, S.J., Wigley, T.M.L. Global Warming Potentials: 2. Accuracy. Climatic Change 44, 459–469 (2000). Accessed March 2022. https://doi.org/10.1023/A:1005537014987.

ACERT STEP 2 – AIRSIDE VEHICLES, MACHINERY, GROUND SERVICE EQUIPMENT (GSE), FIRE TRAINING

Emissions from Mobile Fuel Combustion

ACERT Section 2.1: Fuel used in vehicles, including airside transport, machinery, GSE, de-icing trucks, etc.

Scope	1
Source	CID
Department	Maintenance
Fuel Used	Gasoline – 36,352 Liters
	Diesel – 90,616 Liters
Accompanying Appendix	A.1

Scope 1 emissions from mobile fuel sources were calculated based on data and information provided by CID. Fuels used by mobile sources included unleaded gasoline and diesel.

Equipment ID and description data from summary reports was cross-referenced to detailed transaction reports to derive totals based on vehicle types; however, this detailed fleet analysis did not alter totals used in ACERT.

Total fuel use values were provided in gallons and were converted to liters (L) prior to entry into ACERT using a conversion factor of 3.79 L/gal. Totals were then entered into ACERT under Section 2.1 to calculate emissions from mobile sources in MT of CO_2e.

Emissions from Fire Training

ACERT Section 2.2: Fuel used for fire training

Scope	1
Source	CID
Department	Safety
Fuel Used	Propane – 838 kg
Accompanying Appendix	N/A

Scope 1 emissions from fire training were calculated based on data provided by CID. Propane usage was provided in gallons and converted into kilograms prior to entry into ACERT using a conversion factor of 1.91 kg/gallon of propane.

Emissions from Stationary Fuel Combustion

ACERT Section 2.3: Fuel used for Stationary Emergency Power Generation Units

Scope	1
Source	CID (Consolidated Energy invoices)
Department	Maintenance
Fuel Used	Diesel – 6,549 Liters
Accompanying Appendix	A.2

Scope 1 emissions from stationary diesel fuel sources were calculated based on data and information provided by CID for emergency generators. Natural gas generator usage is included in Step 3.

Total diesel fuel use values were provided in gallons and were converted to liters (L) prior to entry into ACERT using a conversion factor of 3.79 of L/gal. Total diesel fuel use values were then entered into the ACERT tool under Section 2.3 to calculate emissions from stationary emergency power generating units in MT of CO_2e.

ACERT STEP 3 – FUEL USED FOR HEATING BUILDINGS AND GENERATING ELECTRICITY

ACERT Section 3.1: Annual carburant used for electricity and heat generation (buildings or heating plant)

Scope	1
Source	CID (Constellation Energy and MidAmerican bills)
Department	Administration
Fuel Used	Natural Gas – 55,500 m^3
Accompanying Appendix	B

Natural gas usage in buildings was provided by CID utility bills based on purchased natural gas. Following the organizational boundary setting exercise described in Section 1.3, totals for 2019 natural gas usage in buildings under full or partial airport operator control were derived from summing usage from MidAmerican and Constellation Energy bills. These totals were input into ACERT to calculate Scope 1 emissions from building heating. 2019 annual totals were converted from therms of natural gas to cubic meters (m^3) using a conversion factor of 2.851 m^3/therms for entry into ACERT under Section 3.1 to calculate emissions from natural gas utility use in MT of CO_2e. Original data is provided in Appendix B.

ACERT STEP 4 – ELECTRICITY PRODUCED OR PURCHASED FROM EXTERNAL SUPPLIER

Electricity Purchased

Scope 2 emissions from purchased utilities were calculated based on data and information contained in CID's Alliant Energy bills. Following the organizational boundary setting exercise described in Section 1.3, totals for 2019 utility usage under full or partial airport operator control was derived from summing electricity purchased by CID.

ACERT Section 4.1a: Electricity Purchased from 3rd Party (External) Supplier

Scope	**2**
Source	CID (Alliant Energy bills)
Department	Administration
Utility Used	6,727,635 kwH
Accompanying Appendix	C.1

Annual totals for 2019 were provided in kWh of electricity, so no conversion was necessary for entry into ACERT under Section 4.1a to calculate emissions from electric utility use in MT of CO_2e. Original data is provided in Appendix C.

Determination of Electricity Emissions Factor

Alliant Energy's regulated subsidiary, Interstate Power and Light, published GHG emissions rates for Iowa retail electric customers in April 2022.[19] This factor was provided as 929 lbs of CO2e/MWh. Using a conversion factor of 453.59 grams/lb and 1000 kWh/MWh, the emissions factor was converted for entry into ACERT.

ACERT Section 4.b: Electricity Emission Factor

Source	Alliant Energy – Interstate Power and Light
Factor Used	421.8 g CO2/kWh
Accompanying Appendix	C.2

ACERT Step 6– Other Airport Processes & Activities[20]

ACERT Section 6.3: De-icing chemicals for aircraft and surface de-icing

Scope	**1**
Source	CID (NewDeal invoices)
Department	Administration
De-icing chemicals	32,006 kg formate
Accompanying Appendix	D

[19] Source: Interstate Power and Light Electric Utility Supplier-Specific Customer Data Renewable Energy, Energy Mix and Greenhouse Gas Emission Rates. April 2022. Accessed April 2022. https://www.alliantenergy.com/-/media/alliant/documents/cleanenergy/responsibility-report/iplrenewablesgreenhousegasrates.pdf?la=en&hash=2C5614D201DA5FF5560673EB5778B88A.

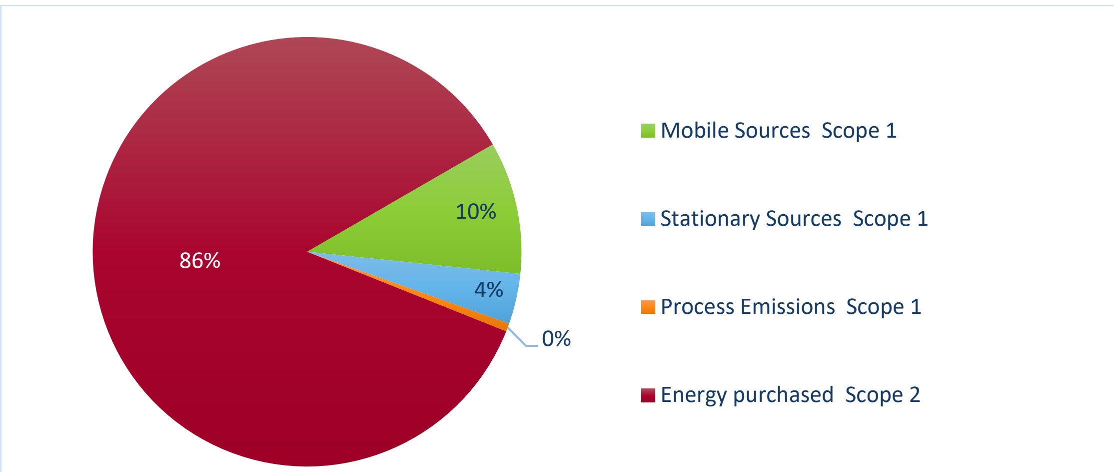
[20] ACERT Step 5 encompasses heat (or steam) generated off-site and/or resold on-site; this was not included in the inventory since it is not a GHG source at CID.

Deicing chemical usage was based on invoices from New Deal Deicing. Total purchased formate for 2019 was converted from pounds to kilograms (kg) using a conversion factor of 0.45 kg/lb. This was entered into ACERT under Section 6.3 to calculate the process emissions from deicing chemical application. Original invoices and data are provided in Appendix D.

1.5 RESULTS

Figure 3 summarizes the results of the baseline GHG emissions inventory at CID in 2019 by scope, source, and GHG emission type.[21] As the airport operator, CID is responsible for a GHG emission total of 3,314.3 MT of CO_2e in 2019, consisting of the CID-controlled Scope 1 and Scope 2 emission sources identified in this report. Scope 2 sources represent 86 percent (2837.7 MT of CO_2e) of the total GHG emissions while 14 percent are attributable to Scope 1 (476.6 MT of CO_2e) sources. Scope 2 emissions represent those from purchased electricity. Scope 1 emissions are comprised of mobile, stationary, and process sources. Mobile sources account for 10 percent of total emissions (330.7 MT of CO_2e) while stationary sources account for 4 percent of total emissions (125.7 MT of CO_2e). Process emissions from deicing chemical application make up less than one percent of this inventory.

Figure 3: Summary of 2019 GHG Emissions at CID



Sources: HMMH Analysis, 2021; Airport Records (received 2021).

Table 3 provides results for Key Performance Indicators (KPIs) at CID in 2019 for the baseline inventory, against which CID can compare progress in reducing GHG emissions. For 2019, CID's airport carbon intensity for commercial operations was 2.46 kg CO_2e/passenger.

Table 3: Key Performance Indicators for 2019 CID GHG Emissions Inventory

Key Performance Indicator (KPI)		Value
Airport Carbon Emissions	Scopes 1+2	3,314 MT CO2e
Airport Carbon Intensity	Scopes 1+2	2.46 kg CO2e/passenger

Sources: HMMH Analysis, 2021; Airport Records (received 2021).

[21] Source: The Output tab of Appendix E summarizes inventory results within the ACERT tool.

1.6 ENERGY USE 2019 BASELINE

Calendar year 2019 was chosen as the representative baseline year for the energy use inventory, due to the COVID-19 pandemic and associated decline in air travel in 2020. This baseline can be used to evaluate progress in reducing future energy use at CID.

Table 4: 2019 Energy Use Baseline

Fuel Type	Fuel Source	Fuel Use Original Units	Fuel Use Converted for ACERT Inputs
Diesel	Mobile	23,938 gal	90,616 L
Gasoline	Mobile	9,603 gal	36,352 L
Propane	Fire Training	440 gal	838 Kg
Diesel	Stationary (Generators)	1,730 gal	6,549 L
Natural gas	Utility Purchased	19,468 therms	55,500 m3
Electricity	Utility Purchased	6,727,635 kWh	6,727,635 kWh

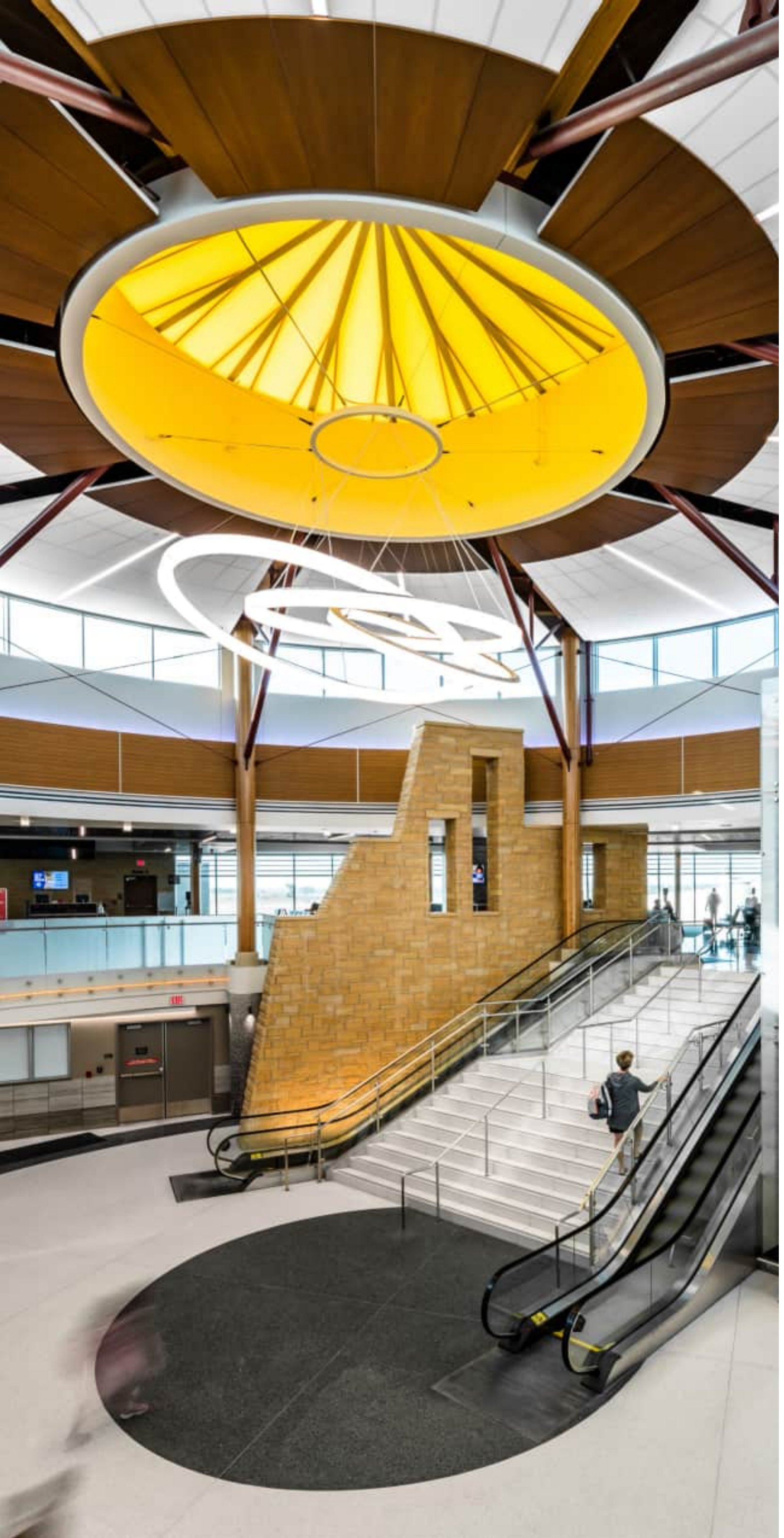
Sources: HMMH Analysis, 2021; Airport Records (received 2021).

Appendix B-2

Sustainability Plan

EASTERN IOWA AIRPORT
FLYCID

2023
EASTERN IOWA AIRPORT
SUSTAINABILITY PLAN



CONTENTS

The following acronyms can be found in this Plan:

ACDBE - Airport Concessions Disadvantaged Business Enterprise
CID - Eastern Iowa Airport
DBE - Disadvantaged Business Enterprise
EV - electric vehicle
GHG - greenhouse gas
GPU - ground power units
GSE - ground support equipment
PCA - pre-conditioned air
PFAS - per- and polyfluoroalkyl substances
PV - photovoltaic

ABOUT THE SUSTAINABILITY PLAN

Airport sustainability is broadly defined as the balance between economic vitality, operational efficiency, natural resource conservation, and social responsibility. CID is committed to incorporating sustainability into all aspects of our organization to improve the customer experience, contribute to community sustainability initiatives, conserve natural resources, reduce costs, and demonstrate leadership. CID has developed this Sustainability Plan to provide a roadmap for successful execution of sustainability goals and actions. The Sustainability Plan goals and actions align with CID's Mission and Core Values.

SUSTAINABILITY VISION STATEMENT

CID strives for continuous improvement through innovation, stakeholder and workforce engagement, and natural resource conservation. CID will maximize operational efficiency and complement sustainability objectives of CID's regional partners.

LETTER FROM MARTY P. LENSS

Airport Director

Although the past few years have been challenging for our industry, the Eastern Iowa Airport (CID) has been busy planning for the future as our region recovers from the COVID-19 global pandemic. Despite the recent unprecedented uncertainty in our industry, I am pleased to present CID's first Sustainable Master Plan – a forward-looking document that integrates sustainability into all that we do, to prepare the airport for future demand and provide the best possible customer service. Innovation and flexibility are key aspects of our organization, and this plan embodies those qualities.

The Eastern Iowa Airport Sustainability Plan was developed over the past year with input from our staff, tenants, business partners, and the community. Although this is our first comprehensive Sustainability Plan, sustainability has long been a strategic objective for CID. The goals, targets, and actions contained in this document build upon years of work to increase the environmental, fiscal, and social benefits of the airport, while minimizing our impacts. Our goals are ambitious but achievable, and together with the greater Eastern Iowa region, we will achieve our vision for a sustainable future.

Plan Development

This Sustainability Plan was developed from 2021 to 2022 as part of CID's overall Master Plan and takes into account future growth and anticipated demand. CID sought input from key stakeholders along the way, regarding their own sustainability efforts and priorities, through a workshop, interviews, and meetings.

Stakeholders included surrounding communities and organizations, tenants, partners, and utility providers:

- Linn and Johnson County
- City of Cedar Rapids
- Iowa City
- University of Iowa
- Airline representatives
- Signature Flight Support
- Concessionaires
- Tenant farmers
- Alliant Energy
- Constellation Energy

The resulting CID Sustainability Plan includes goals organized into four categories:

- Stakeholder Outreach and Engagement
- Greenhouse Gas and Energy Reduction
- Water Quality and Use
- Waste Management

Each goal includes a target, actions required to achieve the goal, prioritization considerations, and related existing initiatives. Through the implementation of the Sustainability Plan, CID hopes to engage with a range of stakeholders and perspectives, align with local sustainability initiatives, build upon existing airport activities and initiatives, and apply industry best practices.

Plan Focus Areas

Stakeholder Outreach and Engagement

- Increase stakeholder awareness
- Be a considerate neighbor
- Be a desirable place to work and do business
- Provide a safe and comfortable experience

01

Greenhouse Gas and Energy Reduction

- Achieve net-zero carbon emissions by 2050

02

Water Quality and Use

- Reduce potable water use
- Protect water resources
- Ensure resilient infrastructure
- Preserve and expand green spaces

03

Waste Management

- Reduce waste

04

CID MISSION AND CORE VALUES

The Eastern Iowa Airport (CID) is committed to being the number one choice for air transportation in Eastern Iowa and the border regions of Wisconsin and Illinois. To accomplish this, CID has five core values:

Fiscal Responsibility

Strengthen financial position by increasing non-airline revenue, optimizing operational and maintenance expenses, and ensuring timely funding for existing and future capital improvement projects.

Accountability

Ensure the safe and financially viable management and development of the Eastern Iowa Airport to the benefit of public and private stakeholders.

Customer Service

Enhance customer experience through friendly, informative, and helpful service.

Environmental Stewardship

Ensure the responsible management of environmental resources in all current and future projects to the benefit of the Eastern Iowa community and generations to come.

Safety and Security

Create a safe and hassle-free travel experience for passengers, and a secure work environment for employees through compliance with Federal and local regulations and standards.

STAKEHOLDER OUTREACH AND ENGAGEMENT

INCREASE STAKEHOLDER AWARENESS

Goal 1

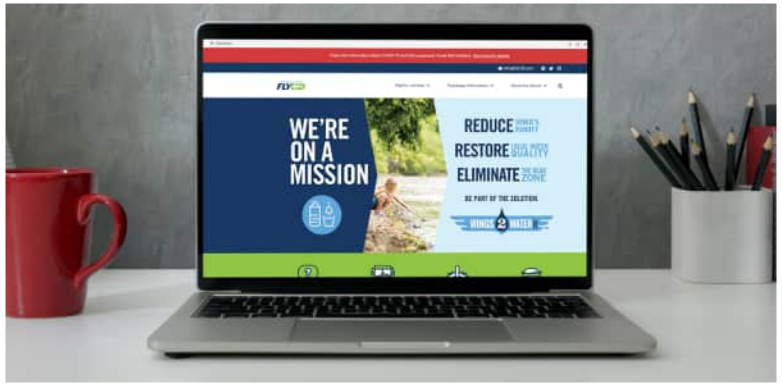
Ensure stakeholders are aware of CID's sustainability efforts and progress and understand sustainability is a priority for the airport.

Targets

- Implement Sustainability Plan, track progress, and communicate outcomes with stakeholders.
- Integrate sustainability throughout the organization.

Actions

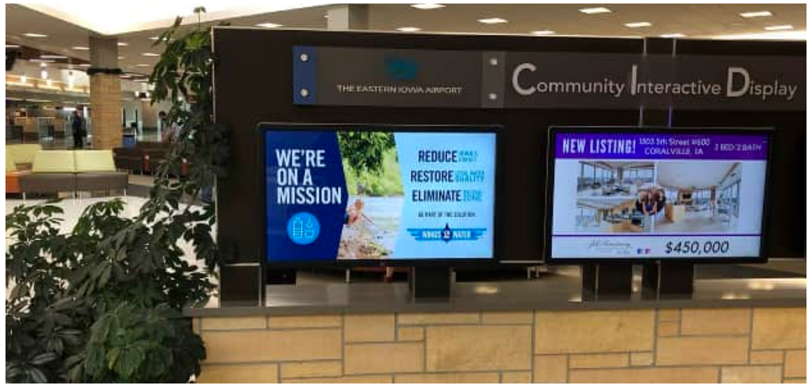
- Create sustainability content for airport the website.
- Incorporate sustainability messaging and updates into outreach and other communications.
- Develop a sustainability dashboard to communicate and track goal progress.
- Publish annual sustainability report summary and progress updates on all goals outlined in the Plan.



CID websites share information with the public.

Existing Initiatives

CID engages passengers in the terminal through displays related to sustainability initiatives and other local cultural institutions that contribute to a sense of place.



A Community Interactive Display in the CID terminal

BE A CONSIDERATE NEIGHBOR

Goal 2

Be a considerate neighbor to surrounding communities.

Target

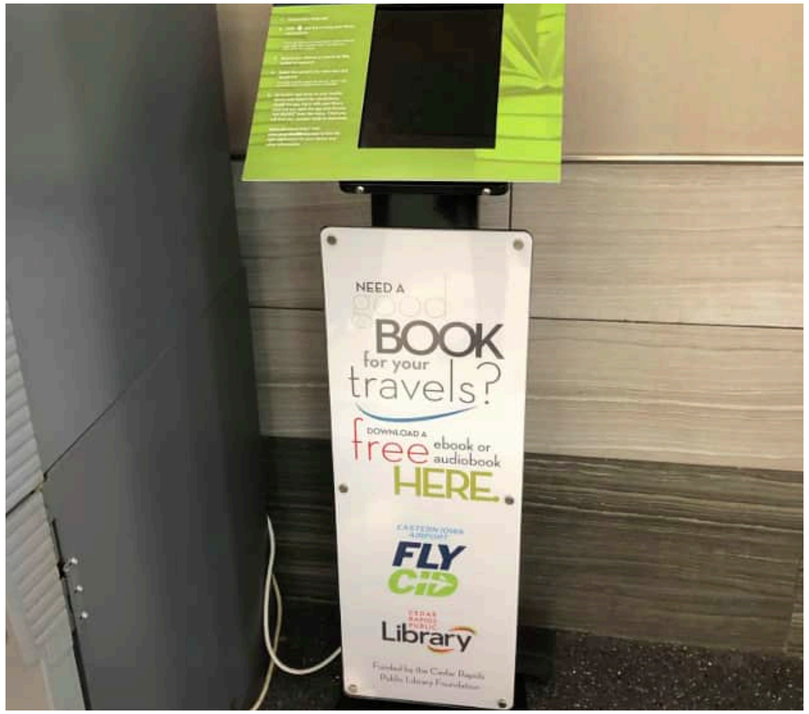
- Partner with other stakeholders to make progress on local initiatives.

Actions

- Evaluate and document partnerships with the City of Cedar Rapids, surrounding counties, and other community stakeholders, such as community groups, nonprofits, and local organizations, to achieve shared sustainability goals.

Existing Initiatives

Sustainability is important to the Eastern Iowa region and the local governments, organizations, and communities in the area. CID is located in Linn County, owned by the City of Cedar Rapids and operated by the Cedar Rapids Airport Commission. It neighbors Johnson County and serves the surrounding area, particularly Iowa City and the University of Iowa. These entities all have sustainability plans and initiatives in various stages of implementation. CID aims to continue partnerships with surrounding municipalities and universities to accomplish shared sustainability research and development initiatives.



A kiosk in the CID terminal allows the public to download a free eBook or audio book in partnership with the Cedar Rapids Public Library.

BE A DESIRABLE PLACE TO WORK

Goal 3

Be a desirable place to work and do business.

Targets

- Ensure employees have career development opportunities.
- Increase employee satisfaction over time.
- Develop a workforce of the future.
- Improve diversity of vendors.
- Consistently exceed minimum contracting goals for disadvantaged, women, and minority-owned businesses.

Actions

- Assess workforce development and training opportunities and identify pathways for advancement and where opportunities are needed.
- Conduct regular employee satisfaction surveys and track responses.
- Identify needed skill sets, develop succession plans that include community workforce training, apprenticeship or internship programs for local residents.
- Provide guidance and assistance to disadvantaged, women, and minority-owned businesses seeking to do business at the airport.
- Conduct training for project managers and contracting officers.
- Track performance against Federal Aviation Administration's 3-year DBE and ACDBE goals for airport grant recipients.

Concessions in the CID terminal

Existing Initiatives

CID currently provides guidance to local small businesses seeking to work with the airport.

PROVIDE A SAFE AND COMFORTABLE EXPERIENCE

Goal 4

Ensure all passengers have a safe, comfortable, and convenient experience at CID.

Target

- Increase passenger satisfaction and service quality scores.

Actions

- Conduct regular passenger satisfaction surveys with sustainability elements and report results.
- Continue to utilize terminal space to display local items and programs of interest to engage the traveling public.
- Provide spaces designed to decrease stress levels such as outdoor space, yoga rooms, mediation rooms, lactation rooms, or sensory rooms.

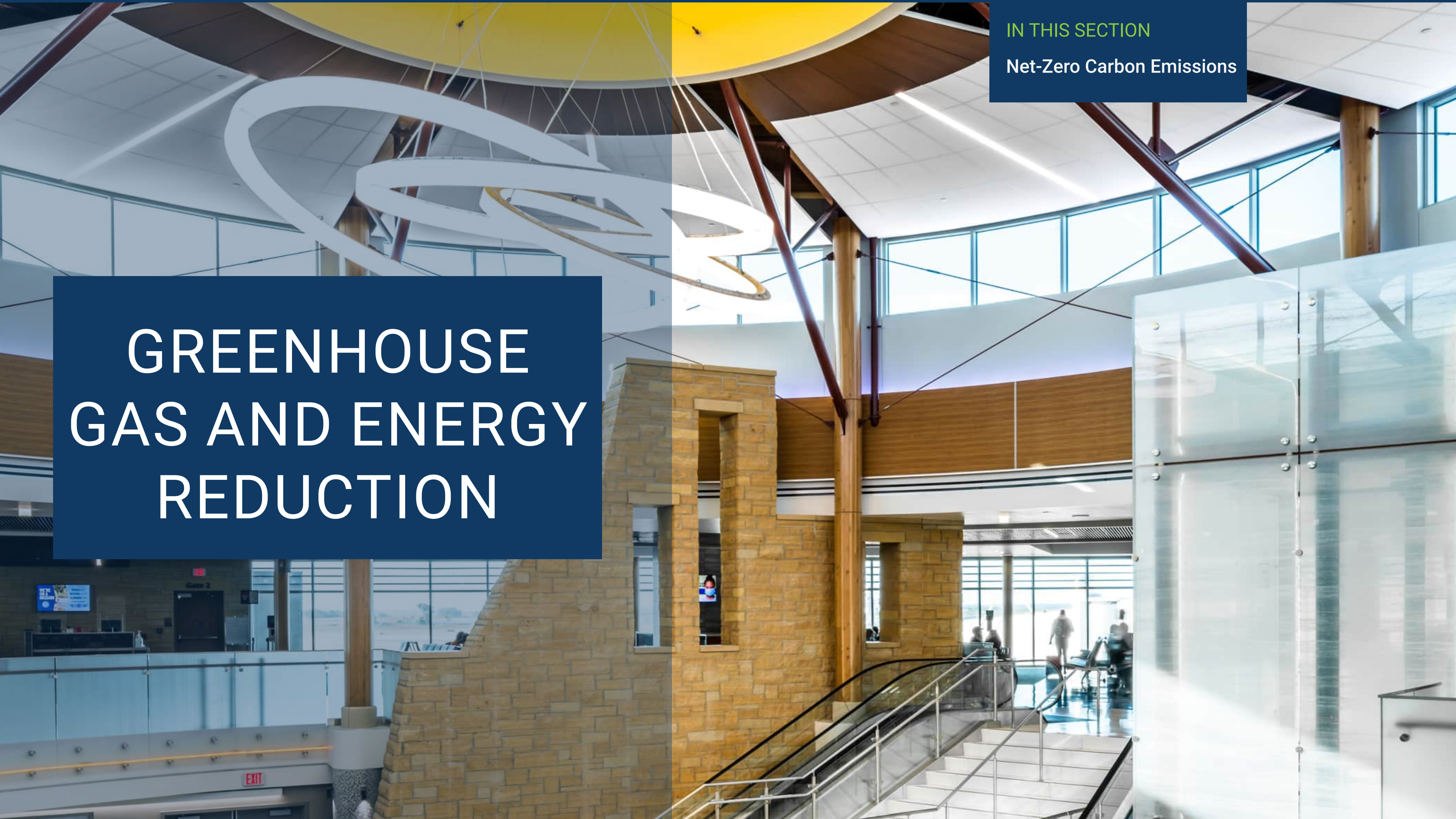
Rooftop patio at CID

Existing Initiatives

CID engages passengers in the terminal through displays related to sustainability initiatives and other local cultural institutions that contribute to a sense of place.

University of Iowa display in the CID terminal

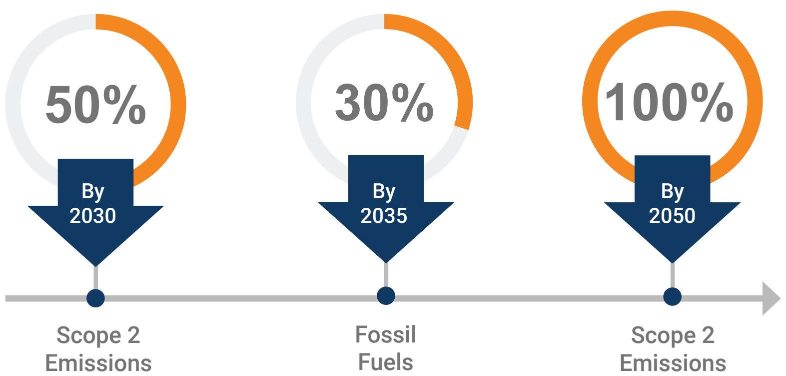
GREENHOUSE GAS AND ENERGY REDUCTION



NET-ZERO CARBON EMISSIONS

Goal 1

Achieve net-zero carbon emissions by 2050.



Targets

- Demonstrate consistent reduction in Scope 1 and 2 emissions on an annual basis (3-year rolling average), measured in metric tons of CO_2 equivalent on an absolute- and per-passenger basis.
- By 2030, reduce Scope 2 emissions by 50%; by 2050, reduce Scope 2 emissions by 100%, measured in metric tons of CO2 equivalent on an absolute and per passenger basis, volume of natural gas used, or percentage of square footage heated by natural gas versus geothermal energy.
- By 2035, reduce use of conventional/fossil fuels by 30%, measured by the number of alternative fuel vehicles in fleet, number of electric vehicle (EV) chargers, percentage of ground support equipment (GSE) fleet that is electric, and percentage of passengers and employees that travel to and from the airport by methods other than a single occupancy vehicle.
- Increase energy efficiency of airport facilities and reduce energy use intensity, measured in annual energy use per square foot.

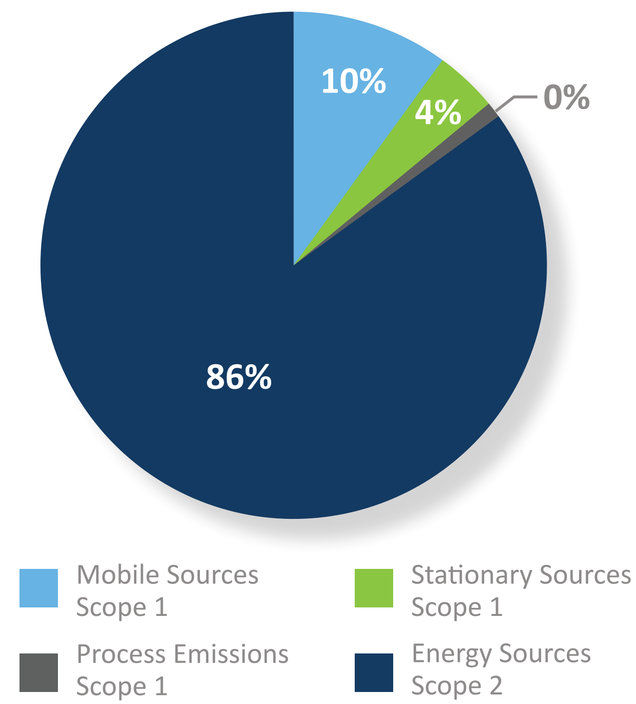
Actions

- Complete annual greenhouse gas (GHG) inventory.
- Identify and implement additional solar projects and innovative partnerships.
- Consider microgrid feasibility study for onsite renewable and resilient energy production.
- Study possibility for expanding geothermal for building heating.
- Consider small wind turbine feasibility study.
- Purchase or replace fleet vehicles with hybrid or EV (when available).
- Invest in EV charging infrastructure.
- Work with tenants to understand and discuss future of electric GSE, ground power units (GPU), pre-conditioned air (PCA) implementation at the airport.
- Consider multimodal transportation terminal to expand public surface transportation connections to the airport.
- Incentivize rental car companies and ground transportation service providers to use low and zero emission vehicles.
- Continue implementation of energy efficiency upgrades including lighting upgrades.
- Continue facility replacement program and continue participation in rebate programs.
- Install and maintain lighting and motor controls.
- Implement continuous commissioning to maintain system efficiency and consider software options for identifying inefficient uses of energy through existing building controls and sensors.

Baseline

Greenhouse Gas

CID developed a 2019 baseline GHG emissions inventory for emissions sources over which CID has control, including both Scope 1 and Scope 2 emissions. CID's baseline GHG emissions totaled 3,314.3 metric tons of CO2 equivalent in 2019. Scope 2 emissions from purchased electricity represent 86% of the total GHG emissions, while 14% of emissions are attributable to Scope 1 sources. Scope 1 emissions include mobile, stationary, and process sources. Mobile sources at CID account for 10% of Scope 1 emissions, while stationary sources account for 4% of Scope 1 emissions. Process emissions from deicing chemical application make up less than one percent of the baseline emissions.



Sources: HMMH Analysis, 2021; Airport Records, received 2021

NET-ZERO CARBON EMISSIONS

Energy Use

CID developed a 2019 energy use baseline as shown in Table 1.

Table 1. 2019 Energy Use Baseline (Sources: HMMH Analysis, 2021; Airport Records, received 2021)

Fuel Type	Fuel Source	Fuel Use Original Units	Fuel Use Metric Units
Diesel	Mobile	23,938 gal	90,616 L
Gasoline	Mobile	9,603 gal	36,352 L
Propane	Fire Training	440 gal	838 Kg
Diesel	Stationary (Generators)	1,730 gal	6,549 L
Natural Gas	Utility Purchased	19,468 therms	55,500 m^3
Electricity	Utility Purchased	6,727,635 kWh	6,727,635 kWh

Existing Initiatives

CID has incorporated solar and geothermal energy sources into new, existing, and renovated facilities to reduce the Airport's electricity and heating demand. Roof-mounted solar panel installations have been installed on five airport buildings and one ground solar photovoltaic (PV) system was installed for associated electrical infrastructure. CID has also installed geothermal heating for the Main Terminal and multiple other locations. Exterior and interior lighting upgrades and installation of an interior skylight in the Main Terminal has improved lighting efficiency and minimized the need for artificial lights during the day. Additionally, CID installed four EV charging stations in 2017 and is working to improve its charging capacity.

Rental car companies at the airport are also planning to add EV charging stations.

Alliant Energy provides electricity to the airport and has a goal of net-zero CO2 emissions by 2050, with a focus on clean, renewable energy. Alliant's efforts to reduce their own GHG emissions will benefit the airport by reducing CID's Scope 2 emissions over time. In addition, Alliant offers energy efficiency rebates, commercial energy audit services, and new renewable energy pilot programs. CID has taken advantage of rebates from Alliant for lighting upgrade projects, as well as commercial new construction energy modeling for the Terminal Modernization project. Alliant and CID continue to partner on initiatives to improve energy efficiency and renewable energy projects.

Roof-mounted solar panels and a ground solar PV system at CID

WATER QUALITY AND USE

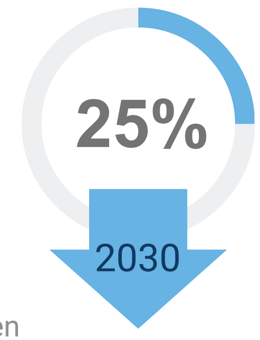
REDUCE POTABLE WATER USE

Goal 1

Reduce potable water use.

Target

- Reduce potable water use by 25% per passenger by 2030, measured in total annual consumption.



Actions

- Ensure that low-flow fixtures are installed during any bathroom or kitchen renovations.
- Ensure that sensor-operated flush valves on toilets and sensor-operated faucets are installed during any bathroom renovations.
- Consider collection and use of rainwater or gray water for landscaping, minimizing watering landscaping, and vehicle washing with gray water.
- Consider collection and use of gray water for other indoor non-potable uses such as toilets.
- Consider implementing metering and monitoring systems for leak detection.
- Work with tenants to implement water-saving strategies.

Baseline

- In 2019, facilities at CID used approximately 8.58 million gallons of water.

Low-flow sinks and sensor-operated faucets in terminal restrooms

Existing Initiatives

As part of their Terminal Modernization Program, the Airport installed water efficiency measures including low-flow sinks and sensor-operated flush valves and faucets within the terminal restrooms. It also included an efficient water bottle refill station to reduce water bottle waste.

Water bottle refill station in the CID terminal

PROTECT WATER RESOURCES

Goal 2

Protect water resources.

Targets

- Minimize impervious surfaces, measured in total area of impervious surfaces.
- Reduce chemical runoff.

Actions

- Continue to implement and update the Stormwater Management Master Plan, as needed.
- Ensure impervious surfaces are minimized in landside development projects.
- Develop a program to utilize low-toxic and non-toxic cleaning products.
- Develop a program to minimize the use of fertilizers, herbicides, and pesticides.
- Continue developing the per- and polyfluoroalkyl substances (PFAS) action plan.
- Continue sustainable farming practices and proactively seek opportunities to implement new sustainable agriculture practices.
- Continue waterway maintenance program.
- Continue support for and participation in Wings2Water program.

PROTECT WATER RESOURCES

Existing Initiatives

In 2012, the airport constructed an outfall deicing basin to improve stormwater quality and it has contracted with an environmental engineering company for monitoring. Additionally, CID founded and promotes the Wings2Water program, a non-profit program in partnership with Linn County Conservation and Johnson County, which funds water quality improvement projects in both counties.

A majority of CID acreage consists of farmland, representing 2,000 of its 3,200 total acres. The farmland is leased and farmed by two local farmers. The land is located at the top of the watersheds for both the Cedar and Iowa rivers, making it critical to reduce fertilizer use and nutrient runoff as much as possible to protect water resources downstream. CID tenant farmers are required to adhere to sustainable farming practices including planting cover crops, no till planting, and no fall fertilizer application.

ENSURE RESILIENT INFRASTRUCTURE

Goal 3

Ensure resilient infrastructure.

Target

- Conduct a climate risk assessment for critical infrastructure.

Actions

- Identify resiliency measures and incorporate these measures into future renovation and development projects.

Existing Initiatives

CID works with the City of Cedar Rapids to support in emergency response situations, such as natural disasters like the 2016 flood and 2020 derecho. Resilience planning ensures that critical infrastructure would remain available in the event of major disasters.

PRESERVE AND EXPAND GREEN SPACES

Goal 4

Ensure resilient infrastructure.

Target

- Onsite landside restoration of native vegetation, measured by total area of green space.

Actions

- Expand native plantings and pollinator habitats where and when practicable.
- Identify sites that can be converted from lawn or paved surface to native plantings.

A sculpture welcomes passengers to the CID terminal.

Existing Initiatives

CID previously installed drought resistant, native and adapted landscaping under the CID Terminal Modernization program.

IN THIS SECTION

WASTE MANAGEMENT

REDUCE WASTE

Goal 1

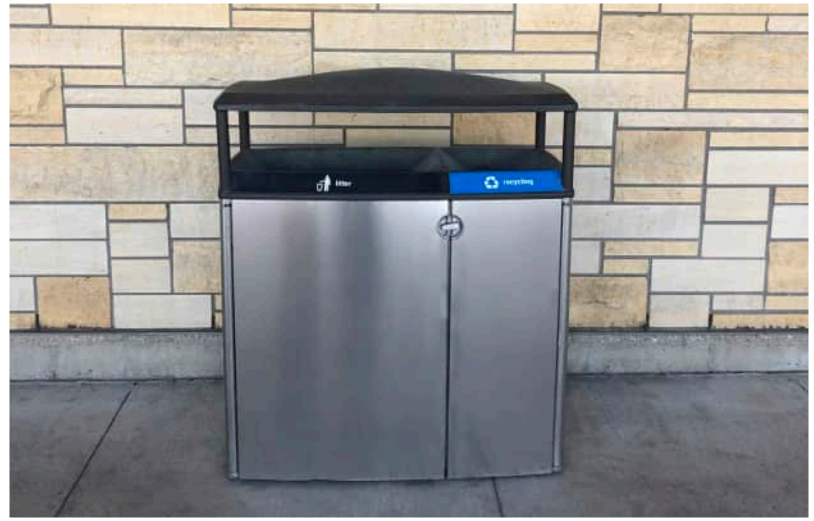
Reduce waste generated by and at CID.

Target

- Decrease amount of waste sent to the landfill, measured in the amount of waste diverted (amount recycled, reused, or composted).

Actions

- Initiate multi-platform education about material separation to passengers and employees.
- Assess and track waste sent to landfill and recycling facilities, potentially conduct a waste audit.
- Expand passenger and employee awareness of the need to empty out liquids prior to recycling any liquid container.
- Encourage use of liquid collection stations.
- Develop waste and recycling pilot programs for specific waste streams.
- Complete a feasibility study for organics composting program.
- Develop and implement construction and demolition waste diversion contract requirements.
- Reduce packaging and other key sources of waste, including plastic containers.
- Reengage food donation program with stakeholders.
- Consider program to separate and recycle deplaned waste.

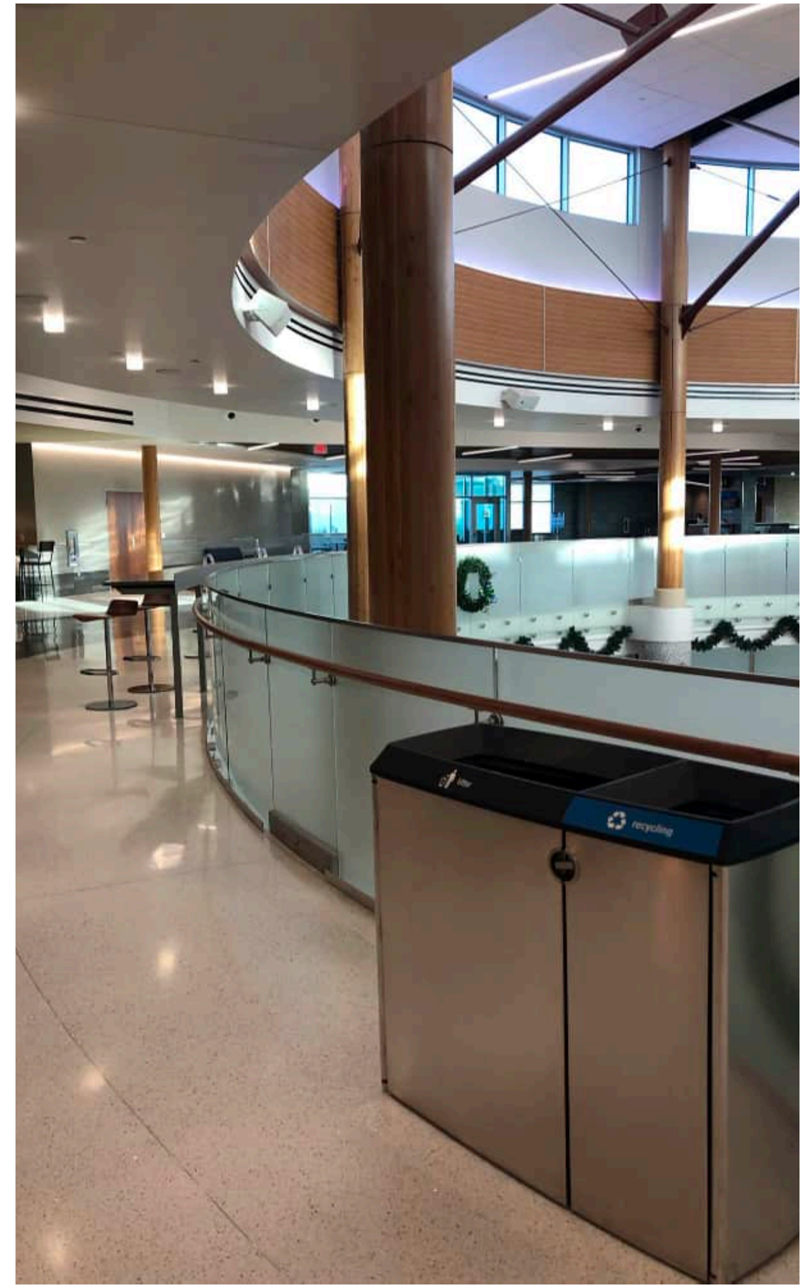


Conjoined waste and recycling bin on the terminal curbside at CID

Existing Initiatives

CID provides recycling bins in the terminal for passengers. The airport also recycles oil, scrap metal, and lighting such as light bulbs and fluorescent lights.

Gates and wayfinding signs in the CID terminal



Conjoined waste and recycling bin in the CID terminal


EASTERN IOWA AIRPORT
FLYCID

Appendix C-1

Land Use Management, Part 1

EASTERN IOWA AIRPORT

Land Use Strategy Document

September 2022

Kimley»Horn

In Association with:

hmmh

LAND USE STRATEGY DOCUMENT

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Land Use Strategy Document

1. INTRODUCTION

As the world emerges from crippling restrictions associated with the COVID-19 pandemic, a growing global economy results in a bullish outlook for aviation in the U.S. This outlook is largely driven by robust projected growth of commercial, cargo, and business jet activity.[1] In anticipation of future growth, airport sponsors (e.g., municipalities, counties, airport authorities) should take steps to promote development that is compatible with aviation activities in relation to operational safety and noise considerations. This includes partnering with local municipal governments to plan and support land uses adjacent to and in the vicinity of airports which are consistent with existing and future airport operations, especially the takeoff and landing of aircraft. This Land Use Strategy Document has been prepared for the Eastern Iowa Airport (the Airport or CID) and local jurisdictions to provide relevant information on land use compatibility planning and to promote collaborative, compatible planning efforts within the airport environs.

2. OVERVIEW OF AIRPORT LAND USE COMPATIBILITY

What is Airport Compatible Land Use?

Airport compatible land uses are defined as those that can coexist with a nearby airport without either constraining the safe and efficient operation of the airport or exposing people living or working nearby to unacceptable levels of noise or hazards.[2] The issue of airport land use compatibility is not new, with documentation dating back to 1952 with a report commissioned by President Harry S. Truman entitled "The Airport and Its Neighbors," also known as the Doolittle Report. While airports historically were built on the outskirts of cities and towns, population growth and the development needed to accommodate that growth began to encroach on airports, creating conflicts over safety, noise, and airspace protection. In some cases, the result of this unconstrained growth was the closure or relocation of airports further from populated areas. In less extreme cases, this led to contentious relationships between airports and their surrounding communities and neighbors as the impacts of incompatibility could be felt on both sides of the airport fence.

Generally, compatible land uses comply with limitations associated with location, height, noise sensitivity, population density, activity, and more. For example, land uses typically considered to be compatible with airport operations include commercial, industrial, and agricultural uses. Alternatively, incompatible land uses, such as those that pose physical obstructions (e.g., tall structures), create visual distractions (e.g., smoke, lights, glare), and attract wildlife (e.g., wetlands, crops, open water) can threaten the safety of aircraft operations. Additionally, the effects of airport operations on incompatible land uses—especially noise impacts on residential and institutional uses (e.g., schools, hospitals, churches)—can create a negative perception of the airport in local communities.

Although certain land uses are generally accepted as being compatible with airport operations, specific instances should be evaluated on a case-by-case basis. For example, land uses that are traditionally considered to be compatible with airport operations may contain incompatible characteristics, such as if a

[1] FAA Aerospace Forecast Fiscal Years 2021–2041.

[2] FAA, DRAFT Advisory Circular 150/5190-4B – Airport Land Use Compatibility Planning, 2021.

commercial use attracts dense concentrations of people or if an industrial use includes tall smoke/ventilation stacks that create both airspace and visual obstructions. Planners must assess the compatibility of the land use in greater detail as it relates to individual communities and the operations of specific airports.

FAA Criteria Related to Airport Land Use Compatibility

The Federal Aviation Administration (FAA) cannot directly regulate or enforce airport land use compatibility efforts. Rather, the FAA promotes airport land use compatibility via grant assurances, airport design standards, airspace obstruction review, and advisory circulars:

- **Grant Assurances:** Airports that receive federal grants from the FAA through the Airport Improvement Program (AIP) must sign assurances to pursue appropriate actions, to the extent reasonable, to secure and promote compatible land use and development within the airport environs.[3] Such actions may include the adoption of zoning laws and changes to zoning that may increase airport land use compatibility.
- **FAA Design Standards:** The FAA publishes design standards that regulate the physical layout of airports. In the context of land use compatibility, FAA design standards pertain to areas in proximity to runway ends and approach/departure areas. These areas are critical to the safe operation of aircraft and the safety of people and property on the ground. These safety areas include Runway Protection Zones (RPZs), Runway Safety Areas (RSAs), and Runway Object Free Areas (ROFAs). More information on these areas can be found in FAA Advisory Circular (AC) 150/5300-13B *Airport Design*.
- **Federal Aviation Regulation (FAR) Part 77 Surfaces:** FAR Part 77 Surfaces provide guidance on navigable airspace around an airport. Objects or structures that penetrate any of the Part 77 "imaginary surfaces" are considered to be obstructions to air navigation. Therefore, any proposed structure near an airport that meets the height criteria as defined in FAR Part 77 must be reported to the FAA via FAA Form 7460 for review. It is important to note that while the FAA may find a proposed structure to be a hazard to air navigation, the FAA does not have the authority to prevent that structure from ultimately being developed – the enforcement of any FAA findings is the responsibility of the governing land use authority.
- **FAA Draft Advisory Circular 150/5190-4B - Airport Land Use Compatibility Planning:** The FAA released Draft AC 150/5190-4B to consolidate and refine available information related to incompatible land use and to promote tools, resources, and techniques intended to protect surrounding communities from adverse effects associated with airport operations. The AC provides resources to assist compatible land use planning efforts at the airport, local, and state levels. Of particular relevance to this document, the AC notes: "Airports owned and operated by the same jurisdiction that is the land use authority (e.g., city- or county-owned airport) are expected to adequately control land use near the airport and prevent new incompatible development."

Existing State and Local Regulations Related to Airport Land Use Compatibility

Individual state and local governments may also determine regulations for compatible land uses around airports. On the state level, Chapter 329 of the State Code of Iowa, entitled Airport Zoning, permits the establishment of airport hazard areas in the vicinity of airports and enables local jurisdictions to enact zoning regulations to protect these areas, specifically as it relates to airspace obstructions (e.g., tall structures in the

[3] Title 49 United State Code (U.S.C.) §47107(a)(10).

vicinity of an airport). Additionally, the Iowa Department of Transportation developed the Iowa Airport Land Use Guidebook to provide airport sponsors and adjacent communities with resources and guidelines to address land use compatibility issues and protect the viability of airports. Through this document, the State of Iowa recognizes the economic importance of aviation within the state and prioritizes the preservation of airports from the possible encroachment of incompatible land use.

On the local level, Chapter 39 of the City of Cedar Rapids Code of Ordinances, entitled Airport Zoning Regulations, establishes airport hazard areas within the city based on FAR Part 77 Surfaces. Like Chapter 329 of the State Code of Iowa, the City's Airport Zoning Regulations focus primarily on the height of structures near the Eastern Iowa Airport that may interfere with the takeoff or landing of aircraft. These regulations also consider potential electrical interference, visual obstructions (e.g., lighting and glare), and bird attractants.

Who is Responsible for Land Use Compatibility?

Achieving compatible land use near airports is a shared responsibility between federal, state, and local agencies. As previously noted, the FAA does not have the authority to directly control or regulate land use in the vicinity of airports. Rather, the FAA serves an advisory role providing guidance to airport sponsors. States can serve a regulatory role through the establishment of enabling legislation that promotes the creation and implementation of airport compatible land use practices. However, the vast majority of the responsibility for achieving compatible land use near airports rests at the local level, where compatibility practices (e.g., notification requirements, building code restrictions, airport zoning) can be enforced.

Airports that receive federal grants through the AIP must sign assurances to pursue appropriate actions, to the extent reasonable, to secure and promote compatible land use and development within the airport environs. Additionally, airport sponsors are expected to remain vigilant and proactive in ensuring land use compatibility around airports. This can be challenging as areas of potential impact extend beyond airport boundaries and within local jurisdictions. Therefore, it is critical that airport sponsors coordinate with local municipal planners to share the importance of compatible land use and the implications of incompatible development on airports and surrounding communities. Airport sponsors should be proactive in partnering with municipal planners to identify tools and techniques that could be implemented locally to help ensure development proposals are compatible with existing and future airport operations.

Airport Land Use Protection Strategies

A multitude of strategies and techniques are available to airport sponsors and local governments to help promote and protect compatible land use. Depending on an airport's specific needs and environment, these strategies and techniques may be used individually or as a combination of multiple tools. Furthermore, as airport land use compatibility is a shared responsibility among a number of agencies, these strategies vary in terms development and implementation authority.

Common airport land use protection strategies can be grouped into four primary categories:

- Land Use Regulations
- Property Acquisition Techniques
- Environmental Management Techniques
- Notification Techniques

A summary of land use protection strategies is presented in **Table 1.** This summary is not meant to represent an all-inclusive list, but rather a sample of the most widely used strategies. A comprehensive list of land use protection strategies is presented in Draft Advisory Circular (AC) 150/5190-4B – *Airport Land Use Compatibility Planning*.

Table 1: Summary and Comparison of Common Land Use Protection Strategies

Tool or Strategy	Description of Tool or Strategy	Issues Potentially Addressed by Protection Tool or Strategy				
		Noise	Safety			
			Population Density	Wildlife	Airspace	
					Height	Visual Obstructions
Land Use Regulations						
Overlay Zoning	• Implemented by local governments • Includes land use and/or height related restrictions • Provides an additional layer of regulation for development • Retains existing base zoning classifications • Most suitable in areas that are undeveloped or anticipate major development	✓	✓	✓	✓	✓
Compatible Use Zoning	• Implemented by local governments • Uses conventional zoning designations near airports to promote compatible land uses (ex. land parcels near an airport may be zoned specifically for industrial uses instead of high-density residential use) • Well understood by developers, officials, and the public • Local jurisdictions may be hesitant to apply this strategy to large areas because demand for these areas may be limited due to use restrictions	✓	✓	✓	✓	✓

Tool or Strategy	Description of Tool or Strategy	Issues Potentially Addressed by Protection Tool or Strategy				
			Safety			
					Airspace	
		Noise	Population Density	Wildlife	Height	Visual Obstructions
Project Review Standards	• Implemented by local governments • Sets specific guidelines for review of development plans • Ensures systematic procedures in place for considering land use compatibility • Review standards can be developed to cover multiple issues, such as noise compatibility, air space protection, and safety	✓	✓	✓	✓	✓
Building Codes	• Implemented by local governments • Establishes specific building codes for areas along flight paths that dictate particular materials or construction methods • Effective when paired with overlay zoning to dictate what types of land uses must adhere to additional regulations • Can increase development costs if regulations require supplemental sound insulation or the use of specialized materials	✓	✓		✓	

Tool or Strategy	Description of Tool or Strategy	Issues Potentially Addressed by Protection Tool or Strategy				
			Safety			
					Airspace	
		Noise	Population Density	Wildlife	Height	Visual Obstructions
Property Acquisition Techniques						
Fee Simple Acquisition	• Implemented by airport sponsors • Occurs when an airport purchases property from a property owner • Most effective mitigation strategy as the airport owns the land and can ensure the property is only used for compatible uses • Property acquisition can be expensive and requires maintenance • Property acquisition should prioritize areas of high importance, such as Runway Protection Zones (RPZs), runway approach areas, and areas with existing incompatible land uses	✓	✓	✓	✓	✓
Avigation Easements	• Implemented by airport sponsors • Allows airports to purchase limited rights to a property owned by another party • Often used to manage vegetation so it does not intrude approach surfaces as the airport (trimming tall trees or cutting back shrubbery) • An economical option for protecting airspace when the land use is generally compatible	✓	✓	✓	✓	✓

<table>
<tr><th rowspan="4">Tool or Strategy</th><th rowspan="4">Description of Tool or Strategy</th><th colspan="5">Issues Potentially Addressed by Protection Tool or Strategy</th></tr>
<tr><th rowspan="3">Noise</th><th colspan="4">Safety</th></tr>
<tr><th rowspan="2">Population Density</th><th rowspan="2">Wildlife</th><th colspan="2">Airspace</th></tr>
<tr><th>Height</th><th>Visual Obstructions</th></tr>
<tr><td colspan="7">Environmental Management Techniques</td></tr>
<tr><td>Wildlife Hazard Management Plans</td><td>• Implemented by airport sponsors
• Identifies wildlife hazards and describes the measures to reduce and manage potential airport hazards
• Should be used in accordance with federal regulations and FAA guidance where wildlife hazards exist.</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td colspan="7">Notification Technique</td></tr>
<tr><td>Mandated Disclosure Notices</td><td>• Implemented by state legislator
• State laws that require sellers to disclose information about a property's proximity to an airport so that the buyer is aware of potential airport-related effects prior to purchasing the land
• Iowa Code Chapter 558A.4 requires sellers to complete a disclosure statement, but it only needs to include the zoning designation and does not require mention of proximal airports</td><td>✓</td><td>✓</td><td></td><td></td><td></td></tr>
</table>

Sources: Draft FAA AC 150/5190-4B – Airport Land Use Compatibility; Kimley-Horn, 2022

As presented in **Table 1**, airport sponsors and local governments are primarily responsible for implementing land use protection tools and strategies. While there may only be one agency that is the primary authority over specific compatible land use strategies, successful implementation and enforcement is reliant upon the support of and coordination between all stakeholders and entities. For example, while airport sponsors may not be able to directly implement overlay zoning, they can provide critical information to their local government(s) to inform overlay zone boundaries and the types of development for which overlay zones should regulate.

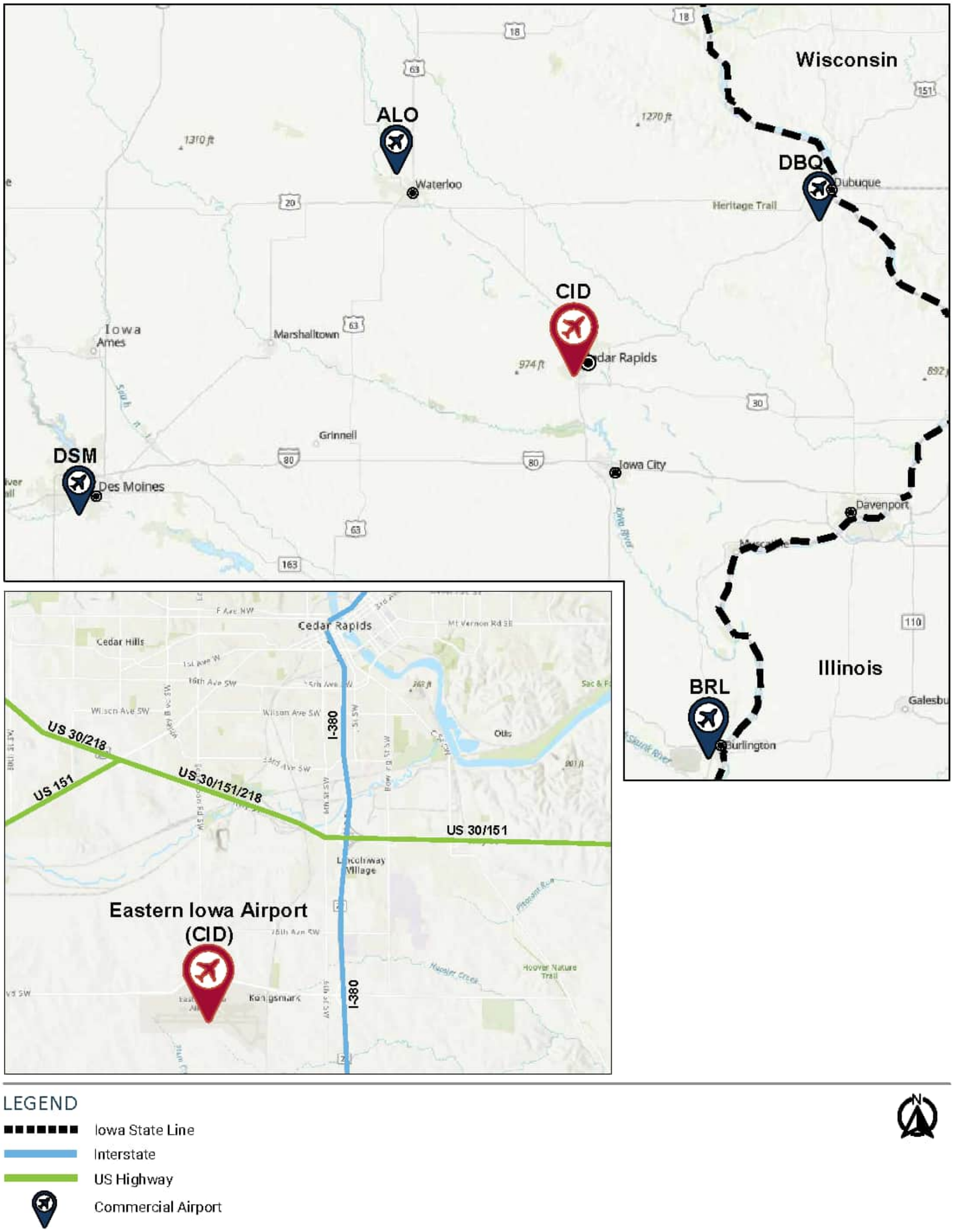
Each land use protection strategy may help address differing combability issues with varying degrees of effectiveness depending on an airport's specific needs, circumstances, and environment. Later sections of this document further investigate the applicability and potential effectiveness of these strategies as it relates to promoting and protecting compatible land use in the vicinity of Eastern Iowa Airport.

3. HISTORICAL, EXISTING, AND FUTURE CONDITIONS

EASTERN IOWA AIRPORT OVERVIEW

The Eastern Iowa Airport is located in Linn County within the corporate limits of the City of Cedar Rapids. Situated approximately seven miles southwest of downtown Cedar Rapids, the Airport serves the Iowa City/Cedar Rapids Corridor and the border regions of Illinois and Wisconsin. CID is publicly owned by the City of Cedar Rapids and is operated by the Cedar Rapids Airport Commission (Airport Commission). The Airport is one of eight commercial airports in Iowa and is an integral part of the state's aviation system. **Figure 1**, also included in Chapter 1. Existing Conditions, presents the location of CID in reference to the bordering states of Illinois and Wisconsin, as well as the four closest commercial service airports.

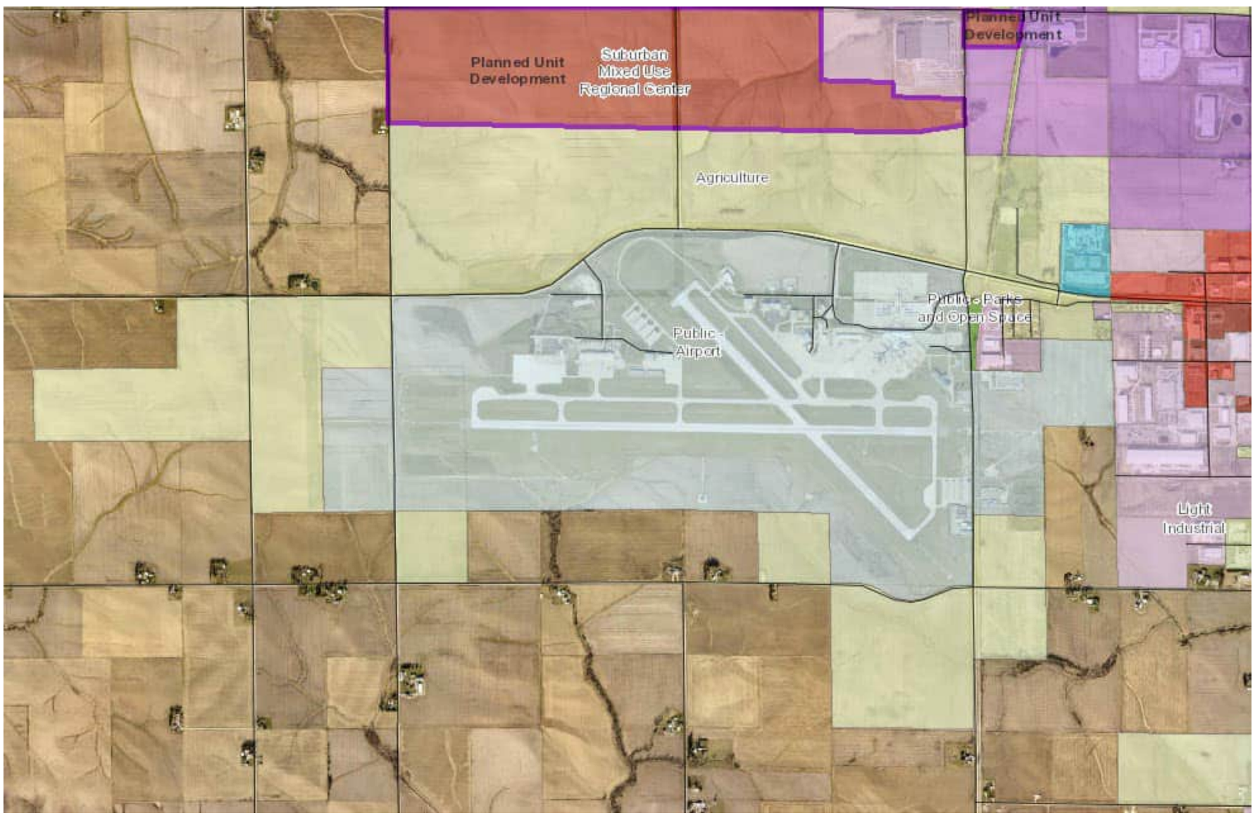
Figure 1: General Location of CID in Relation to Neighboring States and Other Nearby Commercial Service Airports



Source: ArcGIS Pro, Accessed October 2021 | Prepared by Kimley-Horn, 2021

CID is located on an approximately 1,000-acre site that is zoned as "Public Airport" (P-AP) within the City of Cedar Rapids Zoning Ordinance.[4] The Airport Commission also owns approximately 2,200 acres of land with various non-aeronautical zoning designations. Zoning designations in the immediate vicinity of the Airport include agriculture, suburban mixed use regional center, light industrial, public institutional, suburban residential, public parks and open space, and general industrial.[5] To accommodate future airport development and ensure compatible land use in the surrounding areas, the Airport Commission has existing plans to acquire airport-adjacent land from various owners as it becomes available. **Figure 2** presents the property border of CID and the current zoning categories adjacent to the airport. As shown, agriculture, light industry, and a small parcel of public space (in green on the image), are the land use zones directly adjacent to the airport. Beyond that, suburban/mixed use and light industrial land uses are nearby the airport as well.

Figure 2: Airport Property and Current Zoning Adjacent to CID



Source: ReZone Cedar Rapids Viewer, https://crgis.maps.arcgis.com/apps/InformationLookup/index.html?appid=f9f18a81360a4305a70a9d3f66281c4f

[4] Cedar Rapids Zoning Ordinance, Chapter 32 (accessed October 2021).

[5] ReZone Cedar Rapids Viewer, https://crgis.maps.arcgis.com/apps/InformationLookup/index.html?appid=f9f18a81360a4305a70a9d3f66281c4f (Accessed October 2021)

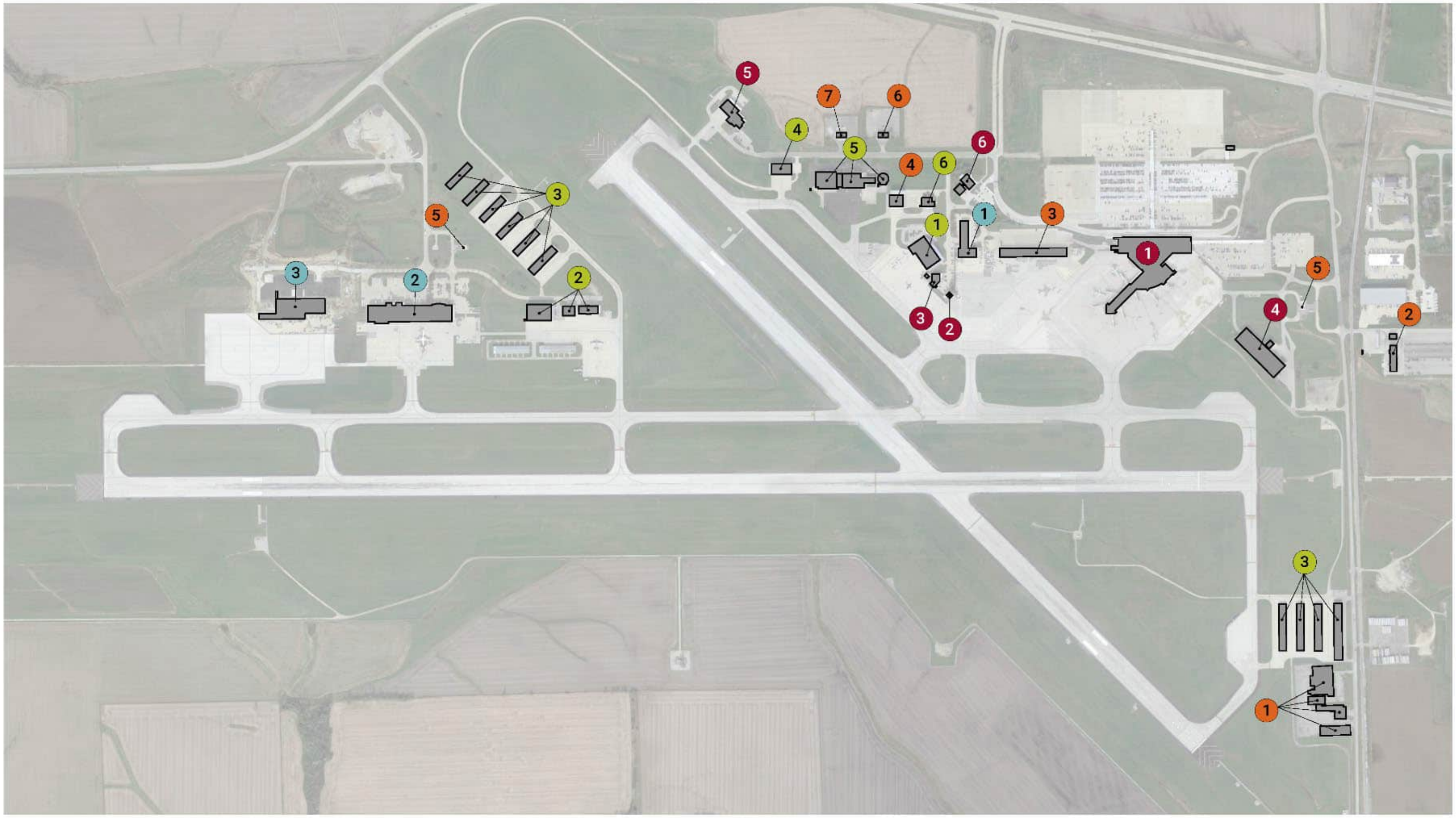
Historical and Future Development

Airport-Owned Land and Facilities

The Airport began providing commercial service in 1947. The present terminal building was constructed in 1986 and has undergone several modifications and modernizations over the years. The airfield experienced significant changes between 2006 and 2016 with the reconfiguration of the taxiway network and the expansion of apron areas. Additionally, between 2019 and 2022, a new cargo facility was constructed for UPS along with associated landside and airside infrastructure to support air cargo operations. The location of general aviation facilities has not significantly changed since 1990. In 1990, Lippisch Place SW served as the northern bounding roadway for the landside facilities. Since then, Wright Brothers Boulevard was shifted north to allow for the extension of Runway 13/31 and additional parking facilities.

The Airport has two runways: a primary runway located in an east-west orientation (designated Runway 9/27) and a crosswind runway oriented southeast and northwest (designated Runway 13/31). The Airport's runways are supported by a system of taxiways that provide access between the runways and the apron areas. Apron areas are located adjacent to the passenger terminal building, the cargo support buildings, and the general aviation hangars. The Donald J. Canney Terminal is a two-story building with a single concourse consisting of nine gates. Additional Airport facilities include the air cargo processing buildings for FedEx, DHL, and UPS; general aviation facilities, including private aircraft hangars and a fixed based operator (FBO); various Airport support facilities such as a control tower, an aircraft rescue and firefighting (ARFF) building, and maintenance buildings; and landside facilities for vehicular parking, commercial ground transportation, and rental cars. **Figure 3**, also included in Chapter 1. Existing Conditions, presents the location of airport support facilities, cargo facilities, and other on-airport buildings.

Figure 3: On-Airport Buildings



LEGEND

Airport Support Buildings
1. Passenger Terminal
2. FAA Airport Traffic Control Tower
3. FAA Technical Operations Center
4. Airport Maintenance Building
5. Airport Rescue and Firefighting Building (ARFF)
6. Airport Administration Building

Cargo Buildings
1. DHL Facility
2. FedEx Facility
3. UPS Facility

General Aviation Buildings
1. East FBO (Signature Flight Support)
2. West FBO (Signature Flight Support)
3. T-Hanger
4. Kinze Manufacturing Hanger
5. Collins Aerospace Hanger
6. CRST Hanger

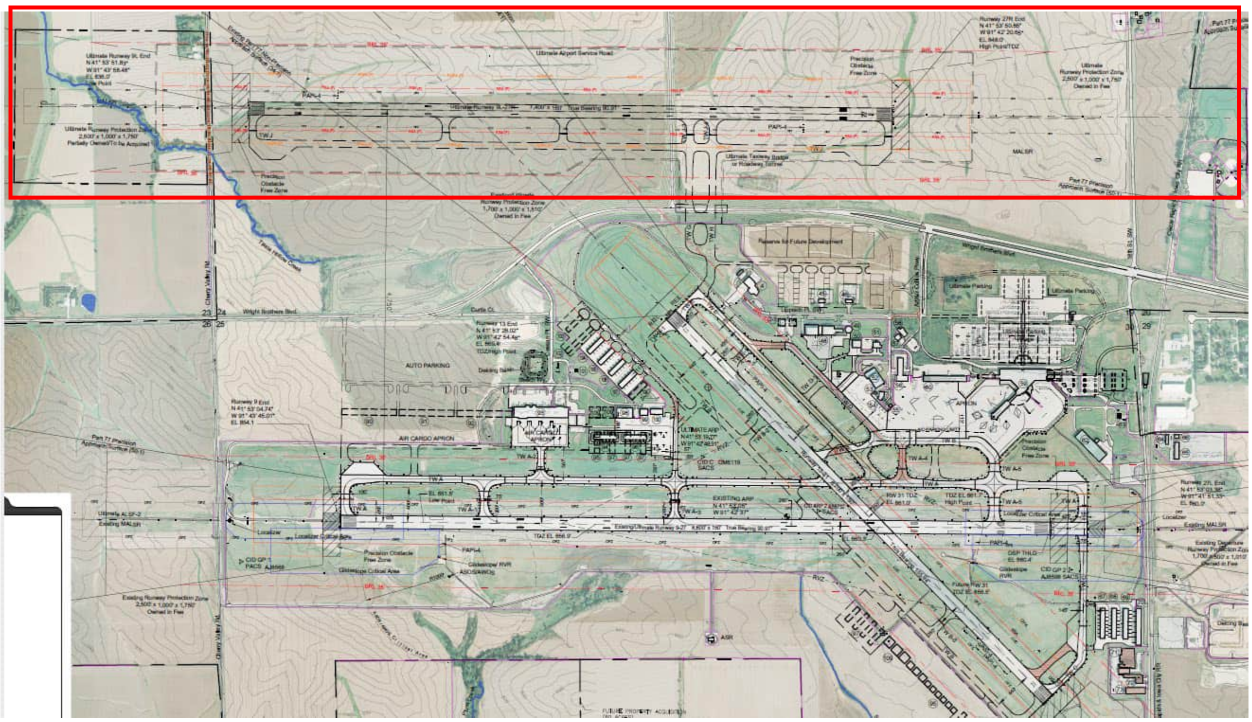
Other
1. Former Iowa Army National Guard Campus
2. Rental Car Quick Turnaround (QTA) Facility
3. Former UPS Facility
4. Former Alliant Energy Hanger / Future Kirkwood Community College Airframe & Power (A&P) Facility
5. Fuel Farm
6. Deafinitely Dogs!
7. Trailways Charter Bus Network

0 300 600 1200 Feet

Source: AcrGIS Pro, 2021 | Prepared by: Kimley-Horn, 2021.

Additionally, the Airport has long been planning for the construction of a parallel runway (Runway 9L/23R) on the north side of Wright Brothers Boulevard which would accommodate increased passenger and cargo traffic. The Airport has acquired property to facilitate this third runway when needed and it is depicted in the following screenshot from the 2014 CID Airport Layout Plan (ALP), as shown in **Figure Figure** 4. The third proposed runway has been outlined with a red box to make its location clearer.

Figure 4: CID ALP Drawing Depicting Location of Future Third Runway 9L/23R



Source: 2014 CID ALP, Airport Layout Drawing, September 2014

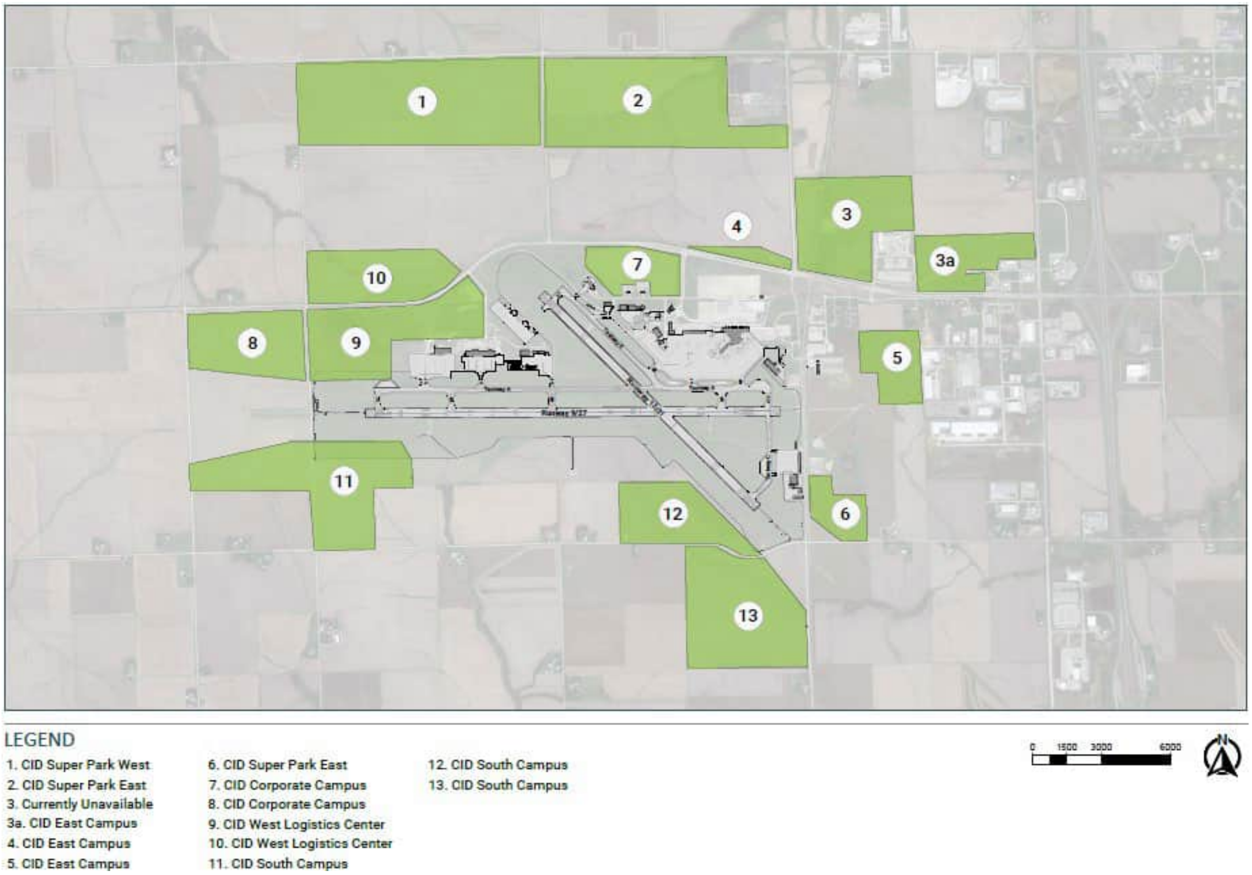
The Airport also owns 1,300 acres, divided into 13 tracts, as shown in **Figure 5**, that are available for property development. The tracts are split into five distinct areas as described below:[6]

- **CID Superpark:** An area north of proposed Runway 9L/27R, consisting of two tracts available for leasing. The area is well suited for an industrial park with opportunities for large transportation and/or warehousing development.
- **CID East Campus:** Located along Wright Brothers Boulevard and 18th Street SW, these five tracts can support commercial development and industrial development.
- **CID Corporate Center:** A single property near the existing corporate hangars, this tract may provide future airfield access to serve commercial, hospitality, or business purposes.
- **CID West Logistics Center:** Located west and northwest of the existing cargo facilities, three tracts can provide opportunities for landside and airside businesses with future airfield access.

[6] CIDSuperpark.com (accessed March 2022).

- **CID South Campus:** Three tracts south of the existing runways are well suited for industrial development.

FIGURE 5: CID PROPERTY TRACTS



Source: https://www.cidsuperpark.com/properties/

The Airport supports development nearby that is compatible with aircraft operations and encourages the utilization of the adjacent transportation corridor to support the regional economy.

Off-Airport Land and Facilities

Historically, development around the Airport has stemmed from industrial, commercial, and residential growth along the I-380 corridor. The corridor provides convenient access to important transportation networks and a large local workforce. Since 1990, various hotels, gas stations, restaurants, and churches have been constructed near the intersection of I-380 and Wright Brothers Boulevard, approximately one and a half miles east of CID. However, industrial facilities, which are considered compatible with airport operations, have accounted for the vast majority of development near the Airport.

Within the last five years, the southwest quadrant of Cedar Rapids, within which the Airport is located, has seen an exponential rise in development, amounting to an estimated $1 billion in investment.[7] In 2022, a 278,000-square-foot aerospace defense facility opened approximately two miles northeast of the Airport. To the southeast, FedEx plans to open a 479,000-square-foot warehouse by late 2022. To the west of the Airport, a 199,200-square-foot industrial supplies facility is also planned for construction. The area is anticipated to continue developing at a fast pace with industrial and commercial uses being constructed in the area surrounding the Airport. City infrastructure investments in southwest Cedar Rapids will also promote additional industrial development.[8]

While there has been off-airport development east of the Airport, the existing and planned industrial and commercial land uses are typically considered compatible with Airport operations. No large residential communities or tall structures have been noted. To the south and west of the Airport, development has been limited and the area has primarily remained farmland.

Flight Paths and Noise Impacts

The primary factor affecting runway use at airports is weather, in particular, the wind direction and wind speed. Aircraft typically fly into the wind and fly on specified routes based on their destinations when departing an airport. Prevailing wind direction and wind speed usually determine the most favorable runway alignment and configuration at an airport. The flight track density maps, presented below in **Figure 6** and **Figure 7**, show the existing predominant arrival and departure routes at CID. Flight track density maps are based on radar data from actual flights and combine a large volume of tracks, with warmer colors showing higher density of flights and cooler colors showing less density. **Figure 6** depicts east flow flight track density at CID and **Figure 7** depicts west flow flight track density.

Aircraft arriving to a runway have a different noise signature when compared to those departing from a runway. Arriving aircraft tend to line up on the runway miles from an airport, whereas departing aircraft turn towards their destination as early in the flight as possible. Understanding predominant flight corridors into and out of an airport plays a major role in establishing land use guidelines to avoid community annoyance.

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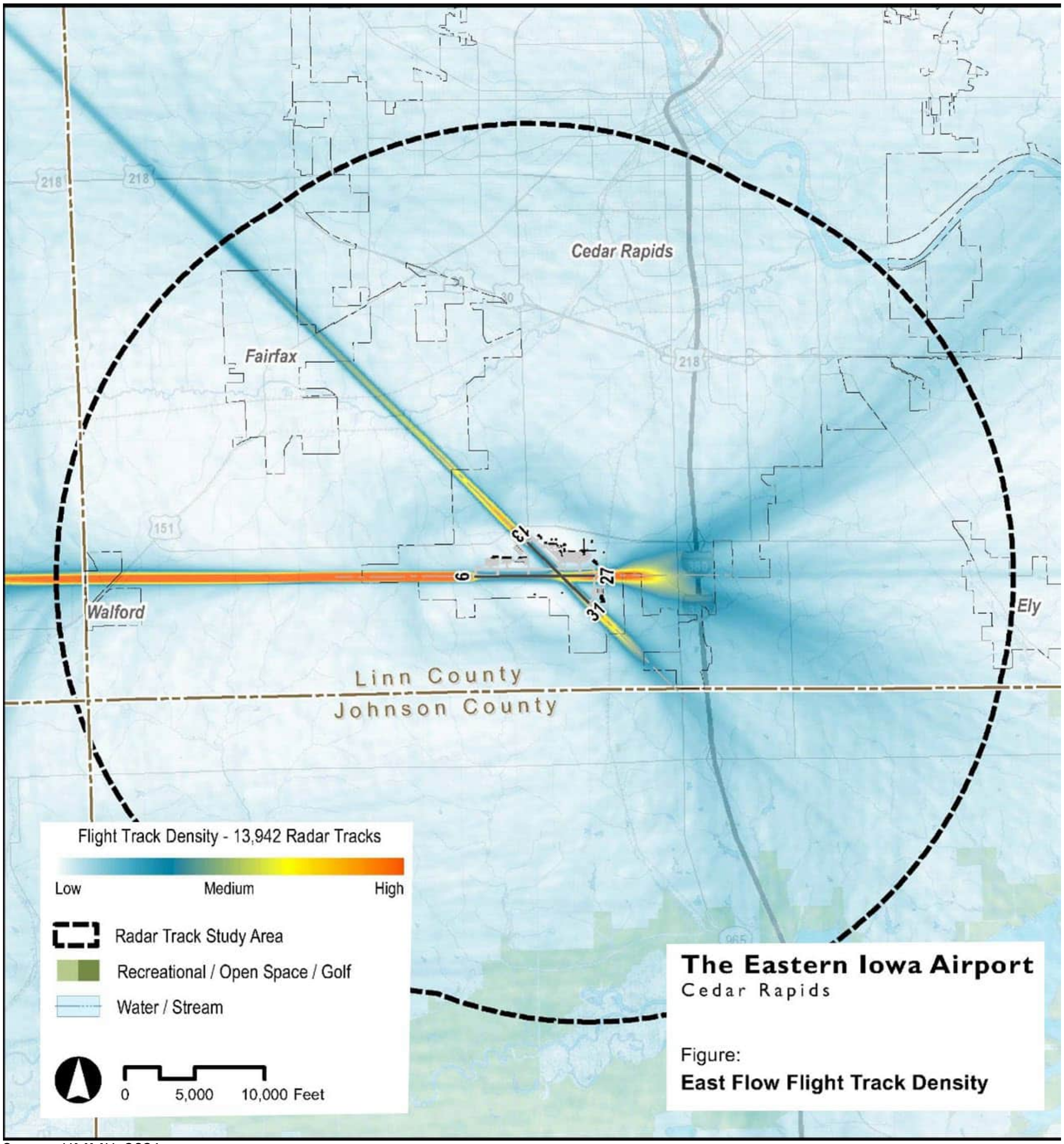
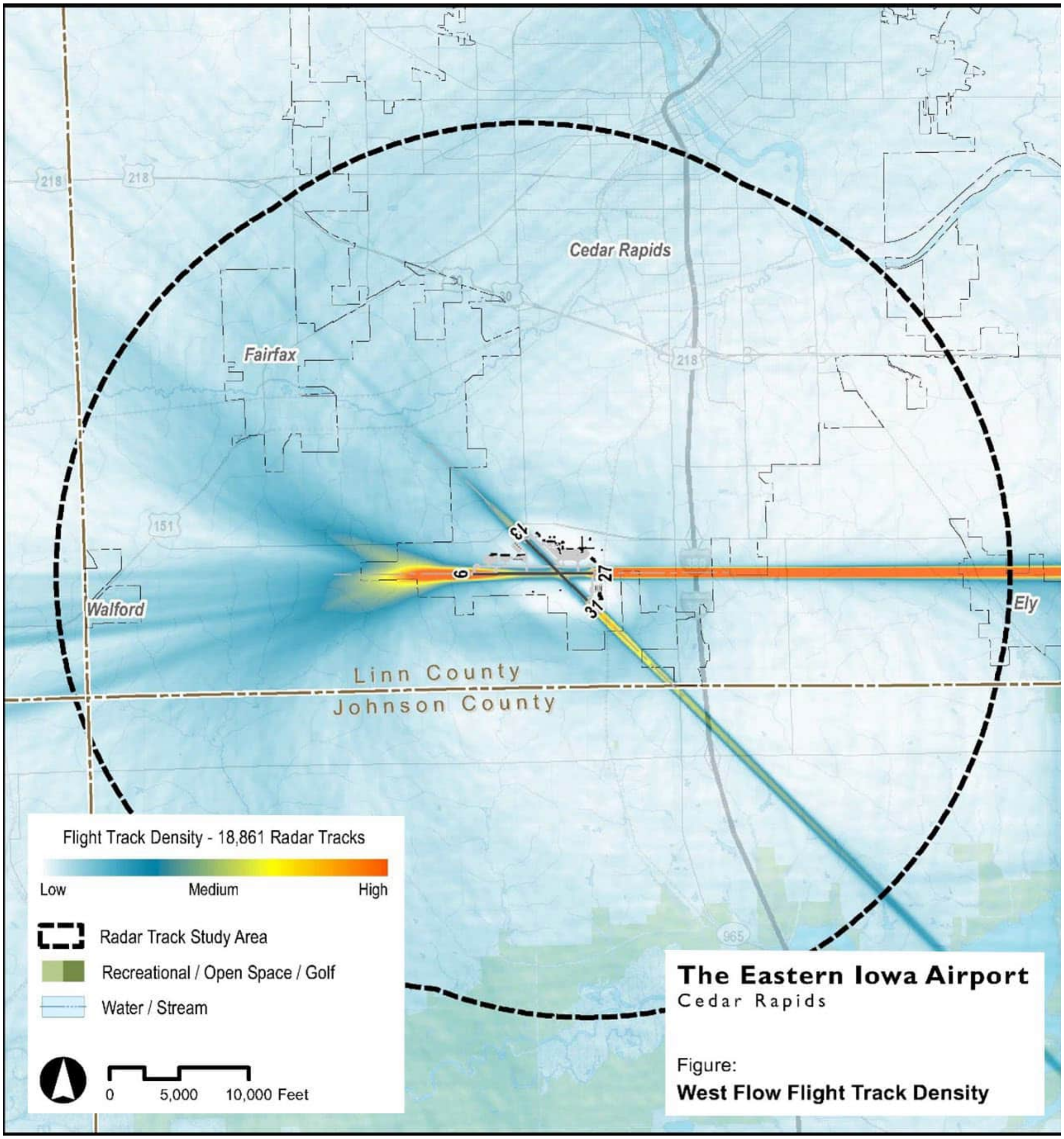
[7] Payne, M., Cedar Rapids' Southwest Quadrant Seeing 'Explosion' of Development, The Gazette, July 2021. https://www.thegazette.com/local-government/cedar-rapids-southwest-quadrant-seeing-explosion-of-development/ (Accessed October 2021).
[8] EnvisionCR, City of Cedar Rapids, 2020 Update.

Figure 6: East Flow Flight Track Density



Source: HMMH, 2021

Figure 7: West Flow Flight Track Density

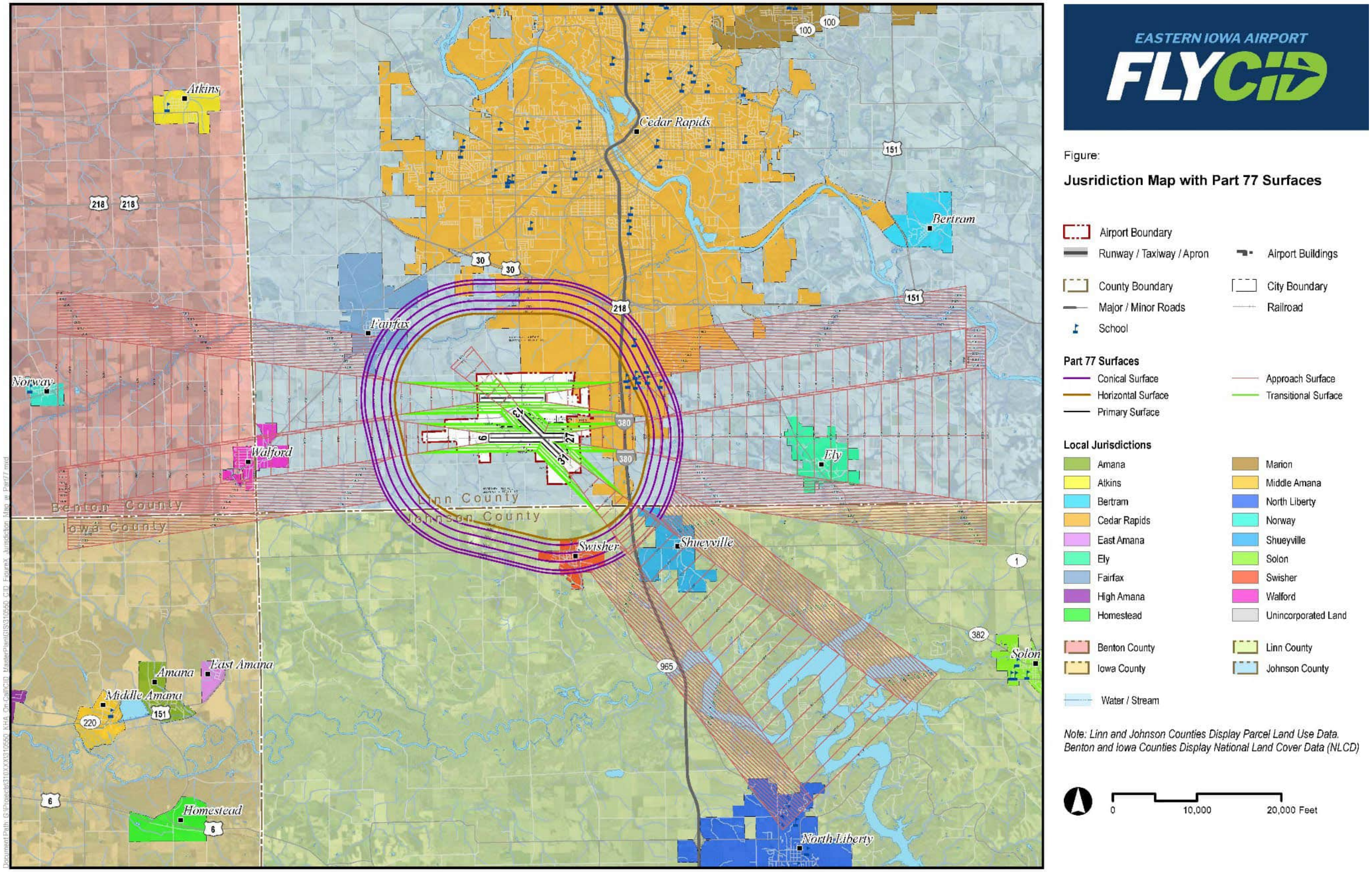


Source: HMMH, 2021

CID Area of Influence

For purposes of this document, a study area was defined to focus land use compatibility planning efforts near the Airport. Known as the Airport's "area of influence," this study area is defined by the Part 77 Surfaces associated with existing and future planned runways at the Airport (Runways 9-27 and 13-31, as well as future Runway 9L-27R). Part 77 Surfaces were used to define the Airport's area of influence as they represent regulated airspace and occupy an area through which most of the flight activity around the Airport occurs. Additionally, the current Airport Zoning Regulations use Part 77 Surfaces to define the Airport's hazard area **Figure 8** illustrates the Airport's area of influence and the jurisdictions (e.g., counties and municipalities) that fall within it.

Figure 8: Eastern Iowa Airport Area of Influence



Prepared by: HMMH, 2021

Land Uses of Nearby Municipalities

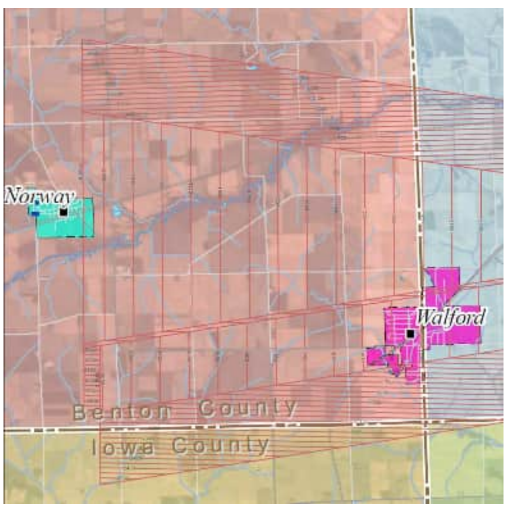
The following sections provide a high-level description of the current development and land uses within the Airport's area of influence by municipality. There are four counties and eight cities that fall within this area. For each city, the approximate altitude of aircraft during community overflights is provided. Aircraft altitude was determined using InFLIGHT, a proprietary software that utilizes radar data to monitor and organize aircraft flight tracks. The approximate altitude is provided in cases where all flight tracks were concentrated. In cases where the flight tracks over a municipality varied by thousands of feet, a range of altitudes was given.

Counties

Benton County

Benton County is located largely to the west and north of the Airport, with its closest portion, the southeast corner, located approximately five miles west of CID. Only a small section of the County, including the Cities of Walford and Norway, is located within the Airport's area of influence. This section of the County is mostly developed (both low intensity and open space) and includes cultivated crops. The remainder of Benton County primarily consists of cultivated crops with sparsely developed areas and the occasional incorporated municipality. As shown in **Figure 9**, approach surfaces from Runway 09/27 and future Runway 09L/27R cover a portion of the southeast corner of the county.

Figure 9: Part 77 Surfaces within Benton County

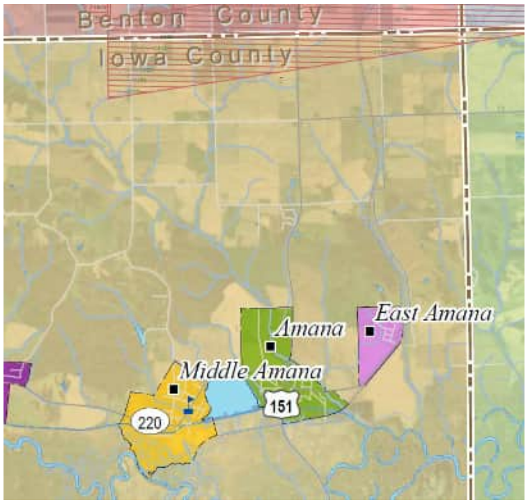


Prepared by: HMMH, 2021

Iowa County

Iowa County is located southwest of CID, with only a small portion of the County located within the Airport's area of influence, approximately five miles southwest of CID. Most of the County's land consists of cultivated crops along with forests and pastures. Of note, Iowa County does not maintain county zoning laws. However, property located inside of or within two miles of any city limit must abide by municipal zoning laws associated with the respective city.[9] As shown in **Figure 10**, only a small portion of the approach surface for Runway 09/27 is included within the northeast corner of Iowa County borders.

Figure 10: Part 77 Surfaces within Iowa County



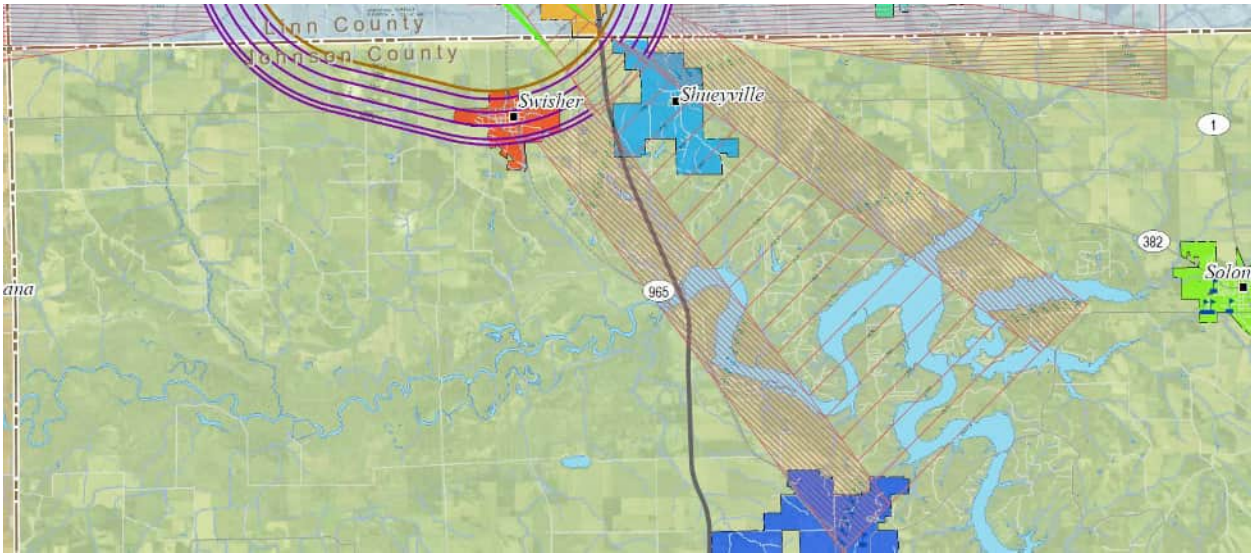
Prepared by: HMMH, 2021

Johnson County

Johnson County is located immediately south of the Airport and extends to the east. The majority of the County's land uses consist of agricultural, single family residential, and recreational areas, with some incorporated municipalities containing multi-family residential, commercial, manufacturing, and institutional land uses. Notably, a large recreational area adjacent to the Iowa River is located five miles south of CID . As shown in **Figure 11**, approach surfaces from Runway End 31 and Runway End 27 extend through the center of Johnson County and the conical surfaces of the airport also extend into the north portion of the county, just below the airport. A very small amount of the approach surface from Runway End 9 is included in the top northwest corner of the county.

[9] Iowa Code2022, Section 414.23, City Zoning, Extending Beyond City Limits, https://www.legis.iowa.gov/docs/code/414.23.pdf, (Accessed September 2022).

Figure 11: Part 77 Surfaces within Johnson County

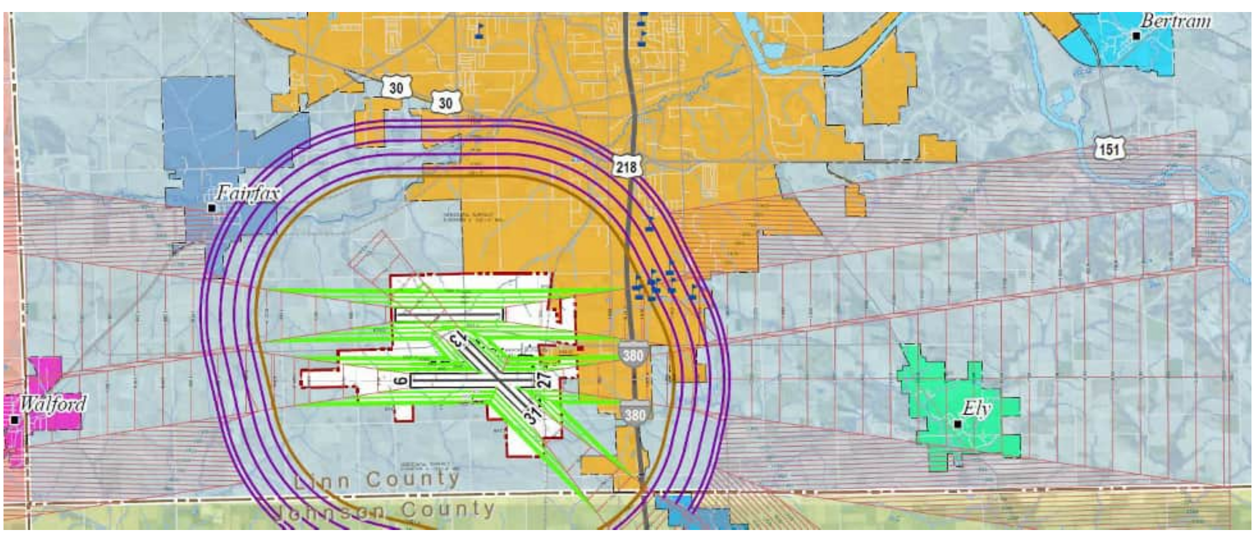


Prepared by: HMMH, 2021

LINN COUNTY

CID is located in southwestern Linn County. Much of the land north of the Airport is within the corporate limits of the City of Cedar Rapids and consists of residential, commercial, and industrial land uses. The remainder of the land within Linn County is largely agricultural. Of note, land east of the Airport, along the extended centerlines of both Runway 9/27 and proposed Runway 9L/27R, is rapidly developing with industrial, commercial, residential, and institutional (e.g., schools) land uses. As shown in **Figure 12**, horizontal, transitional, conical, surfaces, as well as approach surfaces from Runways 09/27, Runway 13/31, and future Runway 09L/27R, are within the boundaries of Linn County. Considering that the airport is located in Linn County it is expected that a significant portion of the study area is included in Linn County's boundaries.

Figure 12: Part 77 Surfaces within Linn County



Prepared by: HMMH, 2021

Cities

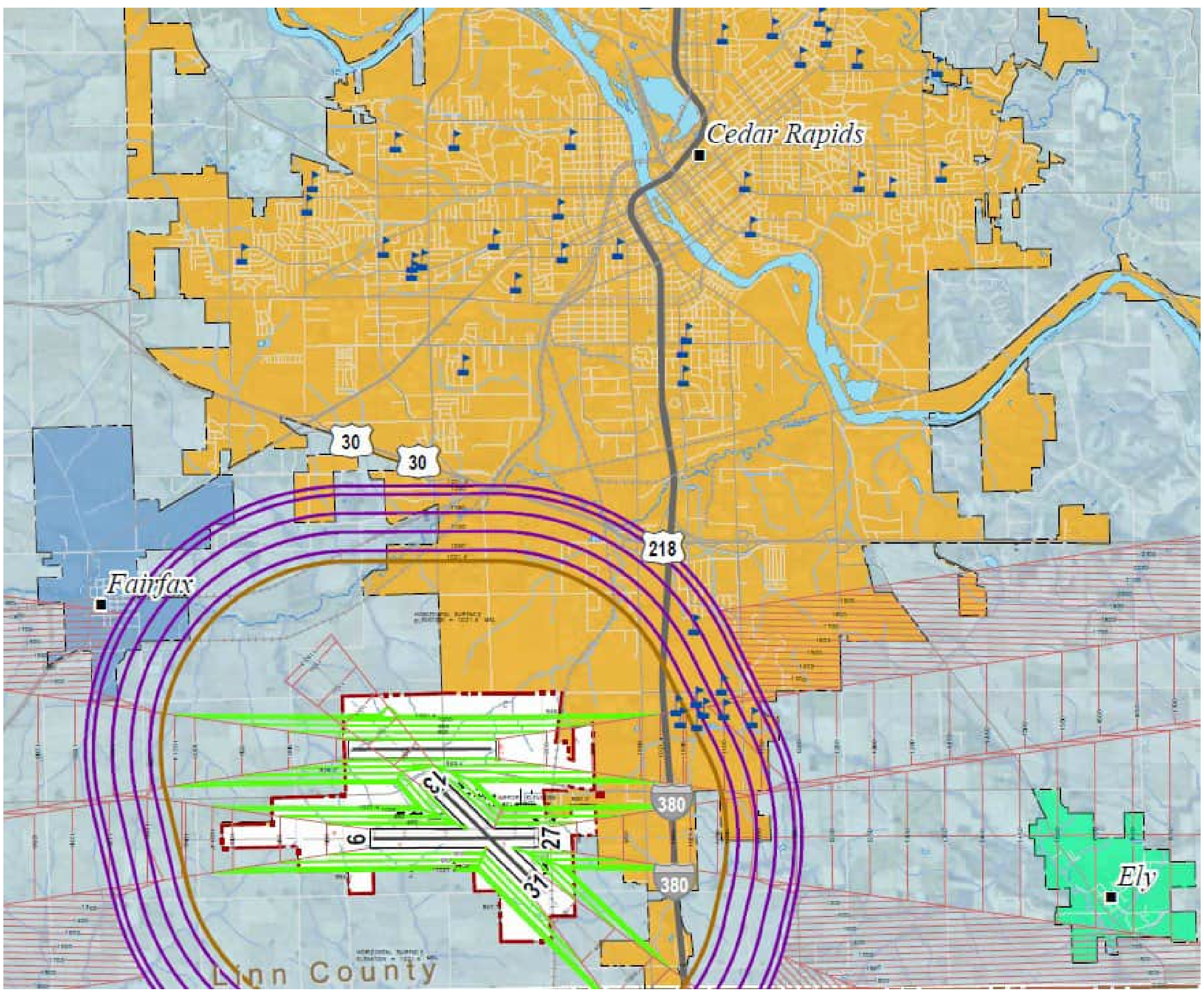
CITY OF CEDAR RAPIDS

The Airport is located within the southern portion of the City of Cedar Rapids. As one of the most populated cities in Iowa, the City of Cedar Rapids primarily consists of single- and multi-family residential, commercial, industrial, and agricultural land uses.

Adjacent to the Airport, City zoning designations include agriculture, light industrial, general industrial, suburban residential low flex, suburban mixed-use regional center, and suburban mixed-use community center. Aircraft fly over the City of Cedar Rapids at various altitudes, ranging from 1,500 to 8,000 ft. mean sea level (MSL), with departure altitudes ranging from 1,500 to 10,000 ft. MSL. Most circuits, or patterns, occur at altitudes between 2,000 and 4,000 ft MSL. As shown in

Figure 13, horizontal, conical, transitional, and approach surfaces are within the boundaries of the City of Cedar Rapids. These surfaces extend into approximately the bottom third of the city.

Figure 13: Part 77 Surfaces with Cedar Rapids

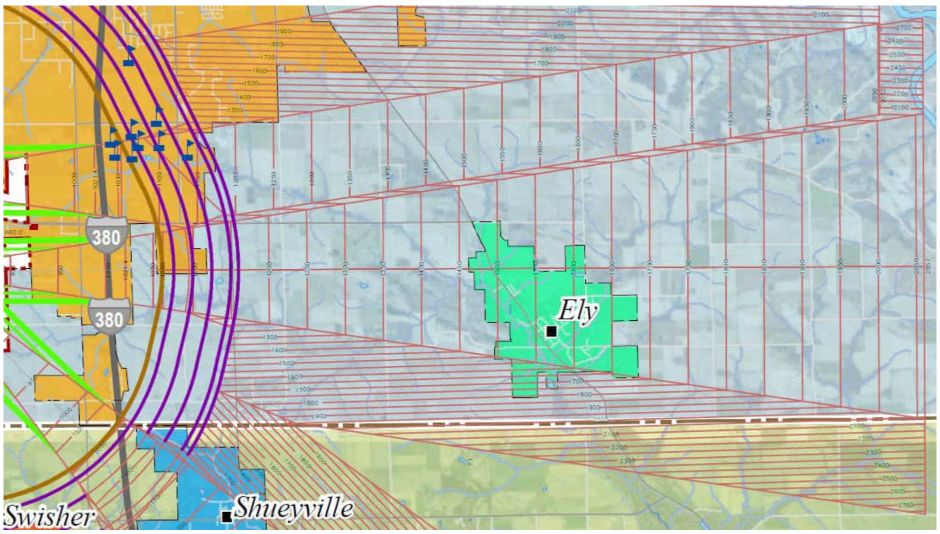


Prepared by: HMMH, 2021

City of Ely

The City of Ely is located five miles east of CID. The majority of the municipality's land use is single family residential, agricultural, and commercial. The altitude of arriving aircraft over Ely is approximately 2,500 ft. MSL, with departures occurring at an altitude range of approximately 3,500 to 7,000 ft. MSL. As shown in **Figure 14** the entire of Ely's city boundaries are within the study area due to the approach surfaces of Runway 13/31.

Figure 14: Part 77 Surfaces within the City of Ely

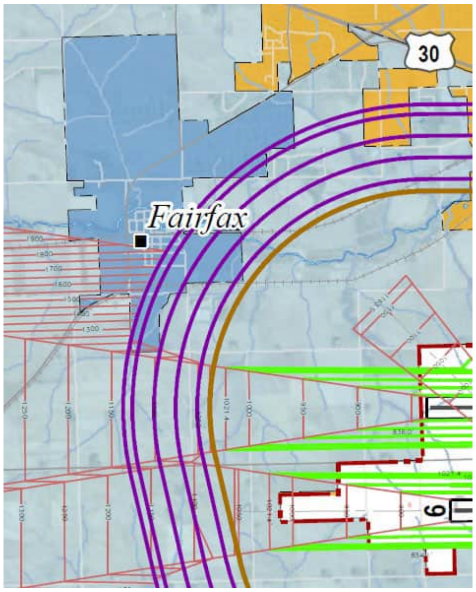


Prepared by: HMMH, 2021

City of Fairfax

The City of Fairfax is located approximately two miles northwest of the Airport. Fairfax is comprised largely of single family residential and agricultural land uses, with some land devoted to commercial use. Zoning designations within the city include multi-family residential, central business district, light and heavy industrial uses, and conservation/public use. Arriving aircraft overfly the City of Fairfax at an altitude of approximately 2,250 ft. MSL and departures occur at altitudes between 2,500 and 5,500 ft. MSL. Circuits over Fairfax occur at an altitude range of approximately 1,750 to 3,500 ft. MSL. As shown in **Figure 15**, the City of Fairfax includes conical surfaces and the approach surfaces from future Runway 09L/27R within its boundaries. These surfaces are located on the eastern half of the city.

Figure 15: Part 77 Surfacers with the City of Fairfax

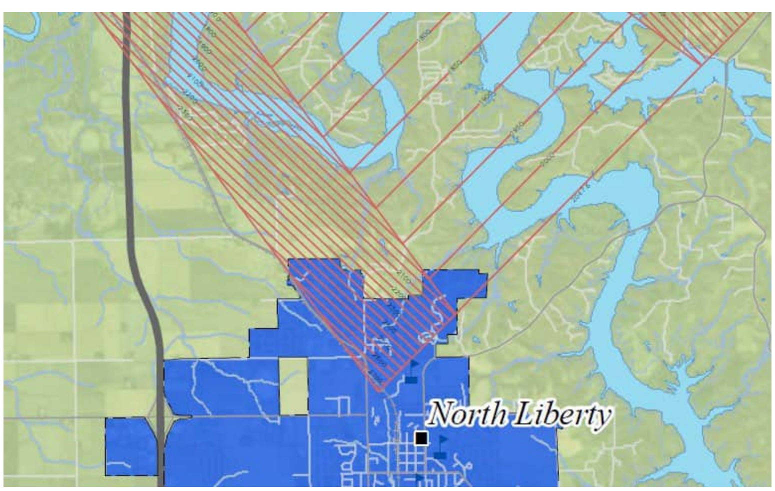


Prepared by: HMMH, 2021

City of North Liberty

The City of North Liberty is located approximately ten miles southeast of CID , with a small portion of the City's northern limits located within the Airport's area of influence. While the City includes a wide variety of land uses, the majority of uses within the Airport's area of influence include residential (single- and multi-family), commercial, and industrial. Arriving aircraft generally fly over the City of North Liberty at altitudes ranging from 2,500 to 7,500 ft. MSL, with departures occurring at altitudes ranging from 6,00 to 10,000 ft. MSL. As shown in **Figure 16**, the bottom corner of the approach surface of Runway End 27 is located within the boundaries of the City of North Liberty.

Figure 16: Part 77 Surfaces within the City of North Liberty

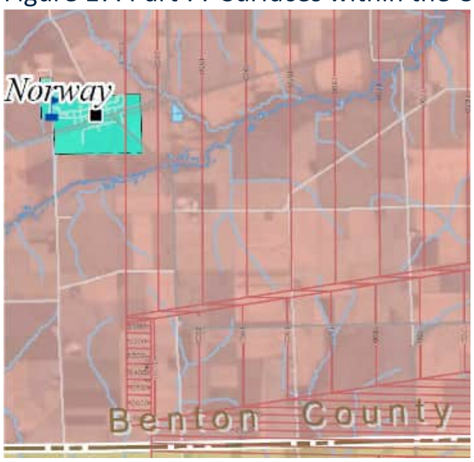


Prepared by: HMMH, 2021

City of Norway

The City of Norway is located approximately nine miles west of CID, with the City's eastern edge located within the Airport's area of influence. Zoning designations within the City include single and multi-family residential, business, and industrial. The land within the area of influence consists of mostly agricultural land, with some industrial and single family residential land uses. Approach overflights occur at a range of 2,500 to 5,000 ft. MSL, and departing aircraft fly over the City at a range and 3,000 to 9,000 ft. MSL. It should be noted that not many departing aircraft fly over the City of Norway. As shown in **Figure 17**, only a small portion of the approach surface from Runway End 09 is located within the City of Norway. This small portion of the approach surface is located on the east side of the City of Norway.

Figure 17: Part 77 Surfaces within the City of Norway

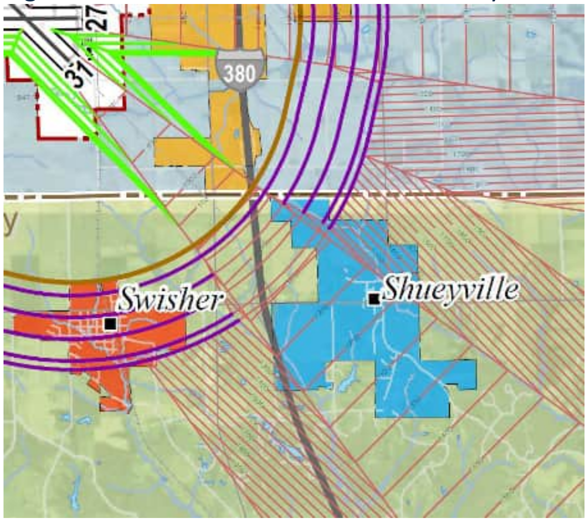


Prepared by: HMMH, 2021

City of Shueyville

The City of Shueyville is located three miles southeast of CID and is entirely located within the Airport's area of influence. The City is mostly comprised of single family residential, commercial, and agricultural land uses, and zoning designations include agricultural, industrial, commercial, single family residential, and two-family residential. Arriving aircraft fly over the City at an average altitude of 2,000 ft. MSL, while departing aircraft perform overflights between 2,500 to 4,500 ft. MSL. Circuit altitudes over the City of Shueyville range from 1,500 to 2,000 ft. MSL. As shown in **Figure 18**, all of the area within the City of Shueyville is covered by approach surfaces from Runway End 31 and Runway End 27. The conical surfaces also intersect with the top corner of the city's boundaries, along the Johnson County boundary.

Figure 18: Part 77 Surfaces within the City of Shueyville

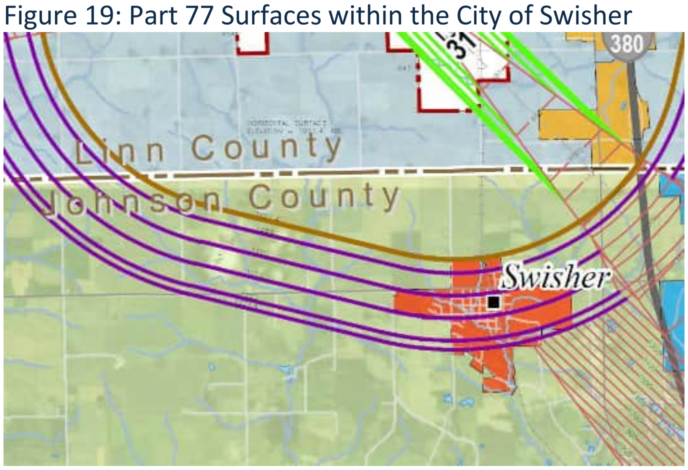


Prepared by: HMMH, 2021

City of Swisher

The City of Swisher is located one and a half miles south of CID. The City is mostly comprised of single family residential and agricultural land uses, with some commercial and multi-family residential. The land located within the Airport area of influence is largely developed and predominantly consists of single-family residential. Arriving aircraft fly over the City of Swisher at an approximate altitude of 2,000 ft. MSL, and departing overflights occurs at altitudes ranging from 2,500 and 4,500 ft. MSL. Circuits over Swisher occur at altitudes between 1,500 and 3,500 ft. MSL. As shown in **Figure 19**, much of the City of Swisher is covered by the conical surfaces of the Airport and only a very small portion of the approach surfaces also accounted for within the city's boundaries.

Figure 19: Part 77 Surfaces within the City of Swisher

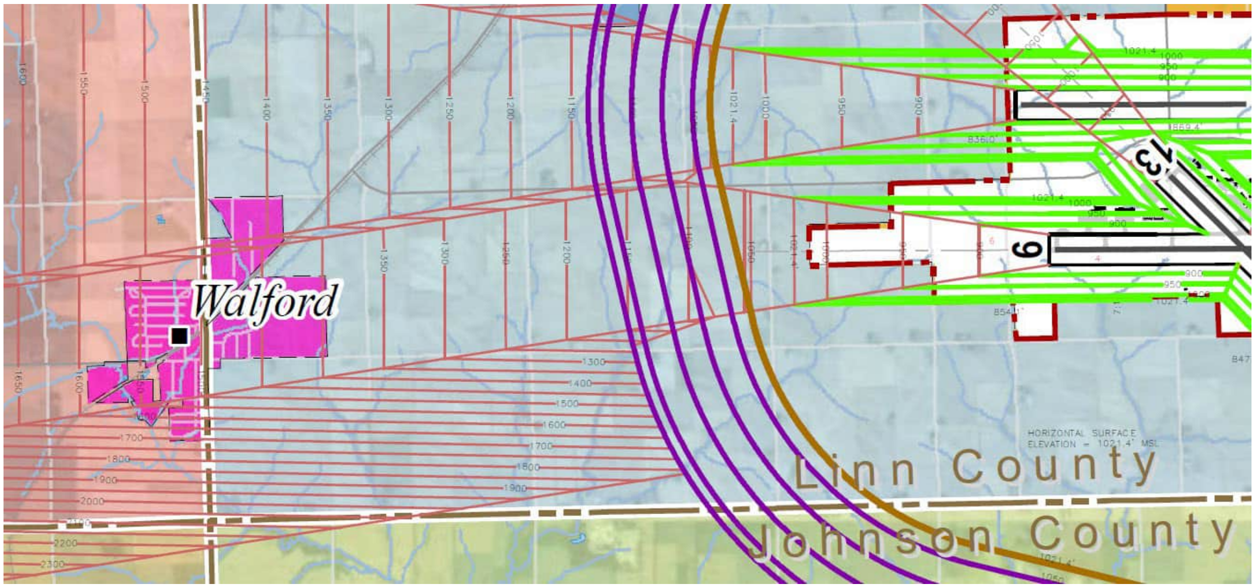


Prepared by: HMMH, 2021

City of Walford

The City of Walford is located approximately three miles west of the Airport and entirely within the Airport's area of influence. Walford is predominantly comprised of single family residential, commercial, and agricultural land uses. Arrivals over the City generally occur at an altitude of approximately 2,500 ft. MSL, while departing overflights occur at an altitude range of 3,500 and 5,500 ft. MSL. Circuit altitudes over Walford range from 1,500 to 4,000 ft. MSL. As shown in **Figure 20**, approach surfaces from Runway End 09 and future Runway End 09L encompass the entire area of the City of Walford.

Figure 20: Part 77 Surfaces within the City of Walford



Prepared by: HMMH, 2021

4. RECOMMENDED STRATEGY FOR IMPLEMENTATION

It is important to recognize that there is no "one size fits all" approach to achieving compatibility between an airport and surrounding land uses. Each airport is unique in size, operation, and composition—as are the communities around them. Some airports are already heavily encroached upon by various development, with limited options to change or increase the level of compatibility between the operation of the airport and the surrounding uses. Others, like CID, are beginning to see development growth in their general vicinity. These airports have an opportunity to collaborate with local municipal planners to identify strategies and solutions to achieve land use compatibility in ways that would mutually benefit communities and the airport. To that end, and in conjunction with the CID Master Plan, this report represents the first step in recognizing the importance of airport land use compatibility and the shared responsibility among many stakeholders to help achieve it.

The FAA's Draft AC 150/5190-4B presents a multitude of potential tools and techniques that could be implemented by airport sponsors and/or local governments to enhance and protect land use compatibility based on local conditions. Some solutions are best suited for communities being proactive before significant development encroaches, where others are more reactionary and meant to limit the impact of incompatible uses already developed nearby. The solution proposed in this document for further consideration by the Airport and local municipalities is intended to provide an outline for the type and level of control that is best suited for the Airport and surrounding communities and that serves the interests of both without major disruption.

To best identify strategies for achieving airport compatible development within the study area, a set of three meetings were held with each impacted municipality from October 2021 to August 2022 to learn more about the action each community is currently taking towards achieving land use compatibility with the Airport. Information gathered during these meetings was used to identify strategies to enhance the effectiveness of land use compatibility practices within the jurisdictions.

Airport Zoning Regulations Amendment

As previously mentioned, Chapter 329 "Airport Zoning "of the State Code of Iowa (herein referred to as Chapter 329) is the statewide authority for establishing airport hazard areas near airports and gives authority to local jurisdictions to enact zoning regulations to achieve airport land use compatibility. In the 1990s, the City of Cedar Rapids developed and adopted "Airport Zoning Regulations" as Chapter 39 of the City of Cedar Rapids Code of Ordinances. These regulations were then adopted by all municipalities under the Airport's Part 77 Surfaces with the exception of the City of North Liberty (it is suspected that the City of North Liberty's jurisdictional boundary did not extend under the Airport's Part 77 Surfaces at the time).

Feedback from the impacted municipalities during the coordination meetings indicate that since the time of initial adoption, the provisions of the Airport Zoning Regulations have been implemented infrequently, with some municipalities unaware of the existence of this language altogether. After multiple meetings with municipal representatives to review and assess the current Airport Zoning Regulations language, four key areas of improvement were identified. Rather than pursue an alternate strategy to supporting compatible land use near the Airport, and based on municipal response, it is recommended that the Airport pursue an amendment to the existing Airport Zoning Regulations to address these four key challenges which are summarized below:

1) Airport Zoning Commissions and Airport Boards of Adjustment are inactive or non-existent due to short staffing and being unable to fill these positions.

2) Current Airport Zoning Regulations are vague and therefore difficult to interpret as the language lacks important details that would facilitate consistent development practices.

3) Current Airport Zoning Regulations are not comprehensive, and do not include strategies to mitigate incompatibility related to population density and noise.

4) Many jurisdictions adopted the Airport Zoning Regulations in their municipal codes under chapters separate from their zoning codes, so the regulations are often overlooked.

Challenge 1: Maintaining Airport Zoning Commissions and Airport Boards of Adjustment

Included in Chapter 329 is a specification that each municipality within an airport environment must establish and maintain an Airport Zoning Commission and Airport Board of Adjustment (herein together referred to as Airport Zoning-Related Bodies):

- **Airport Zoning Commission** (per Chapter 329.9) – "…The airport zoning commission shall consist of two members from each municipality selected by the governing body and one additional member to act as chairperson and to be selected by a majority vote of the members selected by the municipality…"

- **Airport Board of Adjustment** (per Chapter 329.12) – "…The board of adjustment shall consist of two members from each municipality selected by the governing body thereof, and one additional member to act as chairperson and to be selected by majority vote of the members selected by the municipality..."

In the Airport Zoning Regulations adopted by the City of Cedar Rapids and other surrounding municipalities in the 1990s, the regulations call for slightly different compositions of these two Airport-Zoning Related Bodies. Four examples are provided below for reference, including municipal code from the City of Cedar Rapids, City of Norway, City of Fairfax, and City of Walford.

City of Cedar Rapids

- **Airport Zoning Commission** – "…The Zoning Commission shall consist of five (5) members, four (4) of whom shall be appointed by the City Council of the City of Cedar Rapids, Iowa, and one (1) additional member to act as Chairman who shall be selected by a majority vote of the members appointed by the City of Cedar Rapids…"
- **Airport Board of Adjustment – "…**The Board shall consist of five (5) members, four (4) of whom shall be appointed by the City Council of the City of Cedar Rapids, and one (1) additional member to act as Chairman who shall be selected by a majority vote of the members appointed by the City of Cedar Rapids…"

City of Norway

- **Airport Zoning Commission** – "…The Zoning Commission shall consist of five (5) members, two (2) of whom shall be appointed by the City Council of Norway, and (2) of whom shall be selected by the City Council of Cedar Rapids, and one additional member to act as Chairperson, who shall be selected by a majority vote of the members appointed by the City of Norway and the City of Cedar Rapids…"
- **Airport Board of Adjustment** – "…The Board shall consist of five (5) members, two (2) of whom shall be appointed by the City Council of the City of Norway and two (2) of whom shall be appointed by the City Council of the City of Cedar Rapids, and one additional member to act as Chairperson, who shall be selected by a majority vote of the members appointed by the City of Norway and the City of Cedar Rapids…."

City of Fairfax

- **Airport Zoning Commission** – "…The Zoning Commission shall consist of five (5) members, two (2) of whom shall be appointed by the City Council of Fairfax, and (2) of whom shall be selected by the City Council of Cedar Rapids, and one additional member to act as Chairperson, who shall be selected by a majority vote of the members appointed by the City of Fairfax and the City of Cedar Rapids…"
- **Airport Board of Adjustment** – "…The Board shall consist of five (5) members, two (2) of whom shall be appointed by the City Council of the City of Fairfax and two (2) of whom shall be appointed by the City Council of the City of Cedar Rapids, and one additional member to act as Chairperson, who shall be selected by a majority vote of the members appointed by the City of Fairfax and the City of Cedar Rapids…."

City of Walford

- **Airport Zoning Commission** – "…The Zoning Commission shall consist of three (3) members, two (2) of whom shall be appointed by the City Council of Walford, and one additional member to act as Chairperson, who shall be selected by a majority vote of the members appointed by the City of Walford…"
- **Airport Board of Adjustment** – "…The Board shall consist of three (3) members, two (2) of whom shall be appointed by the City Council of the City of Walford, and one additional member to act as Chairperson, who shall be selected by a majority vote of the members appointed by the City of Walford…."

These examples illustrate the differences in composition of the Airport-Zoning Related Bodies from one municipality to the other. Most notably, they call for the creation of *separate* Airport Zoning-Related Bodies *for each municipality*. Feedback from municipalities overwhelmingly indicated that these Airport Zoning-Related Bodies were not being implemented. All of the jurisdictions that participated in the outreach meetings indicated that their respective Airport Zoning Commissions and Airport Boards of Adjustment were either inactive or were never formed. Many of the municipal representatives indicated challenges with creating these bodies due to lack of planning staff and volunteers within their communities. Some noted challenges in maintaining their regular Zoning Commissions and Boards of Adjustment.

The recommended strategy to address this concern is to minimize the burden on each municipality to fill and maintain a separate Airport Zoning Commission and Airport Board of Adjustment. Since Chapter 329 regulates the creation and composition of these Airport Zoning-Related Bodies, this first requires legal interpretation of state code and what is allowed. Preliminary research on other communities in Iowa that are home to public use airports, including the Southeast Iowa Regional Airport and the Waterloo Airport, indicate alternate interpretation of Chapter 329 than was had when the City of Cedar Rapids and surrounding municipalities adopted the current Airport Zoning Regulations. These examples are provided below for comparison.

Des Moines County, Iowa – for the Southeast Iowa Regional Airport

- **Airport Zoning Commission** – "…there shall be a Southeast Iowa Regional Airport Zoning Commission, consisting of 7 members, two of whom shall be appointed by the City of Burlington, two of whom shall be appointed by the City of West Burlington, two of whom shall be appointed by the Board of Supervisors of Des Moines County, and one additional member whom shall be selected by a majority vote of the City and County appointed members, and who shall serve as Chairperson of the commission…"
- **Airport Board of Adjustment** – "… there shall be a Southeast Iowa Regional Airport Zoning Board of Adjustment, consisting of 7 members, two of who shall be appointed by the City of Burlington, two of whom shall be appointed by the City of West Burlington, two of whom shall be appointed by the Board of Supervisors of Des Moines County, and one additional member whom shall be selected by a majority vote of the City and County appointed members, and who shall serve as Chairperson of the said commission…"

Black Hawk County, Iowa – for the Waterloo Regional Airport (note the same code was adopted by the City of Cedar Falls)

- **Airport Zoning Commission** – "…The Airport Zoning Commission shall consist of seven total members, two members from the Planning and Zoning Commission of each jurisdiction (City of Cedar Falls, City of Waterloo and Black Hawk County) and one additional member, who is the Airport Director. The chairperson of the Airport Zoning Commission shall be selected and reappointed by a majority vote of the members serving on the Airport Zoning Commission…"
- **Airport Board of Adjustment** – "…The Airport Board of Adjustment shall consist of seven total members, two members from each jurisdiction (City of Cedar Falls, City of Waterloo and Black Hawk County) and one additional member, the Airport Director. The chairperson of the Airport Board of Adjustment shall be selected and reappointed by a majority vote of the members serving on the Airport Board of Adjustment…"

Reviewing the airport zoning adopted for these other airports in the state, it is clear that the interpretation of Chapter 329 allowed for the creation of a single, multi-jurisdictional Airport Zoning Commission and a single, multi-jurisdictional Airport Board of Adjustment to hear matters related to airport zoning of the subject airport, rather than creating multiple bodies for each municipality. This interpretation of Chapter 329 would drastically reduce the burden currently experienced by the City of Cedar Rapids and surrounding municipalities who are not or cannot staff two additional bodies per jurisdiction (two each for 10+ municipalities). It would allow for a single Airport Zoning Commission with representatives from the City of Cedar Rapids and surrounding municipalities, and a single Airport Zoning Board of Adjustment with representatives from the City of Cedar Rapids and surrounding municipalities.

Legal review of Chapter 329 is ongoing as of the development of this Strategy Document to determine what changes would be allowed regarding the creation and composition of these Airport Zoning-Related Bodies. Challenges with this strategy will arise if legal consultation determines that it is not possible to alter the requirement for each jurisdiction to have an Airport Planning Commission and Airport Board of Adjustment. In this case, the next step would be to undergo the process to amend Chapter 329, which would likely be a complex and lengthy process.

Challenge 2: Lack of Detail Needed for Consistent Interpretation and Implementation

Feedback heard from the jurisdictions indicate that the existing regulations in place lack detail and specific requirements, which can make implementing and enforcing the regulations difficult, particularly for city planners or other development review staff that are not familiar with the nuances of airport compatibility planning practices.

The recommended strategy includes amending the current Airport Zoning Regulation language to provide clear and detailed direction that is easy to interpret by city planners and practitioners from each jurisdiction. For example, the current language notes that land uses or developments that create bird strike hazards should be avoided, however there's no description of what would constitute a bird strike hazard nor is there a list of uses that may inherently be attractive to birds. In this specific example, the language could be expanded to list characteristics of land uses to be avoided to reduce bird strikes within specific airport zones, and establish baseline development standards such as:

- Water bodies must drain within 24 hours
- Waste containers must be lidded
- Trees and other vegetation that produce fruits or seeds attractive to birds or other wildlife must be avoided
- Wastewater treatment facilities, solid waste landfills, and wetlands mitigation should be located at least 10,000ft from the end of a runway of an airport that serves turbojet aircraft[10]

Challenge 3: Comprehensiveness of Existing Language

The current Airport Zoning Regulations language addresses development regulations related to structure height, electrical interference, and bird/wildlife attractants, but does not address other compatibility concerns related to noise or population density.

The recommended strategy includes amending the current Airport Zoning Regulations language to address concerns related to reducing noise exposure and establishing appropriate levels of population density within the study area. Exploration of the establishment of development standards related to appropriate noise insulation requirements and density of uses considered compatible with Airport operations may include a recommendation to identify specific areas (or zones) in which new, noise-sensitive uses or uses with particularly high densities should be avoided.

The intent of this language would not be to hinder future development or growth, rather outline areas within the airport environment where dense development could impact safety or land uses particularly sensitive to noise should be limited or prohibited. Should the amended language account for the development of different zones within the Airport's area of influence, it is important to note that the proposed requirements would account for different levels of compatibility needs based different airport zones. Certain zones closer to the ends of the runways would receive stricter land use guidelines, than zones that are further away from the airport environment and not under certain Part 77 surfaces.

Challenge 4: Location of Airport Zoning Regulations in Municipal Codes

Seven of the ten jurisdictions that adopted the Airport Zoning Regulations in the 1990s did not adopt the language into their zoning code chapter, rather it was adopted as a separate chapter in their larger municipal codes. This makes implementation difficult as local planners and development review staff refer to their jurisdiction's zoning code when reviewing development plans and may not be referring to the broader municipal code or even be aware of the existence of the Airport Zoning Regulations in their code altogether. These seven jurisdictions include:

- City of Cedar Rapids
- City of Ely
- City of Fairfax
- City of Norway

[10] Draft FAA AC 150/5190-4B, Airport Land Use Compatibility Planning, June 2021

- City of Shueyville
- City of Swisher
- City of Walford

As a part of the recommended strategy to amend the Airport Zoning Regulations language, it is suggested that jurisdictions that have not adopted the Airport Zoning Regulations into their zoning codes do so as a part of the amendment. Changing the location of the Airport Zoning Regulations language will likely improve implementation of these regulations as all zoning requirements will be located in a single comprehensive location. Additionally, it will improve awareness of the existence of these regulations and the overall success of implementation.

To aid planners in implementing the amended Airport Zoning Regulations, a Geographic Information Systems (GIS) tool is recommended for development that includes all of the revised Airport Zoning Regulations applicable to property within the Airport's area of influence, including the allowable Part 77 Surfaces height, at the click of a button.

5. CONCLUSION

As the City of Cedar Rapids and surrounding region continue to experience incredible growth and development, the Airport is in an ideal position to undertake efforts to enhance airport land use protections that will protect the future viability of CID as well as the communities surrounding the Airport. The topic of airport land use protection is not new to CID, the City of Cedar Rapids, or the other surrounding municipalities that fall under the Airport's Part 77 Surfaces. Each of the jurisdictions noted in this document adopted Airport Zoning Regulations in the 1990s to prevent the development of hazards to aircraft operations. Unfortunately, the implementation of these regulations has fallen by the wayside for many of these municipalities over the years for a variety of reasons. The continued growth in the region has spurred a renewed look at the protections in place and identification of ways in which these protections can be enhanced to allow for land uses that are compatible with airport operations and minimize the development of uses nearby the Airport that either pose a hazard to aircraft operations or subject uses with high concentrations of people to increased accident risk or noise sensitive uses to increased levels of annoyance. The recommended strategy to improve compatibility protections for both the Airport and surrounding communities is to amend and enhance the current Airport Zoning Regulations language to address the four key challenges noted by municipal representatives:

1) Airport Zoning Commission and Airport Board of Adjustment creation and composition.

2) Vagueness of current language which is difficult to interpret.

3) Comprehensiveness of current language which does not address population density and noise.

4) Separation of Airport Zoning Regulations from municipal zoning codes which are often overlooked.

Appendix C-2

Land Use Management, Part 2

Land Use Management, Part 2 is ongoing. Final study to be inserted upon completion.

Appendix D

Air Cargo Master Plan Study

EASTERN IOWA AIRPORT
FLYCID

Eastern Iowa Airport
Air Cargo Master Plan Study

December 2022

hubpoint
STRATEGIC ADVISORS

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Background and Objectives

In recent years, the air cargo industry has experienced transformative changes that have impacted supply chains and the way goods are shipped and received. These include structural changes related to e-commerce and the use of belly cargo as well as episodic changes related to the COVID-19 pandemic and, more recently, the global supply chain issues. With these changes, air cargo has taken on a new level of importance at many airports. The growth in e-commerce has been particularly impactful on the air cargo industry and has led to increasing activity by new and existing operators at U.S. airports of all types. In turn, new airport infrastructure and facilities are often needed to accommodate rising air cargo demand.

From a planning perspective, airports must understand the drivers of air cargo demand, the types of goods flowing through their facilities and the requirements for efficient movement on both the airside and the landside. With this understanding and a perspective on future growth, effective plans can be developed. Due to the changes in all air cargo segments (general cargo, integrated express, e-commerce) and the general lack of detailed, publicly available air cargo data, formal market studies are conducted to provide the necessary inputs for airport planning.

In September 2021, the Eastern Iowa Airport ("CID" or "the Airport") engaged Kimley-Horn to complete a Master Plan update. Given the rapidly changing environment for air cargo in the U.S., the Airport placed special emphasis on the Master Plan's air cargo elements. To address these topics, Kimley-Horn partnered with Hubpoint Strategic Advisors, LLC – an aviation industry consultancy with deep experience in the air cargo sector. Hubpoint led the Air Cargo Master Plan Study ("the Study") to accomplish the following major objectives:

1. Assess the current situation for air cargo at CID;
2. Analyze the regional air cargo market; and
3. Determine the future implications for air cargo at CID in terms of infrastructure and facilities requirements.

This report describes the methodology and results of Hubpoint's work. Further, the report provides contextual information on the air cargo industry and relevant markets in order to put the findings and analytical output in proper perspective. The Study will substantiate forecasts of air cargo activity levels expected at CID. In turn, the Master Plan team will utilize the forecasts to determine the future needs at the Airport related to air cargo.

1.2 Methodology and Approach

Airports seeking to plan for developing air cargo must have an understanding of their relevant markets as well as the overarching trends shaping the industry. To provide this information in the case of the Eastern Iowa Airport, Hubpoint analyzed the regional market employing both primary and secondary research techniques.

Hubpoint's secondary research included reviews of air cargo industry trade press as well and CID's historic operational statistics. Air cargo databases from the U.S. Department of Transportation's (U.S. DOT) T-100 reports and the U.S. Census Bureau's Foreign Trade Statistics were also utilized to enable valuable quantitative analysis. The T-100 reports provide monthly data by air carrier and by direction for air freight and mail at U.S. airports. As a complement to the T-100 data, Hubpoint also referenced annual cargo tonnage statistics for airports reported by Airports Council International – North America (ACI-NA). The Foreign Trade Statistics provide information on international air cargo flows by U.S. state, foreign countries, and gateway airports.

From Hubpoint's experience with other airport studies, it is clear that a true air cargo market analysis must include primary research. While secondary research via database analysis is valuable and necessary, it cannot provide the micro-level detail required to understand the dynamics of individual markets. Further, publicly available air cargo data lacks the type of detail and transparency that is often found in other parts of the aviation industry such as the robust data that is available for passenger air travel. Importantly, primary research (particularly in the form of stakeholder interviews) allows the consulting team to test hypotheses and validate assumptions.

For this study, Hubpoint conducted interviews with stakeholders including current CID air carriers at both the local and headquarters levels, air cargo service providers, local companies and organizations as well as third-party developers of cargo facilities. The meetings and interviews yielded valuable information specific to the Eastern Iowa Airport and the relevant air cargo market.

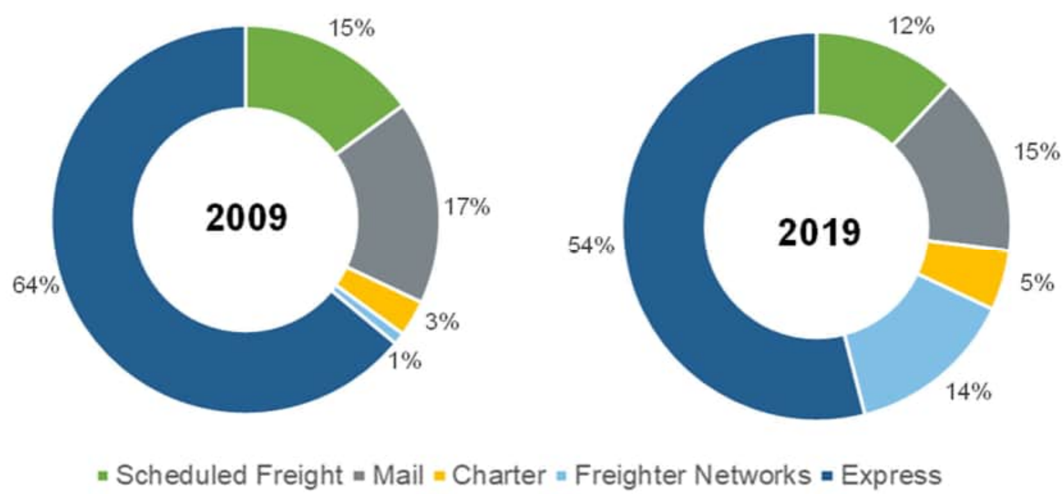
2 AIR CARGO INDUSTRY TRENDS

To provide proper context for this report, it is helpful to describe air cargo industry trends that may impact the Eastern Iowa Airport. While some of the trends are related to the global pandemic, others pre-date 2020. It is very likely that many of these industry trends will continue well into the future and, therefore, they are relevant to consider in airport planning.

2.1 Projected Growth of U.S. Domestic Air Cargo

In recent history, the U.S. domestic air cargo (freight and mail) market had been in an overall state of low growth. The U.S. was characterized as a mature market for air cargo which was primarily served by the duopoly of FedEx Express and UPS. However, in the 2017-2018 period the increasing influence of e-commerce was evident as domestic air cargo volumes rose sharply. This also coincided with new entrant Amazon Air gaining scale with an expanding aircraft fleet and network of U.S. airports. The influence of Amazon Air on the domestic air cargo environment can be observed in the market share gains by “Freighter Networks” between 2009 and 2019 (see Exhibit 2.1). These share shifts are almost completely attributable to Amazon Air and have particularly come at the expense of the integrated express carriers.

Exhibit 2.1
U.S. Air Cargo Market Share by Carrier Category

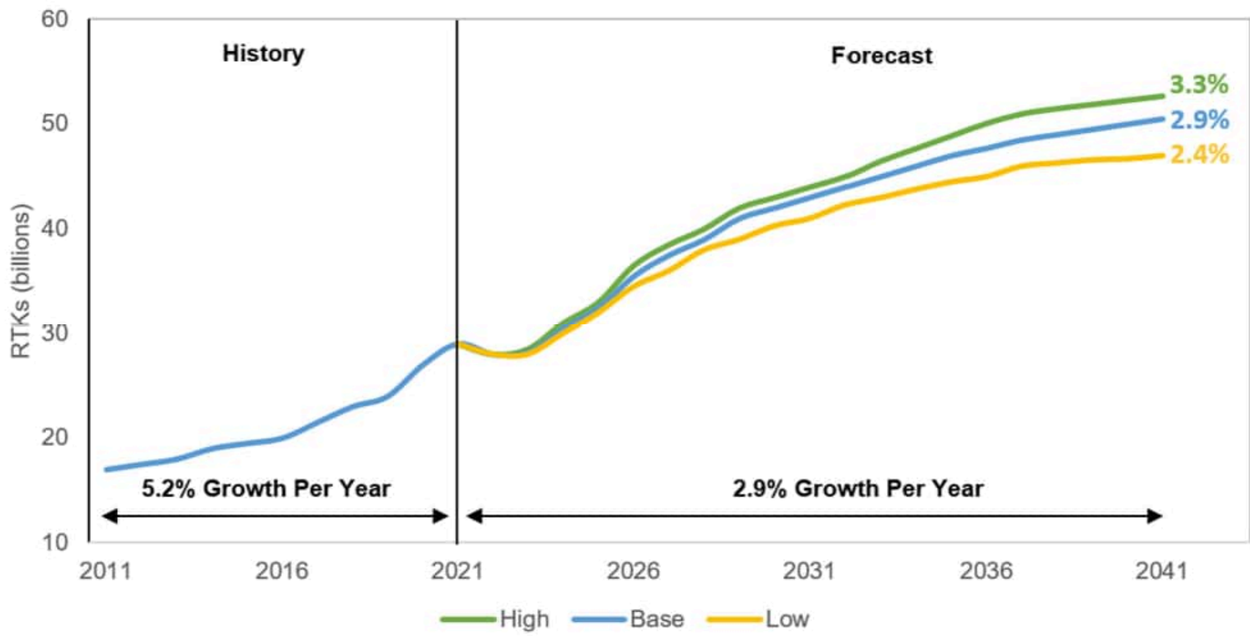


Note: Express category refers to integrated express carriers (e.g., FedEx, UPS)

Source: Boeing

The Boeing World Air Cargo Forecast (WACF) is a standard industry reference tool for estimating future air cargo growth in various global markets, including the U.S. domestic market. In the latest WACF published in November 2022, the U.S. domestic market is expected to grow at an average annual rate of 4.3% from 2022-2031 and an average of 2.9% for the 20-year full forecast 2022-2041(see Exhibit 2.2). The higher growth rate through 2031 is expected primarily due to the rapid rise of e-commerce in the U.S. This contrasts with the pre-COVID 10-year period 2009-2019 when domestic cargo traffic grew at an average annual rate of 3.3%. That period included a recovering U.S. economy following the Great Recession in 2009-2010, as well as the U.S. foreign tariffs and trade wars of 2018-2019 which negatively impacted domestic and international cargo traffic.

Exhibit 2.2
U.S. Domestic Annual Air Cargo Traffic (2011-2041F)



Source: Boeing

Finally, it should be noted that the large, resilient U.S. domestic air cargo market not only survived during the pandemic, but thrived. Again, this is largely a result of e-commerce where health concerns and social distancing led consumers to avoid brick-and-mortar stores and shop online instead. In fact, in the first year of the pandemic, a statistical report produced by the ACI-NA showed that for the approximately 200 U.S. airports analyzed, 100% experienced negative growth in passenger air travel compared to 2019. Meanwhile, in terms of air cargo tonnage, over 42% of the U.S. airports analyzed showed positive year-over-year growth in 2020.

2.2 E-Commerce

The impact of e-commerce on the U.S. air cargo industry cannot be overstated. E-commerce has permanently changed consumer behavior and continues to have transformative effects on transportation networks. In the mid-1990s, as e-commerce truly gained momentum with companies like eBay and Amazon, it quickly became clear that fast, reliable and inexpensive shipping was a key differentiator for online sellers. In those early days of modern e-commerce, start-up companies accepted a lack of profits to gain market share. With that mindset, delivery costs for shipments to individual consumers were subsidized with the capital companies raised from investors.

The major U.S. integrated express carriers, FedEx and UPS, were ideally positioned to serve the growing e-commerce market. Over the prior decades, the express carriers had invested heavily in facilities, equipment and technology to compete and better serve customers. So, by the mid-1990s, the integrators were able to offer the kinds of services e-commerce companies and their customers demanded. These services included door-to-door delivery involving a variety of transportation modes, package tracking, and return processes for unwanted orders.

As e-commerce evolved and grew exponentially, delivery promises of online sellers and the sheer volume of shipments began to cause problems for the integrators. Their air and land transportation networks were overwhelmed and had difficulty keeping up with peak demand periods. This was particularly true around the year-end holidays of 2013. Since then, additional investments and closer cooperation with online sellers has allowed FedEx and UPS to maintain service levels which, in turn, has fueled further e-commerce growth.

Clearly, air cargo has been critical to the growth of e-commerce, and vice versa. Given consumer expectations for deliveries and the often-vast distances between fulfillment centers and individual addresses, e-commerce companies must incorporate air transportation in their businesses to survive. Evidence of this is readily seen in Amazon Air's U.S. network which, in just seven years, has assembled a fleet of 88 aircraft serving 50 domestic markets.

Importantly, Amazon Air is just one company flying e-commerce packages in the U.S. FedEx and UPS continue to prioritize e-commerce in their air networks and passenger airlines also often carry e-commerce for their freight forwarder customers. The U.S. Postal Service is also contracted by e-commerce companies to deliver shipments by air (often via its partner FedEx). Finally, more competitors may eventually enter the market. In October 2020, news articles reported that Walmart had been in talks with various air carriers to control its own U.S. freighter network to compete with Amazon. While the talks ended without an agreement, it is likely that Walmart and other large retailers continue to assess potential strategies related to air cargo services.

Of course, during the pandemic, e-commerce growth only accelerated. Airports wishing to participate in this growth should be aware of the opportunities and challenges that e-commerce air cargo can create. From a planning perspective, this involves understanding potential e-commerce air services and the associated infrastructure and facilities required to support those activities.

2.3 Pandemic-induced Global Supply Chain Constraints and Labor Shortages

Another trend for air cargo relates to the global supply chain constraints and labor shortages induced by the ongoing pandemic. The trend is especially meaningful because the issues, while stemming from the pandemic, are expected to be long-lasting.

The current supply chain issues relate to the unpredictable factory closings from COVID outbreaks and government health restrictions requiring suspension of certain business activities. In many cases, these disruptions to normal business resulted in an inability to plan even basic manufacturing processes and led to worker layoffs. The situation was further exacerbated by the standard global sourcing of parts and components where countries were affected by and reacted to the growing pandemic in different ways. This imbalanced and mistimed flow of supplier shipments often shut down production lines for weeks at a time.

On the demand side, many manufacturers and retailers, faced with unknown consequences of COVID-19 on businesses and consumers, canceled existing orders and severely reduced future orders. In the early months of the pandemic, this appeared to be prudent. However, as economies adjusted and government stimulus was distributed, consumer demand proved steady and, in many cases, was supercharged. People working from home and incurring few of their normal expenses had money to spend and sought purchases to accommodate their new pandemic-driven circumstances.

However, as manufacturers understood the resilience of demand, they were unable to quickly rehire workers and restart normal distribution processes. At the same time, transportation and logistics networks were (and continue to be) severely hampered by labor shortages, backlogged shipments and debilitating port congestion.

The result of this complex situation has been rising inflation as the cost of most inputs to the supply chain have increased markedly over the past two years, including higher fuel and labor costs. The significant mismatches in supply and demand for transportation and logistics services has pushed ocean container rates to all-time highs. Shippers seeking relief from delays and uncertainty then shifted some demand to air cargo and those rates also rose accordingly.

Although air cargo provides speed advantages over ocean containers, air cargo companies are experiencing their own capacity shortages due to lacking belly capacity from passenger aircraft as well as massive congestion at traditional U.S. cargo gateway airports. Further, cargo ground handlers, truckers and other service providers at these U.S. airports face significant challenges with handling more freighters (including passenger freighters), lack of warehouse space and long delays to process shipments.

Many industry experts are predicting that the supply chain constraints will remain in place until sometime in 2023. Meanwhile, the Biden Administration is seeking to enact policies and regulations to return the systems to a more normal, predictable state. Air cargo will undoubtedly play a critical role in the solutions to this problem. Therefore, U.S. airports of all types should prepare for extraordinary air cargo activity for the foreseeable future. This will likely entail flexible planning, air cargo investments and management attention to ensure that airports are as efficient as possible and free of bottlenecks found in other parts of the supply chain.

2.4 Use of Alternative Cargo Airports in the U.S.

Traditionally, the U.S. air cargo market has been dominated by a limited number of international gateway airports and integrated carrier hubs. This is because the business models of airlines and freight forwarders favor consolidation at fewer points and the economies of scale found at large airports. Most other airports have played supporting roles for air cargo, but few have grown beyond that profile and control their own destinies.

For many years, Rickenbacker International Airport (LCK) in Ohio and Huntsville International Airport (HSV) in Alabama have successfully served shippers, freight forwarders and airlines with strategic geographic locations and welcoming air cargo environments. These airports provided a blueprint for other alternative cargo airports to follow, leading to successful international cargo operations at Chicago-Rockford International Airport (RFD) and Greenville-Spartanburg International Airport (GSP). LCK, HSV, RFD and GSP have sustained and grown their cargo activities over time, but overall, they remain niche airports for cargo. While none of these airports offers substantial service with passenger belly cargo to truly challenge the large gateway airports, that is not the objective. Their air cargo operations serve select international markets well and the business has diversified the airports' revenue streams and contributed positively to regional economic development.

Since Amazon Air commenced operations in 2016, it has designated key roles for some domestic airports that can be considered alternative cargo airports. These include Lehigh Valley International Airport (ABE) in Pennsylvania and Lakeland Linder International Airport (LAL) in Florida. Each of these airports had modest air cargo activity prior to Amazon Air, but have transformed their infrastructure and operating models to allow for cargo growth. In turn, parent company Amazon has invested in these communities with additional fulfillment centers leading to more jobs, which then support other local businesses.

In general, alternative cargo airports offer low costs, efficient airside and landside movement of cargo, and ready access to markets by truck and air. As these alternate airports have proven to be viable, there is more acceptance within the air cargo community to consider their added value in the supply chain. Moving forward, as Amazon Air continues to build its U.S. network and traditional cargo gateway airports struggle with congestion and high costs, cargo operators are expected to increasingly turn to alternative U.S. airports for solutions.

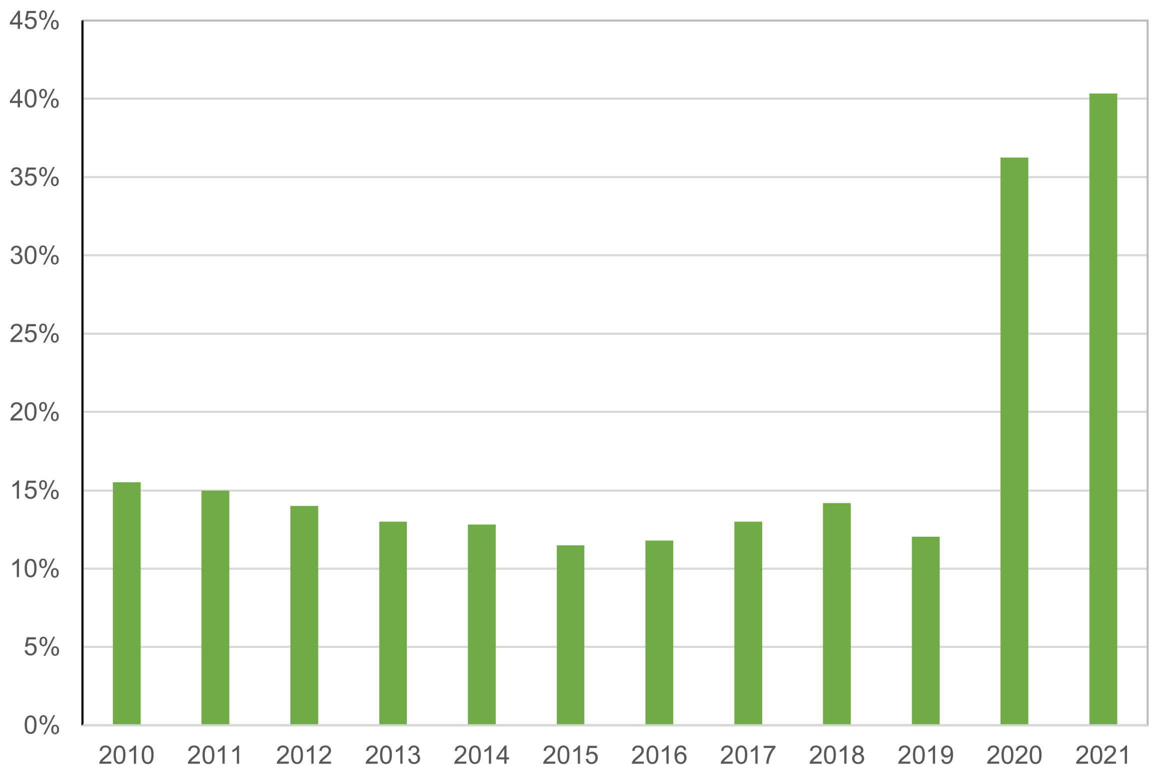
2.5 Elevated Importance of Cargo to Passenger Airlines

Another notable trend related to the pandemic involves the elevated importance of cargo to U.S. passenger airlines. It is well-documented that COVID-19 has led to a devastating loss in air travel demand, particularly for international markets. This situation has been particularly impactful to the air cargo industry where approximately 50% of air cargo is transported in the bellies of passenger airlines – especially on cargo-friendly widebody aircraft that typically fly intercontinental routes.

To generate revenue and utilize aircraft and crews during the slow return of passenger air travel, airlines (including U.S. carriers) have re-purposed some of their passenger aircraft fleet to exclusively carry cargo. These passenger freighter flights have been critical to the delivery of

Personal Protective Equipment (PPE) as well as other commodities. During the pandemic, American Airlines, United Airlines, Delta Airlines and Southwest Airlines have all operated passenger aircraft as freighters with much success. The cargo operations materially improved airlines' financial standing. In Q3 2021, American Airlines cited that its air cargo revenue increased 62% versus its Q3 2019 level. In a June 2022 report, the International Air Transportation Association (IATA) found that air cargo accounted for 40% of global airline revenue in 2021. See Exhibit 2.3.

Exhibit 2.3
Global Airline Industry Cargo Revenue as a Percentage of Total Operating Revenue



Source: IATA Economic Airlines Financial Forecast update, June 2022

Of course, these cargo revenue shares are calculated on lower total revenue for airlines. As passenger travel returns, cargo's share of total revenue will naturally normalize. However, airline management now fully realize the impact that air cargo can have on airline route economics and several leading U.S. airlines have stated that the focus on air cargo will remain elevated even after the pandemic ends. This includes decisions related to new and existing routes where cargo can make the difference between profitable and unprofitable operations.

The new attention devoted to air cargo by U.S. airlines will likely lead to a more competitive market environment where costs, service levels, and operational efficiencies are scrutinized. Airports will surely be integral and influential to these changes. Therefore, airports should be prepared for additional belly cargo volume and the increased demands that will have on both airside and landside activities.

2.6 Other Emerging Trends

In a trend related to the supply chain constraints described above, many companies operating in the U.S. are seeking to mitigate the risks of sourcing goods from distant geographies and unstable regions of the world by obtaining those goods from places closer to home. Nearshoring and reshoring of production facilities among manufacturers has been taking place for years, but is accelerating now due to the negative impacts experienced during COVID-19. A recent survey by a large manufacturer found that 70% of U.S. manufacturing companies plan to establish or relocate production closer to home, their customers or potential buyers. At a higher level, nearshoring can potentially solve supply chain issues related to national security, health security and overall competitiveness.

From an air cargo perspective, increased manufacturing in Mexico and Latin America can have major impacts on the way markets are served. For example, the major Asia-to-U.S. trade lane requires large aircraft flying vast distances and primarily operating at the largest airports to pick up and deliver cargo. As distances between where goods are produced and where they are consumed shorten, smaller aircraft can be utilized to transport cargo. Further, due to the proximity of the markets being served, the aircraft can operate at higher frequencies (i.e. more flights in a given time interval). In such a scenario, cargo airlines flying smaller aircraft would not need to restrict their services to only large airports. Smaller airports that are close to the origins and ultimate destinations of shipments become relevant and, perhaps even preferable, to shippers and cargo airlines.

Finally, in just the past several months, ocean shipping companies Maersk and MSC have acquired airlines and freight forwarders focused on air cargo. These companies have been on the front lines of the global supply chain disruptions and, as a result, their customers have suffered. The move to enter the air cargo industry indicates that they believe the disruptions will likely persist for some time and will likely re-occur at great frequency. Air cargo enables them to serve the subset of goods that are air-eligible even when ocean shipping is experiencing backlogs. The importance of this is that air cargo becomes less of a niche business and a premium service and more of a mainstream transportation mode. In that sense, air cargo services may proliferate and utilize more airports, including smaller airports that currently have only modest cargo activity.

2.7 Summary

The past five years have been extraordinarily active for air cargo in the U.S. This includes Amazon Air's market entry, the impacts related to the COVID-19 pandemic and the ongoing supply chain issues affecting every industry. The once stagnant, duopoly-controlled domestic

U.S. market is now in positive motion with the influx of competition and the need to innovate. The pandemic has brought its own opportunities and challenges and some of the resulting effects may prove to be permanent fixtures of the air cargo industry. The trends outlined above are notable because they likely touch airports of all sizes, including smaller airports like Eastern Iowa Airport. Although air cargo dynamics at smaller airports have been relatively stable in the recent past, a new environment exists which deserves the attention of airport management and planners. The pace of air cargo activity and developments has accelerated and prepared airports will be well-positioned to capitalize on available opportunities.

3 CURRENT SITUATION FOR AIR CARGO AT EASTERN IOWA AIRPORT

3.1 Overview of Air Cargo at CID

Located in the middle of Iowa's eastern region, CID is a convenient airport for the City of Cedar Rapids and many other cities in the eastern third of Iowa, as well as communities in Southwest Wisconsin and Western Illinois. In 2021, over 1.0 million passengers utilized CID, ranking it behind only Des Moines International Airport (DSM) in terms of passenger volume at Iowa's commercial airports. Historically, the majority of passenger operations at CID have been performed with regional jets affiliated with network carriers American Airlines, Delta Air Lines and United Airlines. These smaller passenger aircraft have little belly capacity to carry meaningful levels of cargo. In 2022, the network carriers began operating more narrowbody mainline aircraft at CID. Should this trend continue, it may portend increasing cargo volumes due to the higher cargo carrying capacities for these aircraft. Meanwhile, ultra-low-cost carriers (Allegiant and Frontier) operate narrowbody aircraft at CID, but their internal policies and business models do not allow cargo to be carried in the belly holds. Therefore, dedicated cargo carriers UPS, FedEx and DHL handle almost all of the air freight at CID. Exhibit 3.1 provides a comparison of CID to select Midwest airports in terms of cargo tonnage handled in 2021.

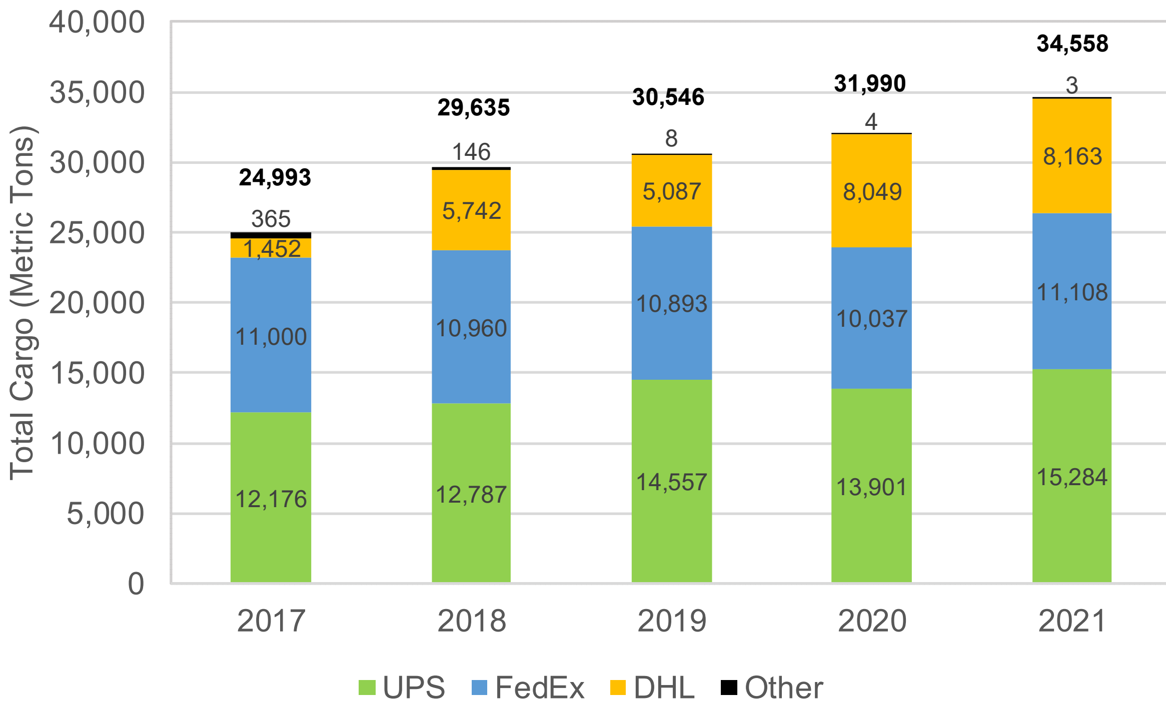
Exhibit 3.1
Air Cargo Tonnage at Select Midwest Airports (2021)

Airport Code	City/State	Airport Name	Total Cargo (Metric Tons)	Change 2020-2021
ORD	Chicago, IL	Chicago O'Hare International Airport	2,536,576	26.7%
RFS	Rockford, IL	Chicago-Rockford International Airport	456,239	20.5%
MSP	Minneapolis, MN	Minneapolis/St. Paul International Airport	234,746	15.2%
MCI	Kansas City, MO	Kansas City International Airport	111,479	24.0%
STL	St. Louis, MO	St. Louis Lambert International Airport	106,921	27.6%
OMA	Omaha, NE	Eppley Airfield	67,845	-3.4%
DSM	Des Moines, IA	Des Moines International Airport	43,337	-17.6%
CID	**Cedar Rapids, IA**	**The Eastern Iowa Airport**	**34,551**	**8.0%**
ICT	Wichita, KS	Wichita Eisenhower National Airport	28,369	10.6%
SGF	Springfield, MO	Springfield-Branson National Airport	15,680	14.1%

Source: Hubpoint analysis of Airports Council International North America (ACI-NA) data.

Between 2017 and 2021, air cargo tonnage at CID grew by 38% to 34,558 metric tons (Exhibit 3.2). During this period, CID experienced two particularly high growth periods. From 2017 to 2018, cargo tons increased by 19% when DHL added 360 net new flights at CID in 2018. Then, in 2021, tonnage increased 8% compared to 2020 when e-commerce fueled higher air cargo activity in most U.S. markets. In the middle years (2018-2020), CID cargo grew at more typical annual rates of 2-3%.

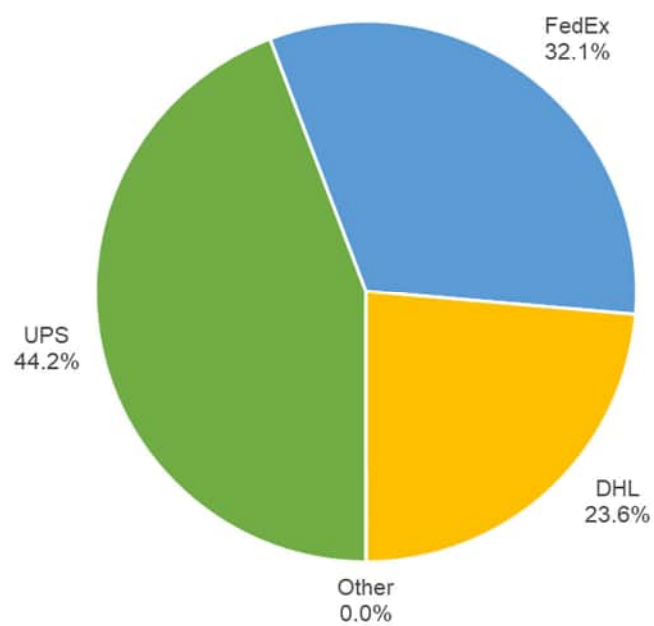
Exhibit 3.2
CID Air Cargo by Carrier (2017-2021)



Source: Hubpoint analysis of CID airport data

As noted previously and shown in Exhibit 3.3, air cargo at CID is dominated by three all-cargo carriers UPS, FedEx and DHL. In 2021, the three express carriers accounted for essentially 100% of the total air freight handled at the Airport. With a 44% share of CID's cargo tonnage, UPS is the leading carrier, followed by FedEx with 32% share and DHL with 24% share. Both UPS and FedEx serve the U.S. domestic and international markets via their respective hub airports. DHL, on the other hand, exited the U.S. domestic air cargo market many years ago and now serves only U.S. international markets via its air hub at Cincinnati (CVG). Beyond the scheduled cargo services provided by the express carriers, charter aircraft (e.g., Ameristar and USA Jet) occasionally carry air cargo at the Airport. However, these charter operations are very limited in terms of their frequency and gross tonnage.

Exhibit 3.3
Carrier Market Shares of CID Air Cargo Tonnage (2021)



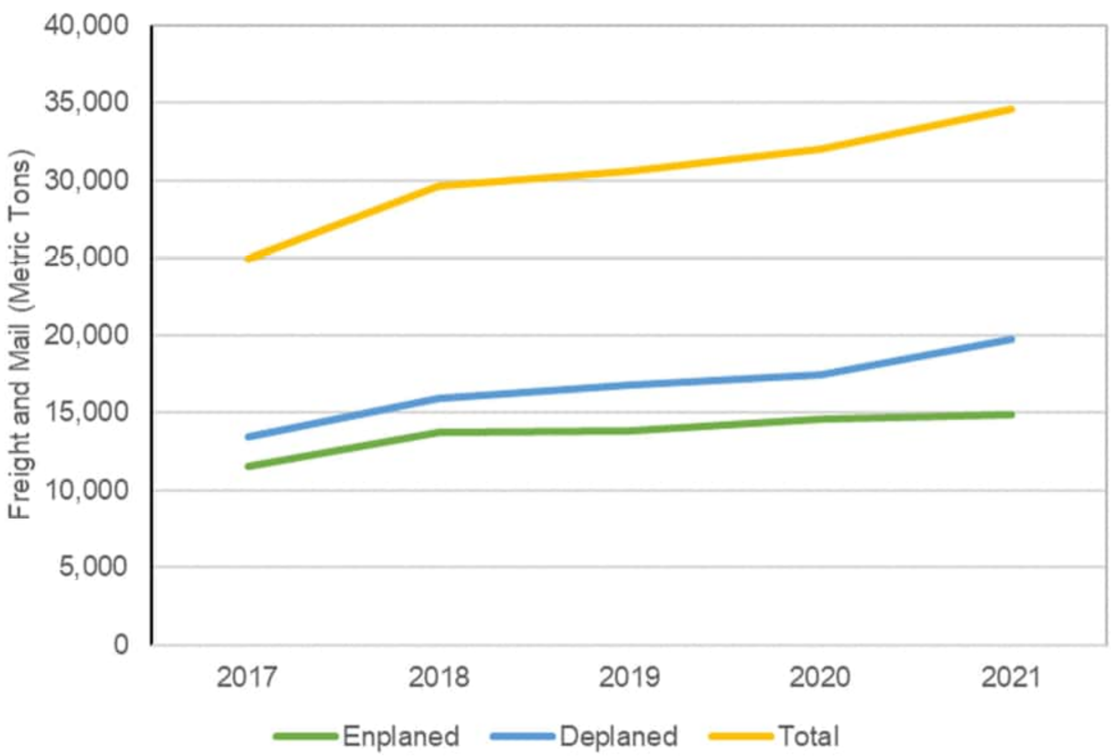
Note: Other airlines carry 0.01% of CID air cargo tonnage.

Source: Hubpoint analysis of CID airport data

From a directional perspective, inbound and outbound air cargo flows at CID have traditionally been fairly balanced. While inbound (deplaned) air cargo tonnage is consistently higher than outbound (enplaned) tonnage, the historic differences have been within a reasonable level. Between 2017 and 2020, the weighted average difference between inbound and outbound tonnage was less than 20%. In 2021, inbound tonnage grew to 33% higher than outbound largely due to increased e-commerce demand within the CID air cargo service area.

Importantly, these statistical observations of the CID market were confirmed through interviews with various air cargo stakeholders in the Cedar Rapids area. Stakeholders characterized CID as a predominantly inbound market, but not to the point of severe imbalance. Air cargo stakeholders generally prefer more balanced directional flows as that translates to higher utilization of assets leading to more efficient and profitable operations.

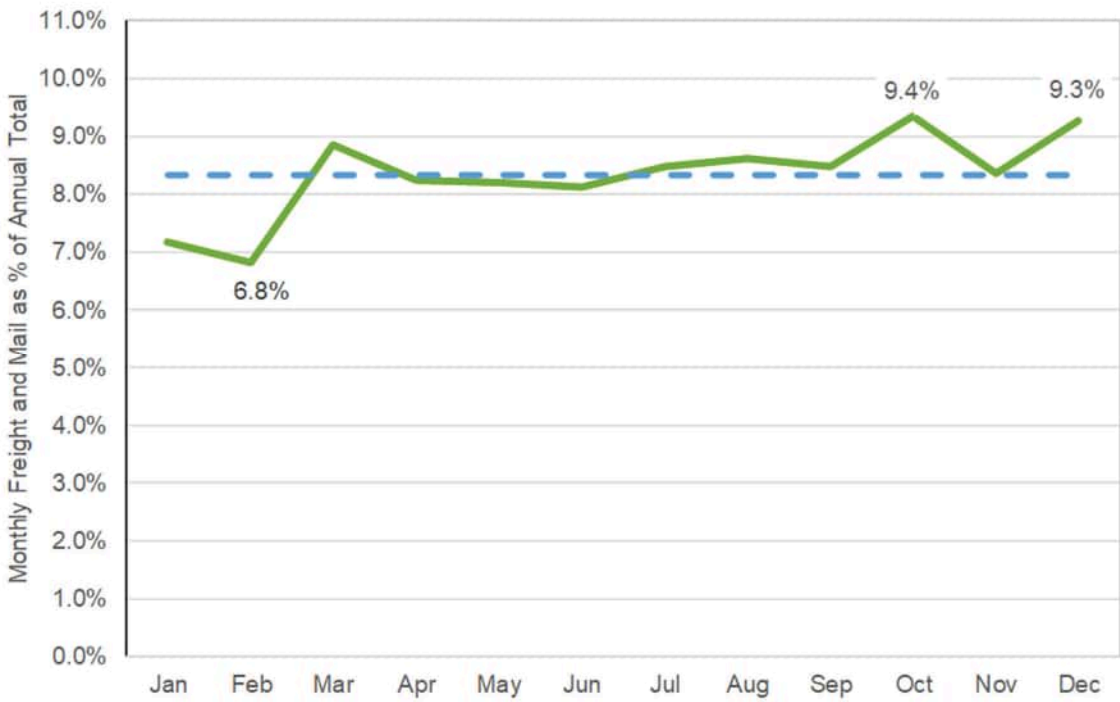
Exhibit 3.4
CID Air Cargo Tonnage by Direction (2017-2021)



Source: Hubpoint analysis of CID airport data

Seasonality of demand is another factor that airports consider when assessing their air cargo markets. The seasonal differences in cargo activity at CID are typical of many U.S. markets. As shown in Exhibit 3.5, CID experiences its air cargo peak in the Fourth Quarter where October and December are the busiest months of the year, accounting for 9.4% and 9.3% of total cargo, respectively, when analyzing 2017-2021 data on an aggregated basis. This compares to the pro rata average of 8.3% per month (represented in the exhibit with a blue dotted line). Notably, the Third Quarter of the year is also characterized by air cargo volumes above the pro rata monthly average, which may relate to companies stocking inventories in preparation for the holiday season. Air cargo volumes are lowest during February, which accounted for just 6.8% of the annual totals for CID tonnage. With the increasing use of air shipments for e-commerce order fulfillment, a potential trend to track relates to returns of goods to retailers and manufacturers. In such cases, the month of January may begin to experience higher than normal levels of activity as returns are processed after the holiday season.

Exhibit 3.5
Seasonality for CID Air Cargo Tonnage (2017-2021 aggregated)

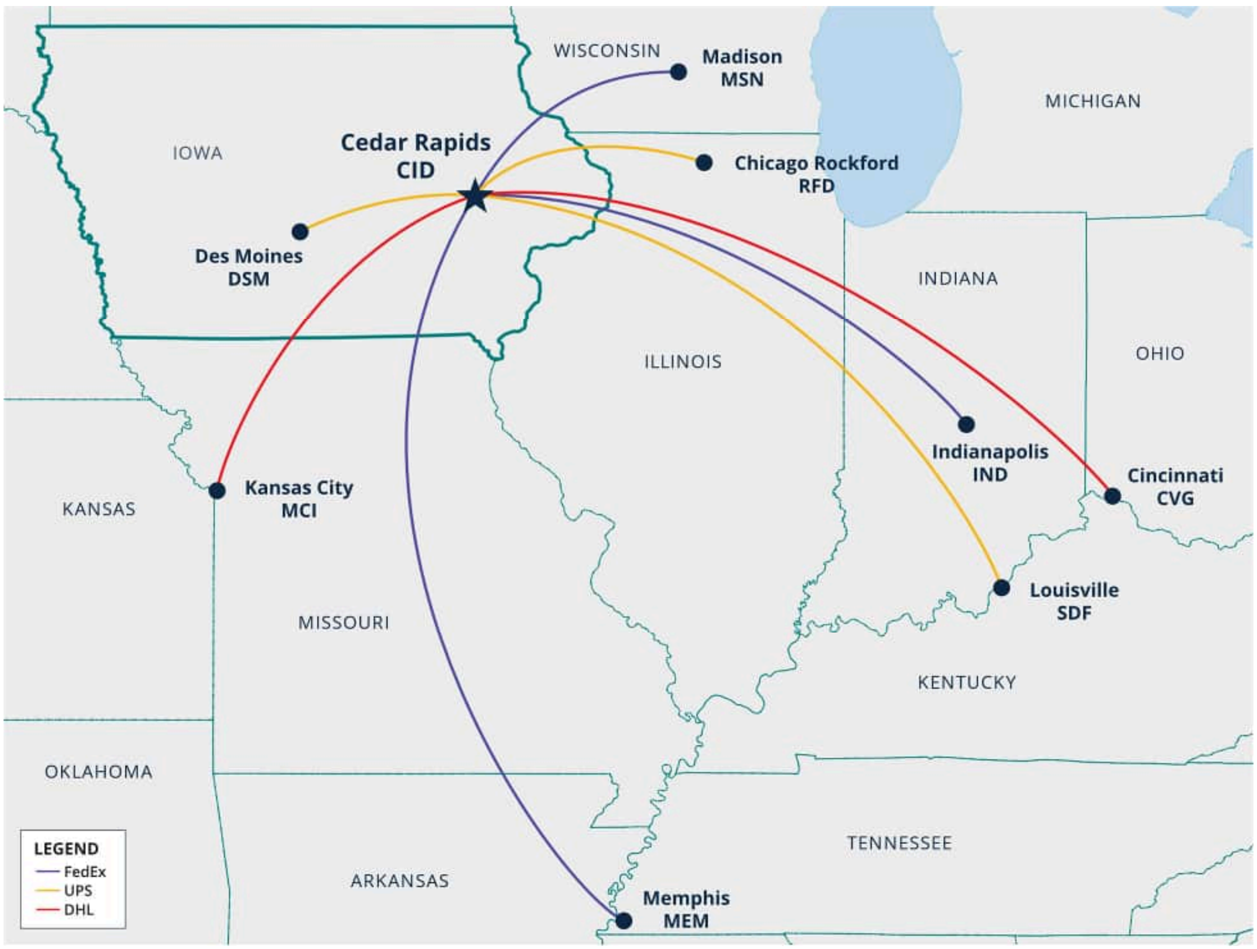


Source: Hubpoint analysis of CID airport data

3.2 Air Cargo Operations at CID

In describing the current situation for air cargo at the Eastern Iowa Airport, it is helpful to have a detailed understanding of the activities of the airport's three cargo carriers. In some ways, UPS, FedEx and DHL have similar operations at CID, but they are also unique in other ways. How CID is served by the carriers is influenced by factors such as the size and dynamics of the Cedar Rapids market, the distance to other airports in the respective carrier networks and the carriers' ability to utilize multiple aircraft types and trucks to efficiently move cargo. The operational profiles of each carrier are outlined below and provide valuable context for other findings and conclusions of this study. See Exhibit 3.6 for the route map of the cargo carriers serving CID.

Exhibit 3.6
CID Routes Map for FedEx, UPS and DHL



Source: Hubpoint analysis

UPS

UPS is an integrated express carrier which provides reliable door-to-door services for both businesses and consumers utilizing a variety of transportation modes, technologies and human resources. In the U.S., UPS has established national and regional hub airports to efficiently move goods from origin to destination. UPS flows much of the volume in its network through its primary Worldport hub at the Louisville International Airport (SDF), but other smaller hubs like Chicago-Rockford International Airport (RFD) enable UPS to execute strategies at a regional level.

On a typical weekday, UPS operates two mainline aircraft arrivals at CID. Each flight arrives in the early morning hours – one from RFD (usually a B757F) and one from SDF (usually a B767F). After a brief stop at CID, the SDF aircraft then departs for Des Moines (DSM). The aircraft from RFD stays on the ground at CID until late evening when it departs for SDF. The capacity of the larger B767F aircraft is effectively shared between CID and DSM. This is a common practice by the integrated express carriers (particularly in smaller markets) which allows them to provide similar service levels in multiple markets without dedicating an entire aircraft to each one.

FedEx

Like UPS, FedEx is an integrated express carrier that provides complete door-to-door services under one brand to customers of all types. The FedEx Express unit oversees the air network of the larger corporation. Unlike UPS which has its roots in surface transportation (e.g., vans) and later added airplanes to its portfolio, FedEx began by offering premium transportation services with airplanes. While FedEx has since added extensive surface transportation capabilities, it is still viewed as a more air-centric company than UPS. The FedEx Express World Hub located at the Memphis International Airport (MEM) is the workhorse of its U.S. network. FedEx also maintains multiple regional hubs around the U.S., including one at Indianapolis International Airport (IND). Importantly, for decades, FedEx has been under contract with the U.S. Postal Service to transport mail using its air network.

At CID, a typical weekday sees two FedEx mainline jet aircraft (usually B757Fs) arrive early in the morning from MEM and IND. A third aircraft arrives mid-morning from IND - an ATR72F turboprop operated by FedEx partner Mountain Air Cargo. FedEx’s departures from CID start with a quick turn of the IND B757F destined for Madison (MSN) in the early morning. The other two FedEx aircraft remain at CID until late evening departures back to their home airports (MEM and IND).

As with the UPS aircraft that is shared between CID and DSM, FedEx shares the capacity of one of the B757Fs between CID and MSN. Again, it is an efficient use of one airplane to serve two smaller markets. The use of the smaller (and slower) ATR72F at CID enables FedEx to serve different customer segments with appropriate and cost-effective solutions. The ATR72F from IND is particularly utilized to handle less time sensitive, lower-priced shipments.

DHL

DHL is similar to both UPS and FedEx in that it operates a global integrated freight transportation network. In much of the world, DHL provides door-to-door deliveries under its brand, even when using contractors. A key difference is that DHL, as a non-U.S. company, cannot fly its own airplanes within the U.S. to serve the domestic market. Therefore, DHL flights at CID are mainly operated by DHL partner Kalitta Air. Further, after exiting the U.S. domestic market in 2008, DHL has focused its U.S. business on international time-definite services. As a result, all the air cargo handled by DHL at CID either originates outside of the U.S or is heading to an international destination.

Currently, DHL operates two daily flights at CID with B737F aircraft. An early morning flight arrives CID from DHL's main U.S. hub at Cincinnati (CVG). This aircraft stays on the ground at CID for about one hour and then departs for Kansas City (MCI). In the evening, DHL routes aircraft through CID in a reverse manner of the morning operation. A late evening arrival from MCI which turns in less than one hour and departs for CVG.

3.3 CID Air Cargo Infrastructure

Infrastructure and facilities provided at the Eastern Iowa Airport enable the safe and efficient operations of the air cargo companies described above. This includes runways, taxiways, cargo ramp space, air cargo buildings, loading docks, truck parking and staging areas, and on-airport access roads. See Exhibit 3.7. Further, CID is located 2 miles from I-380 and less than 20 miles from I-80, a major east-west interstate highway providing excellent access to important markets and trucking routes for freight.

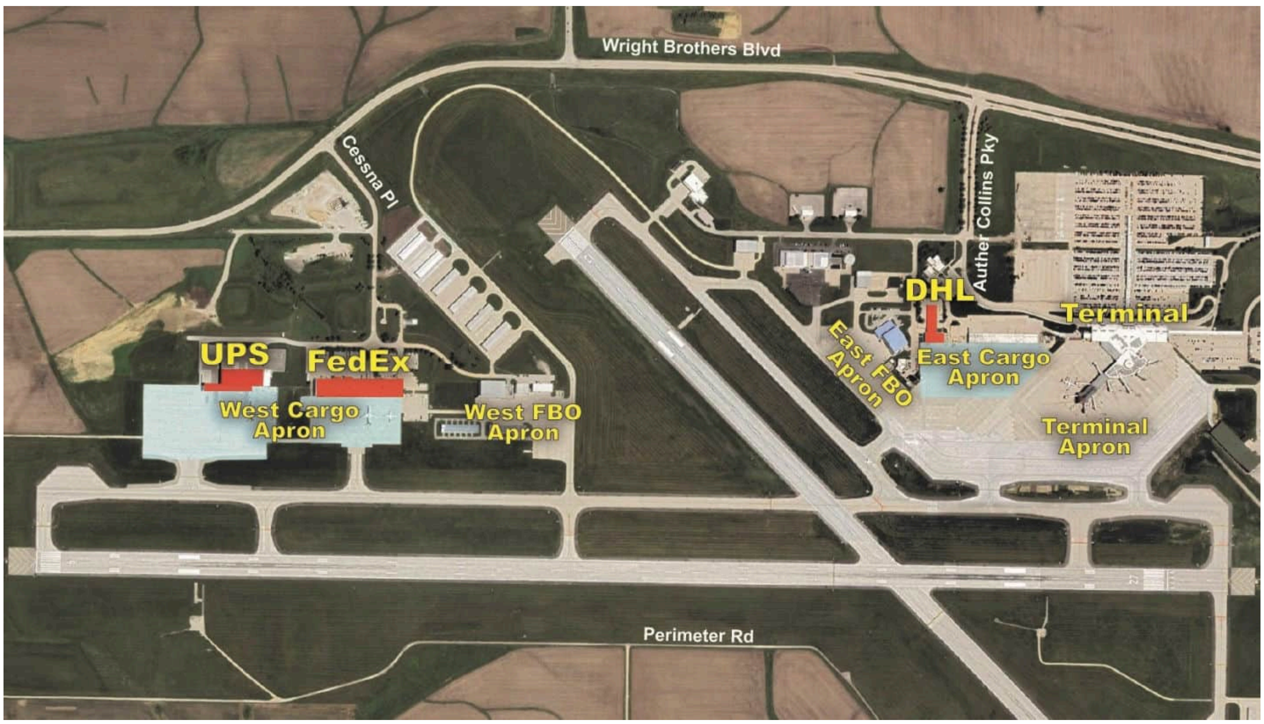
CID has three air cargo facilities, one dedicated building for each of the current cargo carriers. The separate facilities for UPS and FedEx are adjacent to each other in the West Cargo Area. DHL operates from the East Cargo Area close to the passenger terminal. UPS also operated from the East Cargo Area in an older facility until 2021 when it moved to its new location. From Wright Brothers Boulevard W, the West Cargo Area is accessed via Cessna Place SW. The East Cargo Area is accessed from Wright Brothers Boulevard W via a series of on-airport roadways – Arthur Collins Parkway SW, Lippisch Place SW and Shepard Court SW.

UPS operates from a brand new 53,800 square foot facility (with core warehouse space of 28,530 square feet) that was custom designed by UPS and built by the Airport. The building opened in July 2021, so it is anticipated to have adequate capacity to accommodate long-term UPS growth at CID. The UPS facility includes indoor GSE space of 4,100 square feet and office space of 6,500 square feet. Cargo ramp space is approximately 485,000 square feet. The building has 25 landside truck docks and close to 50 automobile parking spaces for employees, visitors and customers.

FedEx also has a large, modern facility at CID which is over 90,000 square feet (with core warehouse space of 52,800 square feet). The FedEx facility includes indoor GSE space of over 5,000 square feet and a large two-story office space covering 34,000 square feet. Cargo ramp space is over 216,000 square feet. The building has 22 landside truck docks, 33 truck parking spaces and almost 100 automobile parking spaces.

DHL has CID's smallest and oldest cargo facility at 20,000 square feet (with core warehouse space of 12,250 square feet). The DHL building has 3,400 square feet of indoor GSE space and office space of 5,400 square feet. The cargo ramp space available to DHL is over 426,000 square feet, but it shares that space with other operators in the East Cargo Area. Given the size of the overall facility, DHL has only 2 landside truck docks and less than 50 automobile parking spaces. Truck parking and staging area is also constrained in the landlocked area in which the facility is located.

Exhibit 3.7
CID Air Cargo Areas



Source: Google Earth and Hubpoint

Finally, there is no current facility at CID designated for handling belly cargo associated with commercial passenger aircraft. Although the facility in the East Cargo Area was originally constructed to support passenger airline belly cargo, that function ended in the mid-1990's. While no passenger airline is presently carrying a material amount of air cargo, there is reason to believe that the situation may change. During the pandemic, air cargo took on a higher profile within passenger airlines as passenger demand sunk and carrying cargo provided critical revenue. Many passenger airlines, including the network carriers, made public commitments to focus more on belly cargo moving forward – even after the pandemic. Further, American, Delta and United are currently operating more narrowbody mainline aircraft at CID as regional airlines struggle with pilot shortage issues. For the third quarter of 2022, network carriers will operate narrowbody mainline aircraft on 54% of their flights at CID compared to just 11% of flights in the third quarter of 2021. A continuance of these scheduling practices by the network airlines would certainly increase the likelihood of more belly cargo being carried by narrowbody aircraft at CID moving forward.

4 REGIONAL MARKET OVERVIEW

In order to produce reliable development plans at the Eastern Iowa Airport, the relevant air cargo market must be defined and analyzed. Analysis is conducted via both primary and secondary research to obtain information about demand drivers, commodity flows and the market's future outlook. Traditional market research and historic data adds additional context to validate the primary research findings. Interviews with regional stakeholders are particularly useful due to the lack of transparency in the industry. Further, industry stakeholders offer granular details and forward-looking perspectives based on their own business activities in the region.

The objective of the analysis is to understand the market dynamics which then enables future demand estimates for air cargo services in the Cedar Rapids region. Forecasts can then be developed with reasonable assumptions regarding CID's anticipated air cargo activity levels. Finally, based on the CID forecasts, plans for required cargo infrastructure and facilities can be formalized.

4.1 CID Air Cargo Market Area Definition

Among other factors, air cargo market areas for airports are primarily defined by the availability of cargo air services, the distance between competing commercial airports and the ability to access markets from various airports via trucks. The market areas for airports are dynamic in nature depending on changes in the factors described above and the areas tend to not be mutually exclusive with overlapping borders. Given this situation, identifying the relevant market area for the Eastern Iowa Airport (or any airport) can be challenging and a mix of art and science.

A practical alternative to defining CID's current air cargo market area is to determine the reach of the Airport's main cargo service providers: UPS, FedEx and DHL. Based on direct inputs from these air cargo operators, the Primary Market Area can be considered an irregular area around the Airport ranging from a 1.5-hour drive time to the east, a 2.0-hour drive time to the south and a 2.5-hour drive time to the north. While this service area is not meant to be definitive, it is representative of the inputs obtained and seems logical upon review. See Exhibit 4.1.

Traveling east from CID brings cargo closer to the strong gravitational pull of the large Chicago-area airports. So, a shorter CID reach to the east makes sense. The 2.0-hour drive time to the south is clearly influenced by the presence of the Des Moines (DSM) which has similar services to CID by FedEx and UPS. Finally, the larger area north of CID withing a 2.5-hour drive time is less competitive from a commercial airport perspective until cargo gets closer to Minneapolis-St. Paul (MSP).

The Primary Market Area extends north to Mason City, east to Dubuque and Moline, south to Ottumwa and west towards Grinnell and Oskaloosa. This area includes a total of 28 counties in Iowa. Total population for the area is almost 1.3 million residents and the per capita income level is approximately $33,000. The Primary Market Area has over 32,000 business establishments which employ approximately 600,000 people. With these indicators, it is reasonable to conclude that demand for air cargo services exists in the region, whether it is serviced by CID or other airports.

Exhibit 4.1
CID Primary Air Cargo Market Area

Source: Hubpoint analysis

4.2 Demand Drivers in the Relevant Market Area

Demand for CID air cargo services is driven by both business and consumer activity in the relevant market area. Businesses often ship and receive parts, finished goods, small packages and documents utilizing air transportation. Consumers often receive small packages shipped by air. Traditionally, air-eligible shipments tended to be high in value, relatively low in weight, and time-sensitive. While these descriptors are still generally applicable, e-commerce shipments break many of the traditional rules of air cargo. Still, air cargo is a premium-priced service with some limitations, making it more relevant to certain business and consumer shipments than others.

There are a variety of companies in the CID air cargo market area which fit the profile of companies known to ship by air. These businesses relate to electronics, pharmaceuticals, healthcare, apparel, industrial and electrical machinery, and motorized vehicles and vehicle parts. In interviews with local companies, it was confirmed that air cargo shipments at CID commonly include e-commerce, machine parts, pharmaceuticals, medical samples, electronics and electrical components. Information on the types of goods being shipped by all transportation modes is also helpful as it identifies core business activities in the region. The 2017 Commodity Flow Survey administered by the Bureau of Transportation Statistics provides weight and value data for commodity shipments originating in Iowa. Exhibits 4.2 and 4.3 show that the majority of Iowa's products are being transported by modes other than air.

Exhibit 4.2
Top Commodity Shipments Originating in Iowa, Ranked by Value

Commodity Description	Value (USD Millions)	Percent of Total
Machinery	$20,781	9.9%
Mixed freight	$19,550	9.3%
Meat, poultry, fish, seafood, and their preparations	$17,694	8.5%
Motorized and other vehicles (includes parts)	$16,377	7.8%
Other prepared foodstuffs and fats and oils	$15,537	7.4%
Animal feed, eggs, honey, and other products of animal origin	$14,142	6.8%
Plastics and rubber	$9,129	4.4%
Other chemical products and preparations	$9,119	4.4%
Gasoline and aviation turbine fuel	$7,960	3.8%
Cereal grains (includes seed)	$7,829	3.7%
Top 10 commodities	**$138,118**	**66.0%**
Other commodities	$71,274	34.0%
Grand Total	**$209,392**	**100.0%**

Source: Bureau of Transportation Statistics, 2017 Commodity Flow Survey

Exhibit 4.3
Top Commodity Shipments Originating in Iowa, Ranked by Weight

Commodity Description	Tons (thousands)	Percent of Total
Cereal grains (includes seed)	62,209	19.2%
Gravel and crushed stone (excludes dolomite and slate)	54,230	16.7%
Animal feed, eggs, honey, and other products of animal origin	51,274	15.8%
Other prepared foodstuffs and fats and oils	28,310	8.7%
Agricultural products (excludes animal feed, cereal grains, and forage products)	21,136	6.5%
Gasoline and aviation turbine fuel	17,538	5.4%
Fertilizers	14,881	4.6%
Non-metallic mineral products	13,620	4.2%
Natural sands	5,637	1.7%
Milled grain products and preparations, and bakery products	5,551	1.7%
Top 10 commodities	**274,386**	**84.5%**
Other commodities	50,141	15.5%
Grand Total	**324,527**	**100.0%**

Source: Bureau of Transportation Statistics, 2017 Commodity Flow Survey

Heavy, dense, lower value goods like agricultural products, minerals, oils and fuels are more likely be transported by surface modes, including trucking and railroads. However, other Iowa originating commodities may utilize air cargo, including motor vehicle parts and electronics. The Commodity Flow Survey also provides data on the transportation modes utilized by Iowa's shippers. Over 78% of the commodities transported from the state, by value, used trucks exclusively. Air cargo accounted for just 1.3% of shipments, by value. Parcel, USPS and Courier modes include some movements by air, but the Commodity Flow Survey does not provide separate information on the air cargo component. It is important to note that the Truck mode likely has some air cargo value and weight embedded in its data. However, the survey's modal categories do not include "Truck and Air" under Multiple Modes. So, for instance, Iowa air cargo moving by truck to airports in Chicago are recorded in the Single Mode Truck category. See Exhibit 4.4.

Exhibit 4.4
Weight and Value of Iowa Freight Shipments by Transportation Mode

Transportation Mode	Weight		Value	
	Short Tons (Thousands)	Percent of Total	U.S. Dollars (Millions)	Percent of Total
Single				
Truck	$258,755	79.4%	$166,526	78.4%
Rail	$32,270	9.9%	$9,521	4.5%
Air (including truck and air)	$57	0.0%	$2,704	1.3%
Water	$4,027	1.2%	$963	0.5%
Multiple				
Parcel, USPS, courier	$310	0.1%	14,443	6.8%
Truck and rail	$29,044	8.9%	11,820	5.6%
Truck and water	$532	0.2%	3,491	1.6%
Rail and water	$393	0.1%	2,433	1.1%
Other				
Other Modes	406	0.1%	$549	0.3%
Total shipments (all modes)	**325,794**	**100.0%**	**$212,450**	**100.0%**

Source: Bureau of Transportation Statistics, 2017 Commodity Flow Survey

Independent research and guidance from the Cedar Rapids Metro Economic Alliance identified several companies expected to have some level of demand for air cargo services. Exhibit 4.5 below lists some of these local companies and their primary business activities. Even in this small sample, a diverse mix of businesses are represented. From interviews, it is also known that the usage of air cargo services varies widely within this group of companies, ranging from daily outbound shipments to sporadic use that may average a few small shipments per month.

Exhibit 4.5
Profiles of Select Eastern Iowa Area Companies

Company Name	Primary Business Activity	Location
John Deere	Tractor engines	Waterloo
Nordstrom Direct	Internet and catalog sales fulfillment for fashion specialty retailer	Cedar Rapids
BAE Systems	Navigation & Sensor Systems business, which makes mission-critical military GPS products	Cedar Rapids
Collins Aerospace	Global aerospace and defense industry manufacturing	Cedar Rapids
General Dynamics	General Dynamics Information Technology - global aerospace and defense company	Coralville
JRS Pharma	Leading manufacturer of excipients for the global health science industry	Cedar Rapids
SmartScripts	Medical e-commerce, online pharmacy	Washington
3M	Distribution center, manufacturing plants in Ames and Knoxville	Mason City
Digital Diagnostics	AI healthcare diagnostics company	Coralville
P & G	Beauty & Oral Care plants	Iowa City
Whirlpool-Amana	Manufacturer of household appliances	Amana
IFF (formerly DuPont)	International Flavors & Fragrances - Pharma Solutions	Cedar Rapids
AMTek Microwaves	Designs, manufactures industrial microwave systems	Cedar Rapids
International Paper	Paper mill	Cedar Rapids
PMX Copper Materials	Produces copper materials in strip, coil, sheet, plate and tube forms	Cedar Rapids
Profol Americas, Inc.	Manufacturer of plastic film	Cedar Rapids
Diamond V North America	Feed additives manufacturer	Cedar Rapids
General Mills Operations	Multinational manufacturer and marketer of branded consumer foods	Cedar Rapids
Quaker Oats	Manufactures oatmeal, cereals, syrup, snacks, pancake mix	Cedar Rapids
Ingredion	Manufactures sweeteners, starches, biomaterials	Cedar Rapids

As a further indicator of the types of activities that drive air cargo demand at CID, the concentration of industries in the Cedar Rapids Metropolitan Statistical Area (MSA) was assessed. For the analysis, location quotients were calculated for more than twenty industries operating locally. Location quotients measure the relative employment levels for metropolitan areas by industry against national averages. A location quotient of 1.0 for a particular industry means that the industry's regional employment level compared to overall employment is equal to that of the U.S. average. Location quotients greater than 1.0 indicate regional employment for an industry exceeds the U.S. average for that industry.

Certain industries are known to be correlated to air cargo demand, including Transportation and Warehousing. The Cedar Rapids location quotient for Transportation and Warehousing is 1.4, meaning that Cedar Rapids' employment and activities in this sector are well above the U.S. average, signifying that the area highly focused and competent in these types of services, including air cargo. Exhibit 4.6 below shows the location quotients for the Top 20 Industries in the Cedar Rapids MSA.

Exhibit 4.6
Cedar Rapids MSA Employment Concentration by Industry (2021)

Industry	Location Quotient	Total Employment (thousands)
Utilities	2.8	1.5
Manufacturing	1.7	20.3
Farm	1.5	3.5
Information	1.4	4.4
Transportation and Warehousing	1.4	12.4
Finance and Insurance	1.3	14.0
Construction	1.1	11.0
Retail Trade	1.1	19.3
Wholesale Trade	1.1	6.5
Educational Services	1.0	4.7
Health Care and Social Assistance	1.0	20.8
Arts, Entertainment, and Recreation	0.9	4.1
Other Services, except Public Administration	0.9	9.5
Administrative and Waster Services	0.9	10.6
State and Local Government	0.9	15.8
Real Estate, Rental and Lease	0.8	7.5
Accommadtion and Food Services	0.8	11.3
Professional and Technical Services	0.6	8.8
Management of Companies and Enterprises	0.6	1.6
Forestry, Fishing, and Related Activities	0.6	0.5
Top 20 Total		**188.1**
Other		2.5
Total		**190.6**

Source: Hubpoint analysis of Woods & Poole Economics data

The prevalence of transportation, warehousing and logistics activity in the Cedar Rapids area is validated by other observations gathered during this study. Indeed, transportation and logistics are common topics in local Cedar Rapids news reports of both trade publications and the popular press. It is clear that the region has a "Logistics DNA". Two of the largest trucking companies in the U.S. (Heartland Express and CRST Logistics) are based in the Cedar Rapids metro area and railroads serving the agricultural and manufacturing sectors are robust in the region. According to the U.S. Bureau of Labor Statistics, General Freight Trucking is 8 times more concentrated in the Cedar Rapids-Iowa City region than the U.S. average and General Warehousing and Storage is 2 times more concentrated than the U.S. average.

Specific to air cargo, it is important to note that Cedar Rapids is part of the Forward Air network of U.S. cities. Forward Air is the largest operator of Road Feeder Services (RFS) to the air cargo industry, providing scheduled trucking services between airports on behalf of freight forwarders and shippers. This is a critical service which allows shipments from numerous sources to be aggregated at airports, thereby providing enough volume to profitably operate direct cargo flights.

4.3 Iowa's International Air Cargo

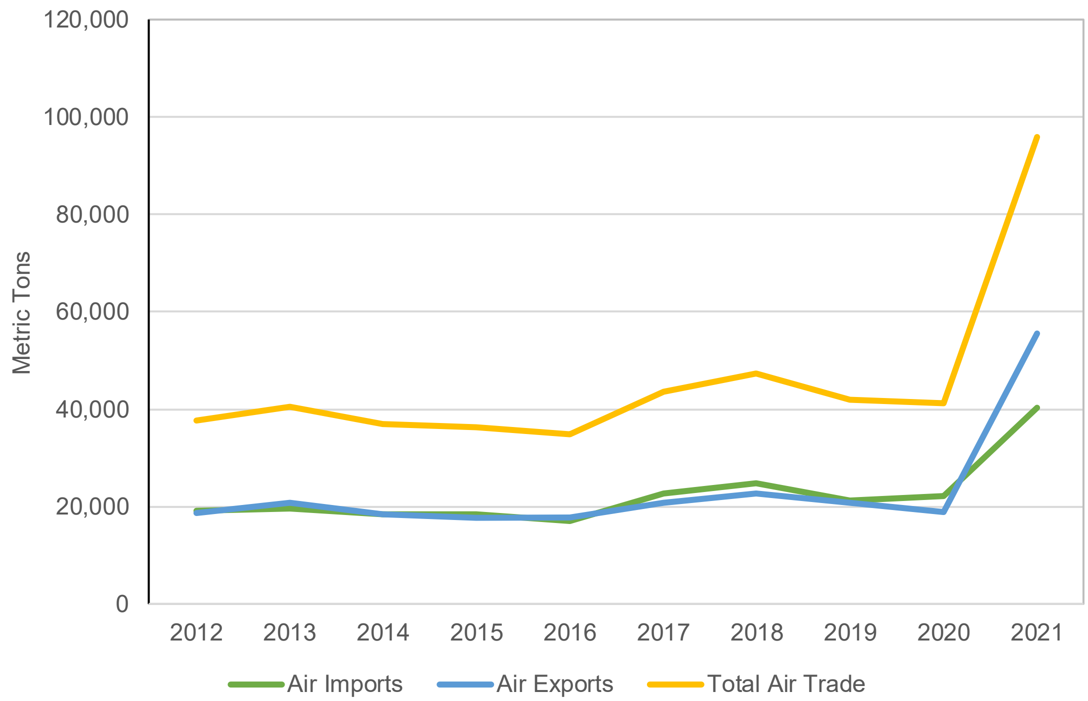
An important component of air cargo is international trade between the U.S. and foreign countries. While the majority of international cargo travels by truck to large gateway airports, significant volumes also move on integrated express carriers via their U.S. hub airports with origins and destinations at spoke airports within their networks. Further, as discussed in Chapter 2, there are industry trends suggesting that smaller airports are becoming more relevant to international air cargo services. In this manner, international cargo can be viewed as a driver of demand and activity at CID.

International air trade statistics are reported by the U.S. Census Bureau's Foreign Trade Division offering very good information on air imports and exports on a U.S. state and foreign country basis. For air trade, it is possible to analyze Iowa's international commodities, foreign trading partners and shipment volumes by both weight and value on a monthly basis. This complements the Commodity Flow Survey data by providing even more detail on CID's air cargo market reported at regular intervals and allowing for meaningful trend analysis.

Between 2012 and 2020, Iowa's international trade was somewhat stagnant, maintaining fairly consistent tonnage levels. However, Iowa's international air trade (measured in metric tons) grew substantially between 2020 and 2021, with air imports almost doubling and air exports almost tripling. By any measure, this is extraordinary growth and deserves some pointed analysis. See Exhibit 4.7.

Interestingly, the 2021 growth in Iowa air imports and exports includes a wide variety of commodities. Often a spike in international trade activity is centered on a particular commodity or type of industry, but the broad-based growth for Iowa's trade with foreign countries may signal a different type of demand dynamic. For example, Iowa air exports of dairy products had year-over-year growth from 200 metric tons in 2020 to over 7,500 metric tons in 2022. Meanwhile, exports of industrial machinery experience year-over-year growth of almost 4,000 metric tons. For air imports, industrial machinery and electrical machinery experience massive gains in 2021, but so did vehicle parts and organic chemicals. This growth in Iowa's international air trade should be tracked moving forward to determine any relation to CID's Primary Market Area and possible opportunities for CID's air cargo business.

Exhibit 4.7
Iowa Air Trade Trends (CY 2012-2021)



Source: Hubpoint analysis of U.S. Census Bureau, Foreign Trade Statistics

Commodity detail for Iowa's 2021 air imports and exports are provided in Exhibits 4.8 and 4.9. Air imports are dominated by traditional air cargo commodities like industrial machinery, computers, electric machinery and vehicle parts, representing almost 55% of the state's total air import weight. Air exports are somewhat more diversified led by dairy products, industrial machinery, albuminoidal substances and chemical products, representing almost 50% of total exports.

Exhibit 4.8
Iowa Top Air Imports by Weight (2021)

Rank	Commodity	Air Weight (Metric Tons)	% Share of Total
1	Industrial Machinery, including Computers	11,351	28.2%
2	Electric Machinery; Sound and TV Equipment; Parts	6,538	16.2%
3	Vehicles, Except Rail or Tram, and Parts	4,044	10.0%
4	Cereals	2,216	5.5%
5	Iron or Steel Articles	2,084	5.2%
6	Albuminoidal Substrates, Modified Starch	2,027	5.0%
7	Oil Seeds and Misc. Grain	1,553	3.9%
8	Organic Chemicals	1,453	3.6%
9	Plastics	1,008	2.5%
10	Milling Products, Malt, Starch	625	1.6%
	All Other	7,383	18.3%
	Total Iowa Air Imports	**40,282**	**100.0%**

Source: Hubpoint analysis of U.S. Census Bureau, Foreign Trade Statistics, CY 2021

Exhibit 4.9
Iowa Top Air Exports by Weight (2021)

Rank	Commodity	Air Weight (Metric Tons)	% Share of Total
1	Dairy Products, Bird Eggs, Honey	7,557	13.6%
2	Industrial Machinery, including Computers	6,250	11.3%
3	Albuminoidal Substances, Modified Starch	5,864	10.6%
4	Chemical Products	5,291	9.5%
5	Vehicles, Except Rail or Tram, and Parts	4,273	7.7%
6	Plastics	4,043	7.3%
7	Tanning & Dye Extracts; Dye, Paint	3,685	6.6%
8	Pharmaceutical Products	2,315	4.2%
9	Electric Machinery; Sound and TV Equipment; Parts	1,829	3.3%
10	Optical, Photographic, Medical Instruments	1,751	3.2%
	All Other	12,613	22.7%
	Total Iowa Air Exports	**55,471**	**100.0%**

Source: Hubpoint analysis of U.S. Census Bureau, Foreign Trade Statistics, CY 2021

For decades, the leading country for U.S. air imports has been China and, therefore, it is to be expected that China is also Iowa's top trading partner for air imports. Other leading countries for Iowa imports come from diverse world regions, including Europe, South America and India, in addition to Asia. Iowa's air exporting partners are led by South Korea, Germany and China. As with imports, the top partners for exports include countries from Asia, Europe and South America. This diversity should translate positively over time as it helps minimize sensitivity to the economic variations of a particular world region. See Exhibits 4.10 and 4.11.

Exhibit 4.10
Iowa Air Imports by Country – CY 2021

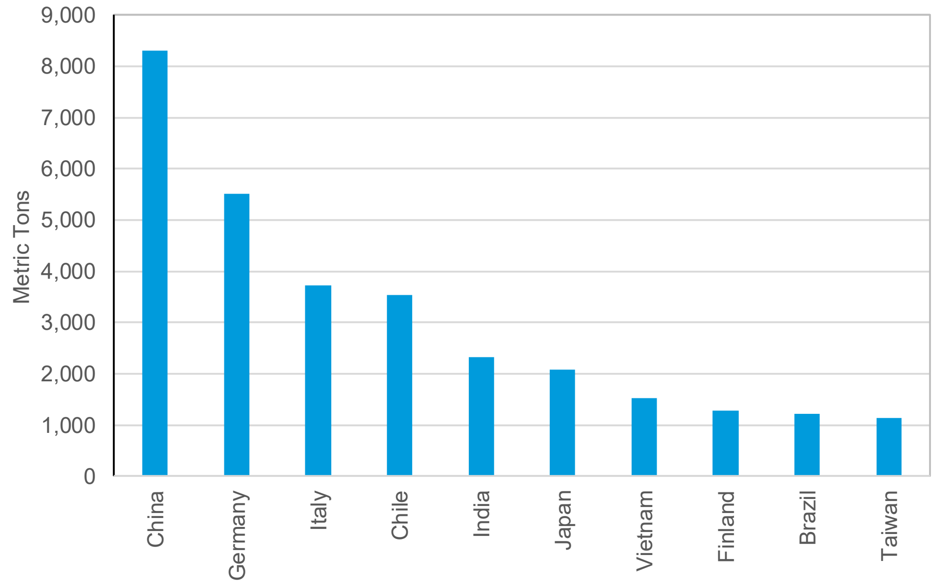
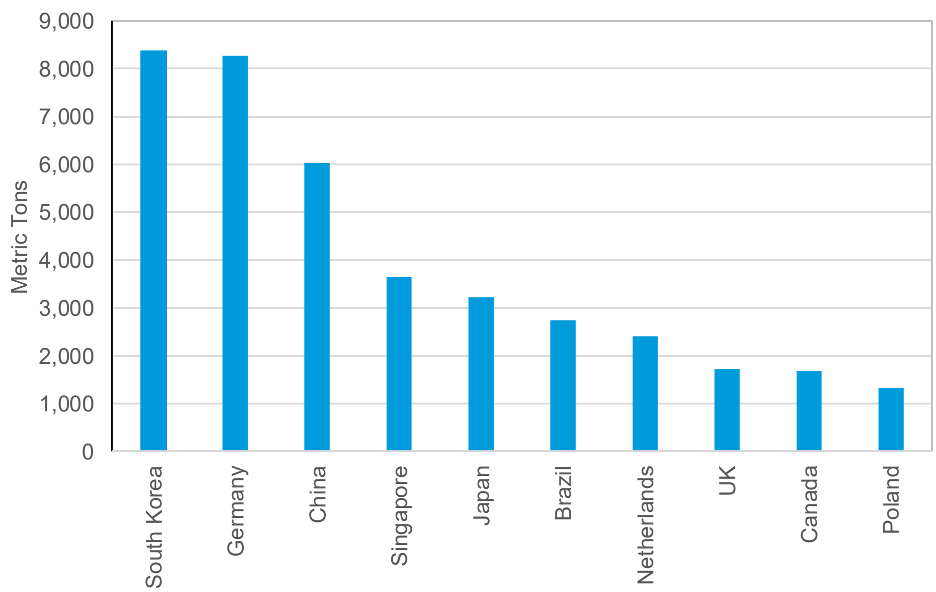


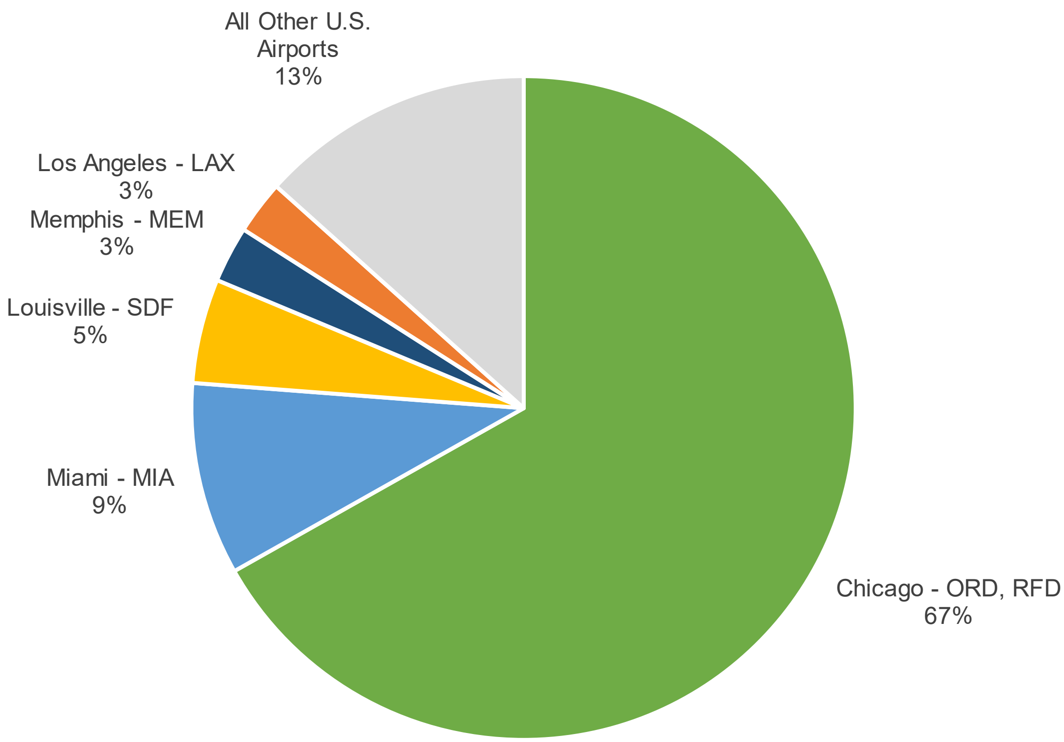
Exhibit 4.11
Iowa Air Exports by Country – CY 2021



Source: Hubpoint analysis of U.S. Census Bureau, Foreign Trade Statistics, CY 2021

Finally, it is helpful to understand the routings of Iowa's international air cargo shipments. For each state, the Foreign Trade data reports information on the last U.S. airport utilized for outbound international shipments (U.S. airport of exit) as well as the first U.S. airport for inbound international shipments (U.S. airport of entry). Exhibit 4.12 shows the distribution of Iowa's international air trade (imports and exports combined) in 2021 by airport of entry/exit. As expected, the Chicago airports (O'Hare and Rockford) account for the majority (67% share) of the state's air cargo shipments directly before and after the international flights. Chicago is followed by the Miami airport for the South America trade mentioned above (9% share), then UPS's Louisville hub and FedEx's Memphis hub, with 5% and 3% shares of total Iowa international air trade. It is safe to assume that some of the volumes handled by the integrated express carriers are transiting CID on the way to and from international markets. Unfortunately, quantifying those volumes is not possible given the lack of cargo data transparency and the way UPS, FedEx and DHL report their activities. However, the exhibit below shows that large volumes of Iowa air imports and exports are moving by truck to competing U.S. airports where they are loaded on aircraft for the air portion of their international journey.

Exhibit 4.12
Iowa Air Imports and Exports by Airport of Entry and Exit (2021)



Source: Hubpoint analysis of U.S. Census Bureau, Foreign Trade Statistics, CY 2021

4.4 Market Outlook

Based on input from stakeholders and other research, the outlook for the CID air cargo market will be influenced by continued regional economic development, potential growth of inbound/outbound e-commerce and interactions with the growing logistics community in the Cedar Rapids area. Accordingly, the market impacts (positive or negative) will be primarily driven by demand of the region's businesses and consumers. However, supply (in the form of CID air services and infrastructure) will determine the Airport's ability to handle that demand versus ceding the activity to competing airports and/or other modes.

Economic development relates to factors like business growth, expansion and retention in the CID market area as well as demographic changes like population and income growth. Importantly, the types of businesses operating in the market will be critical to improving the outlook for air cargo. Of particular note are the numerous existing and planned logistics parks and industrial centers in close proximity to the Eastern Iowa Airport. See Exhibit 4.13.

Exhibit 4.13
CID Area Map – Nearby Logistics Parks Industrial Centers

Source: Iowa Economic Development Authority

These developments include Travero's Logistics Park Cedar Rapids, Big Cedar Industrial Center, the Edgewood Logistics Park, and the CID SuperPark. Depending on the tenants and activities at these facilities, there may be significant future interactions with CID and its air cargo operators.

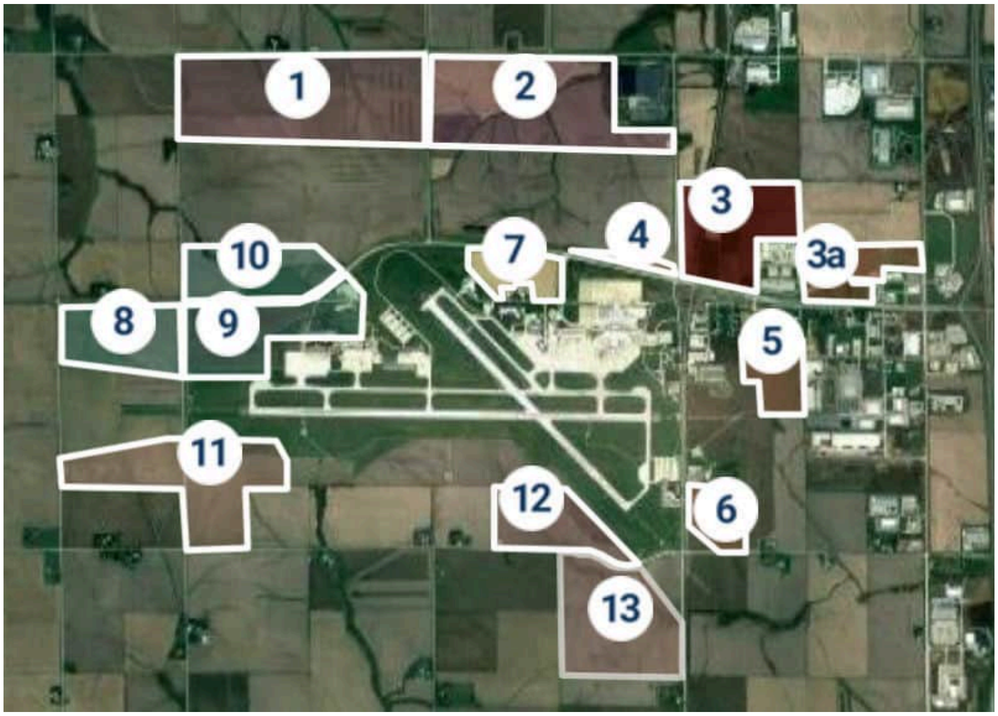
- Travero's Logistics Park Cedar Rapids is the region's newest and largest rail-served, food grade-certified public warehouse and transload facility. This state-of-the-art, food-grade certified facility is located just north of the Eastern Iowa Airport. Shippers have access to a rail-served warehouse, rail-to-truck transload area and an on-site 3PL team. Travero is a logistics company that focuses on warehousing and transportation solutions and a subsidiary of Alliant Energy. The 145-acre campus is intended to house four 250,000 square foot warehouses.

- The Big Cedar Industrial Center is a 1,391-acre site located 4 miles from I-380 and less than 3 miles from the Eastern Iowa Airport. It includes the 890-acre certified Big Cedar Mega Site. The development is an Alliant Energy economic development project and is expected to serve a variety of industries including industrial manufacturing, food manufacturing, in addition to logistics and distribution. The site will also have rail access and a Foreign Trade Zone (FTZ). Additionally, FTZ No. 175 is located nearby at the Eastern Iowa Airport.

- The Edgewood Logistics Park is a new development located just 3 miles from I-380 within close proximity to the Eastern Iowa Airport. The park will feature newly constructed or build-to-suit, precast warehouse and distribution buildings. The developers expect Edgewood Logistics Park to eventually house 1.5 million square feet of industrial space.

- The CID SuperPark encompasses 582 acres of the 1,300 acres available for development surrounding the Eastern Iowa Airport. Currently, there are 13 tracts designated for development, including the State Certified Land & Air SuperPark located just north of CID. The tracts are on-airport properties and some have runway access. The potential users include large industrial, small industrial, commercial and aviation-related businesses. See Exhibit 4.14.

Exhibit 4.14
CID SuperPark – Planned Development Tracts



Source: CIDsuperpark.com and various news articles

Clearly, Cedar Rapids is in the midst of a logistics-centric building boom likely driven, in part, by the severe supply chain disruptions impacting domestic and international markets. The number and size of these projects also indicates the overall attractiveness of Cedar Rapids for transportation and logistics businesses due to advantages of cost, location, market access and workforce supply.

All of this activity does not guarantee increasing amounts of air cargo demand will be generated in the Cedar Rapids area. However, it certainly increases the likelihood of that happening. For good reason, logistics companies tend to cluster around each other and, in doing so, the breadth and depth of their services naturally expand – to include goods that require air transportation. From that standpoint, the close proximity to CID of these new developments should be mutually beneficial for the tenants and the Airport.

5 COMPETITIVE AIRPORTS

Understanding the competitive environment for the Eastern Iowa Airport is important because air cargo typically moves long distances by truck to airports well away from the initial origin or ultimate destination of a shipment. This is especially true for international shipments where the ground movements are a minor portion of the overall journey, but, depending on the type of shipment, this practice can occur in the U.S. domestic market as well. As a result of this dynamic, the catchment area for cargo is often larger and includes more competitive airports than would typically be considered for passenger travel.

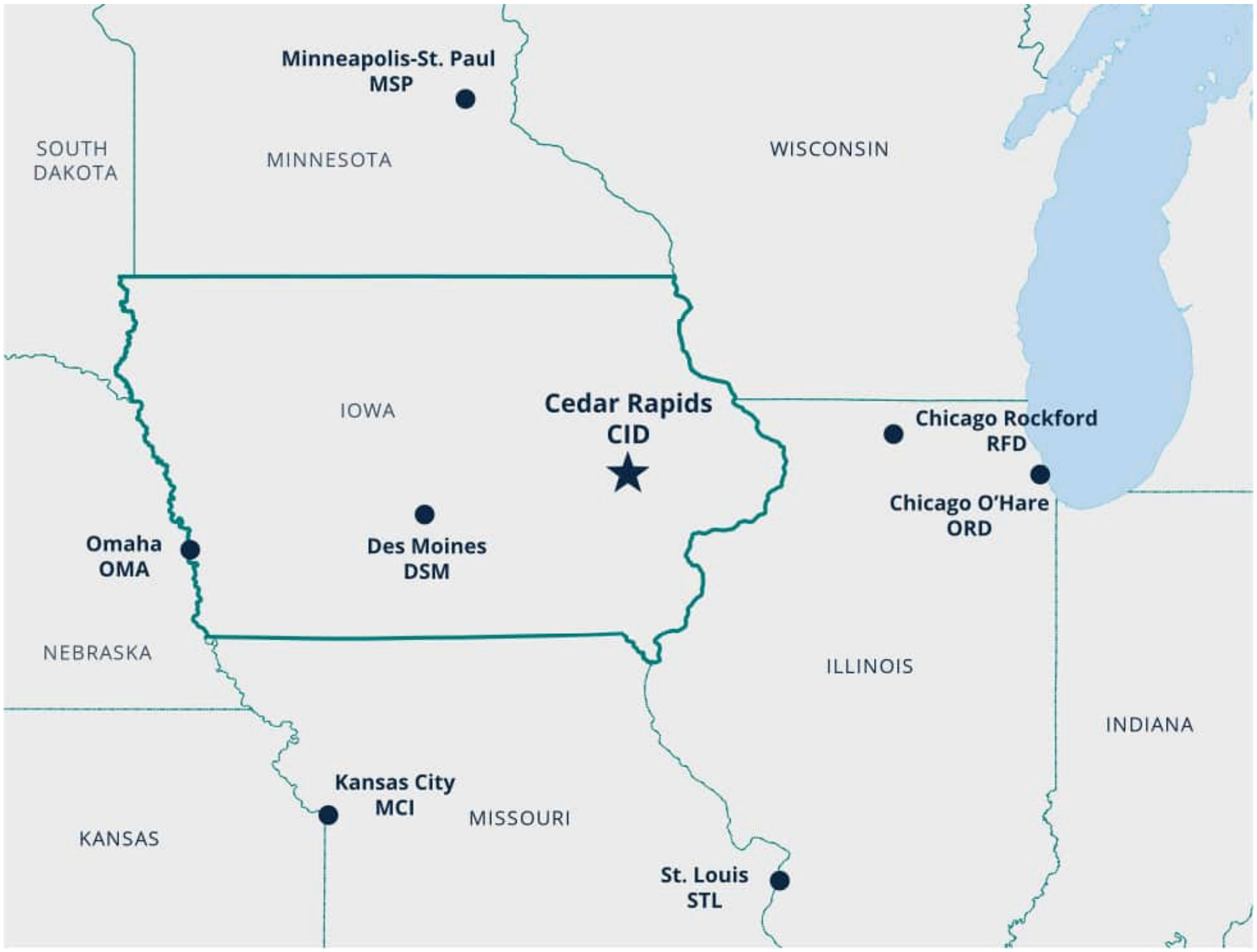
At many U.S. airports, FedEx and UPS provide excellent services and timely access to markets across the country and around the world. Further, the integrated express services are homogeneous at most airports, thereby making the closest airport the most likely choice for shippers. However, for general cargo, involving many different stakeholders (e.g., freight forwarders, ground handlers, trucking companies, airlines and warehouse operators), decisions for choosing airports are much more complex and can vary widely based on critical factors like pricing, timing and reliability.

For this Study, the following airports were included in the competitive analysis:

1. O'Hare International Airport (ORD) in Chicago, IL
2. Chicago-Rockford International Airport (RFD) in Rockford, IL
3. Des Moines International Airport (DSM) in Des Moines, IA
4. Minneapolis–Saint Paul International Airport (MSP) in Minneapolis, MN
5. St. Louis Lambert International Airport (STL) in St. Louis, MO
6. Eppley Airfield (OMA) in Omaha, NE
7. Kansas City International Airport (MCI) in Kansas City, MO

The competitive analysis is meant to provide CID with a perspective on how it is positioned relative to other airports in a broad region. Each airport is profiled in terms of its location, accessibility, cargo air services, facilities, infrastructure and cargo volumes. A map of the airports reviewed is shown in Exhibit 5.1.

Exhibit 5.1
Airports Reviewed for CID Competitive Analysis



Source: Hubpoint analysis

5.1 O'Hare International Airport (ORD)

The Chicago O'Hare International Airport (ORD) is a FAA large hub airport located 14 miles northwest of the Chicago business district, 250 miles east of CID via I-80 and I-88, and covers 7,627 acres. ORD also has convenient access to I-90, I-94 and I-294. ORD is a major international gateway for both passenger and cargo flights. The airport's passenger service is dominated by hub carriers American and United. From a cargo perspective, there are over a dozen airlines offering scheduled and non-scheduled cargo freighter service to domestic and international points. There is also an abundance of domestic and international belly cargo capacity available due to ORD's dual network carrier hub status. Amazon Air uses ORD to complement its regional hub in nearby Rockford, IL (RFD), to provide complete coverage for Prime customers in the area. Additionally, as mentioned, ORD captures the majority of Iowa's international air trade.

The Chicago-Naperville-Elgin, IL-IN-WI MSA includes a population of 9.6 million (34.6 times the size of the Cedar Rapids MSA) with a gross regional product of $677.9 billion (36.5 times the size of the Cedar Rapids MSA) and GDP per capita of $70,759 (+6% vs. Cedar Rapids MSA). The transportation and warehousing sector has a substantial presence in the Chicago area, which supports ORD's position as a leading air cargo gateway in the U.S.

ORD has eight runways, including one at 13,000 feet, capable of handling any type of aircraft. The airport has over 2 million square feet of cargo warehouse space and 2 million square feet of cargo apron space. Despite the substantial amount of on-airport cargo warehouse space, record e-commerce and pandemic-related cargo volumes have caused significant congestion at the airport over the past few years. This situation at ORD has been exacerbated with the shortage of labor, particularly in the cargo ground handling sector.

To manage the congestion and delays, air cargo operators are employing some innovative operational practices. For example, ground handlers Alliance Ground International and Maestro International Cargo opened large off-airport transfer facilities near ORD to enable faster pickup of import cargo. This will enable cargo handlers to move as much inbound cargo as possible to off-airport facilities and prioritize on-airport space for outbound shipments. Some freight forwarders have even started to relocate capacity to nearby Rockford, IL (RFD) due to lack of space and facilities at ORD. This trend could continue where smaller secondary airports gain additional capacity and cargo volumes at the expense of larger congested gateway airports.

In 2021, ORD ranked 5th among North American airports in air cargo tonnage according to ACI-NA data. ORD is highly diversified in terms of market share by cargo carriers, with no carrier having more than a 10% share.

5.2 Chicago-Rockford International Airport (RFD)

The Chicago-Rockford International Airport (RFD) is a FAA non-hub airport located 4 miles south of Rockford, 85 miles northwest of Chicago, 250 miles east of CID via I-80 and I-88 and covers 2,900 acres. RFD has direct interstate access to both I-90 and I-39. The airport has minimal passenger service, but is an air cargo hub for both UPS and Amazon Air. In 2021, UPS averaged approximately 20 daily flights each way at its RFD hub while Amazon Air is estimated to operate 8-10 flights each day.

The Rockford, IL MSA includes a population of 340,000 (23% larger than the Cedar Rapids MSA) with a gross regional product of $16.1 billion (-13% vs. the Cedar Rapids MSA) and GRP per capita of $47,509 (-29% vs. Cedar Rapids MSA). Employment related to air cargo with particularly high concentrations in the area includes the manufacturing, transportation and warehousing, and wholesale trade industries.

RFD has two runways; the longest is 10,000 feet. The airport is estimated to have over 1 million square feet of cargo warehouse space distributed among four buildings. UPS occupies a building with 670,000 square feet while Amazon Air is operating from a 212,000 square foot facility. Another 72,000 square foot facility is utilized by other cargo carriers. Additionally, there is over 4 million square feet of cargo apron space available at RFD.

In early 2021, RFD announced a large expansion of its cargo facilities, with two additional cargo buildings and more parking space for freighters. The $42 million International Cargo Center includes a 90,000 square foot facility and a 100,000 square foot facility. Additionally, in June 2022, construction of a third air cargo facility valued at $8 million was announced with the tenant expected to be a ground handling company. As part of these projects, RFD will create ramp space for six additional aircraft large enough to accommodate B747 freighter aircraft.

Senator International expanded charter cargo service between Hahn, Germany and Greenville-Spartanburg to RFD on a weekly basis with plans to use RFD as its Midwest U.S. hub. RFD has also received interest from other international forwarders and cargo carriers planning to implement freighter service. The two new International Cargo Center buildings are expected to handle much of this new activity as two-thirds of one building will be operated by ground handler Emery Air and leased to Senator International.

In 2021, RFD ranked 20th among North American airports in air cargo tonnage according to ACI-NA data. Over 70% of cargo was handled by UPS, while Amazon Air's contract carriers Air Transport International, Southern Air, and Atlas Air carried the majority of the remaining balance.

5.3 Des Moines International Airport (DSM)

The Des Moines International Airport (DSM) is a FAA small hub airport located 5 miles southwest of downtown Des Moines, 125 miles southwest of CID via I-80 and covers 2,600 acres. The airport offers scheduled air cargo service to the immediate region via FedEx and UPS.

The typical operation for FedEx consists of an early morning arrival from the MEM hub followed by a late evening departure back to MEM with an A300F. UPS follows very similar schedules, as FedEx at DSM. In 2017, UPS moved most of the DSM operation to its Rockford, Illinois (RFD) hub. The intention was to move 13 flights per week from DSM to RFD. However, UPS continues to operate one nightly flight from DSM in order to offer next-day delivery services.

In November 2021, Amazon Air initiated new daily service to DSM with the ATR-72F turboprop aircraft. The carrier leases 8,052 square feet of existing warehouse space for its on-airport sortation. With the service, DSM became one of the launch airports for the Amazon Air turboprops.

The Des Moines-West Des Moines, IA MSA has a population of 711,000 (2.6 times the size of the Cedar Rapids MSA) with a gross regional product of $51.0 billion (2.7 times the size of the Cedar Rapids MSA) and GDP per capita of $71,695 (+7% vs. Cedar Rapids MSA).

DSM has two runways; the longest is 9,004 feet and currently supports aircraft as large as the A300F and B767F. DSM has approximately 100,000 square feet of cargo warehouse space. FedEx has a dedicated building on airport. It is unknown how much space UPS continues to use after relocating much of their cargo operation to RFD. Finally, DSM has approximately 1.0 million square feet of cargo apron space.

In 2021, DSM ranked 81st among North American airports in air cargo tonnage according to ACI-NA data. The majority of this cargo was carried by FedEx and UPS.

5.4 Minneapolis–Saint Paul International Airport (MSP)

The Minneapolis International Airport (MSP) is a FAA large hub airport located within 10 miles of downtown Minneapolis/Saint Paul and proximate to several major highways (I-35, I-94, I-494, and I-394). The airport occupies 2,930 acres and is 260 miles northwest of CID via I-380 and US-52.

MSP is a passenger hub for Delta Air Lines and its SkyTeam partners, providing substantial access to belly cargo capacity on both narrowbody and widebody aircraft to domestic and international destinations. The airport also offers scheduled air cargo service by FedEx and UPS, along with daily flights by Amazon Air.

FedEx operations are characterized by four daily flights to/from hubs at IND and MEM with B767Fs and one daily flight to/from Duluth, MN (DLH) with the Beechcraft 18F. UPS typically operates five daily inbound and outbound flights with a mix of aircraft (MD11F, B757F, and A300F) to and from its SDF and RFD hubs. Other UPS operations at MSP include service to Philadelphia, PA (PHL), Dallas Ft. Worth, TX (DFW), and Winnipeg, Manitoba (YWG).

Current Amazon Air service includes Sun Country-operated flights with the B737F to Lakeland, FL (LAL) and Ft. Worth, TX (AFW). The flights generally arrive into MSP late at night and depart in the mid-morning hours to accommodate Amazon’s two-day shipping from the region.

The Minneapolis-St. Paul-Bloomington, MN-WI MSA has a population of 3.7 million (13.4 times the size of the Cedar Rapids MSA) with a gross regional product of $262.1 billion (14 times the size of the Cedar Rapids MSA) and GDP per capita of $70,822 (+6% vs. Cedar Rapids MSA).

MSP has four runways, including an 11,000-foot runway capable of handling the largest widebody aircraft. There is an estimated 245,000 square feet of cargo warehouse space in two buildings. FedEx occupies a 193,000 square foot facility and DHL likely shares a separate 52,000 square foot facility with other tenants. The total cargo apron is estimated at over 2 million square feet, with FedEx utilizing the 1.5 million square foot cargo apron on the infield and DHL utilizing the 640,000 square foot west cargo apron.

In 2021, MSP ranked 30th among North American airports in air cargo tonnage according to ACI-NA data. Approximately 80% of air cargo was handled by FedEx and UPS, while Delta carried 10% as belly cargo. Amazon Air carried the remaining balance via its contracted carriers.

5.5 St. Louis Lambert International Airport (STL)

St. Louis Lambert International Airport (STL) is a FAA medium hub airport located within 14 miles of downtown St Louis and proximate to several major highways (I-70, I-170, I-270, and US-67). The airport occupies 2,800 acres and is 280 miles southeast of CID via I-380, US-218, US-61, and I-70.

STL is a focus city for Southwest Airlines, providing excellent access to belly cargo capacity on B737 aircraft to domestic markets. Additionally, all three network carriers (American, Delta and United) operate from STL to their various U.S. domestic hub airports. STL also hosts regular scheduled air cargo service by FedEx, UPS, DHL and Amazon Air.

FedEx typically operates three daily flights during weekday to/from hubs at IND and MEM mainly with B767Fs and B757Fs. UPS operates two daily flights during weekdays with, B757F, and A300F aircraft to/from its SDF and RFD hubs. DHL contract carriers Kalitta and Mesa operate B737Fs with approximately two daily flights on weekdays to OMA and CVG. Amazon Air services at STL are flown by contractors ATI, ABX Air and Atlas Air. They operate B767Fs with two daily flights to/from ILN and SBD. Finally, on a fairly regular basis, STL has inbound cargo charters operated by IFL Group and USA Jet. These charters appear to be servicing the automotive market with Mexico shipments.

The St Louis, MO-IL MSA has a population of 2.8 million (10 times the size of the Cedar Rapids MSA) with a gross regional product of $166.1 billion (9 times the size of the Cedar Rapids MSA) and GDP per capita of $58,894 (-12% vs. Cedar Rapids MSA).

STL has four runways, three parallel and one crosswind, including an 11,020-foot runway capable of handling the largest widebody aircraft. There is an estimated 145,000 square feet of cargo warehouse space in two buildings. FedEx, DHL and Amazon Air are the primary tenants of a 125,000 square foot facility. UPS has a separate facility that is approximately 20,000 square feet. The total cargo apron is about 640,000 square feet and is shared by all cargo operators.

In 2021, STL ranked 49th among U.S. airports in air cargo tonnage according to ACI-NA data. Cargo volumes are fairly fragmented amongst the carriers with current market shares as follows: FedEx (36%), Amazon Air (28%), UPS (26%) and DHL (9%).

5.6 Eppley Airfield (OMA)

Eppley Airfield (OMA) is a FAA medium hub airport located 3 miles northeast of downtown Omaha, 260 miles southwest of CID via I-80 and covers 2,650 acres. In close proximity to three major highways including I-80, I-680, and I-29, the airport offers scheduled air cargo service on integrated carriers FedEx and UPS. Other OMA cargo carriers include Atlas Air, Southern Air and Northern Air Cargo which, in addition to flying charters, appear to operate on behalf of major carriers such as UPS and DHL.

The FedEx operation at OMA typically includes two daily departures and arrivals between the MEM hub with a mix of A300F, B757F and B767F aircraft. These flights are also supported by morning and evening Cessna Caravan feeder operations to rural Nebraska cities Grand Island (GRI), Kearney (EAR), North Platte (LBF), and McCook (MCK). UPS generally operates one daily evening departure and a morning arrival between the Louisville (SDF) hub with an A300F.

DHL is operating from OMA to St. Louis (STL) via Mesa Airlines with B737F aircraft. Additionally, the Southern Air and Northern Air Cargo operations may be related to the DHL operation given the destination airports in Cincinnati (CVG), Kansas City (MCI) and St. Louis (STL), all of which have an existing DHL presence. Notably, DHL is undergoing a significant expansion in the Americas totaling $360 million for additional facilities and new air capacity to support e-commerce growth. The Midwest is a significant area of focus for the company. The increased investment in the region may facilitate more e-commerce growth at OMA.

The Omaha-Council Bluffs, NE-IA MSA has a population of 962,000 (3.5 times the size of the Cedar Rapids MSA) with a gross regional product of $60.9 billion (3.3 times the size of the Cedar Rapids MSA) and GDP per capita of $63,275 (-6% vs. Cedar Rapids MSA). The transportation and warehouse industry has an outsized presence compared to the national average. Recent flight tracking data shows increased air cargo operations, particularly by FedEx and UPS, which likely relate to increased e-commerce volumes.

OMA has three runways, with the longest being 9,502 feet and currently supporting aircraft as large as the B767F and A300F. It is estimated that OMA has approximately 125,000 square feet of cargo warehouse space. Tenants UPS, FedEx, DHL, and Cargo Force have dedicated space along with a separate area for the processing of belly cargo for passenger carriers such as Southwest. Additionally, OMA has approximately 500,000 square feet of cargo apron space.

In 2021, OMA ranked 64th among North American airports in air cargo tonnage according to ACI-NA data. Nearly all cargo at OMA is handled by FedEx and UPS.

5.7 Kansas City International Airport (MCI)

The Kansas City International Airport (MCI) is a FAA medium hub airport located 15 miles northwest of downtown Kansas City, 350 miles southwest of CID via I-80 and I-35 and covers 10,680 acres. MCI is conveniently accessed via I-29 to I-70 and I-35. The airport offers scheduled cargo service to the immediate region mainly via FedEx and UPS. Other cargo flights are operated by Amazon Air and DHL (Kalitta). There is also belly cargo capacity available from the U.S. network carriers (American, Delta, United) and some low-cost carriers such as Southwest.

FedEx operations generally consist of early morning inbound flights from hubs at MEM, IND, and AFW. These are followed by late evening outbound flights returning to the hubs with mostly B767F and B757F aircraft. UPS follows a similar schedule, but operates flights to its hubs at SDF and RFD with a comparable mix of freighter aircraft. These schedules enable UPS to complete overnight deliveries from the region.

In contrast, Amazon Air inbound flights from hubs at Lakeland, FL (LAL) and San Bernardino (SBD) arrive in the late evening, remain overnight at MCI, and depart early the following day. The LAL flights are being operated by Sun Country with B737Fs while Air Transport International (ATI) is among the contract carriers operating SBD service with B767Fs.

The DHL flight patterns are similar to the FedEx and UPS operations, with inbound flights from CID generally arriving in the morning followed by late evening outbound flights back to CID with the B737F.

In 2021, DHL announced a significant expansion in the Americas totaling $360 million for additional facilities and new air capacity to support e-commerce growth; it is expected to grow overall North and South America capacity by 30%. A significant part of the investment involves Kansas City where DHL is moving to a $5 million facility near MCI that will be twice the capacity of the existing facility.

The Kansas City, MO MSA includes a population of 2.2 million (7.9 times the size of the Cedar Rapids MSA) with a gross regional product of $129.0 billion (7 times the size of the Cedar Rapids MSA) and GDP per capita of $58,834 (-12% vs. Cedar Rapids MSA). Major industries include wholesale trade and transportation and warehousing.

MCI has three runways, including one at 10,800 feet. The airport has an estimated 191,000 square feet of cargo warehouse space spread across three buildings. FedEx occupies a building with 76,000 square feet, DHL occupies another 60,000 square foot facility, and UPS is in a separate 55,000 square foot building. In 2021, Amazon Air started new service to MCI and is now leasing 34,000 square feet of cargo space from one of the existing buildings. Total cargo apron space is estimated at around 658,000 square feet, with 308,000 square feet adjacent to the FedEx facility, 245,000 square feet near the DHL facility, and 105,000 square feet near the UPS facility.

In 2021, MCI ranked 45th among North American airports in air cargo tonnage according to ACI-NA data. Approximately 90% of the cargo was handled by FedEx and UPS, while DHL, Southwest and Delta carried most of the remaining balance. Given its service level and overall growth profile, it is expected that Amazon Air will gain increasing shares of MCI's cargo volume during the coming years.

5.8 Summary

A competitive review for the Eastern Iowa Airport includes seven airports with varying levels of air cargo volumes capabilities and relevance to CID. Exhibit 5.2. summarizes key cargo and demographic metrics for these airports and their communities. Chicago O'Hare is, by far, the largest airport in proximity to CID and its plentiful air services and infrastructure enable it to attract cargo from the entire Midwest region and, indeed, from much of the continental U.S. In particular, ORD's international capacity is attractive to Iowa businesses generating demand for air imports and exports. Meanwhile, Chicago-Rockford is aggressively adding air cargo services and facilities which should prove attractive to shippers located in Iowa.

The competing airports of similar size and operational profile as CID tend to also have similar types of cargo services. FedEx and UPS serve each of these competing airports and some also have operations by DHL and Amazon Air. Overall, for U.S. domestic air cargo, the Eastern Iowa Airport offers competitive services for the region's demand. With rapid changes occurring in the U.S. cargo market and lingering supply chain issues, it is likely that each of the airports reviewed will continue to expand their cargo businesses.

Exhibit 5.2
Competitive Airport Summary (GRP)

Airport	Cargo - Metric Tons (2021)	Est'd Cargo Facilities (Sq. Ft.)	MSA Population (2021)	GRP (billions USD)
ORD	2,536,576	2,000,000	9,580,970	$677.9
RFD	456,329	1,000,000	339,578	$16.1
MSP	234,746	245,000	3,701,101	$262.1
MCI	111,479	191,000	2,190,707	$129.0
STL	106,921	145,000	2,827,926	$166.1
OMA	67,845	125,000	961,919	$60.9
DSM	43,337	100,000	711,405	$51.0
CID	34,551	165,000	276,609	$18.6

Source: Hubpoint analysis of ACI-NA data, Woods & Poole Economics data 2021, Google Earth

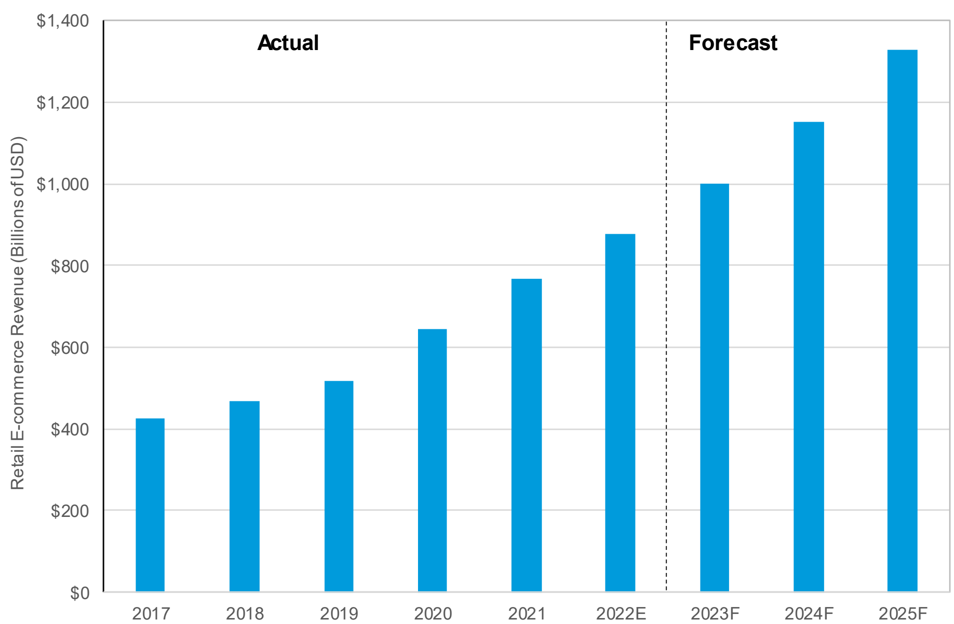
6 E-COMMERCE, AMAZON AIR AND IMPLICATIONS FOR CID

6.1 Introduction

Over the past decade, the most important trend in air cargo, by far, has been the global growth of e-commerce. The ease of ordering, massive selection and convenient delivery of e-commerce has attracted customers and their spending at historic levels. The impacts of e-commerce are evident in every developed country and, in many cases, air cargo plays a significant role in the fulfillment of customer orders. In the U.S., e-commerce has grown unabated since the mid-1990s. In more recent years, U.S. e-commerce sales passed the $500 billion mark in 2019 and, by the end of 2022, sales are expected to reach almost $900 billion. Even as predictions of a global and/or U.S. recession in 2023 prevail, the long-term outlook for e-commerce is bright. See Exhibit 6.1.

Notably, e-commerce growth has been super-charged during the ongoing COVID-19 pandemic where lockdowns and social-distancing made the retail sales platform even more attractive. From the onset of the pandemic in 2019 through 2021, the U.S. experienced almost 50% growth in e-commerce sales. E-commerce growth coupled with higher service commitments (in the form of shorter order delivery times) has led to the increasing use of air transportation for goods movements. From a transportation perspective, the primary beneficiaries of e-commerce growth in the U.S. were FedEx and UPS. The integrated express carriers were ideal enablers of e-commerce due to their scale, technologies and door-to-door delivery capabilities. However, the legacy business models of both FedEx and UPS were severely tested as e-commerce volumes grew and customer requirements increased.

Exhibit 6.1
Annual U.S. Retail E-commerce Sales (2017-2025F)



Source: Statista

6.2 Origin of Amazon Air

As the world leader in e-commerce, Amazon has been at the forefront of innovation and performance in the sector. From its early days, Amazon realized the importance of reliable shipping to its business model. Free shipping and two-day deliveries have been mainstays of the Amazon brand which led to high market share and created barriers to entry for competitors. Amazon's emphasis on customer deliveries made partnering with FedEx and UPS a natural decision as its business evolved beyond books and into every product imaginable.

For almost 20 years, Amazon and the integrated express carriers grew in concert and served customers well. However, strains in the relationships became public during the peak holiday season of 2013. In that year, e-commerce volumes exceeded the capacity of FedEx and UPS, leading to many delayed customer deliveries. Due to the late deliveries, Amazon was forced to issue refunds to customers and repair its brand reputation. More importantly, this was the seminal moment where Amazon determined that it needed more control over the critical delivery function of its rapidly growing business.

In 2015, Amazon entered into discussions to lease 20 B767F aircraft to augment the capacity of its transportation partners, FedEx and UPS. The leased aircraft were to be operated by U.S. cargo airlines, including Atlas Air and Air Transport Services Group (ATSG). By 2016, Amazon's plans to manage its own air network became public. The network was initially centered in southwest Ohio at Wilmington Air Park (ILN), the prior home of Airborne Express and DHL's domestic U.S. air carrier. Amazon stated that its air operation, initially branded as Prime Air and later named Amazon Air, was meant to assist FedEx and UPS deliveries in peak periods. However, over time, more aircraft were leased and the Amazon Air "experiment" was judged a success – allowing for faster customer deliveries and more freedom from the legacy business practices of the integrated express carriers.

Although FedEx and UPS remained partners to Amazon, the imminent threat to their future business with the e-commerce company was clear. In June 2019, FedEx proactively ended its contract with Amazon for providing air transportation services. Two months later, FedEx completed it separation from Amazon by canceling its contracts for ground delivery services. FedEx had become frustrated with the continued growth of Amazon Air and determined its better long-term strategy would be to focus on assisting other e-commerce companies with their transportation and logistics needs. UPS did not follow FedEx's lead and, in fact, benefited from the exit of a competitor for Amazon's business. In 2019, UPS reported that Amazon represented approximately 20% of its U.S. revenue. To this day, UPS and Amazon remain partners and co-exist, even as Amazon Air's fleet and network expand.

6.3 Business Model

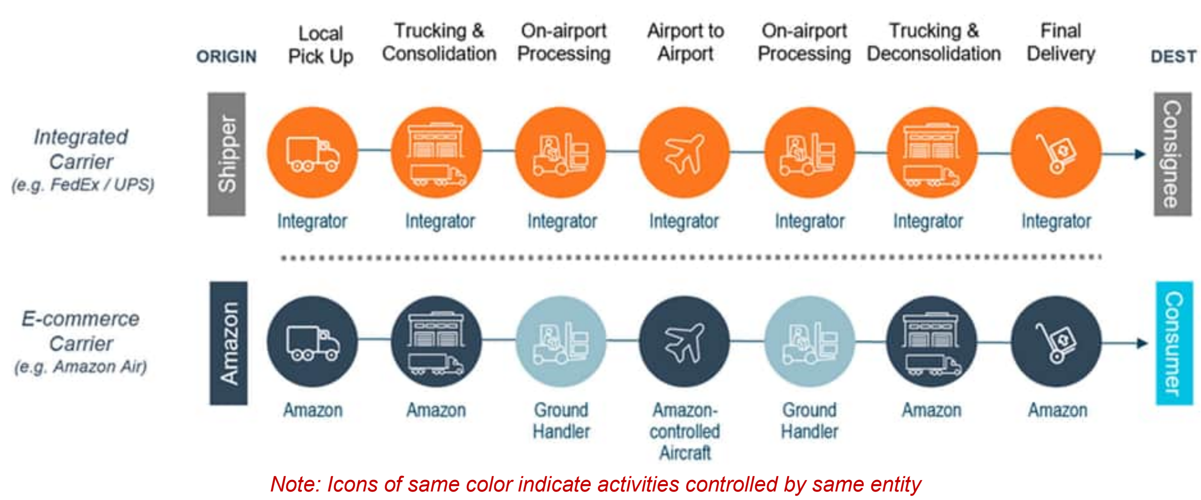
In its current form, Amazon Air exists solely to serve Amazon. This allows the air group to be extraordinarily focused on one entity and executing on a defined set of objectives to ensure the success of Amazon. Because Amazon Air capacity is not currently available for use by the general public or by other companies, there are no requirements to serve every address or make random customer pick-ups. Further, unlike FedEx and UPS, the Amazon Air group is not motivated by revenue targets or the profitability of its transportation services. Rather, it is the performance of the larger Amazon entity that matters.

By analyzing flight schedules, it is clear that Amazon Air's business model is very different from FedEx and UPS. Amazon has historically focused on meeting two-day delivery commitments, while the main drivers for the FedEx and UPS aviation networks center around overnight shipping. FedEx and UPS construct their respective schedules to meet next day deliveries, which generally involve morning departures from the hubs at Memphis, TN (MEM) and Louisville, KY (SDF) to the outstation airports. These operations are then followed by late evening return flights back to the hubs. The cargo can then be sorted at the hubs and placed on departing aircraft or trucks for next day delivery.

In contrast, Amazon Air flights generally depart from the regional hubs in the morning and return the same morning or afternoon, depending on an airport's role in the Amazon network. The e-commerce orders are then sorted at the respective hubs and flown to other Amazon Air cities where Amazon has up to two days to complete deliveries. Further, the Amazon Air network still includes point-to-point flights between large markets which bypass established hubs. Finally, Amazon Air is not only utilized to facilitate customer deliveries, it is also critical to the repositioning of Amazon inventory around the U.S. based on real-time trends. Therefore, ideally, Amazon Air points of service involve markets with not only adequate levels of consumer demand, but also established fulfillment centers where inventory can be sourced and delivered.

Exhibit 6.2 provides a diagram of the door-to-door journey of cargo utilizing an integrated carrier such as FedEx or UPS compared to an e-commerce carrier such as Amazon Air.

Exhibit 6.2
Door-to-Door Journey for Integrated Carrier vs. E-Commerce Carrier

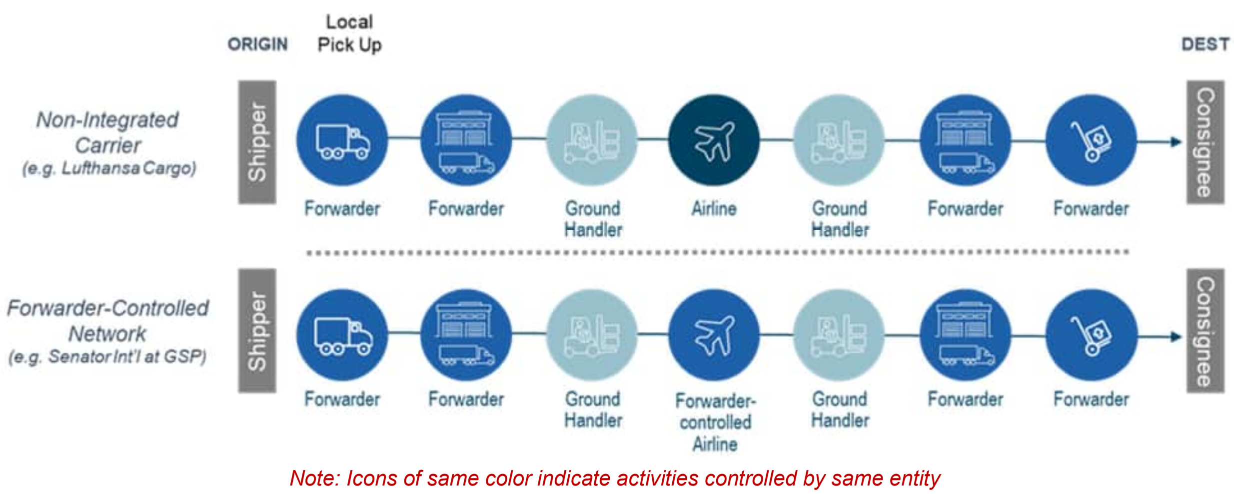


Source: Hubpoint analysis

Although there are many similarities between integrated carriers and an e-commerce carrier like Amazon, the primary differences relate to Amazon's control of the ordering process, its outsourcing of airport ground handling and its contracting with air carriers to operate leased aircraft. Of these, the control of the customer order process is most impactful because it allows for complete visibility of the required order fulfillment process at the earliest time possible. Conversely, integrated carriers often know about an orders' details once it is tendered to them by a customer. The early notification to Amazon Air of demand levels, product details and delivery locations enables optimal logistics planning.

It is also useful to compare Amazon Air's door-to-door journey to those of non-integrated carriers and forwarder-controlled networks, as depicted in Exhibit 6.3. These carrier models are particularly employed for general cargo shipments, as opposed to express package and e-commerce shipments. Non-integrated carriers primarily perform the basic airport-to-airport transportation function, but do not offer door-to-door services. Freight forwarders serve shippers and contract with non-integrated carriers to fly cargo shipments to the intended destination airport. Forwarders also ensure that all involved parties are coordinated to move goods from origin to destination. The emphasis of this business model is on cost, flexibility, and customized solutions. Forwarder-controlled networks are very similar to non-integrated carrier models, but the key difference is that the freight forwarder charters the aircraft and, therefore, controls the airport-to-airport transportation function. This enables the forwarder to dictate where and when aircraft fly in order to provide unique services to key customers.

Exhibit 6.3
Door-to-Door Journey for Integrated Carrier vs. E-Commerce Carrier

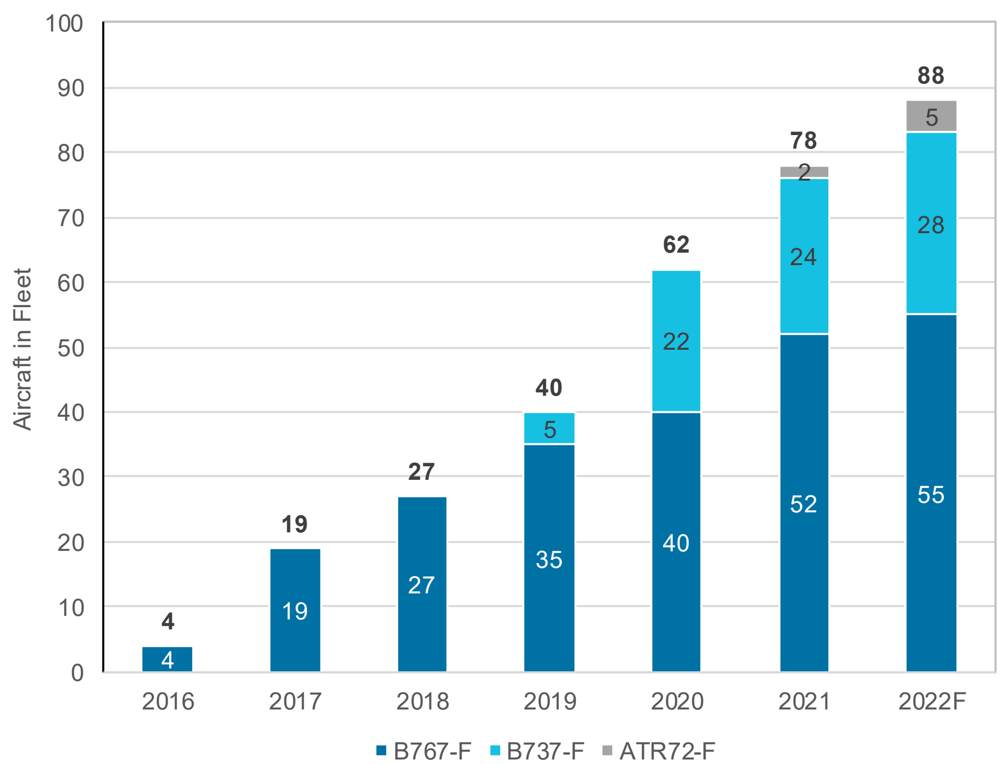


Source: Hubpoint analysis

6.4 Fleet Expansion

Since its initial 2016 lease of 20 B767F aircraft, Amazon Air's fleet has grown to nearly 90 aircraft. Exhibit 6.4 details Amazon's fleet trends over time. Through 2018, all aircraft remained B767Fs operated by Atlas Air and ATSG. In 2019, B737 freighters were added to the fleet mix and operated by partner Sun Country Airlines. Until recently, Amazon Air has leased all of the aircraft utilized in its network. However, in early 2021, Amazon Air purchased 11 used B767 aircraft from Delta and WestJet which it will convert to freighters. Despite now owning some aircraft, Amazon Air is expected to continue using third-party crews to operate the fleet. In late 2021, Amazon began services with a third aircraft type - the ATR-72 turboprop freighter. Amazon Air currently has five ATRs, all of which are operated by its partner Silver Airways at the Alliance Fort Worth (AFW) hub.

Exhibit 6.4
Amazon Air Fleet (2016-2022F)



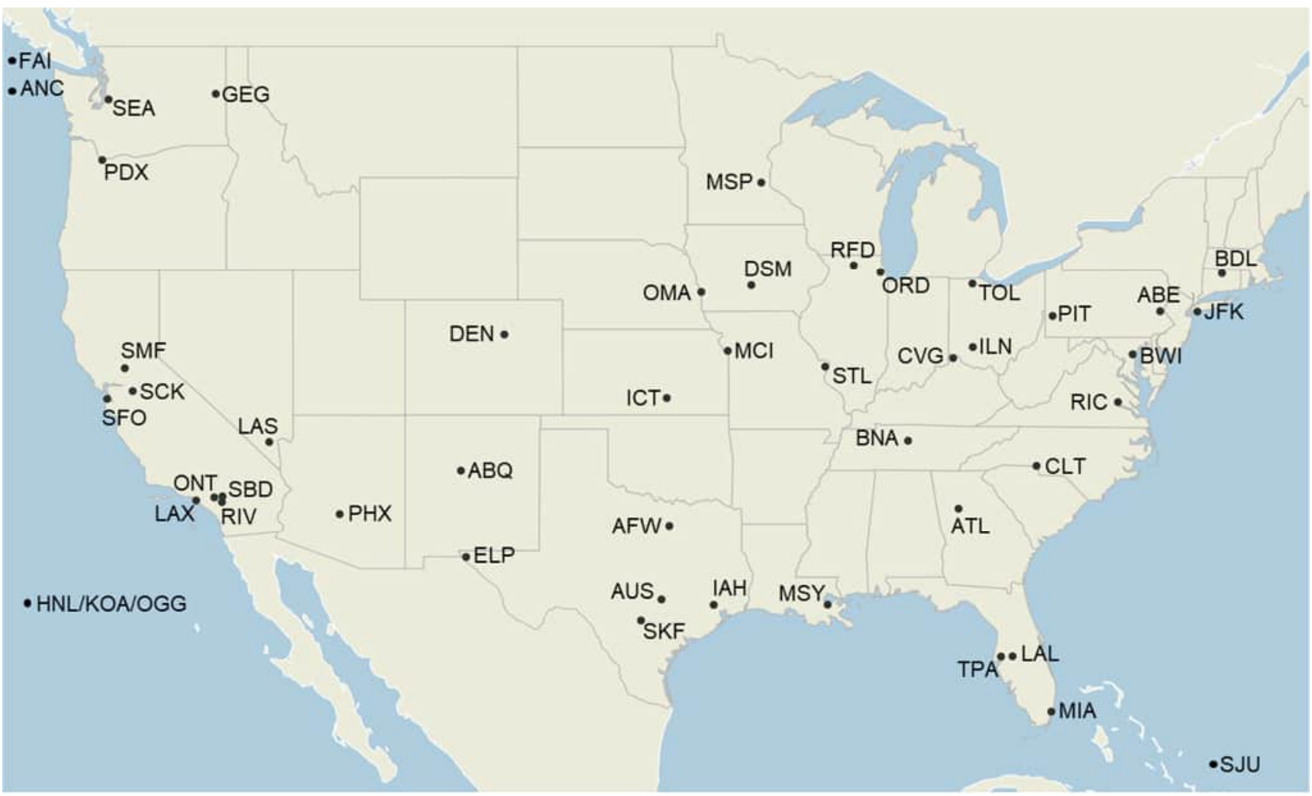
Source: Hubpoint analysis of press releases and planespotters.net data

The growth and diversification of the Amazon Air fleet is a clear sign that the air network is a key part of the company's forward-looking strategy. While aircraft are costly to operate and add complexity to the distribution of goods, they also provide unmatched speed advantages which can enable the next major step in Amazon's customer service levels – next-day and same-day deliveries. Further, as movable assets, aircraft can be placed in any market on a short-term basis, as needed, to meet the needs of Amazon. Amazon Air's growth is expected to continue with some estimating a fleet of over 200 aircraft by 2028.

6.5 Network Evolution

As Amazon Air's fleet has grown, so have the number of points in its network. Currently, Amazon Air serves over 50 U.S. stations with daily flights. Additionally, the airline operates intra-Canada flights as well as intra-Europe flights via partner air carriers. Exhibit 6.5 provides a view of Amazon Air's existing domestic U.S. network. The changing fleet mix has also led to a change in terms of the types of airports and communities served. More small markets are being added and that trend is expected to continue.

Exhibit 6.5
Amazon Air Network Map (September 2022)



Source: Hubpoint analysis of Flightradar24 data, U.S. DOT T-100 data, various press releases

Starting in 2016, Amazon Air focused on serving large metropolitan areas like New York City, Los Angeles, San Francisco and Seattle. This strategy was likely driven by high e-commerce demand levels and high concentrations of Amazon Prime members. While the large metro areas were targeted for service, the carrier often utilized smaller, secondary airports rather than the major airports in a region. For instance, to serve New York City, Amazon Air initiated services at Allentown-Bethlehem, PA (ABE) and to serve San Francisco, it based operations at

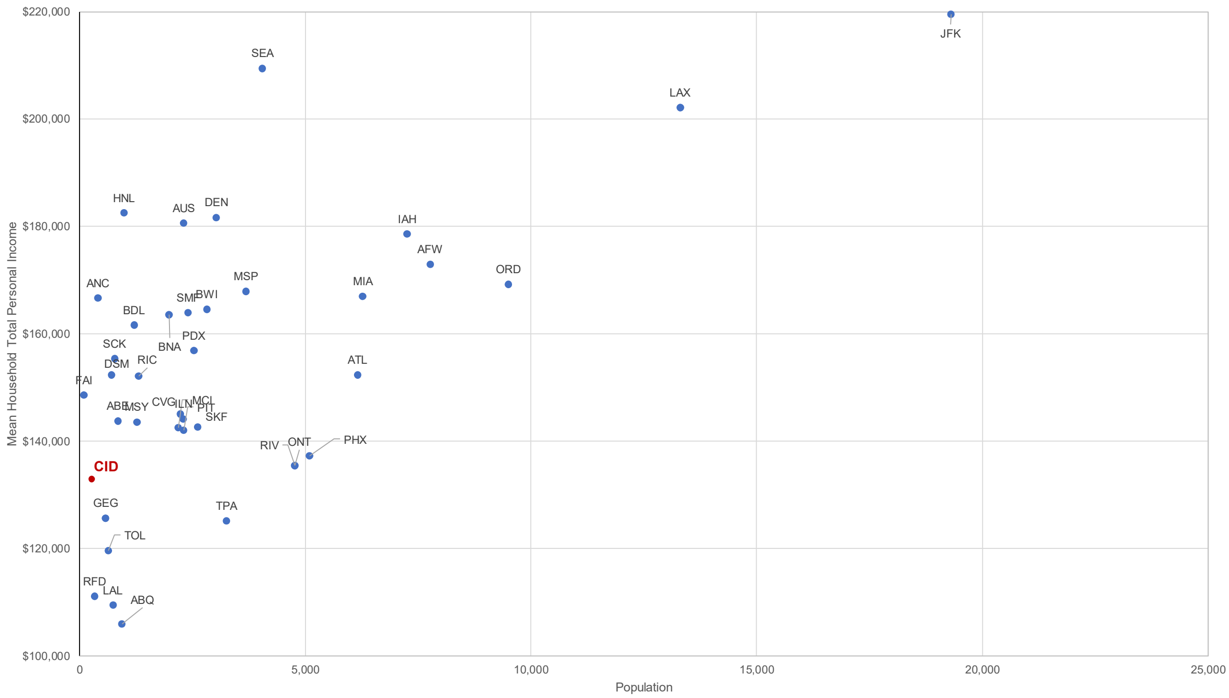
Stockton, CA (SCK). At these smaller airports, Amazon Air realized uncongested operations and ready access to the major metro areas via interstate highways. As the largest metro areas have become well-served, Amazon Air has added a mix of medium and small cities to its network. This strategy has been enabled by the introduction of smaller aircraft that are right-sized for the cities and the e-commerce volumes they generate.

Some of the more recent additions to the U.S. network include Wichita, KS (ICT), Des Moines, IA (DSM), and Albuquerque, NM (ABQ). Each of these can be defined as small- to medium-sized markets and, indeed, they are mainly served by Amazon Air's B737Fs and ATR72s. Importantly, the ATR72 airports (ICT, DSM and ABQ) are in rural areas, relatively isolated geographically and located in close proximity to large Amazon fulfillment centers.

In August 2021, Amazon opened a $1.5 billion hub on a 600-acre campus at the Cincinnati / Northern Kentucky International Airport (CVG), which now serves as Amazon Air's primary U.S. hub and further enable Amazon's faster delivery plans. Amazon's CVG hub has the capacity to handle 100 aircraft and an estimated 200 daily flights. As of October 2022, CVG operations totaled almost 44 daily flights with aircraft scheduled in tightly organized arrival and departure banks. Much of the growth at CVG has occurred since March 2022 as the re-engineered network has taken on a clearer shape.

As shown in Exhibit 6.6, Cedar Rapids compares favorably to some existing Amazon Air communities, including Albuquerque, NM; Spokane, WA; and Toledo, OH in terms of key demographics - population and mean household total personal income. Beyond demographics and other economic indicators, the presence of Amazon fulfillment and distributions centers close to an airport is clearly preferred by Amazon Air. For large metro areas, Amazon often serves multiple airports to efficiently serve different geographic segments of the population base. Smaller metro areas are expected to be served by Amazon Air with just one airport.

Exhibit 6.6
Demographics Comparison among Amazon Air Stations



Source: Hubpoint analysis of Woods & Poole Economics data and Flightradar24 data

6.6 Criteria for Potential Amazon Air Service

Based on research and analysis of the Amazon Air network, Hubpoint has identified several criteria that are considered for airports to attract service. While the criteria are flexible in some ways, they provide a baseline for understanding an airport's eligibility for inclusion in the network. The common criteria for airport selection include:

- **Presence of existing Amazon fulfillment or distribution centers in close proximity to an airport**
  - Amazon Air not only serves local e-commerce consumer demand with its aircraft, but also links Amazon's large warehouses for inventory management purposes. This operational dynamic leads to a natural two-way flow of goods which increases aircraft utilization and optimizes the value of its vast warehouse assets.
  - In effect, the ideal markets for Amazon Air have strong inbound demand (for customer order fulfillments) as well as strong outbound demand (for sourcing of products needed elsewhere in the network).

- **Access to a significant labor force**
  - Labor supply continues to be a major issue across all industries – even coming out of the COVID-19 pandemic. This problem is especially acute for the hourly workers sought by Amazon to staff its facilities, drive delivery vehicles and load/unload aircraft.
  - Areas with relatively high levels of potential employees are attractive because they allow Amazon's complex multi-modal distribution networks to operate efficiently and deliver customer orders on time.

- **Strategic location and market access**
  - As the Amazon Air network of cities grows, it is important to find pockets of demand that can be served better with air transportation. In practice, these areas are identified by Amazon and passed on to the air group for consideration. Again, while certain economic indicators may signal potential for Amazon Air operations, ultimately, Amazon determines where the greatest needs exist.
  - Having noted this, it is logical to conclude that new airports to the network should be sufficiently distanced from existing Amazon Air airports and serve a distinct strategic purpose.
  - An airport's location also dictates market access via highways and, preferably, in an omnidirectional manner.

- **Lack of environmental entitlements and shovel-ready on-airport sites**
  - In cases where Amazon Air wants to add service, but requires additional on-airport facilities and/or infrastructure, there is a high preference to have sites that do not have environmental entitlements and can be developed in the near-term.
  - The key point is that Amazon and Amazon Air move at a fast pace and once decisions are made, it is important to execute in a timely manner.
  - Environmental studies not only consume enormous amounts of time, they also have unknown outcomes. These situations increase the risk profile of a potential operation and have been known to cause Amazon Air to suspend interest in various U.S. airports.
  - Similarly, sites that require little land preparation and zoning approvals allow Amazon Air to quickly move forward with cargo facilities development, as required.

- **Risk-sharing and airport incentives**
  - Amazon and Amazon Air are known to be expert negotiators in their business transactions. This environment certainly extends to its dealings with airports regarding fees, incentives and development.
  - Historically, Amazon Air has insisted on short-term contracts with its airline partners as well as its airports. The goal is maximum flexibility and an ability to pivot in a different direction with minimal risk and exit costs. Over time and as Amazon Air has become more of a permanent fixture in the company, this

position has softened somewhat, but there are still vestiges of these business practices in their airport deals.
    - While Amazon Air has invested directly in certain airport development projects, its preference has typically been to: 1) have airports directly fund require developments or 2) partner with third-party developers who assume more of the long-term risk.

- **Airport-specific capabilities**
    - Depending on the circumstances, Amazon Air has been known to require airports to have CAT III ILS runway capabilities. This has been particularly important for airports in the U.S. that experience regular weather events that can potentially lead to flight delays and cancellations. Amazon Air exists to add time advantages to Amazon and if there are regular service interruptions at airports, the value of the operation is negatively impacted. The CAT III systems help to ensure that Amazon Air's flights operate on-time, regardless of the weather conditions in a region.
    - In the past, Amazon Air has also prioritized airports with capabilities to handle Group IV aircraft. This would ensure that the B767Fs could take off and land at any airport in their network. The importance of this criteria has likely been reduced as smaller aircraft have entered the fleet. However, a Group IV capable airport would allow Amazon Air to grow in a market by upgauging its aircraft and it also provides additional flexibility within the operation, even if B767Fs are only used sporadically at an airport.

6.7 Typical Operations of Amazon Air

Understanding Amazon Air's typical operations in the U.S. allows prospective airports to properly plan and make proactive decisions relevant to the carrier. Dozens of airports are now being utilized by Amazon Air with differing profiles of geographic location, market size, network mission, aircraft usage and flight frequencies. A summary of these operations is provided herein with particular emphasis on those cases similar to Cedar Rapids and the Eastern Iowa Airport.

Generally, Amazon Air has at least one daily inbound and outbound departure for airports where it has committed to scheduled service. Other airports may receive unscheduled operations as needed during peak periods such as holidays and other times of the year when e-commerce volumes are surging. An analysis of recent Amazon Air operations shows smaller markets with 2-4 daily flight operations (defined as takeoffs and landings), medium-sized markets with 6-10 daily flight operations and regional hubs with 12-15 daily flight operations. Amazon Air's primary U.S. hub at CVG has almost 44 daily flight operations.

In smaller markets, Amazon Air typically arrives in the very early morning hours (12:00 – 2:00 AM) and then depart a few hours later (4:00 – 8:00 AM). Medium-sized cities tend to have schedules with early to late evening arrivals followed by late morning departures. As demand warrants, Amazon Air has shown a preference to increasing frequencies versus upgauging aircraft in small- and medium-sized markets. For example, just three months after initiating new once daily service at Pittsburgh International Airport (PIT) in May 2021, it increased to a second frequency on the B737F. It is yet to be determined how Amazon Air will add capacity in smaller markets that begin services with ATR72 turboprops.

A critical element of any air cargo operation involves the ground handlers at each airport. Ground handlers are responsible for the loading and unloading air cargo containers in the cargo facility, loading and unloading containers at the aircraft and operating handling equipment such as forklifts, main-deck loaders, tugs and dollies. At many airports, Amazon Air outsources this function to qualified ground handlers already working on the airport. At hubs like CVG, Fort Worth, TX (AFW) and Lakeland, FL (LAL), Amazon Air self-handles cargo with its own staff and ground handling equipment.

Air cargo facilities vary widely amongst Amazon Air's airports depending on the specific network mission and e-commerce volumes handled. Airport stations which added Amazon Air service fairly recently include Kansas City International Airport (MCI), Pittsburgh International Airport (PIT), Albuquerque International Support (ABQ), and Des Moines International Airport (DSM). Medium-sized markets MCI and PIT have leveraged existing 34,000 and 50,000 square foot facilities, respectively, to be used for on-airport sortation of e-commerce packages. Smaller markets ABQ and DSM have on-airport cargo facilities of 31,000 square feet and 8,000 square feet, respectively. Again, these markets are supported by Amazon Air's ATR72s, so smaller facilities would seem appropriate for that level of operation. Exhibit 6.7 provides an overview of Amazon Air's operations at select small- and medium-sized cities.

The majority of the smaller airports that Amazon Air has entered utilized existing on-airport cargo facilities. Exceptions to this relate to new facilities at ABQ which is being completely funded by Amazon and Spokane International Airport (GEG) which attracted funding from S3R3 Solutions – a Spokane-based economic development group which leverages public-private partnerships to invest in impactful projects.

Exhibit 6.7
Amazon Air Service Comparison (2022)

Airport	Facility Size (Sq Ft)	New/ Existing Facility	Initial Flights	Current Flights	Approximate Flight Schedules	Population	Additional Relevant Information
ABQ	31,000	New	1x daily ATR-72F	1x daily ATR-72F	1:15 AM arrival, 4:00 AM departure	933,573	- New facility financed by Amazon - Launch market for ATR-72
DSM	8,052	Existing	1x daily ATR-72F	1x daily ATR-72F	2:15 AM arrival, 4:00 AM departure	710,943	- Launch market for ATR-72
GEG	30,750	New	1x daily 737-800F	1x daily 737-800F	2:00 AM arrival, 10:00 AM departures	576,712	- Also renting 5,200 sq ft of office space - Facility will have 10 truck docks and 90 parking stalls
MCI	34,000	Existing	1x daily 737-800F	2x daily 737-800F	1:45 AM and 9:45 PM arrivals, 7:00 AM and 8:00 AM departures	2,185,689	- Daily flights typically rotate between LAL, CVG, RIV
PIT	50,000	Existing	1x daily 737-800F	2x daily 737-800F	4:20 PM and 11:00 PM arrivals, 9:00 AM and 7:00 PM departures	2,309,927	- Increased from 1x to 2x daily flights 3 months after launch
TOL	65,000	Existing	1x daily 737-800F	2x daily 737-800F	8:00 AM and 12:00 PM arrivals, 10:00 AM and 3:30 PM departures	640,931	- Airport funded $1.7 million in renovations to prepare facility for Amazon Air

Source: Various press releases, Flightradar24 data for October 2022.

6.8 Implications for Eastern Iowa Airport

Ultimately, from a planning perspective, this review of e-commerce and, specifically, Amazon Air is meant to provide some guidance of what may be required at Eastern Iowa Airport should the carrier be interested initiating services. With knowledge of the fleet types, operational practices and facility standards, CID may choose to incorporate relevant details in its Master Plan.

Currently, there are no large Amazon fulfillment centers close to CID although a smaller Amazon delivery station is located in Iowa City. In December 2020, a small sortable Amazon fulfillment center opened in Des Moines. The presence of this fulfillment center was certainly a key in Amazon Air's move to serve DSM in 2021. An even larger small sortable center was to open in 2022 in Davenport, Iowa less than 90 minutes from CID. In May 2022, Amazon disclosed that the Davenport project had been delayed and the opening of the new facility is now expected in 2024. In the absence of another Amazon fulfillment center opening closer to CID, it would seem that the Davenport facility is the project that could signal the best near-term opportunity for attracting Amazon Air.

Finally, it is clear that even without direct Amazon Air service, many U.S. airports are benefiting from e-commerce goods shipped by Amazon and many other retailers. Amazon's partnerships with UPS and DHL are certainly increasing cargo activity at CID and that will continue into the future. The Eastern Iowa Airport need not look further than nearby Nordstrom Direct to understand the positive impact of e-commerce on its air cargo volumes. It will be important for CID to monitor developments within the region related to e-commerce fulfillment centers and distribution centers that interact with air cargo carriers and to be prepared to facilitate their needs.

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7 SWOT ANALYSIS

7.1 Introduction

An analysis of the Eastern Iowa Airport 's **S**trengths, **W**eaknesses, **O**pportunities and **T**hreats ("SWOT") related to air cargo is a useful tool to identify areas where the Airport may focus attention to ensure the success of its air cargo business. On the following page, a SWOT matrix is presented to summarize each element. Notably, Strengths and Weaknesses are considered to be Internally-oriented – meaning they can be influenced by the Airport or they relate to factors on or near the Airport. On the other hand, Opportunities and Threats are considered to be Externally-oriented – meaning they are largely outside the influence of the Airport and relate more to the macro-environment.

7.2 Air Cargo SWOT Analysis Matrix for the Eastern Iowa Airport

STRENGTHS	WEAKNESSES
• Strong, stable scheduled cargo carriers (UPS, FedEx, DHL) • Easy interstate highway access (I-80, I-380) • No constraints on available land for potential new cargo development • Strong financial position of Airport and access to grant funding • Progressive airport management committed to air cargo business • Third-party ground handler (WFS) capable of handling freighter aircraft • On-going Master Plan will consider alternative cargo development options • Low operating costs and efficiencies from uncongested cargo environment • Numerous logistics parks near CID, incl. large, new FedEx Ground hub	• No available cargo facility for a potential new operator (existing cargo facilities are dedicated to express carriers) • UPS, FedEx, DHL share CID aircraft capacity with other airports indicating smaller sized Cedar Rapids market • No freighter operator servicing general / heavy freight segment • Historic lack of belly cargo capacity on most passenger aircraft serving CID (though current trends to mainline aircraft operations may change this dynamic) • Lack of facility to handle potential growing volumes of passenger belly cargo • DHL operating from small facility outside the established West Cargo Area • Lack of space for truck parking and staging in East Cargo Area
OPPORTUNITIES	**THREATS**
• Rapid e-commerce growth in U.S.; air cargo shipping provides competitive advantages • Growth by UPS, FedEx, DHL at CID, esp. related to e-commerce • Diverse regional manufacturing and distribution centers generates air cargo demand • Cedar Rapids attracting large logistics operations creates momentum for further sector growth • Growing international air cargo market in state of Iowa for both imports and exports • Amazon Air continuing fleet and network expansion – including at airports in smaller communities • Passenger airlines prioritizing air cargo in network planning decisions translates to potential for more belly cargo • Federal infrastructure bill includes funding for airport projects • UPS in capital spending freeze at airports; CID's new UPS facility could be relief valve for regional demand • Strong freight transportation and logistics competency in CID region	• Currently, no large cluster of shippers in CID market area moving large volumes of air-eligible goods on a regular basis • Small regional population constrains consumer demand • Lack of air cargo-oriented freight forwarding community at/around CID • Close proximity to large Chicago-area cargo airports leads to leakage away from the CID market area • Limited labor market • No large nearby Amazon fulfillment center • Amazon Air service at DSM – 2 hours from CID • Nordstrom Direct e-commerce operation near CID currently downsizing employment base; potential for substantial management changes within parent company

8 SYNTHESIS

Based on the findings of this Study, outlined below are several air cargo-related matters for consideration by the Eastern Iowa Airport in its current Master Plan process. These matters have been prioritized to reflect the impact they may have on CID's future cargo growth and development.

1. **CID should be prepared for growing e-commerce activity, including possible services by Amazon Air**

    - As discussed, e-commerce is currently a primary driving force for air cargo growth at CID.
    - Regional consumer and business demand drives inbound e-commerce orders at CID. Meanwhile, local e-commerce operations generate air cargo demand, both outbound (consumer order fulfillment) and inbound (product returns, stocking inventory).
    - While UPS and FedEx operate from large, modern facilities with capacity to handle growing e-commerce volumes, DHL's smaller, older facility could struggle to keep up with the expected high-growth in e-commerce activity.
    - Even the West Cargo Area may experience capacity constraints in peak periods involving cargo facility space, ramp space, GSE storage and maintenance space, truck parking, and employee parking.
    - The situation may be further challenged with the entry of another cargo carrier to the Airport, possibly to include Amazon Air or a start-up carrier. Should that occur, the current lack of adequate infrastructure and available cargo facility space would complicate activities, leading to inefficiencies and a sub-optimal air cargo environment.
    - Additionally, a third-party ground handler would be required to assist any new cargo operators with aircraft loading/unloading, fueling and other aviation / air cargo services. Existing CID operator WFS may be well-positioned to handle new freighter airlines serving the airport.
    - CID should prepare for these potential situations to promote efficiency of air cargo operations, thereby enabling further growth of its cargo business.

2. Position CID as an alternative to larger airports for handling regional general / heavy freight air cargo demand

- Even before the pandemic, smaller airports were gaining traction with air cargo operators as a viable alternative to large cargo gateway airports. This trend became even more pronounced during the pandemic as supply chain issues forced cargo operators to utilize new airports. The positive experiences at these airports may alter the dynamics of the cargo industry moving forward.

- Additionally, Amazon Air's recent expansion in the U.S. market has led it to operate at many airports that had previously had little cargo activity. These smaller airports have responded capably, thereby further exhibiting the value of alternative airports to the cargo community.

- CID has existing service by all three major global express carriers, but lacks freighter operations appropriate for general / heavy freight and which is available for use by air freight forwarders. CID may investigate the demand for these air cargo services in its market area (or currently passing through its region via trucks on I-380 and I-80).

- The region's robust trucking activity as well as the growing concentration of industrial centers and logistics parks in the Cedar Rapids area may bring air-eligible goods closer to CID, making it a viable alternative to other larger airports.

- In seeking opportunities to serve market needs and increase its cargo activity, CID can promote its advantages to air the cargo community, including low costs, on-airport efficiencies, available land for development, market access, labor supply etc.

- Consider targeting general freight services, including charter operations and special project cargo flights, that can prove CID's cargo capabilities and value proposition.

3. Anticipate growing interactions between FedEx Express and FedEx Ground leading to increased CID on-airport truck traffic related to growing cargo volumes

- With projected growth in e-commerce, UPS and FedEx are best positioned to accommodate the increases given their modern facilities and access to the large West Cargo Apron.
- Issues for FedEx may more likely relate to the landside where increased trucking frequencies and truck size can lead to congestion and create inefficiencies. FedEx has already cited its increasing need for truck parking and staging areas at the CID facility.
- This is even more likely as FedEx Express and FedEx Ground operations more closely align their operations and with the presence of a new FedEx Ground hub near CID.
- As more cargo volume is handled at CID, it will add the need for more trucking capacity and likely in the form of large trucks (as opposed to vans or straight trucks).
- The requirements for parking, turning and staging large tractor trailers are very different than for vans and smaller trucks.
- This situation should be considered with adequate landside infrastructure.

4. As passenger airlines increase focus on air cargo and possibly operate larger aircraft at CID, the Airport should be prepared to handle more belly cargo

- Currently, less than 1% of cargo at CID is handled by commercial passenger airlines.
- As discussed, cargo's profile has been elevated within airlines due to the revenue it can generate.
- While smaller regional jet aircraft have very little cargo carrying capabilities, narrowbody aircraft can handle substantial amounts of loose loaded cargo in their bellies.
- As the Cedar Rapids air travel market grows and as regional airline operations are constrained by the pilot shortage, it is possible that network carriers will upgauge their aircraft from regional jets to mainline, narrowbody equipment.
- With those fleet changes, belly air cargo will become more common at CID.
- Due to the low belly cargo volumes historically at CID, there has been no need for cargo-specific ground handling capabilities (including trained staff, special equipment or cargo-related facilities).
- To prepare for additional belly cargo volumes, CID should investigate available options for adding air cargo handling capacity both on the airside and the landside. Existing CID operator WFS may be well-positioned to handle increasing belly cargo activity at the airport.

5. **Nearshoring and re-shoring trends bring supply chains closer to North America, possibly leading to opportunities for smaller U.S. airports in international air cargo operations**

   - From a longer-term perspective and considering the recent high growth of Iowa's international air trade volumes, CID should track opportunities for international cargo flights.
   - Several smaller, alternative U.S. airports have successfully developed international cargo operations, often starting with charter or seasonal operations and growing to regularly scheduled points of service.
   - Through analysis of international trade flows in CID's market area, identify relevant industries, commodities and international country markets. Understand current shipping patterns for inbound and outbound air cargo for Iowa, portions of Wisconsin and Illinois as well as U.S. air imports and exports potentially moving on trucks near the Eastern Iowa Airport via I-380 and I-80.
   - Determine requirements and alternatives for international air cargo operations, including regulations and processes for Customs clearance, in-bond shipments, Foreign Trade Zones etc.
   - Study strategies and action plans of alternative airports to determine applicability to CID.
   - Based on potential opportunities, map process over time to attract international air cargo operations at CID including key milestones, timelines, involved stakeholders etc.

hubpoint
STRATEGIC ADVISORS

Appendix E

Noise Technical Report

Noise Technical Report

Eastern Iowa Airport Master Plan

HMMH Report No. 310050

December 15, 2022

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1 Introduction

Harris Miller Miller & Hanson Inc. (HMMH) completed aircraft noise modeling and land use analysis associated with the Eastern Iowa Airport (CID) Master Plan update. This noise technical report describes the methodology and results of the noise analysis and enables readers to understand aircraft noise terminology.

CID's long-range plan includes constructing a parallel runway to the north of Runway 9/27 when justified by activity levels. The Airport intends to protect the land purchased for the potential runway as well as land beyond the existing airport boundary to ensure it remains compatible with potential future aircraft operations on the planned parallel runway. Therefore, the noise analysis for the CID Master Plan includes a total of three modeling scenarios:

1. Existing Condition (2021)
2. 20-Year Forecast Condition (2041)
3. Forecast Condition with a Parallel Runway

This noise technical report contains the methodologies and results of the noise analysis for the existing and 20-year aviation forecast for CID. Forecasting is an essential part of the master planning process as it provides the basis for determining future facility requirements and justification for investment. It also serves to forecast revenues for certain aspects of the Airport's operation. Forecasting elements include passenger enplanements, aircraft operations (commercial, general aviation, air cargo, military), and air cargo tonnage, as well as activity peaking characteristics and a determination of the Airport's existing and future design aircraft. The forecasts represent a 20-year outlook using 2021 as the existing year and 2041 as the forecast year. Kimley-Horn Associates (KHA) led development of the forecasts and considered historical trends, aviation industry trends, local socioeconomic information, and reference forecasts to capture factors that may influence future activity at CID. HMMH utilized forecast information from KHA for this noise technical report.

The Federal Aviation Administration (FAA) requires the use of the Day-Night Average Sound Level (DNL) metric for noise analysis undertaken for purposes of land use compatibility. The 24-hour analysis period must represent the average annual day (AAD), indicating average daily aircraft operations over a 365-day period.

Chapter 2 presents the noise modeling approach, input data, and assumptions used in the preparation of DNL contours. Chapter 3 includes the noise analysis results and associated land use. The appendix provides explanation of acoustical terminology, for the benefit of reviewers who may lack familiarity with the terms.

2 Noise Modeling Methodology and Inputs

AEDT inputs are developed under the following categories:

- Physical description of the airfield layout
- Aircraft noise and performance characteristics
- Annual aircraft operations
- Runway utilization rates
- Aircraft flight track geometry and utilization rates
- Meteorological data
- Terrain data

Sections 2.1 through 2.7 address the noise model inputs for each of these categories, respectively.

2.1 Physical Description of the Airfield Layout

CID is located approximately seven miles south-southwest of downtown Cedar Rapids in Linn County, Iowa. The airport layout is comprised of two runways, Runway 9/27 and Runway 13/31. **Figure 2-1** shows the current airport diagram and **Table 2-1** provides the runway specifications used in modeling the 2021 Existing Condition and the 2041 20-Year Forecast Condition. Operations were modeled including a planned parallel runway north of Runway 9/27 in the Forecast Condition with a Parallel Runway. In this scenario, Runway 9/27 is renamed Runway 9R/27L and the planned parallel runway is named Runway 9L/27R. **Figure 2-2** shows the airport diagram with the parallel runway and **Table 2-2** provides the runway specifications used in modeling this scenario.

The number used to designate each runway end reflects, with the addition of a trailing "0", the magnetic heading of the runway to the nearest 10 degrees from the perspective of the pilot. Runway 9/27 is oriented along approximate magnetic headings of 90° and 270° and is 8,600 feet long by 150 feet wide. Runway 13/31 is oriented along approximate magnetic headings of 130° and 310° and is 6,200 feet long by 150 feet wide. The planned parallel runway, Runway 9L/27R, is oriented along approximate magnetic headings of 90° and 270° and is 7,400 feet long by 150 feet wide. Runway length, runway width, instrumentation, and declared distances affect which runway an aircraft will use and under what conditions, and therefore, will determine the rate of utilization of a runway relative to the other runways at the airport.

Table 2-1. Existing Runway Specifications

Sources: HMMH 2022, FAA Form 5010 Data, accessed 1/24/2022

Runway End	Latitude (dd-mm-ss)	Longitude (dd-mm-ss)	Elevation (feet, MSL)	Length (feet)	Approach Angle (degrees)	Threshold Crossing Height (feet)	Displaced Thresholds (feet)
9	41.884650	-91.729169	854.1	8,600	3	60	-
27	41.884272	-91.697591	859.9	8,600	3	46	425
13	41.891116	-91.715133	869.4	6,200	3	51	-
31	41.878891	-91.699302	847.6	6,200	2	50	-

Table 2-2. Parallel Runway Specifications

Sources: HMMH 2022, FAA Form 5010 Data, accessed 1/24/2022

Runway End	Latitude (dd-mm-ss)	Longitude (dd-mm-ss)	Elevation (feet, MSL)	Length (feet)	Approach Angle (degrees)	Threshold Crossing Height (feet)	Displaced Thresholds (feet)
9R	41.884650	-91.729169	854.1	8,600	3	60	-
27L	41.884272	-91.697591	859.9	8,600	3	46	425
9L	41.897732	-91.73291	854.1	7,400	3	60	-
27R	41.897405	-91.705734	859.9	7,400	3	46	425
13	41.891116	-91.715133	869.4	6,200	3	51	-
31	41.878891	-91.699302	847.6	6,200	2	50	-

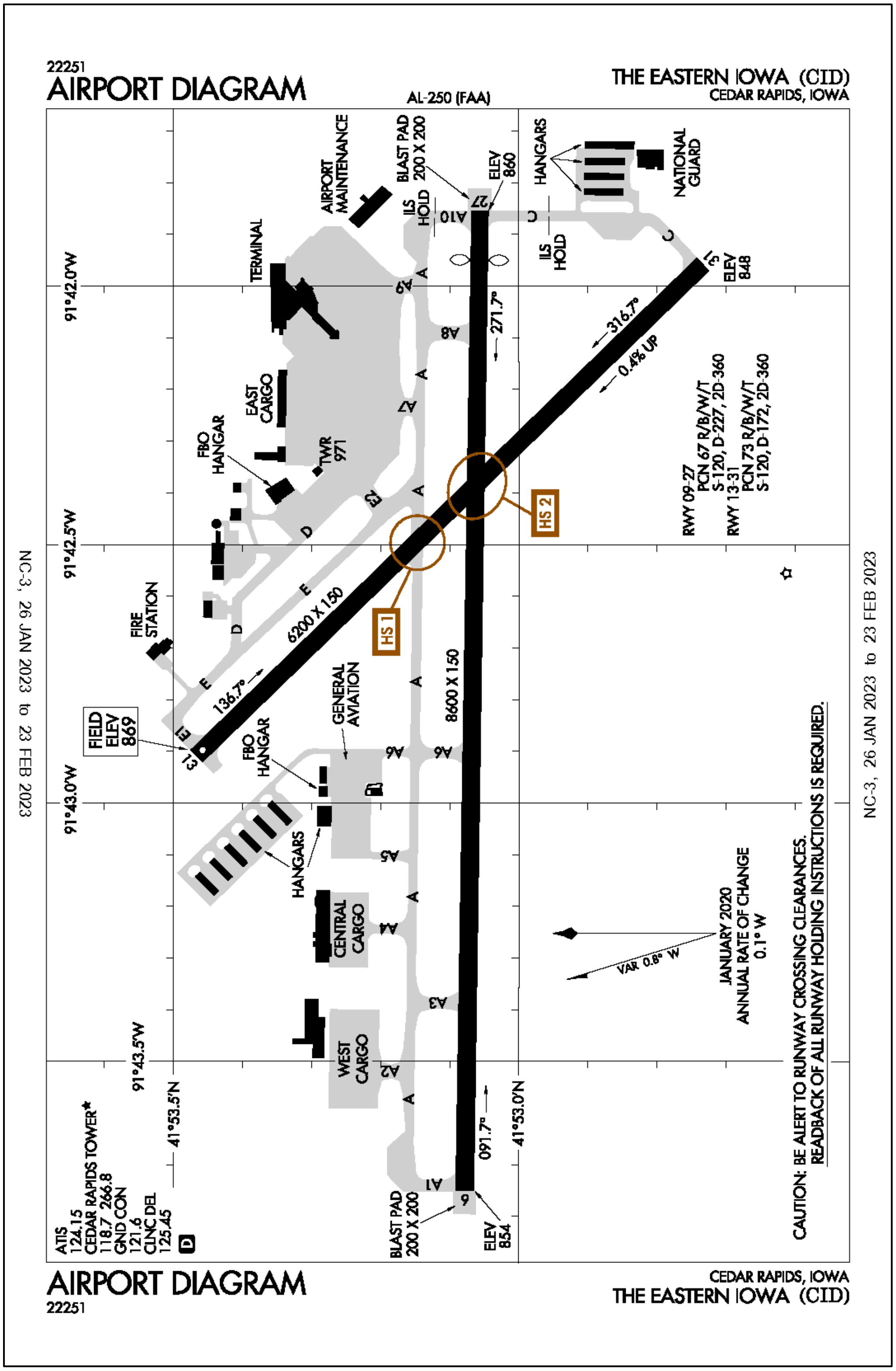


Figure 2-1. Existing CID Airport Layout

Source: FAA https://aeronav.faa.gov/d-tpp/2301/00250ad.pdf#nameddest=(CID), accessed 2/9/2023

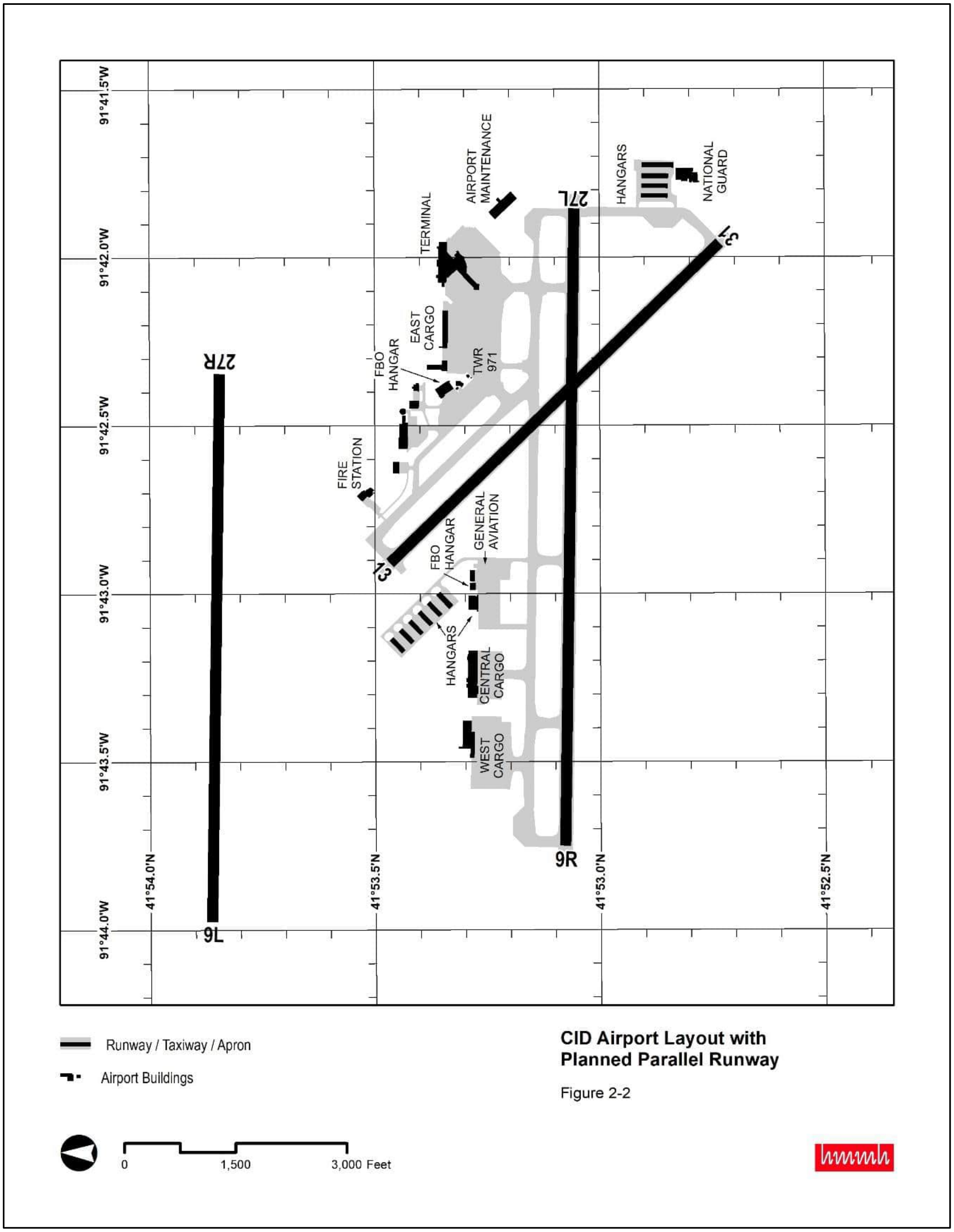


Figure 2-2. CID Airport Layout with Planned Parallel Runway

Source: HMMH, 2022

2.2 Aircraft Noise and Performance Characteristics

AEDT requires the use of specific noise and performance data for each aircraft type operating at the airport. Noise data represents Sound Exposure Level (SEL) at a range of distances (from 200 feet to 25,000 feet) from a particular aircraft with engines at a range of thrust levels. Performance data includes thrust, speed, and altitude profiles for takeoff and landing operations. The AEDT database contains standard noise and performance data for over 300 different fixed-wing aircraft types, most of which are civilian aircraft.

Within the AEDT database, it is standard for aircraft takeoff or departure profiles to be defined by a range of trip distances identified as "stage lengths." Higher stage lengths (longer trip distances) are associated with a heavier aircraft due to the increase in fuel requirements for the flight. For the CID Master Plan, stage lengths are defined using city pair distances, determined by the great-circle distance from the originating airport to the planned arrival city.

Aside from identifying the aircraft type in the database, AEDT has STANDARD and International Civil Aviation Organization (ICAO) aircraft flight profiles for takeoffs, landings, and flight patterns or touch-and-go operations. HMMH used STANDARD profiles for all civilian aircraft types and military aircraft types in the existing and future scenarios.

2.3 Annual Aircraft Operations

The FAA organizes aircraft operations into categories per FAA Order 7210.3 "Facility Operation and Administration"; namely Air Carrier (AC), Air Taxi (AT), General Aviation (GA), and Military (ML). AC and AT are commercial categories distinguished by aircraft capacity, while GA includes all non-commercial, non-military operations.

The existing conditions scenario in this Master Plan represents calendar year 2021. HMMH obtained flight track and aircraft identification data from Envirosuite. This data was used to develop the existing fleet mix and day/night operations and modeled flight tracks. The data was then scaled for the five-year, ten-year, fifteen-year, and twenty-year operational counts for 2026, 2031, 2036, and 2041 from the CID Master Plan Working Paper 2: Aviation Forecasts, published April 2022, as shown in **Table 2-3**.

Table 2-3. Operation Counts by Master Plan Category

Source: CID Master Plan Working Paper 2: Aviation Forecast, 2022

Year	Commercial	Cargo	General Aviation	Military	Total
2021	18,544	4,049	20,860	267	43,720
2026	20,600	4,000	26,050	267	50,917
2031	22,100	4,000	26,650	267	53,017
2036	24,400	4,200	27,250	267	56,117
2041	27,000	4,075	27,850	267	59,192
Note: Totals may not match exactly due to rounding					

The aircraft operations data entered into AEDT includes the number of day and night arrivals, departures, and pattern (circuit) operations. Pattern (circuit) operations are local pattern operations modeled on closed-circuit flight paths, which are flight tracks that depart and turn into a downwind pattern before landing back on the same runway. It should be noted that a "local" operation departs and lands at CID rather than going to or arriving from another airport, but a local operation is not necessarily a closed-circuit flight path. Any aircraft that arrives and departs from the same airport but uses a different runway end or flies a different path than a unidirectional turn would be considered a "local" operation, but not a closed-circuit flight path. For the purposes of this analysis, all local civil operations are modeled as circuits, and local military operations are modeled as arrival and departure operations.

For noise modeling purposes, itinerant operations listed in the Master Plan forecast were divided equally into arrivals and departures, while local operations were represented as closed patterns, or circuits. The fleet mix was derived using existing aircraft operations at CID; it includes itinerant commercial passenger, cargo, general aviation, and military, as well as local general aviation operations. **Table 2-4** and **Table 2-5** list the modeled annual arrival, departure, circuit, and overall operations by category and aircraft type for itinerant and local operations at CID for the Existing Condition (2021). **Table 2-6** and **Table 2-7** list the modeled operations for the 20-Year Forecast Condition (2041) and **Table 2-8** and **Table 2-9** list the modeled operations for the Forecast Condition with a Parallel Runway.

The modeled operations on the Parallel Runway (Runway 9R/27L) are the same as the operations on Runway 9/27 in the 20-Year Forecast Condition (2041). For this modeled scenario both runways (9R/27L and 9/27) have equal operations, which results in 106,578 operations for the Forecast Condition with a Parallel Runway as compared to the 20-Year Forecast Condition (2041) that has 59,192 operations. Additional information on runway utilization rates is provided in Section 2.4

Due to the low operational levels of military aircraft, these operations were distributed into the commercial passenger and general aviation categories. Data from the FAA's Traffic Flow Management System Counts (TFMSC) was analyzed in order to determine the number and type of military aircraft operating at CID. TFMSC operations were assigned to commercial or general aviation based on the size and type of the aircraft being flown, and the relative percentage of the military operations from the master plan were then distributed to these categories.

Table 2-4. Modeled Existing Condition (2021) Annual Itinerant Operations

Sources: HMMH 2022, CID Master Plan Aviation Forecast, FAA OPSNET, Envirosuite

Category	Propulsion Class	AEDT Aircraft Type	Arrivals			Departures			Total
			Day	Night	Total	Day	Night	Total	
Cargo	Jet	727EM2	34	12	47	18	29	47	93
		737400	391	59	450	186	265	450	900
		757PW	40	319	359	111	248	359	718
		757RR	41	359	399	113	286	399	799
		7673ER	246	255	501	13	488	501	1,002
	Turboprop	DHC6	3	49	52	1	51	52	103
		HS748A	214	3	217	7	210	217	434
	Subtotal		**969**	**1,056**	**2,025**	**449**	**1,577**	**2,025**	**4,049**
Commercial	Jet	717200	106	30	136	83	53	136	271
		737800	12	52	64	17	47	64	128
		A319-131	290	60	349	279	71	349	699
		A320-211	374	2	376	351	24	376	752
		A320-232	334	79	413	364	50	413	827
		A320-271N	131	-	131	130	1	131	261
		CL600	2,723	67	2,791	2,441	349	2,791	5,581
		CRJ9-ER	2,901	594	3,495	2,686	808	3,495	6,989
		EMB145	38	9	48	40	8	48	95
		EMB14L	748	12	760	749	11	760	1,519
		EMB170	127	11	139	136	3	139	278
		EMB175	475	143	618	606	12	618	1,236
	Subtotal		**8,259**	**1,059**	**9,320**	**7,882**	**1,437**	**9,320**	**18,636**
General Aviation	Jet	CL600	80	2	82	76	5	82	163
		CL601	123	7	131	105	25	131	261
		CNA510	214	15	229	201	27	229	457
		CNA525C	137	12	149	145	4	149	298
		CNA55B	515	35	550	501	49	550	1,100
		CNA560U	47	4	51	51	-	51	102
		CNA560XL	258	9	267	254	13	267	533
		CNA680	272	6	278	276	2	278	555
		CNA750	252	20	272	259	13	272	544
		ECLIPSE500	205	2	207	200	7	207	414
		GIV	36	2	38	32	6	38	76
		GV	24	-	24	24	-	24	47
		LEAR35	197	12	209	194	15	209	417
		MU3001	107	2	109	107	2	109	218
	Piston Propeller	BEC58P	111	7	118	107	11	118	236
		CNA172	577	28	604	581	24	604	1,208
		CNA182	174	-	174	174	-	174	348
		CNA20T	29	-	29	29	-	29	58
		COMSEP	689	17	706	679	27	706	1,412
		GASEPF	236	8	243	240	4	243	486
		GASEPV	818	26	844	831	13	844	1,687
		PA28	649	33	682	666	16	682	1,364
		PA30	64	-	64	54	9	64	127
	Turboprop	CNA208	254	13	267	249	18	267	533
		DHC6	138	11	149	141	7	149	298
		GASEPV	74	4	78	78	-	78	156
	Subtotal		**6,280**	**275**	**6,554**	**6,254**	**297**	**6,554**	**13,098**
Itinerant Total			**15,508**	**2,390**	**17,899**	**14,585**	**3,311**	**17,899**	**35,783**

Note: Totals may not match exactly due to rounding

Table 2-5. Modeled Existing Condition (2021) Annual Local Operations

Sources: HMMH 2022, CID Master Plan Aviation Forecast, FAA OPSNET, Envirosuite

Category	Propulsion Class	AEDT Aircraft Type	Day	Night	Total
Local General Aviation	**Piston Propeller**	CNA172	1,418	-	1,418
		COMSEP	1,255	-	1,255
		GASEPF	804	-	804
		GASEPV	4,458	-	4,458
Local Total			**7,935**	**-**	**7,935**

Note: Totals may not match exactly due to rounding

Table 2-6. Modeled 20-Year Forecast Condition (2041) Annual Itinerant Operations

Sources: HMMH 2022, CID Master Plan Aviation Forecast, FAA OPSNET, Envirosuite

Category	Propulsion Class	AEDT Aircraft Type	Arrivals			Departures			Total
			Day	Night	Total	Day	Night	Total	
Cargo	**Jet**	737400	469	71	540	223	317	540	**1,080**
		757PW	20	158	177	55	123	177	**355**
		757RR	20	177	197	56	141	197	**395**
		7673ER	413	427	839	22	817	839	**1,679**
		A300-622R	62	22	84	32	52	84	**167**
	Turboprop	HS748A	197	3	200	7	193	200	**399**
	Subtotal		**1,180**	**858**	**2,037**	**394**	**1,644**	**2,038**	**4,075**
Commercial	**Jet**	717200	743	207	950	581	369	950	**1,899**
		737800	73	334	407	110	297	407	**814**
		A319-131	732	150	882	703	179	882	**1,764**
		A320-211	405	2	407	381	26	407	**814**
		A320-232	714	168	882	776	106	882	**1,764**
		A320-271N	1,018	-	1,018	1,010	8	1,018	**2,035**
		CRJ9-ER	3,547	726	4,274	3,285	988	4,274	**8,547**
		EMB170	623	55	678	663	16	678	**1,357**
		EMB175	1,042	315	1,357	1,330	27	1,357	**2,713**
		EMB190	2,578	136	2,713	2,578	136	2,713	**5,427**
	Subtotal		**11,474**	**2,093**	**13,567**	**11,415**	**2,151**	**13,567**	**27,134**
Itinerant General Aviation	**Jet**	CL600	106	2	108	101	7	108	**217**
		CL601	163	10	173	140	34	173	**347**
		CNA510	284	20	303	267	36	303	**607**
		CNA525C	182	15	197	193	5	197	**395**
		CNA55B	683	46	730	665	65	730	**1,459**
		CNA560U	63	5	67	67	-	67	**135**
		CNA560XL	342	12	354	337	17	354	**708**
		CNA680	361	7	368	366	2	368	**737**
		CNA750	334	27	361	344	17	361	**722**
		ECLIPSE500	272	2	274	265	10	274	**549**
		GIV	48	2	51	43	8	51	**101**
		GV	31	-	31	31	-	31	**63**
		LEAR35	261	15	277	257	20	277	**554**
		MU3001	142	2	144	142	2	144	**289**

Category	Propulsion Class	AEDT Aircraft Type	Arrivals			Departures			Total
			Day	Night	Total	Day	Night	Total	
Itinerant General Aviation	Piston Prop	BEC58P	147	10	156	142	14	156	**313**
		CNA172	765	37	802	770	31	802	**1,604**
		CNA182	231	-	231	231	-	231	**462**
		CNA20T	39	-	39	39	-	39	**77**
		COMSEP	914	23	937	900	36	937	**1,873**
		GASEPF	313	10	323	318	5	323	**645**
		GASEPV	1,085	34	1,120	1,103	17	1,120	**2,239**
		PA28	861	44	905	884	22	905	**1,811**
		PA30	84	-	84	72	12	84	**169**
	Turboprop	CNA208	337	17	354	330	24	354	**708**
		DHC6	183	15	197	188	10	197	**395**
		GASEPV	99	5	104	104	-	104	**207**
	Subtotal		**8,330**	**362**	**8,692**	**8,298**	**393**	**8,692**	**17,383**
Itinerant Total			**20,984**	**3,312**	**24,296**	**20,108**	**4,188**	**24,296**	**48,592**
Note: Totals may not match exactly due to rounding									

Table 2-7. Modeled 20-Year Forecast Condition (2041) Annual Local Operations

Sources: HMMH 2022, CID Master Plan Aviation Forecast, FAA OPSNET, Envirosuite

Category	Propulsion Class	AEDT Aircraft Type	Day	Night	Total
Local General Aviation	**Piston Propeller**	CNA172	1,894	-	1,894
		COMSEP	1,677	-	1,677
		GASEPF	1,074	-	1,074
		GASEPV	5,955	-	5,955
Local Total			**10,600**	**-**	**10,600**
Note: Totals may not match exactly due to rounding					

Table 2-8. Modeled Forecast Condition with a Parallel Runway Annual Itinerant Operations

Sources: HMMH 2022, CID Master Plan Aviation Forecast, FAA OPSNET, Envirosuite

Category	Propulsion Class	AEDT Aircraft Type	Arrivals			Departures			Total
			Day	Night	Total	Day	Night	Total	
Cargo	Jet	737400	907	140	1,048	430	628	1,057	**2,105**
		757PW	38	312	350	106	242	348	**698**
		757RR	39	351	390	108	280	388	**778**
		7673ER	799	844	1,643	43	1,616	1,659	**3,301**
		A300-622R	119	43	163	61	103	164	**326**
	Turboprop	HS748A	358	5	363	11	378	389	**753**
	Subtotal		**2,261**	**1,695**	**3,956**	**759**	**3,246**	**4,005**	**7,961**
Commercial	Jet	717200	1,418	405	1,824	1,116	729	1,846	**3,669**
		737800	140	654	794	211	588	799	**1,594**
		A319-131	1,397	295	1,691	1,350	354	1,704	**3,395**
		A320-211	773	4	777	731	52	783	**1,560**
		A320-232	1,362	330	1,692	1,490	210	1,700	**3,392**
		A320-271N	1,942	-	1,942	1,939	16	1,955	**3,897**
		CRJ9-ER	6,771	1,425	8,195	6,309	1,956	8,266	**16,461**
		EMB170	1,189	109	1,298	1,273	31	1,304	**2,601**
		EMB175	1,989	617	2,606	2,554	53	2,607	**5,213**
		EMB190	4,920	266	5,186	4,951	269	5,219	**10,405**
	Subtotal		**21,901**	**4,105**	**26,006**	**21,924**	**4,258**	**26,182**	**52,188**

Category	Propulsion Class	AEDT Aircraft Type	Arrivals			Departures			Total
			Day	Night	Total	Day	Night	Total	
Itinerant General Aviation	Jet	CL600	186	4	191	164	11	175	**366**
		CL601	287	18	306	226	53	279	**585**
		CNA510	499	36	535	433	57	490	**1,025**
		CNA525C	320	29	349	312	8	320	**668**
		CNA55B	1,201	86	1,287	1,077	102	1,179	**2,466**
		CNA560U	110	9	119	109	-	109	**228**
		CNA560XL	601	23	623	546	27	573	**1,196**
		CNA680	634	14	648	593	4	597	**1,245**
		CNA750	587	50	638	558	27	584	**1,222**
		ECLIPSE500	478	4	483	429	15	444	**927**
		GIV	85	4	89	70	12	82	**171**
		GV	55	-	55	51	-	51	**106**
		LEAR35	460	29	488	417	31	448	**936**
		MU3001	250	5	254	230	4	234	**488**
	Piston Prop	BEC58P	234	15	249	230	24	255	**504**
		CNA172	1,218	58	1,276	1,250	53	1,303	**2,579**
		CNA182	368	-	368	375	-	375	**743**
		CNA20T	61	-	61	62	-	62	**124**
		COMSEP	1,455	36	1,491	1,461	61	1,522	**3,013**
		GASEPF	498	16	514	516	8	524	**1,037**
		GASEPV	1,728	54	1,782	1,789	29	1,817	**3,600**
		PA28	1,372	69	1,441	1,433	37	1,470	**2,911**
		PA30	134	-	134	117	20	138	**272**
	Turboprop	CNA208	582	29	611	547	41	589	**1,199**
		DHC6	316	24	340	311	17	328	**669**
		GASEPV	171	8	179	172	-	172	**350**
	Subtotal		**13,889**	**622**	**14,511**	**13,478**	**640**	**14,118**	**28,630**
Itinerant Total			**38,051**	**6,422**	**44,473**	**36,161**	**8,144**	**44,305**	**88,779**
Note: Totals may not match exactly due to rounding									

Table 2-9. Modeled Forecast Condition with a Parallel Runway Annual Local Operations

Sources: HMMH 2022, CID Master Plan Aviation Forecast, FAA OPSNET, Envirosuite

Category	Propulsion Class	AEDT Aircraft Type	Day	Night	Total
Local General Aviation	Piston Propellor	CNA172	3,180	-	3,180
		COMSEP	2,816	-	2,816
		GASEPF	1,804	-	1,804
		GASEPV	9,999	-	9,999
Local Total			**17,799**	**-**	**17,799**
Note: Totals may not match exactly due to rounding					

2.4 Runway Utilization Rates

The primary factor affecting runway use at airports is weather, specifically, the wind direction and wind speed. Aircraft typically fly into the wind. Prevailing wind direction and wind speed usually determine the most favorable runway alignment and configuration at an airport. An additional factor that may affect runway use includes the position of the terminal facility or ramp relative to the runway.

HMMH utilized 2021 data obtained from Envirosuite to compile runway use tables and categorized the data by arrival, departure, or circuits, as well as day and night split. HMMH separated the data by category as well as engine type (i.e. jet, piston prop, turboprop) since these categories of aircraft types may use the runways differently. **Table 2-10** presents the runway utilization rates used to model the aircraft noise contours for the Existing Condition (2021), **Table 2-11** presents the runway utilization rates used for the 20-Year Forecast Condition (2041), and **Table 2-12** presents the runway utilization rates used for the Forecast Condition with a Parallel Runway.

Table 2-10. Existing Condition (2021) Runway Utilization for Fixed-Wing Aircraft

Source: HMMH 2022, Envirosuite, FAA OPSNET

Category	Propulsion Class	Operation Mode	Day					Night				
			9	13	27	31	Total	9	13	27	31	Total
Cargo	Jet	Arrivals	47%	3%	46%	3%	**100%**	27%	1%	71%	1%	**100%**
		Departures	48%	4%	45%	3%	**100%**	51%	2%	46%	0%	**100%**
	Turboprop	Arrivals	37%	8%	45%	10%	**100%**	22%	9%	57%	11%	**100%**
		Departures	30%	15%	45%	10%	**100%**	64%	4%	32%	1%	**100%**
Commercial	Jet	Arrivals	37%	4%	54%	5%	**100%**	51%	2%	45%	2%	**100%**
		Departures	35%	5%	57%	3%	**100%**	30%	1%	68%	1%	**100%**
General Aviation	Jet	Arrivals	35%	11%	41%	13%	**100%**	43%	6%	43%	8%	**100%**
		Departures	19%	30%	43%	8%	**100%**	12%	35%	45%	7%	**100%**
	Piston Propeller	Arrivals	22%	22%	38%	19%	**100%**	24%	33%	34%	9%	**100%**
		Departures	18%	23%	44%	15%	**100%**	23%	20%	46%	11%	**100%**
		Circuits	27%	17%	41%	15%	**100%**	N/A				
	Turboprop	Arrivals	30%	10%	43%	18%	**100%**	61%	17%	6%	17%	**100%**
		Departures	21%	24%	45%	10%	**100%**	17%	28%	56%	0%	**100%**
Note: Totals may not match exactly due to rounding												

Table 2-11. 20-Year Forecast Condition (2041) Runway Utilization for Fixed-Wing Aircraft

Source: HMMH 2022, Envirosuite, FAA OPSNET

Category	Propulsion Class	Operation Type	Day					Night				
			9	13	27	31	Total	9	13	27	31	Total
Cargo	Jet	Arrivals	47%	3%	46%	3%	**100%**	27%	<1%	71%	1%	**100%**
		Departures	48%	4%	45%	3%	**100%**	51%	2%	46%	<1%	**100%**
	Turboprop	Arrivals	37%	8%	45%	10%	**100%**	22%	9%	57%	11%	**100%**
		Departures	30%	15%	45%	10%	**100%**	64%	4%	32%	<1%	**100%**
Commercial	Jet	Arrivals	37%	4%	54%	5%	**100%**	51%	2%	45%	2%	**100%**
		Departures	35%	5%	57%	3%	**100%**	30%	1%	68%	1%	**100%**
General Aviation	Jet	Arrivals	35%	11%	41%	13%	**100%**	43%	6%	43%	8%	**100%**
		Departures	19%	30%	43%	8%	**100%**	12%	35%	45%	7%	**100%**
	Piston Propeller	Arrivals	22%	22%	38%	19%	**100%**	24%	33%	34%	9%	**100%**
		Departures	18%	23%	44%	15%	**100%**	23%	20%	46%	11%	**100%**
		Circuits	27%	17%	41%	15%	**100%**	N/A				
	Turboprop	Arrivals	30%	10%	43%	18%	**100%**	61%	17%	6%	17%	**100%**
		Departures	21%	24%	45%	10%	**100%**	17%	28%	56%	0%	**100%**
Note: Totals may not match exactly due to rounding												

Table 2-12. Forecast Condition with a Parallel Runway Runway Utilization for Fixed-Wing Aircraft

Source: HMMH 2022, Envirosuite, FAA OPSNET

Category	Propulsion Class	Operation Type	Percent (%) Day							Percent (%) Night						
			9L	9R	13	27L	27R	31	Total	9L	9R	13	27L	27R	31	Total
Cargo	Jet	Arrivals	24	24	2	24	24	2	**100**	14	14	<1	36	36	<1	**100**
		Departures	25	25	2	23	23	1	**100**	26	26	<1	23	23	<1	**100**
	Turboprop	Arrivals	20	20	4	25	25	5	**100**	12	12	5	32	32	6	**100**
		Departures	17	17	9	26	26	6	**100**	33	33	2	16	16	<1	**100**
Commercial	Jet	Arrivals	19	19	2	28	28	2	**100**	26	26	1	23	23	<1	**100**
		Departures	18	18	2	30	30	2	**100**	15	15	<1	34	34	<1	**100**
General Aviation	Jet	Arrivals	20	20	6	23	23	7	**100**	23	23	3	23	23	4	**100**
		Departures	12	12	18	27	27	5	**100**	8	8	23	28	28	5	**100**
	Piston Prop	Arrivals	14	14	14	24	24	12	**100**	15	15	21	22	22	6	**100**
		Departures	11	11	14	27	27	9	**100**	14	14	12	27	27	6	**100**
		Circuits	16	16	10	25	25	9	**100**	N/A						
	Turboprop	Arrivals	17	17	6	25	25	10	**100**	37	37	10	3	3	10	**100**
		Departures	13	13	15	27	27	6	**100**	10	10	16	32	32	0	**100**
Note: Totals may not match exactly due to rounding																

2.5 Aircraft Flight Track Geometry and Utilization Rates

The flight tracks for the existing and future scenarios were developed from the Envirosuite data. HMMH used an industry-standard method to develop model tracks that entails analyzing a full year of flight tracks and aircraft identification for CID by splitting the flight tracks into similar and manageable groups. The standard procedure separates tracks by operation type, (i.e. arrival, departure, circuit) and runway end, aircraft type (i.e. jet, piston prop, turboprop, helicopter) and destination/direction. HMMH analyzed flight tracks with the same operation type, runway end, and destination direction for similar geometry and this resulted in the final radar track bundles used to create model tracks. Aircraft departing CID fly to destinations within the United States in all four compass directions. As such, aircraft departing on any of the runways will turn to a given destination: South, West, North, or East. Depending on the final destination of aircraft, flight tracks will share similar geometry. Because of this consistency seen in the data, geometrically similar groups with similar destination dispersions are modeled using a 'backbone' track and one to two 'dispersion' sub tracks on either side of the backbone, for three or five total tracks (e.g. one backbone and two or four sub tracks).

Figure 2-3 through **Figure 2-5** depict all model track bundles for the Existing Condition (2021) and the 20-Year Forecast Condition (2041); the assigned model track percent usage are shown in **Table 2-13** through **Table 2-16**. All model tracks for jet and non-jet aircraft used to model the Forecast Condition with a Parallel Runway are presented in **Figure 2-6** through **Figure 2-8** with the model track percent usage shown in **Table 2-17** and **Table 2-18**. Backbone and dispersion tracks are listed as one master bundle name below.

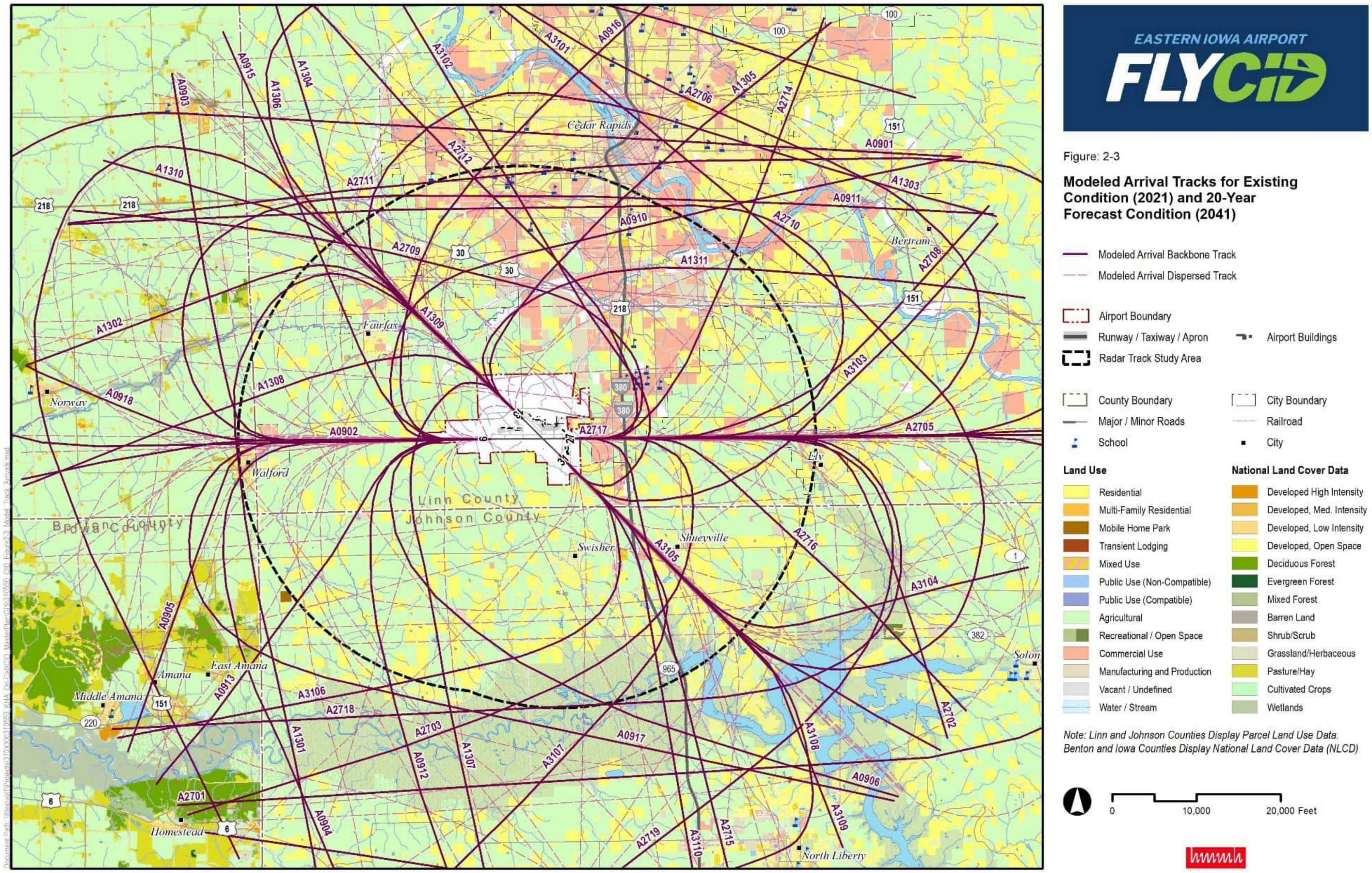


Figure 2-3. Modeled Arrival Tracks for Existing Condition (2021) and 20-Year Forecast Condition (2041)

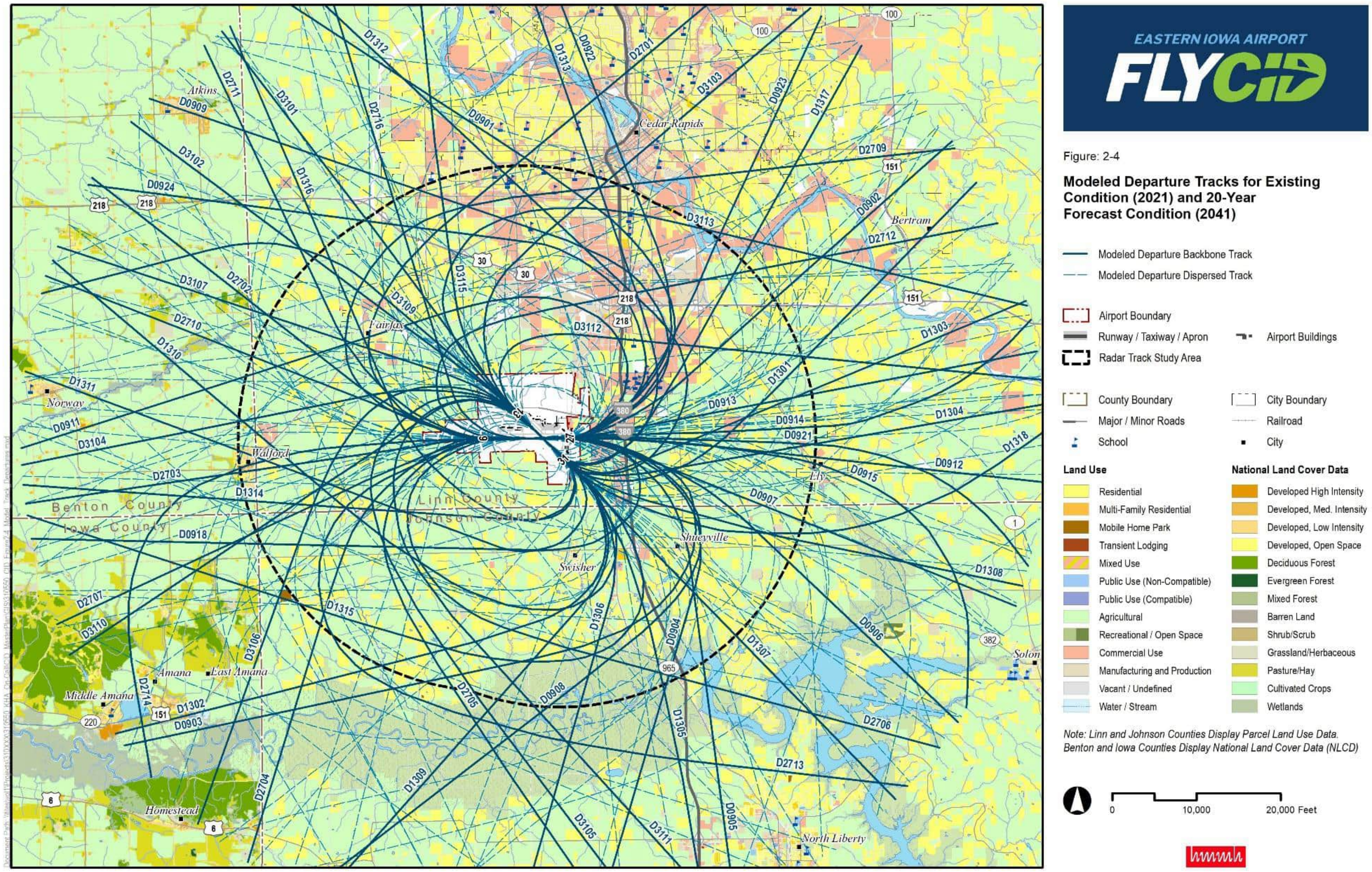


Figure 2-4. Modeled Departure Tracks for Existing Condition (2021) and 20-Year Forecast Condition (2041)

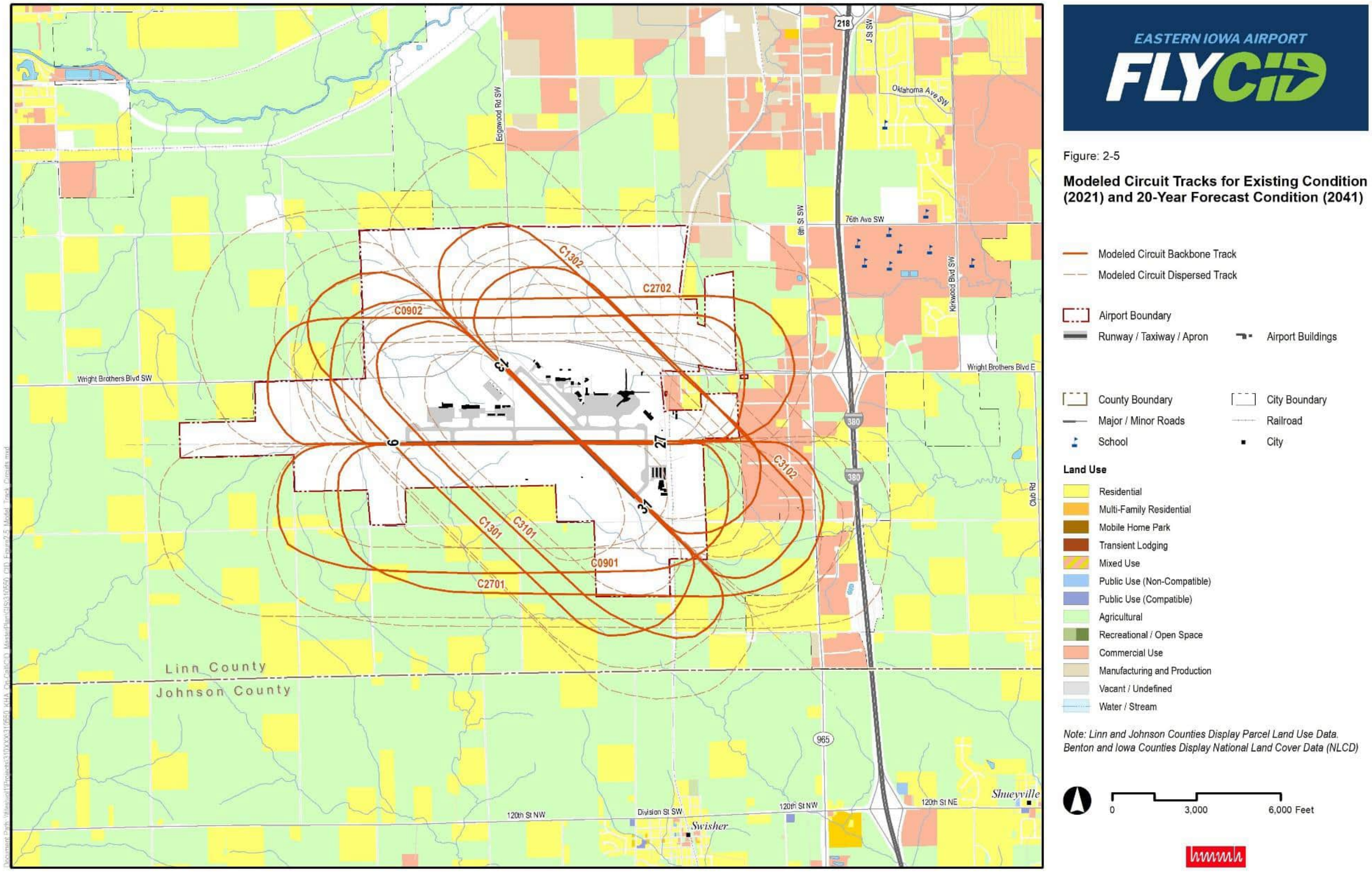


Figure 2-5. Modeled Circuit Tracks for Existing Condition (2021) and 20-Year Forecast Condition (2041)

Table 2-13. Existing Condition (2021) Itinerant Fixed-Wing Model Track Utilization

Source: HMMH 2022, FAA OPSNET, Envirosuite

Operation Mode	Runway	Track Group	Commercial	Cargo		General Aviation		
			Jet	Jet	Turboprop	Jet	Piston	Turboprop
Arrivals	9	A0901	14%	7%	30%	14%	14%	22%
		A0902	36%	56%	18%	41%	25%	37%
		A0903	7%	<1%	0%	3%	2%	3%
		A0904	4%	8%	0%	3%	<1%	<1%
		A0905	8%	13%	0%	5%	5%	3%
		A0906	<1%	<1%	9%	14%	19%	11%
		A0910	<1%	0%	3%	4%	8%	3%
		A0911	16%	2%	0%	3%	1%	2%
		A0912	<1%	<1%	1%	1%	4%	4%
		A0913	0%	<1%	0%	<1%	8%	<1%
		A0915	0%	0%	2%	<1%	6%	4%
		A0916	0%	0%	9%	1%	2%	4%
		A0917	13%	12%	26%	8%	3%	3%
		A0918	1%	<1%	1%	<1%	<1%	2%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
	13	A1301	13%	7%	0%	7%	2%	3%
		A1302	10%	7%	0%	9%	5%	3%
		A1303	30%	27%	34%	8%	2%	9%
		A1304	15%	0%	0%	10%	27%	27%
		A1305	0%	0%	5%	7%	20%	9%
		A1306	12%	21%	20%	7%	4%	11%
		A1307	0%	0%	0%	11%	11%	12%
		A1308	1%	0%	0%	7%	7%	6%
		A1309	8%	12%	0%	3%	2%	0%
		A1310	10%	23%	7%	10%	6%	6%
		A1311	1%	3%	34%	23%	16%	12%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
	27	A2701	11%	9%	2%	9%	7%	9%
		A2702	8%	15%	<1%	11%	2%	3%
		A2703	2%	<1%	2%	16%	18%	20%
		A2705	46%	60%	70%	37%	22%	19%
		A2706	12%	<1%	0%	5%	6%	7%
		A2708	<1%	0%	9%	6%	13%	14%
		A2709	<1%	0%	4%	2%	4%	7%
		A2710	<1%	<1%	5%	2%	<1%	<1%
		A2711	<1%	<1%	2%	1%	<1%	<1%
		A2712	<1%	0%	0%	2%	13%	5%
		A2714	<1%	0%	4%	<1%	5%	0%
		A2715	0%	0%	0%	<1%	4%	<1%
		A2716	<1%	0%	0%	1%	2%	0%
		A2717	<1%	0%	3%	3%	1%	5%
		A2718	11%	11%	0%	3%	1%	2%
		A2719	9%	4%	0%	3%	1%	6%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Operation Mode	Runway	Track Group	Commercial	Cargo		General Aviation		
			Jet	Jet	Turboprop	Jet	Piston	Turboprop
Arrivals	31	A3101	9%	0%	0%	<1%	2%	4%
		A3102	<1%	0%	0%	1%	12%	2%
		A3103	1%	3%	5%	5%	11%	7%
		A3104	22%	0%	14%	10%	8%	14%
		A3105	17%	60%	73%	13%	7%	5%
		A3106	7%	3%	0%	12%	21%	16%
		A3107	9%	11%	0%	15%	9%	12%
		A3108	14%	3%	0%	8%	4%	7%
		A3109	20%	20%	8%	34%	15%	28%
		A3110	0%	0%	0%	2%	11%	5%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Departures	9	D0901	11%	2%	1%	6%	11%	4%
		D0902	31%	16%	<1%	6%	16%	19%
		D0903	17%	14%	7%	16%	9%	12%
		D0904	12%	12%	0%	8%	9%	15%
		D0905	7%	36%	3%	12%	9%	10%
		D0906	12%	5%	1%	10%	5%	1%
		D0907	1%	2%	78%	5%	6%	1%
		D0908	<1%	<1%	0%	2%	2%	3%
		D0909	<1%	<1%	0%	3%	<1%	3%
		D0911	<1%	1%	1%	0%	<1%	0%
		D0912	1%	4%	7%	14%	8%	10%
		D0913	<1%	3%	0%	9%	4%	3%
		D0914	<1%	<1%	0%	<1%	<1%	0%
		D0915	<1%	1%	0%	0%	0%	0%
		D0918	<1%	<1%	0%	<1%	3%	0%
		D0921	<1%	1%	0%	2%	<1%	0%
		D0922	<1%	<1%	<1%	2%	8%	11%
		D0923	2%	<1%	0%	<1%	6%	3%
		D0924	<1%	<1%	0%	3%	2%	4%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
	13	D1301	30%	0%	4%	7%	9%	10%
		D1302	16%	8%	37%	15%	14%	17%
		D1303	0%	0%	0%	3%	3%	0%
		D1304	<1%	0%	0%	7%	3%	2%
		D1305	13%	38%	0%	11%	12%	11%
		D1306	9%	29%	0%	5%	5%	5%
		D1307	9%	10%	0%	16%	6%	8%
		D1308	3%	15%	59%	16%	14%	17%
		D1309	<1%	0%	0%	4%	4%	6%
		D1310	7%	0%	0%	2%	<1%	2%
		D1311	1%	0%	0%	2%	1%	6%
		D1312	4%	0%	0%	2%	4%	2%
		D1313	0%	0%	0%	2%	3%	2%
		D1314	0%	0%	0%	1%	5%	4%
		D1315	1%	0%	0%	3%	<1%	2%
		D1316	<1%	0%	0%	<1%	3%	5%
		D1317	<1%	0%	0%	3%	12%	0%
		D1318	3%	0%	0%	1%	<1%	0%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Operation Mode	Runway	Track Group	Commercial	Cargo		General Aviation		
			Jet	Jet	Turboprop	Jet	Piston	Turboprop
Departures	27	D2701	30%	6%	<1%	7%	13%	15%
		D2702	13%	1%	0%	3%	1%	4%
		D2703	18%	18%	29%	17%	14%	16%
		D2704	10%	19%	0%	7%	8%	11%
		D2705	17%	34%	5%	21%	14%	8%
		D2706	2%	4%	54%	12%	10%	12%
		D2707	6%	8%	10%	15%	11%	12%
		D2709	<1%	<1%	0%	7%	1%	3%
		D2710	<1%	1%	0%	2%	3%	4%
		D2711	2%	4%	0%	4%	12%	11%
		D2712	<1%	<1%	0%	2%	7%	3%
		D2713	<1%	0%	1%	2%	<1%	0%
		D2714	<1%	3%	0%	1%	<1%	0%
		D2716	0%	0%	0%	<1%	4%	<1%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
	31	D3101	<1%	0%	0%	7%	16%	13%
		D3102	11%	0%	0%	2%	0%	0%
		D3103	32%	0%	14%	10%	22%	10%
		D3104	18%	0%	0%	11%	6%	27%
		D3105	10%	0%	0%	6%	7%	10%
		D3106	10%	70%	71%	10%	4%	13%
		D3107	4%	0%	14%	5%	3%	3%
		D3109	1%	0%	0%	2%	<1%	0%
		D3110	0%	6%	0%	3%	6%	0%
		D3111	4%	12%	0%	3%	6%	3%
		D3112	2%	6%	0%	14%	14%	3%
		D3113	4%	6%	0%	18%	2%	10%
		D3115	2%	0%	0%	7%	12%	7%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Note: Totals may not match exactly due to rounding								

Table 2-14. Existing Condition (2021) Local Fixed-Wing Model Track Utilization

Source: HMMH 2022, FAA OPSNET, Envirosuite

Operation Mode	Runway	Track Group	General Aviation
			Piston
Circuits	9	C0901	43%
		C0902	57%
		Total	**100%**
	13	C1301	29%
		C1302	71%
		Total	**100%**
	27	C2701	72%
		C2702	28%
		Total	**100%**
	31	C3101	75%
		C3102	25%
		Total	**100%**
Note: Totals may not match exactly due to rounding			

Table 2-15. 20-Year Forecast Condition (2041) Itinerant Fixed-Wing Model Track Utilization

Source: HMMH 2022, FAA OPSNET, Envirosuite

Operation Type	Runway	Track Group	Cargo		Commercial	General Aviation		
			Jet	Turboprop	Jet	Jet	Piston Prop	Turboprop
Arrivals	9	A0901	6%	31%	13%	14%	14%	22%
		A0902	58%	21%	37%	41%	25%	37%
		A0903	<1%	0%	7%	3%	2%	3%
		A0904	6%	0%	4%	3%	<1%	<1%
		A0905	15%	0%	8%	5%	5%	3%
		A0906	<1%	10%	<1%	14%	19%	11%
		A0910	0%	<1%	<1%	4%	8%	3%
		A0911	1%	0%	15%	3%	1%	2%
		A0912	<1%	1%	<1%	1%	4%	4%
		A0913	<1%	0%	0%	<1%	8%	<1%
		A0915	0%	1%	0%	<1%	6%	4%
		A0916	0%	4%	0%	1%	2%	4%
		A0917	12%	30%	13%	8%	3%	3%
		A0918	1%	1%	1%	<1%	<1%	2%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
	13	A1301	7%	0%	13%	7%	2%	3%
		A1302	7%	0%	10%	9%	5%	3%
		A1303	26%	36%	30%	8%	2%	9%
		A1304	0%	0%	14%	10%	27%	27%
		A1305	0%	<1%	0%	7%	20%	9%
		A1306	19%	18%	11%	7%	4%	11%
		A1307	0%	0%	0%	11%	11%	12%
		A1308	0%	0%	1%	7%	7%	6%
		A1309	11%	0%	9%	3%	2%	0%
		A1310	26%	9%	10%	10%	6%	6%
		A1311	4%	36%	1%	23%	16%	12%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
	27	A2701	10%	1%	11%	9%	7%	9%
		A2702	14%	1%	8%	11%	2%	3%
		A2703	<1%	1%	2%	16%	18%	20%
		A2705	56%	82%	45%	37%	22%	19%
		A2706	<1%	0%	12%	5%	6%	7%
		A2708	0%	<1%	<1%	6%	13%	14%
		A2709	0%	4%	<1%	2%	4%	7%
		A2710	<1%	6%	<1%	2%	<1%	<1%
		A2711	<1%	2%	<1%	1%	<1%	<1%
		A2712	0%	0%	<1%	2%	13%	5%
		A2714	0%	<1%	<1%	<1%	5%	0%
		A2715	0%	0%	0%	<1%	4%	<1%
		A2716	0%	0%	<1%	1%	2%	0%
		A2717	0%	1%	<1%	3%	1%	5%
		A2718	14%	0%	11%	3%	1%	2%
		A2719	6%	0%	10%	3%	1%	6%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Operation Type	Runway	Track Group	Cargo		Commercial	General Aviation		
			Jet	Turboprop	Jet	Jet	Piston Prop	Turboprop
Arrivals	31	A3101	0%	0%	9%	<1%	2%	4%
		A3102	0%	0%	<1%	1%	12%	2%
		A3103	2%	<1%	1%	5%	11%	7%
		A3104	0%	6%	22%	10%	8%	14%
		A3105	56%	85%	17%	13%	7%	5%
		A3106	3%	0%	8%	12%	21%	16%
		A3107	13%	0%	9%	15%	9%	12%
		A3108	3%	0%	14%	8%	4%	7%
		A3109	23%	9%	20%	34%	15%	28%
		A3110	0%	0%	0%	2%	11%	5%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Departures	9	D0901	3%	1%	11%	6%	11%	4%
		D0902	17%	<1%	31%	6%	16%	19%
		D0903	14%	7%	17%	16%	9%	12%
		D0904	11%	0%	12%	8%	9%	15%
		D0905	35%	3%	7%	12%	9%	10%
		D0906	5%	1%	12%	10%	5%	1%
		D0907	2%	78%	1%	5%	6%	1%
		D0908	<1%	0%	<1%	2%	2%	3%
		D0909	<1%	0%	<1%	3%	<1%	3%
		D0911	1%	1%	<1%	0%	<1%	0%
		D0912	4%	7%	1%	14%	8%	10%
		D0913	3%	0%	<1%	9%	4%	3%
		D0914	<1%	0%	<1%	<1%	<1%	0%
		D0915	1%	0%	<1%	0%	0%	0%
		D0918	<1%	0%	<1%	<1%	3%	0%
		D0921	1%	0%	<1%	2%	<1%	0%
		D0922	<1%	<1%	<1%	2%	8%	11%
		D0923	<1%	0%	2%	<1%	6%	3%
		D0924	<1%	0%	<1%	3%	2%	4%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
	13	D1301	0%	4%	30%	7%	9%	10%
		D1302	8%	37%	16%	15%	14%	17%
		D1303	0%	0%	0%	3%	3%	0%
		D1304	0%	0%	<1%	7%	3%	2%
		D1305	38%	0%	13%	11%	12%	11%
		D1306	26%	0%	9%	5%	5%	5%
		D1307	11%	0%	9%	16%	6%	8%
		D1308	16%	59%	3%	16%	14%	17%
		D1309	0%	0%	<1%	4%	4%	6%
		D1310	0%	0%	7%	2%	<1%	2%
		D1311	0%	0%	1%	2%	1%	6%
		D1312	0%	0%	4%	2%	4%	2%
		D1313	0%	0%	0%	2%	3%	2%
		D1314	0%	0%	0%	1%	5%	4%
		D1315	0%	0%	1%	3%	<1%	2%
		D1316	0%	0%	<1%	<1%	3%	5%
		D1317	0%	0%	<1%	3%	12%	0%
		D1318	0%	0%	3%	1%	<1%	0%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Operation Type	Runway	Track Group	Cargo		Commercial	General Aviation		
			Jet	Turboprop	Jet	Jet	Piston Prop	Turboprop
Departures	27	D2701	6%	<1%	30%	7%	13%	15%
		D2702	1%	0%	13%	3%	1%	4%
		D2703	19%	29%	18%	17%	14%	16%
		D2704	17%	0%	10%	7%	8%	11%
		D2705	34%	5%	17%	21%	14%	8%
		D2706	5%	54%	2%	12%	10%	12%
		D2707	9%	10%	6%	15%	11%	12%
		D2709	<1%	0%	<1%	7%	1%	3%
		D2710	1%	0%	<1%	2%	3%	4%
		D2711	4%	0%	2%	4%	12%	11%
		D2712	<1%	0%	<1%	2%	7%	3%
		D2713	0%	1%	<1%	2%	<1%	0%
		D2714	2%	0%	<1%	1%	<1%	0%
		D2716	0%	0%	0%	<1%	4%	<1%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
	31	D3101	0%	0%	<1%	7%	16%	13%
		D3102	0%	0%	11%	2%	0%	0%
		D3103	0%	15%	32%	10%	22%	10%
		D3104	0%	0%	18%	11%	6%	27%
		D3105	0%	0%	10%	6%	7%	10%
		D3106	67%	70%	10%	10%	4%	13%
		D3107	0%	15%	4%	5%	3%	3%
		D3109	0%	0%	1%	2%	<1%	0%
		D3110	7%	0%	0%	3%	6%	0%
		D3111	14%	0%	4%	3%	6%	3%
		D3112	5%	0%	2%	14%	14%	3%
		D3113	7%	0%	4%	18%	2%	10%
		D3115	0%	0%	2%	7%	12%	7%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Note: Totals may not match exactly due to rounding

Table 2-16. 20-Year Forecast Condition (2041) Local Fixed-Wing Model Track Utilization

Source: HMMH 2022, FAA OPSNET, Envirosuite

Operation Type	Runway	Track Group	General Aviation
			Piston
Circuits	9	C0901	43%
		C0902	57%
		Total	**100%**
	13	C1301	29%
		C1302	71%
		Total	**100%**
	27	C2701	72%
		C2702	28%
		Total	**100%**
	31	C3101	75%
		C3102	25%
		Total	**100%**

Note: Totals may not match exactly due to rounding

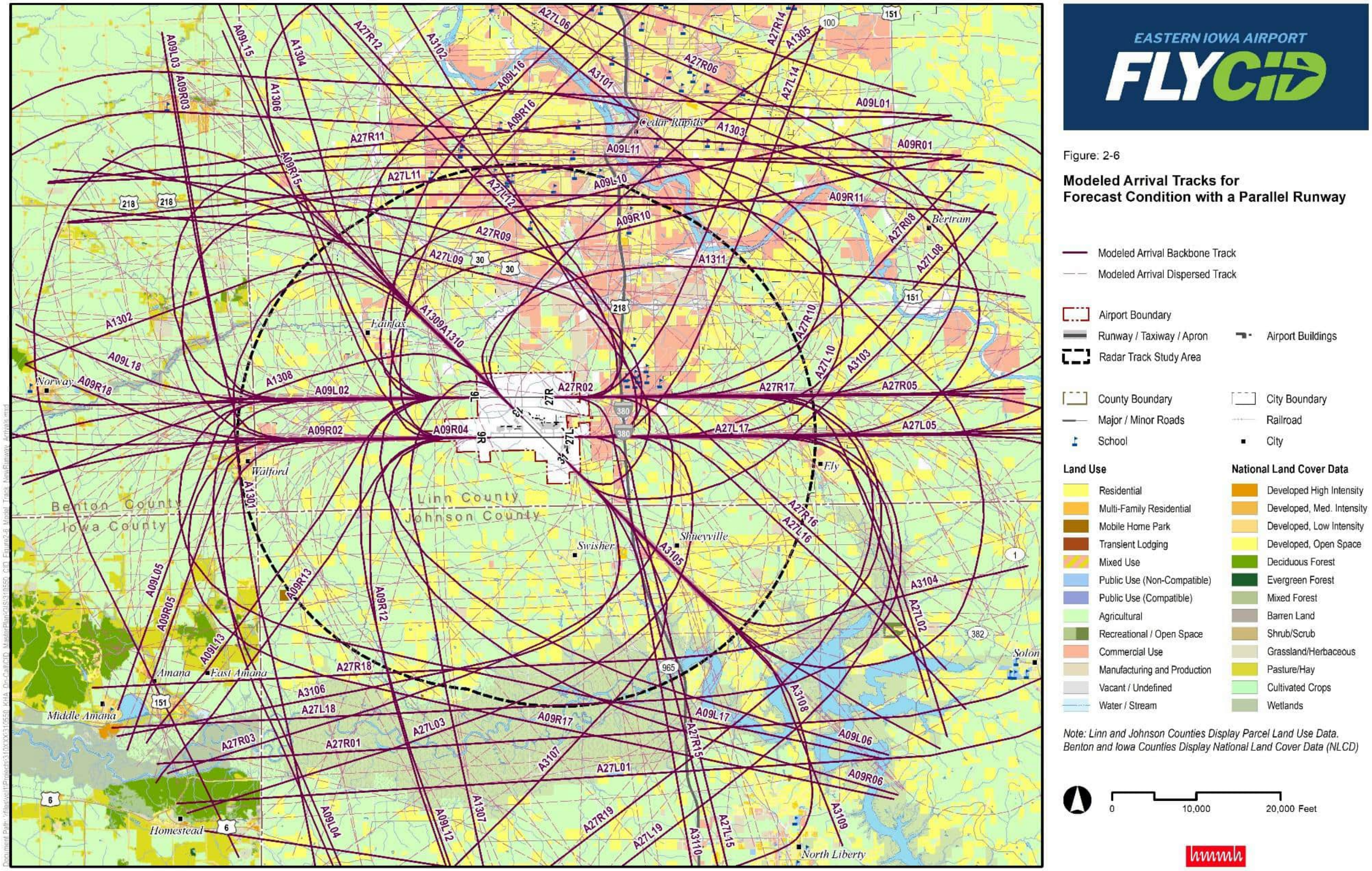


Figure 2-6. Modeled Arrival Tracks for Forecast Condition with a Parallel Runway

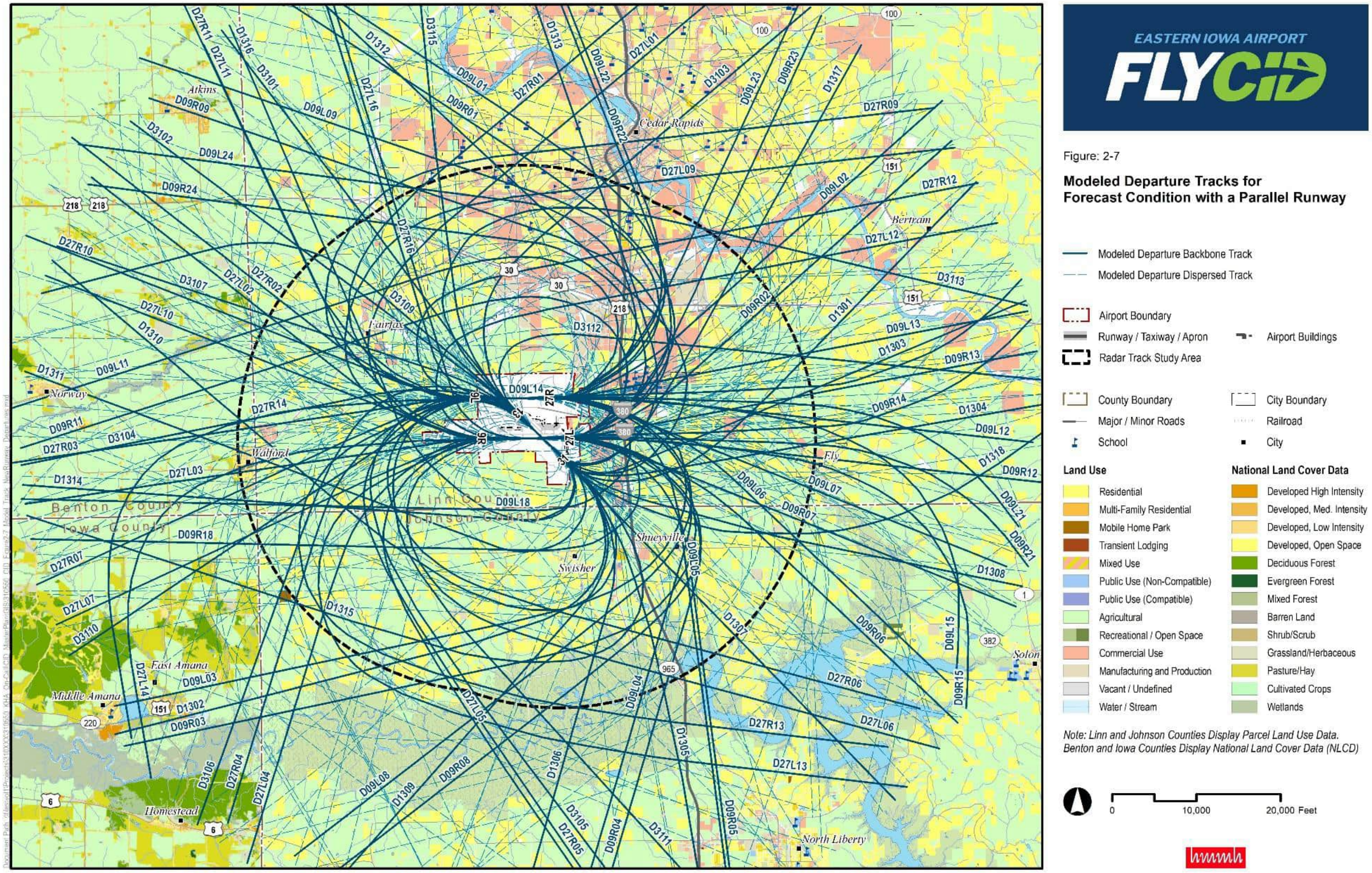


Figure 2-7. Modeled Departure Tracks for Forecast Condition with a Parallel Runway

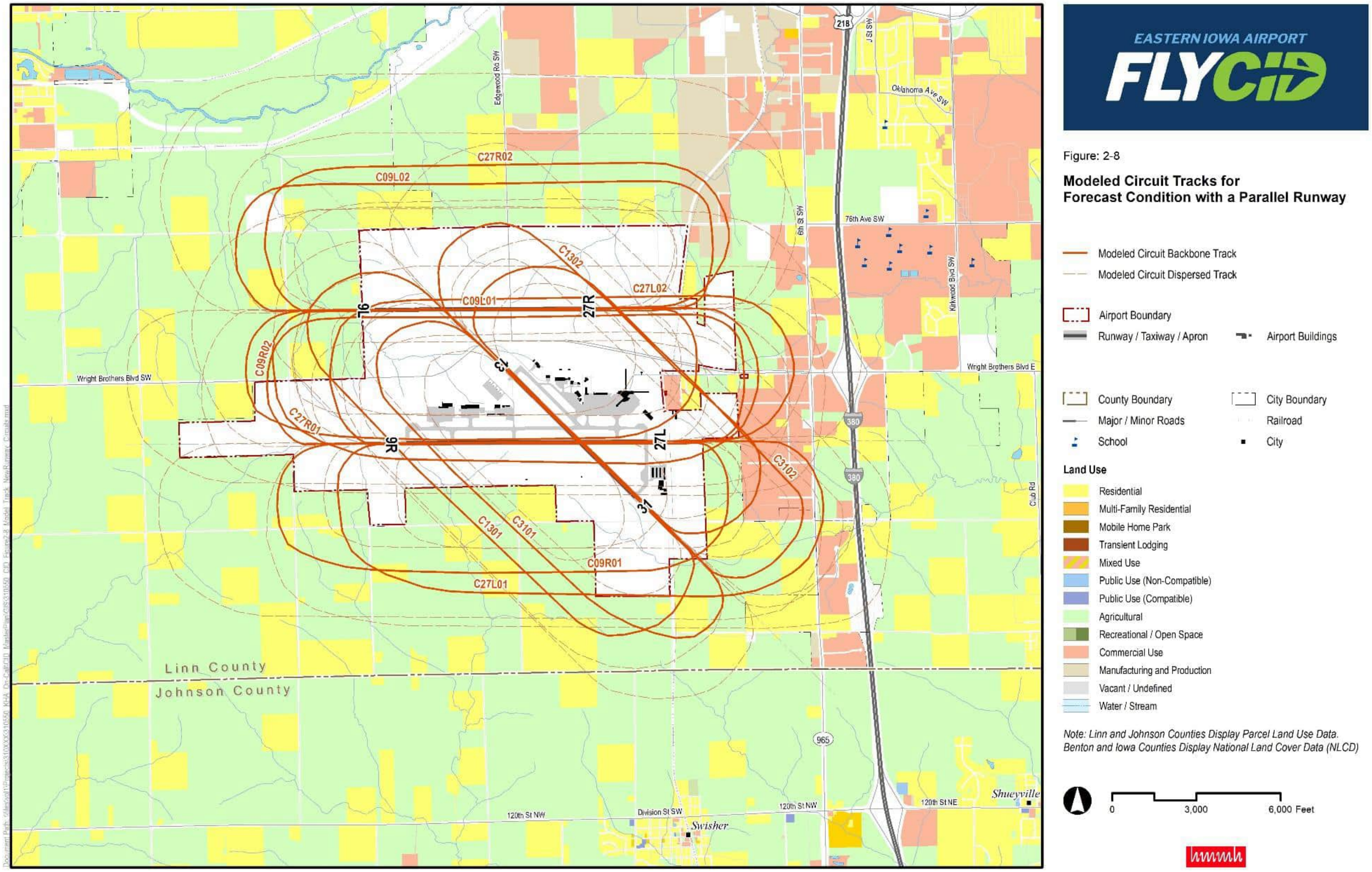


Figure 2-8. Modeled Circuit Tracks for Forecast Condition with a Parallel Runway

Table 2-17. Forecast Condition with a Parallel Runway Itinerant Fixed-Wing Model Track Utilization

Source: HMMH 2022, FAA OPSNET, Envirosuite

Operation Type	Runway	Track Group	Cargo		Commercial	General Aviation		
			Jet	Turboprop	Jet	Jet	Piston Prop	Turboprop
Arrivals	9L	A09L01	6%	31%	13%	14%	14%	22%
		A09L02	58%	21%	37%	41%	25%	37%
		A09L03	<1%	0%	7%	3%	2%	3%
		A09L04	6%	0%	4%	3%	<1%	<1%
		A09L05	15%	0%	8%	5%	5%	3%
		A09L06	<1%	10%	<1%	14%	19%	11%
		A09L10	0%	<1%	<1%	4%	8%	3%
		A09L11	1%	0%	15%	3%	1%	2%
		A09L12	<1%	1%	<1%	1%	4%	4%
		A09L13	<1%	0%	0%	<1%	8%	<1%
		A09L15	0%	1%	0%	<1%	6%	4%
		A09L16	0%	4%	0%	1%	2%	4%
		A09L17	12%	30%	13%	8%	3%	3%
		A09L18	1%	1%	1%	<1%	<1%	2%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
	9R	A09R01	6%	31%	13%	14%	14%	22%
		A09R02	58%	21%	37%	41%	25%	37%
		A09R03	<1%	0%	7%	3%	2%	3%
		A09R04	6%	0%	4%	3%	<1%	<1%
		A09R05	15%	0%	8%	5%	5%	3%
		A09R06	<1%	10%	<1%	14%	19%	11%
		A09R10	0%	<1%	<1%	4%	8%	3%
		A09R11	1%	0%	15%	3%	1%	2%
		A09R12	<1%	1%	<1%	1%	4%	4%
		A09R13	<1%	0%	0%	<1%	8%	<1%
		A09R15	0%	1%	0%	<1%	6%	4%
		A09R16	0%	4%	0%	1%	2%	4%
		A09R17	12%	30%	13%	8%	3%	3%
		A09R18	1%	1%	1%	<1%	<1%	2%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
	13	A1301	7%	0%	13%	7%	2%	3%
		A1302	7%	0%	10%	9%	5%	3%
		A1303	26%	36%	30%	8%	2%	9%
		A1304	0%	0%	14%	10%	27%	27%
		A1305	0%	<1%	0%	7%	20%	9%
		A1306	19%	18%	11%	7%	4%	11%
		A1307	0%	0%	0%	11%	11%	12%
		A1308	0%	0%	1%	7%	7%	6%
		A1309	11%	0%	9%	3%	2%	0%
		A1310	26%	9%	10%	10%	6%	6%
		A1311	4%	36%	1%	23%	16%	12%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Operation Type	Runway	Track Group	Cargo		Commercial	General Aviation		
			Jet	Turboprop	Jet	Jet	Piston Prop	Turboprop
Arrivals	27L	A27L01	10%	1%	11%	9%	7%	9%
		A27L02	14%	1%	8%	11%	2%	3%
		A27L03	<1%	1%	2%	16%	18%	20%
		A27L05	56%	82%	45%	37%	22%	19%
		A27L06	<1%	0%	12%	5%	6%	7%
		A27L08	0%	<1%	<1%	6%	13%	14%
		A27L09	0%	4%	<1%	2%	4%	7%
		A27L10	<1%	6%	<1%	2%	<1%	<1%
		A27L11	<1%	2%	<1%	1%	<1%	<1%
		A27L12	0%	0%	<1%	2%	13%	5%
		A27L14	0%	<1%	<1%	<1%	5%	0%
		A27L15	0%	0%	0%	<1%	4%	<1%
		A27L16	0%	0%	<1%	1%	2%	0%
		A27L17	0%	1%	<1%	3%	1%	5%
		A27L18	14%	0%	11%	3%	1%	2%
		A27L19	6%	0%	10%	3%	1%	6%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
	27R	A27R01	10%	1%	11%	9%	7%	9%
		A27R02	14%	1%	8%	11%	2%	3%
		A27R03	<1%	1%	2%	16%	18%	20%
		A27R05	56%	82%	45%	37%	22%	19%
		A27R06	<1%	0%	12%	5%	6%	7%
		A27R08	0%	<1%	<1%	6%	13%	14%
		A27R09	0%	4%	<1%	2%	4%	7%
		A27R10	<1%	6%	<1%	2%	<1%	<1%
		A27R11	<1%	2%	<1%	1%	<1%	<1%
		A27R12	0%	0%	<1%	2%	13%	5%
		A27R14	0%	<1%	<1%	<1%	5%	0%
		A27R15	0%	0%	0%	<1%	4%	<1%
		A27R16	0%	0%	<1%	1%	2%	0%
		A27R17	0%	1%	<1%	3%	1%	5%
		A27R18	14%	0%	11%	3%	1%	2%
		A27R19	6%	0%	10%	3%	1%	6%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
	31	A3101	0%	0%	9%	<1%	2%	4%
		A3102	0%	0%	<1%	1%	12%	2%
		A3103	2%	<1%	1%	5%	11%	7%
		A3104	0%	6%	22%	10%	8%	14%
		A3105	56%	85%	17%	13%	7%	5%
		A3106	3%	0%	8%	12%	21%	16%
		A3107	13%	0%	9%	15%	9%	12%
		A3108	3%	0%	14%	8%	4%	7%
		A3109	23%	9%	20%	34%	15%	28%
		A3110	0%	0%	0%	2%	11%	5%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Operation Type	Runway	Track Group	Cargo		Commercial	General Aviation		
			Jet	Turboprop	Jet	Jet	Piston Prop	Turboprop
Departures	9L	D09L01	3%	1%	11%	6%	11%	4%
		D09L02	17%	<1%	31%	6%	16%	19%
		D09L03	14%	7%	17%	16%	9%	12%
		D09L04	11%	0%	12%	8%	9%	15%
		D09L05	35%	3%	7%	12%	9%	10%
		D09L06	5%	1%	12%	10%	5%	1%
		D09L07	2%	78%	1%	5%	6%	1%
		D09L08	<1%	0%	<1%	2%	2%	3%
		D09L09	<1%	0%	<1%	3%	<1%	3%
		D09L11	1%	1%	<1%	0%	<1%	0%
		D09L12	4%	7%	1%	14%	8%	10%
		D09L13	3%	0%	<1%	9%	4%	3%
		D09L14	<1%	0%	<1%	<1%	<1%	0%
		D09L15	1%	0%	<1%	0%	0%	0%
		D09L18	<1%	0%	<1%	<1%	3%	0%
		D09L21	1%	0%	<1%	2%	<1%	0%
		D09L22	<1%	<1%	<1%	2%	8%	11%
		D09L23	<1%	0%	2%	<1%	6%	3%
		D09L24	<1%	0%	<1%	3%	2%	4%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
	9R	D09R01	3%	1%	11%	6%	11%	4%
		D09R02	17%	<1%	31%	6%	16%	19%
		D09R03	14%	7%	17%	16%	9%	12%
		D09R04	11%	0%	12%	8%	9%	15%
		D09R05	35%	3%	7%	12%	9%	10%
		D09R06	5%	1%	12%	10%	5%	1%
		D09R07	2%	78%	1%	5%	6%	1%
		D09R08	<1%	0%	<1%	2%	2%	3%
		D09R09	<1%	0%	<1%	3%	<1%	3%
		D09R11	1%	1%	<1%	0%	<1%	0%
		D09R12	4%	7%	1%	14%	8%	10%
		D09R13	3%	0%	<1%	9%	4%	3%
		D09R14	<1%	0%	<1%	<1%	<1%	0%
		D09R15	1%	0%	<1%	0%	0%	0%
		D09R18	<1%	0%	<1%	<1%	3%	0%
		D09R21	1%	0%	<1%	2%	<1%	0%
		D09R22	<1%	<1%	<1%	2%	8%	11%
		D09R23	<1%	0%	2%	<1%	6%	3%
		D09R24	<1%	0%	<1%	3%	2%	4%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
	13	D1301	0%	4%	30%	7%	9%	10%
		D1302	8%	37%	16%	15%	14%	17%
		D1303	0%	0%	0%	3%	3%	0%
		D1304	0%	0%	<1%	7%	3%	2%
		D1305	38%	0%	13%	11%	12%	11%
		D1306	26%	0%	9%	5%	5%	5%
		D1307	11%	0%	9%	16%	6%	8%
		D1308	16%	59%	3%	16%	14%	17%
		D1309	0%	0%	<1%	4%	4%	6%
		D1310	0%	0%	7%	2%	<1%	2%

Operation Type	Runway	Track Group	Cargo		Commercial	General Aviation		
			Jet	Turboprop	Jet	Jet	Piston Prop	Turboprop
Departures	13	D1311	0%	0%	1%	2%	1%	6%
		D1312	0%	0%	4%	2%	4%	2%
		D1313	0%	0%	0%	2%	3%	2%
		D1314	0%	0%	0%	1%	5%	4%
		D1315	0%	0%	1%	3%	<1%	2%
		D1316	0%	0%	<1%	<1%	3%	5%
		D1317	0%	0%	<1%	3%	12%	0%
		D1318	0%	0%	3%	1%	<1%	0%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
	27L	D27L01	6%	<1%	30%	7%	13%	15%
		D27L02	1%	0%	13%	3%	1%	4%
		D27L03	19%	29%	18%	17%	14%	16%
		D27L04	17%	0%	10%	7%	8%	11%
		D27L05	34%	5%	17%	21%	14%	8%
		D27L06	5%	54%	2%	12%	10%	12%
		D27L07	9%	10%	6%	15%	11%	12%
		D27L09	<1%	0%	<1%	7%	1%	3%
		D27L10	1%	0%	<1%	2%	3%	4%
		D27L11	4%	0%	2%	4%	12%	11%
		D27L12	<1%	0%	<1%	2%	7%	3%
		D27L13	0%	1%	<1%	2%	<1%	0%
		D27L14	2%	0%	<1%	1%	<1%	0%
		D27L16	0%	0%	0%	<1%	4%	<1%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
	27R	D27R01	6%	<1%	30%	7%	13%	15%
		D27R02	1%	0%	13%	3%	1%	4%
		D27R03	19%	29%	18%	17%	14%	16%
		D27R04	17%	0%	10%	7%	8%	11%
		D27R05	34%	5%	17%	21%	14%	8%
		D27R06	5%	54%	2%	12%	10%	12%
		D27R07	9%	10%	6%	15%	11%	12%
		D27R09	<1%	0%	<1%	7%	1%	3%
		D27R10	1%	0%	<1%	2%	3%	4%
		D27R11	4%	0%	2%	4%	12%	11%
		D27R12	<1%	0%	<1%	2%	7%	3%
		D27R13	0%	1%	<1%	2%	<1%	0%
		D27R14	2%	0%	<1%	1%	<1%	0%
		D27R16	0%	0%	0%	<1%	4%	<1%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
	31	D3101	0%	0%	<1%	7%	16%	13%
		D3102	0%	0%	11%	2%	0%	0%
		D3103	0%	15%	32%	10%	22%	10%
		D3104	0%	0%	18%	11%	6%	27%
		D3105	0%	0%	10%	6%	7%	10%
		D3106	67%	70%	10%	10%	4%	13%
		D3107	0%	15%	4%	5%	3%	3%
		D3109	0%	0%	1%	2%	<1%	0%
		D3110	7%	0%	0%	3%	6%	0%
		D3111	14%	0%	4%	3%	6%	3%
		D3112	5%	0%	2%	14%	14%	3%
		D3113	7%	0%	4%	18%	2%	10%
		D3115	0%	0%	2%	7%	12%	7%
		Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Note: Totals may not match exactly due to rounding

Table 2-18. Forecast Condition with a Parallel Runway Local Fixed-Wing Model Track Utilization

Source: HMMH 2022, FAA OPSNET, Envirosuite

Operation Type	Runway	Track Group	Percent Use
Circuits	**9L**	C09L01	43%
		C09L02	57%
		Total	**100%**
	9R	C09R01	43%
		C09R02	57%
		Total	**100%**
	13	C1301	18%
		C1302	45%
		Total	**63%**
	27L	C27L01	110%
		C27L02	43%
		Total	**154%**
	27R	C27R01	110%
		C27R02	43%
		Total	**154%**
	31	C3101	43%
		C3102	14%
		Total	**57%**
Note: Totals may not match exactly due to rounding			

2.6 Meteorological Data

The AEDT has several settings that affect aircraft performance profiles and sound propagation based on meteorological data. Meteorological settings include average annual temperature, barometric pressure, and relative humidity at the airport. The AEDT holds the following default values for annual average weather conditions at CID and these values were used for all modeling:

- Temperature: 48.38º F
- Sea-level Pressure: 1016.36 millibars
- Relative Humidity 76.28%
- Dew Point: 41.25° F
- Wind Speed: 8.83 Knots

2.7 Terrain

Terrain data describes the elevation of the ground surrounding the airport and on airport property. The AEDT uses terrain data to adjust the ground level under the flight paths. The terrain data does not change the aircraft's performance or noise levels but alters the vertical distance between the aircraft and a "receiver" on the ground. This affects assumptions about how noise propagates over ground. HMMH obtained the terrain data from the United States Geological Survey (USGS) National Elevation Dataset with one-third arc second (approximately 33 feet) resolution. Terrain data was utilized in conjunction with the terrain feature of the AEDT to generate the noise contours for all scenarios.

3 Noise Analysis Results

DNL contours are the primary mechanisms for evaluating airport noise associated with land use compatibility, as described and depicted in Section 3.1. To evaluate the aircraft noise experienced from aircraft operations in the areas surrounding the Airport, HMMH also modeled the number of aircraft events above 70 dB (NA70) and prepared contours showing a varied number of such operations. An inventory of the acreage, population, and housing units within the various bands of noise exposure (DNL) and number of aircraft events above 70 dB is summarized in Section 3.2.

3.1 DNL and NA70 Contours

As noted in Section 2, all flight activity was modeled within AEDT. Each model produced a grid of DNL values, which were then combined in AEDT, with contours generated using the AEDT algorithm. **Figure 3-1** through **Figure 3-3** present the DNL contours of 55 dB, 60 dB, 65 dB, 70 dB, and 75 dB. FAA considers DNL 65 dB as the threshold below which all land uses are compatible.

Figure 3-1 depicts the Existing Condition (2021) DNL contours, based on actual 2021 aircraft operations. **Figure 3-2** presents the 20-Year Forecast Condition DNL contours for the forecast year of 2041. **Figure 3-3** shows the Forecast Condition with a Parallel Runway DNL contours.

The Number Above metric, sometimes abbreviated as “NA”, counts the number of noise events whose maximum level exceeds a given threshold. The NA70 contours represent the number of events above 70 dB that an area experiences in an annual-average twenty-four hour period. **Figure 3-4** through **Figure 3-6** illustrate the number of aircraft noise events above 70 dB contours for each scenario.

On each of the NA figures, the contour labeled with “1” represents the area within the contour that experiences an average of one NA70 event per day. The contour labeled with “2” represents the area within the contour that experiences an average of two to four NA70 events per day. The contour labeled with “5” represents the area within the contour that experiences an average of five to nine NA70 events per day. The contour labeled with “10” represents the area within the contour that experiences an average of ten to nineteen NA70 events. The contour labeled with “20” represents the area within the contour that experiences an average of twenty to fifty NA70 events. The contour labeled with “50” represents the area within each contour that experiences an average of at least fifty NA70 events.

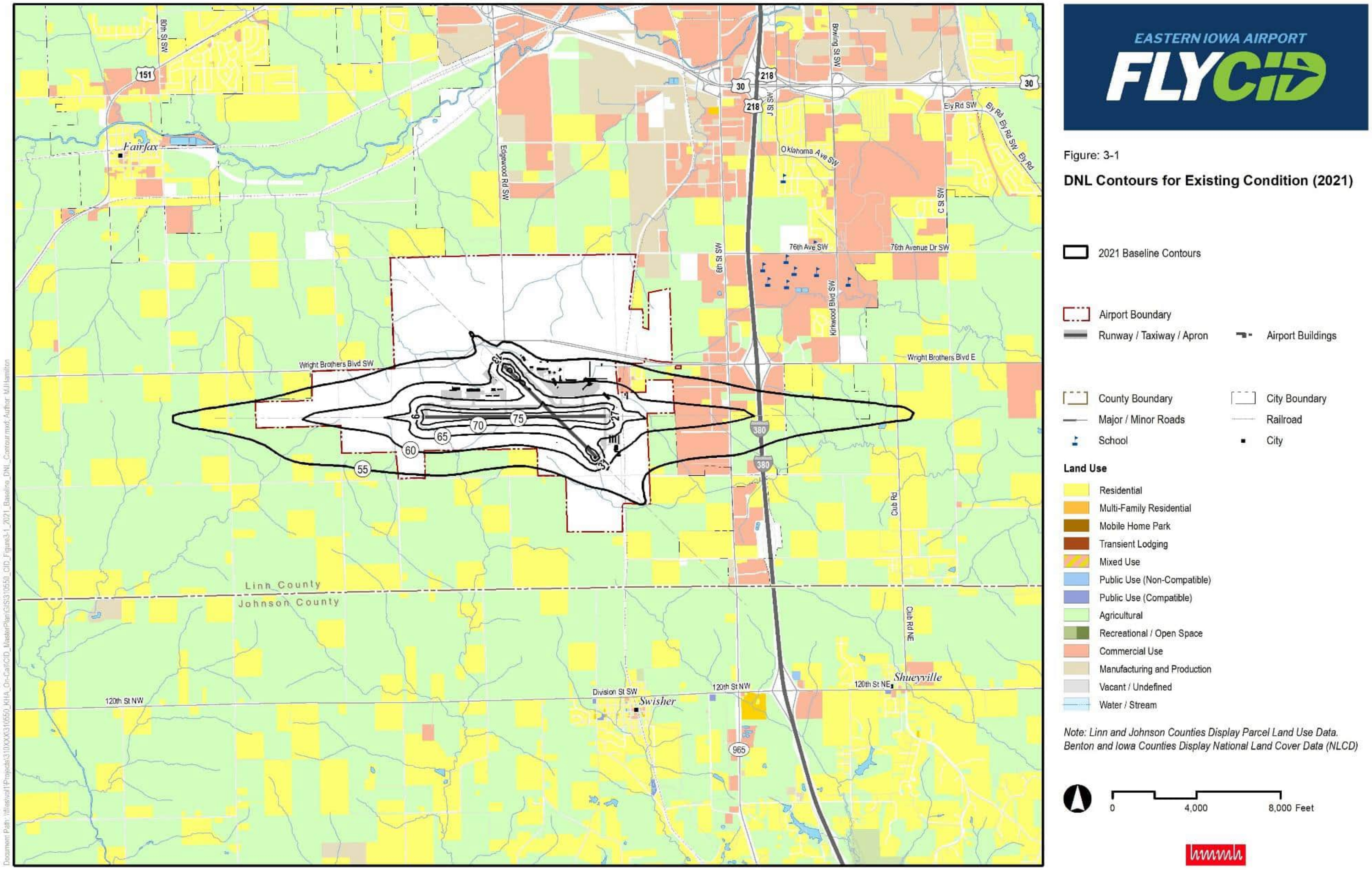


Figure 3-1. DNL Contours for Existing Condition (2021)

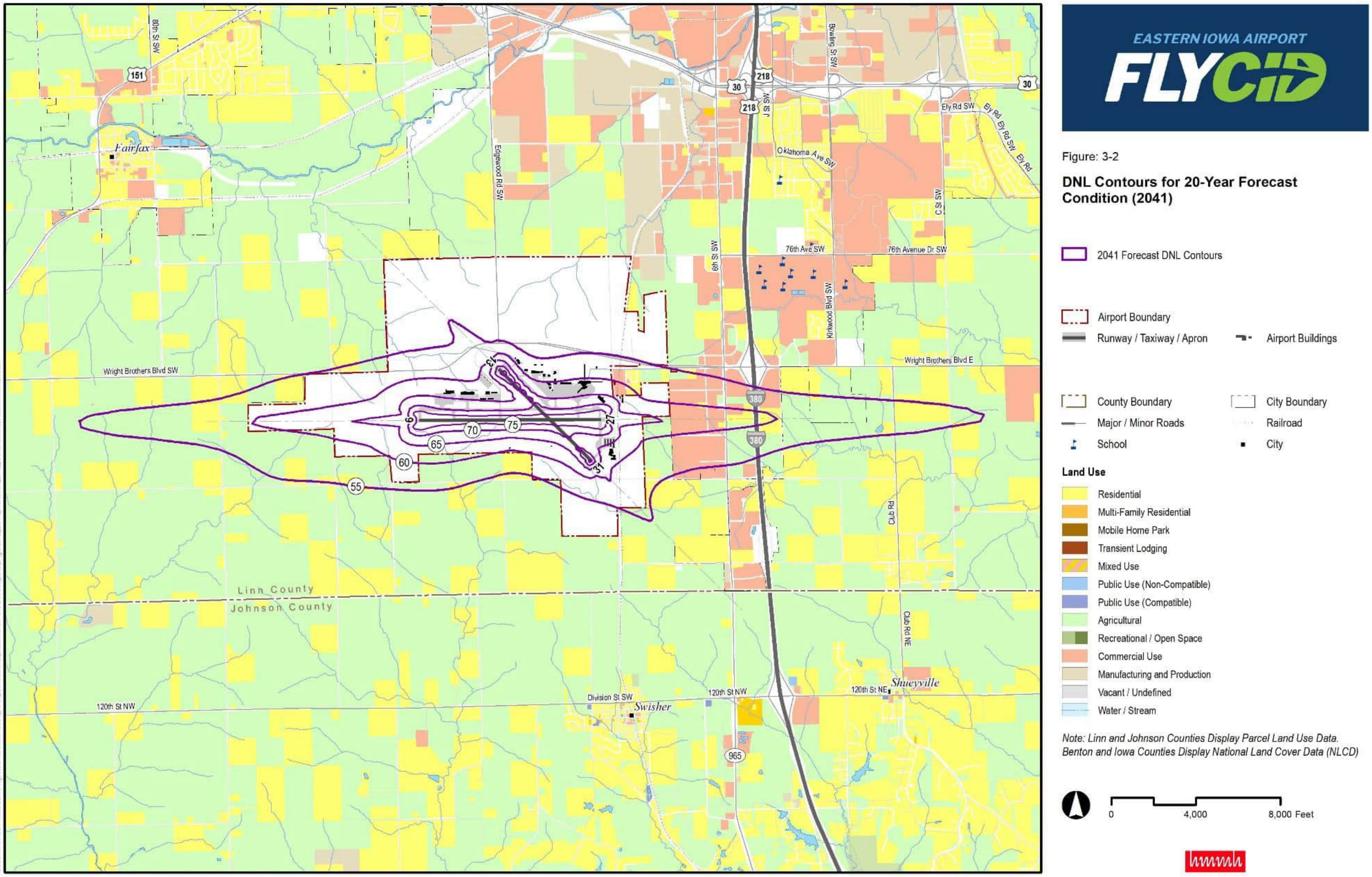


Figure 3-2. DNL Contours for 20-Year Forecast Condition (2041)

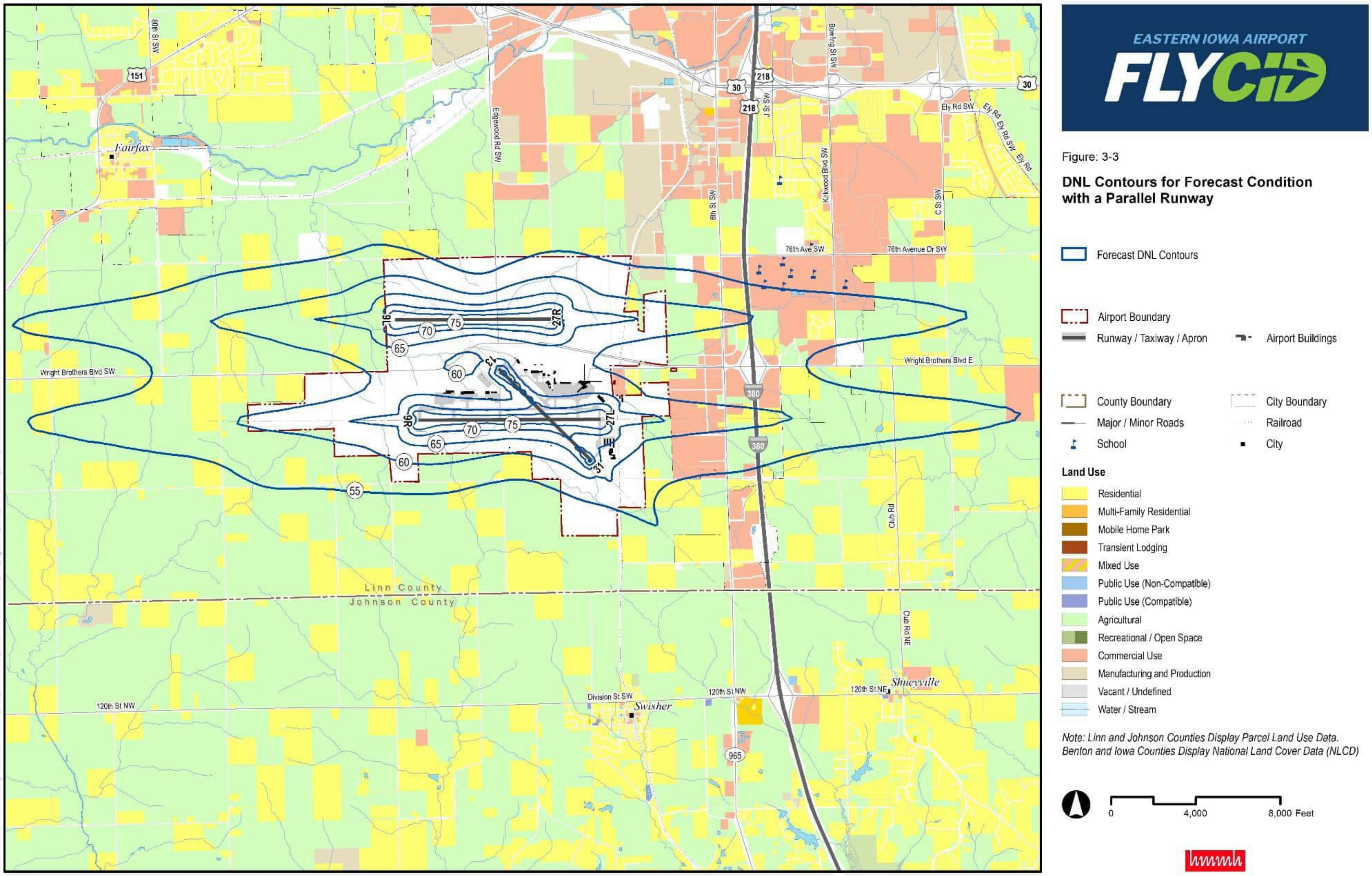


Figure 3-3. DNL Contours for Forecast Condition with a Parallel Runway

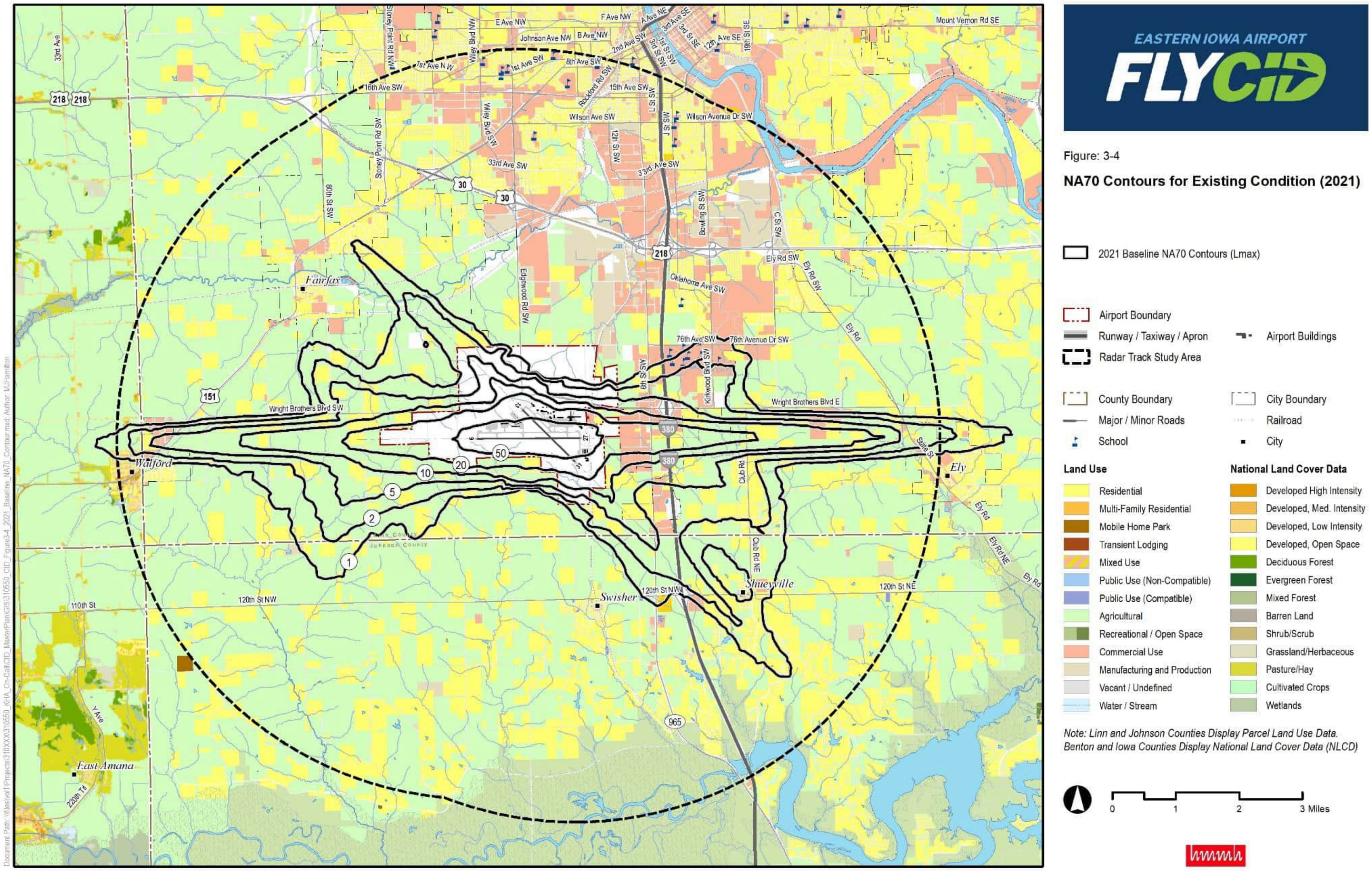


Figure 3-4. NA70 Contours for Existing Condition (2021)

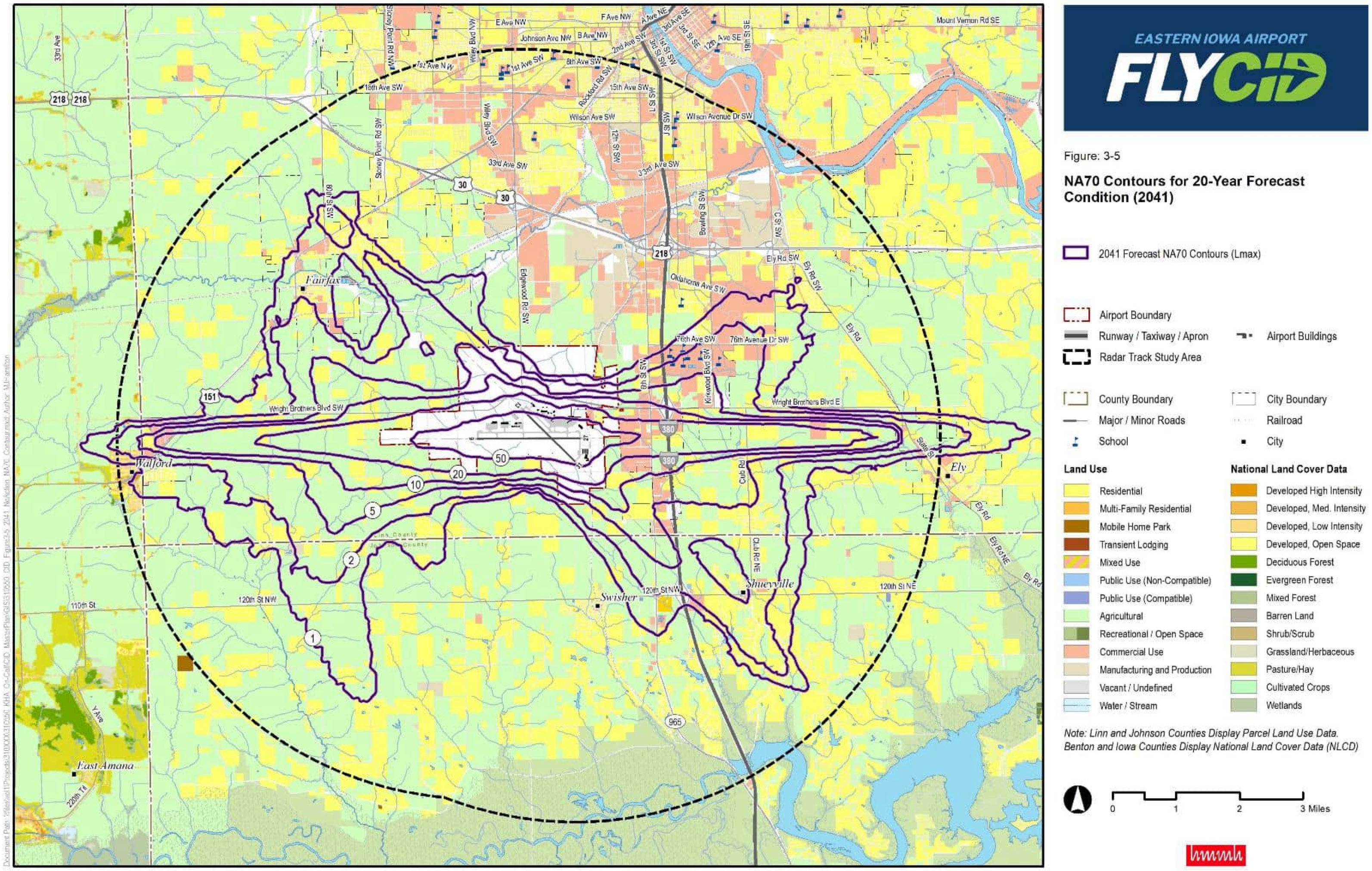


Figure 3-5. NA70 Contours for 20-Year Forecast Condition (2041)

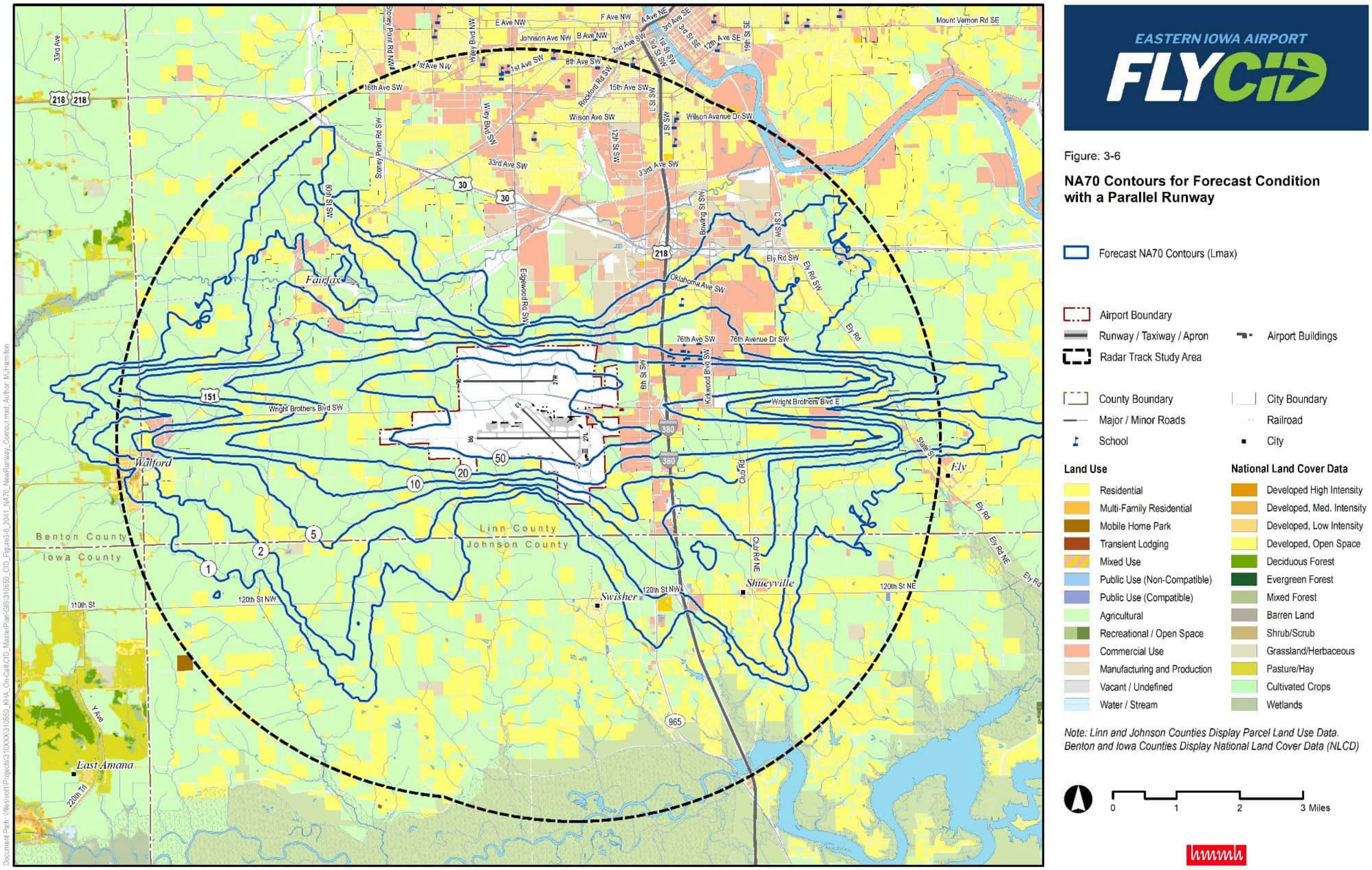


Figure 3-6. NA70 Contours for Forecast Condition with a Parallel Runway

3.2 Land Use

The land use within the DNL contours for all scenarios represents a combination of residential, agricultural, and commercial use. The 65 DNL contour does not extend off airport property in the Existing Condition (2021) and only extends slightly off airport property to the east of Runway 9/27 into agricultural land in the 20-Year Forecast Condition (2041). In the Forecast Condition with a Parallel Runway, the 65 DNL contour extends into the same agricultural land to the east of Runway 9R/27L and also extends off airport property to the west of planned parallel runway 9L/27R into agricultural land and several residential parcels.

Land use is summarized in **Table 3-1** through **Table 3-6**, including the land area, population, and housing units within each DNL contour and NA70 contour for the Existing Condition (2021), 20-Year Forecast Condition (2041), and Forecast Condition with a Parallel Runway. **Figure 3-7** depicts the existing land use.

Table 3-1. Existing Condition (2021) Land Use Compatibility by DNL Contour
Source: HMMH, 2022

Contour Interval	Population Census 2020	Housing Units	Area (Acres)
55-60 DNL	69	23	1,822.01
60-65 DNL	3	1	647.63
65-70 DNL	0	0	283.26
70-75 DNL	0	0	131.35
>75 DNL	0	0	82.44
Total	**72**	**24**	**2966.69**

Table 3-2. 20-Year Forecast Condition (2041) Land Use Compatibility by DNL Contour
Source: HMMH, 2022

Contour Interval	Population Census 2020	Housing Units	Area (Acres)
55-60 DNL	100	34	2,488.42
60-65 DNL	3	1	856.16
65-70 DNL	0	0	337.14
70-75 DNL	0	0	157.66
>75 DNL	0	0	110.52
Total	**103**	**35**	**3949.90**

Table 3-3. Forecast Condition with a Parallel Runway Land Use Compatibility by DNL Contour

Source: HMMH, 2022

Contour Interval	Population Census 2020	Housing Units	Area (Acres)
55-60 DNL	651	240	5,287.58
60-65 DNL	17	3	2,125.36
65-70 DNL	9	1	644.59
70-75 DNL	0	0	271.48
>75 DNL	0	0	220.98
Total	**677**	**244**	**8549.99**

Table 3-4. Existing Condition (2021) Land Use Compatibility by NA70 Contour

Source: HMMH, 2022

Contour Interval	Population Census 2020	Housing Units	Area (Acres)
1 Event	1,280	498	5,769.45
2 Events	877	349	4,925.94
5 Events	103	39	3,038.69
10 Events	90	32	2,182.80
20 Events	31	11	1,878.58
50 Events	0	0	691.89
Total	**2,381**	**929**	**18,487.36**

Table 3-5. 20-Year Forecast Condition (2041) Land Use Compatibility by NA70 Contour

Source: HMMH, 2022

Contour Interval	Population Census 2020	Housing Units	Area (Acres)
1 Event	4,099	1,659	9,122.99
2 Events	1,780	764	8,267.21
5 Events	628	235	3,766.38
10 Events	65	25	2,684.07
20 Events	106	39	2,907.32
50 Events	0	0	1,150.29
Total	**6,678**	**2,722**	**27,898.26**

Table 3-6. Forecast Condition with a Parallel Runway Land Use Compatibility by NA70 Contour

Source: HMMH, 2022

Contour Interval	Population Census 2020	Housing Units	Area (Acres)
1 Event	5,460	2,158	11,593.66
2 Events	7,070	3,116	10,852.10
5 Events	1,022	418	5,266.40
10 Events	130	52	4,312.75
20 Events	646	243	5,781.75
50 Events	28	5	2,844.01
Total	**14,356**	**5,992**	**40,650.67**

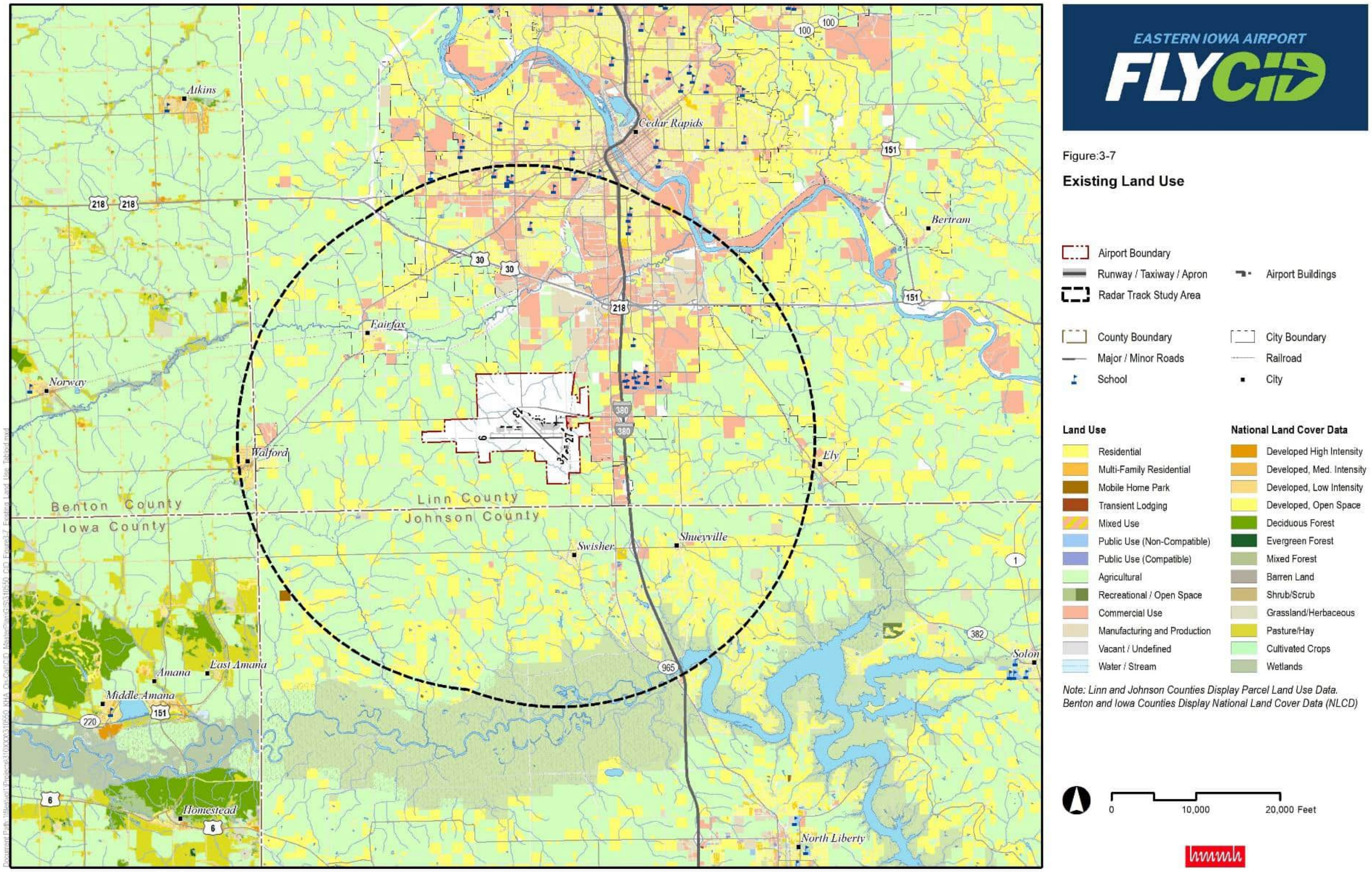


Figure 3-7. Existing Land Use

Appendix A Aircraft Noise Terminology

Noise is a complex physical quantity. The properties, measurement, and presentation of noise involve specialized terminology that can be difficult to understand. To provide a basic reference on these technical issues, this section introduces fundamentals of noise terminology, the effects of noise on human activity, and noise propagation.

A.1 Introduction to Noise Terminology

Analyses of potential impacts from changes in aircraft noise levels rely largely on a measure of cumulative noise exposure over an entire calendar year, expressed in terms of a metric called the Day-Night Average Sound Level (DNL). However, DNL does not provide an adequate description of noise for many purposes. A variety of measures, which are further described in subsequent sub-sections, are available to address essentially any issue of concern, including:

- Sound Pressure Level, SPL, and the Decibel, dB
- A-Weighted Decibel, dBA
- Maximum A-Weighted Sound Level, L_{max}
- Time Above, TA and Number of Events Above, NA
- Sound Exposure Level, SEL
- Equivalent A-Weighted Sound Level, L_{eq}
- Day-Night Average Sound Level, DNL

A.1.1 Sound Pressure Level, SPL, and the Decibel, dB

All sounds come from a sound source – a musical instrument, a voice speaking, an airplane passing overhead. It takes energy to produce sound. The sound energy produced by any sound source travels through the air in sound waves – tiny, quick oscillations of pressure just above and just below atmospheric pressure. The ear senses these pressure variations and – with much processing in our brain – translates them into “sound.”

Our ears are sensitive to a wide range of sound pressures. The loudest sounds that we can hear without pain contain about one million times more energy than the quietest sounds we can detect. To allow us to perceive sound over this very wide range, our ear/brain “auditory system” compresses our response in a complex manner, represented by a term called sound pressure level (SPL), which we express in units called decibels (dB).

Mathematically, SPL is a logarithmic quantity based on the ratio of two sound pressures, the numerator being the pressure of the sound source of interest (P_{source}), and the denominator being a reference pressure ($P_{reference}$) [1]

[1] The reference pressure is approximately the quietest sound that a healthy young adult can hear.

$$\textit{Sound Pressure Level (SPL)} = 20 * Log\left(\frac{P_{source}}{P_{reference}}\right) dB$$

The logarithmic conversion of sound pressure to SPL means that the quietest sound that we can hear (the reference pressure) has a sound pressure level of about 0 dB, while the loudest sounds that we hear without pain have sound pressure levels of about 120 dB. Most sounds in our day-to-day environment have sound pressure levels from about 40 to 100 dB[2].

Because decibels are logarithmic quantities, we cannot use common arithmetic to combine them. For example, if two sound sources each produce 100 dB operating individually, when they operate simultaneously, they produce 103 dB -- not the 200 dB we might expect. Increasing to four equal sources operating simultaneously will add another three decibels of noise, resulting in a total SPL of 106 dB. For every doubling of the number of equal sources, the SPL goes up another three decibels.

If one noise source is much louder than another is, the louder source "masks" the quieter one and the two sources together produce virtually the same SPL as the louder source alone. For example, a 100 dB and 80 dB sources produce approximately 100 dB of noise when operating together.

Two useful “rules of thumb” related to SPL are worth noting: (1) humans generally perceive a six to 10 dB increase in SPL to be about a doubling of loudness,[3] and (2) changes in SPL of less than about three decibels for a particular sound are not readily detectable outside of a laboratory environment.

A.1.2 A-Weighted Decibel

An important characteristic of sound is its frequency, or "pitch.” This is the per-second oscillation rate of the sound pressure variation at our ear, expressed in units known as Hertz (Hz).

When analyzing the total noise of any source, acousticians often break the noise into frequency components (or bands) to consider the “low,” “medium,” and “high” frequency components. This breakdown is important for two reasons:

- Our ear is better equipped to hear mid and high frequencies and is least sensitive to lower frequencies. Thus, we find mid- and high-frequency noise more annoying.
- Engineering solutions to noise problems differ with frequency content. Low-frequency noise is generally harder to control.

The normal frequency range of hearing for most people extends from a low of about 20 Hz to a high of about 10,000 to 15,000 Hz. Most people respond to sound most readily when the predominant frequency is in the range of normal conversation – typically around 1,000 to 2,000 Hz. The acoustical

[2] The logarithmic ratio used in its calculation means that SPL changes relatively quickly at low sound pressures and more slowly at high pressures. This relationship matches human detection of changes in pressure. We are much more sensitive to changes in level when the SPL is low (for example, hearing a baby crying in a distant bedroom), than we are to changes in level when the SPL is high (for example, when listening to highly amplified music).

[3] A “10 dB per doubling” rule of thumb is the most often used approximation.

community has defined several “filters,” which approximate this sensitivity of our ear and thus, help us to judge the relative loudness of various sounds made up of many different frequencies.

The so-called "A" filter (“A weighting”) generally does the best job of matching human response to most environmental noise sources, including natural sounds and sound from common transportation sources. “A-weighted decibels” are abbreviated “dBA.” Because of the correlation with our hearing, the U. S. Environmental Protection Agency (EPA) and nearly every other federal and state agency have adopted A-weighted decibels as the metric for use in describing environmental and transportation noise. **Figure A-1** depicts A-weighting adjustments to sound from approximately 20 Hz to 10,000 Hz.

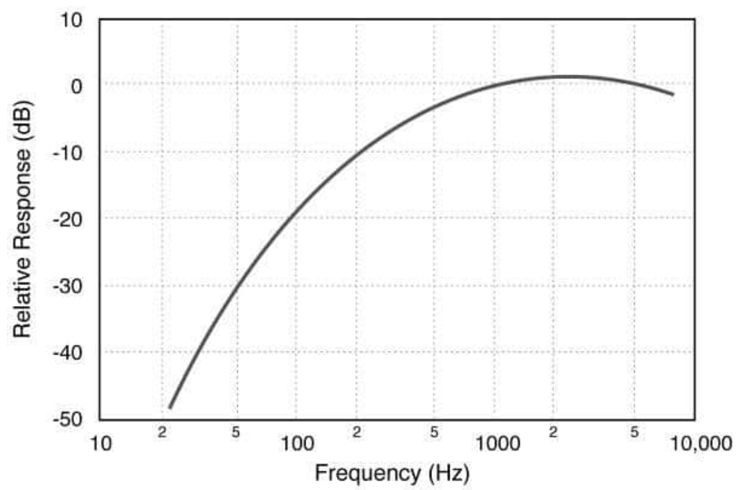


Figure A-1. A-Weighting Frequency Response

Source: Extract from Harris, Cyril M., Editor, “Handbook of Acoustical Measurements and Control,” McGraw-Hill, Inc., 1991, pg. 5.13; HMMH

As the figure shows, A-weighting significantly de-emphasizes noise content at lower and higher frequencies where we do not hear as well, and has little effect, or is nearly "flat,” in for mid-range frequencies between 1,000 and 5,000 Hz. All sound pressure levels presented in this document are A-weighted unless otherwise specified.

Figure A-2 depicts representative A-weighted sound levels for a variety of common sounds.

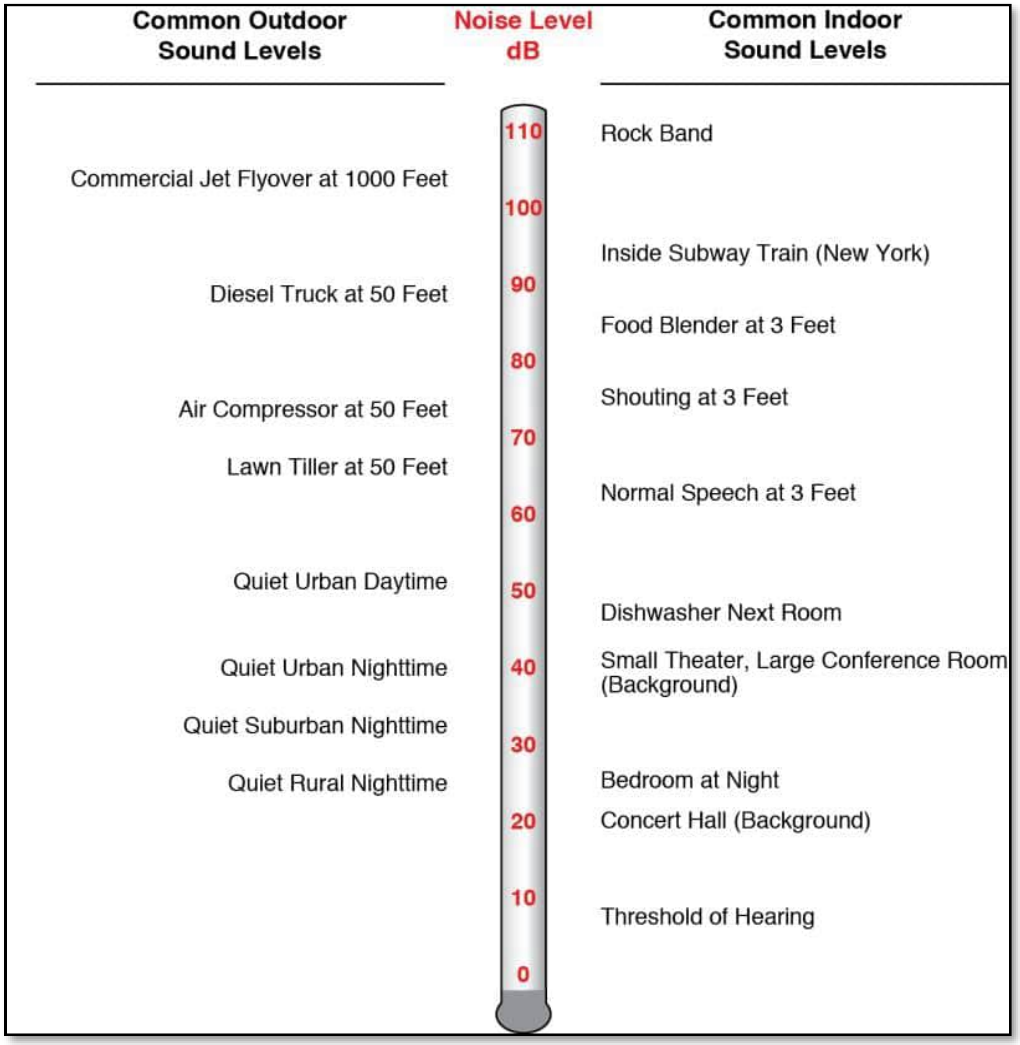


Figure A-2. A-Weighted Sound Levels for Common Sounds
Source: HMMH

A.1.3 Maximum A-Weighted Sound, L_{max}

An additional dimension to environmental noise is that A-weighted levels vary with time. For example, the sound level increases as a car or aircraft approaches, then falls and blends into the background as the aircraft recedes into the distance. The background or “ambient” level continues to vary in the absence of a distinctive source, for example due to birds chirping, insects buzzing, leaves rustling, etc. It is often convenient to describe a particular noise "event" (such as a vehicle passing by, a dog barking, etc.) by its maximum sound level, abbreviated as L_{max}.

Figure A-3 depicts this general concept, for a hypothetical noise event with an L_{max} of approximately 102 dB.

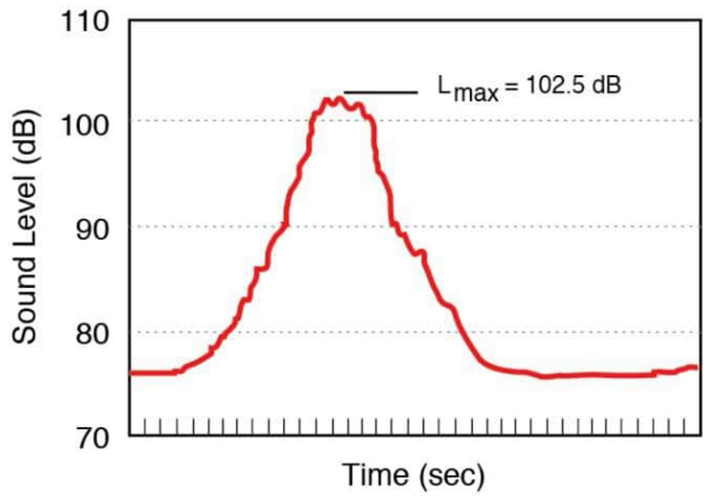


Figure A-3. Variation in A-Weighted Sound Level over Time and Maximum Noise Level

Source: HMMH

While the maximum level is easy to understand, it suffers from a serious drawback when used to describe the relative “noisiness” of an event such as an aircraft flyover; i.e., it describes only one dimension of the event and provides no information on the event’s overall, or cumulative, noise exposure. In fact, two events with identical maximum levels may produce very different total exposures. One may be of very short duration, while the other may continue for an extended period and be judged much more annoying. The next section introduces a measure that accounts for this concept of a noise "dose," or the cumulative exposure associated with an individual “noise event” such as an aircraft flyover.

A.1.4 Time Above, TA and Number of Events Above, NA

The Time Above (TA) noise metric measures the total time that the A-weighted aircraft noise level exceeds an indicated level within an annual-average twenty-four hour period. TA correlates linearly with the number of flight operations and is also sensitive to changes in fleet mix. Time Above is typically reported in terms of the numbers of minutes or seconds per day that the noise is above incremental values of, for instance, 55, 65, 75, 85, 95, and 105 dB(A). Given that time is a more intuitive and familiar quantity than noise exposure, non-technical community members often understand and accept this concept more readily than exposure measured in decibels.

Number of Events Above (NA) is similar to TA, but instead of measuring the length of time above a specific noise level, NA computes the number of events that exceed a given threshold within an annual-average twenty-four hour period. Thresholds are often the same as for TA, e.g., 50, 65, 75, 85 dB(A). Many people believe NA is also more easily understood than DNL/CNEL.

A.1.5 Sound Exposure Level, SEL

The most commonly used measure of cumulative noise exposure for an individual noise event, such as an aircraft flyover, is the Sound Exposure Level, or SEL. SEL is a summation of the A-weighted sound energy over the entire duration of a noise event. SEL expresses the accumulated energy in terms of the one-second-long steady-state sound level that would contain the same amount of energy as the actual time-varying level.

SEL provides a basis for comparing noise events that generally match our impression of their overall "noisiness," including the effects of both duration and level. The higher the SEL, the more annoying a noise event is likely to be. In simple terms, SEL "compresses" the energy for the noise event into a single second. **Figure A-4** depicts this compression, for the same hypothetical event shown in **Figure A-3**. Note that the SEL is higher than the L_{max}.

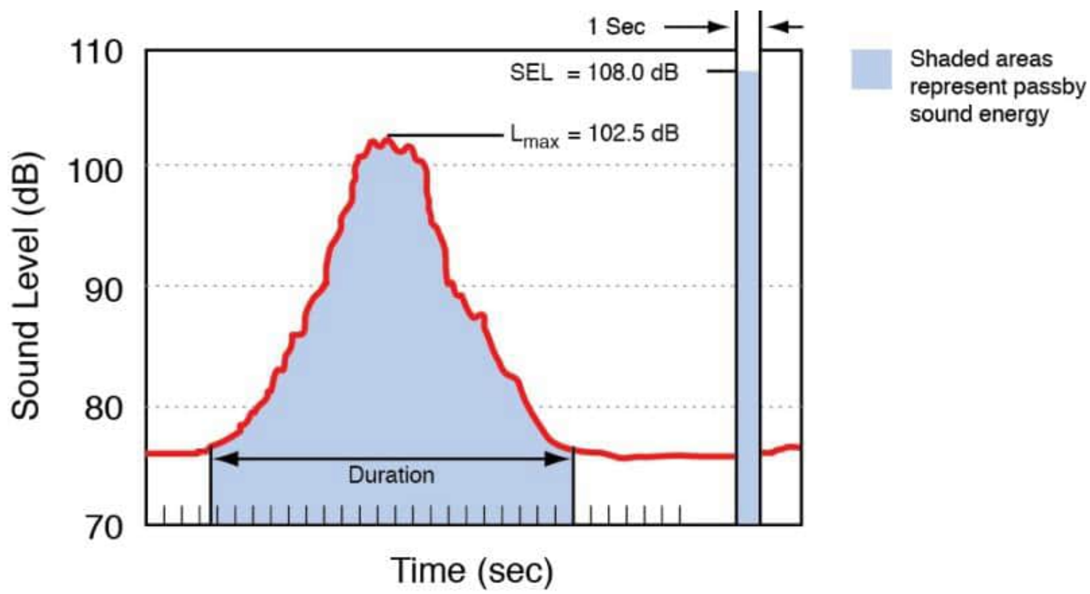


Figure A-4. Graphical Depiction of Sound Exposure Level

Source: HMMH

The "compression" of energy into one second means that a given noise event's SEL will almost always will be a higher value than its L_{max}. For most aircraft flyovers, SEL is roughly five to 12 dB higher than L_{max}. Adjustment for duration means that relatively slow and quiet propeller aircraft can have the same or higher SEL than faster, louder jets, which produce shorter duration events.

A.1.6 Equivalent A-Weighted Sound Level, L_{eq}

The Equivalent Sound Level, abbreviated L_{eq}, is a measure of the exposure resulting from the accumulation of sound levels over a particular period of interest, e.g., one hour, an eight-hour school day, nighttime, or a full 24-hour day. L_{eq} plots for consecutive hours can help illustrate how the noise dose rises and falls over a day or how a few loud aircraft significantly affect some hours.

L_{eq} may be thought of as the constant sound level over the period of interest that would contain as much sound energy as the actual varying level. It is a way of assigning a single number to a time-varying sound level. **Figure A-5** illustrates this concept for the same hypothetical event shown in **Figure A-3** and **Figure A-4**. Note that the L_{eq} is lower than either the L_{max} or SEL.

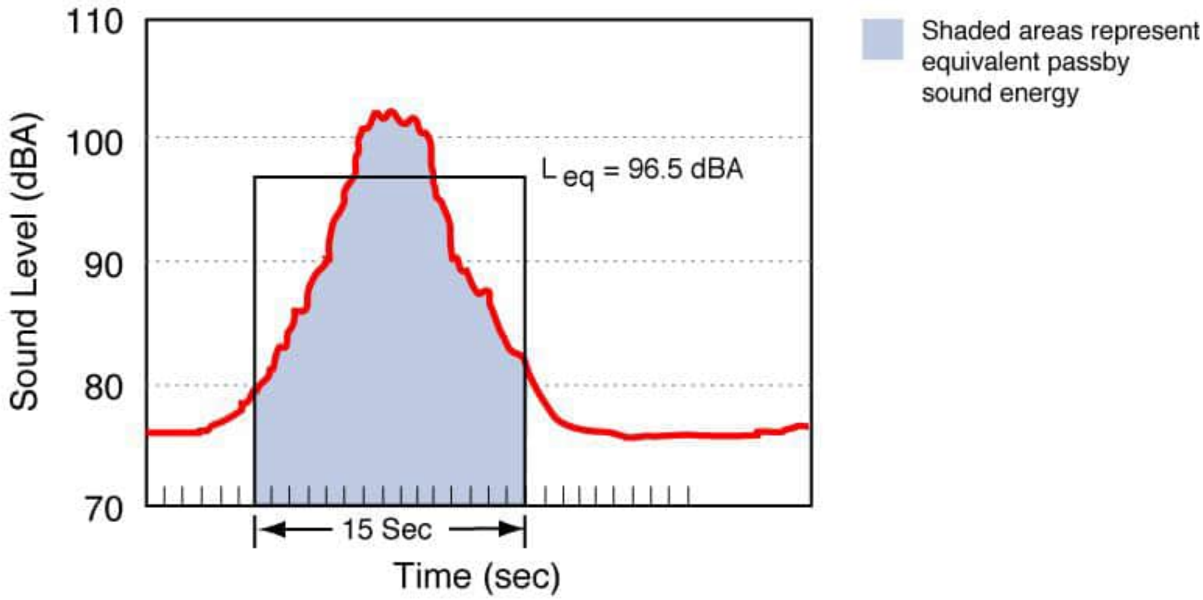


Figure A-5. Example of a 15-Second Equivalent Sound Level

Source: HMMH

A.1.7 Day-Night Average Sound Level, DNL or L_{dn}

The FAA requires that airports use a measure of noise exposure that is slightly more complicated than L_{eq} to describe cumulative noise exposure – the Day-Night Average Sound Level, DNL.

The U.S. EPA identified DNL as the most appropriate means of evaluating airport noise based on the following considerations.[4]

- The measure should be applicable to the evaluation of pervasive long-term noise in various defined areas and under various conditions over long periods.
- The measure should correlate well with known effects of the noise environment and on individuals and the public.
- The measure should be simple, practical, and accurate. In principle, it should be useful for planning as well as for enforcement or monitoring purposes.
- The required measurement equipment, with standard characteristics, should be commercially available.
- The measure should be closely related to existing methods currently in use.
- The single measure of noise at a given location should be predictable, within an acceptable tolerance, from knowledge of the physical events producing the noise.

[4] "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety," U. S. EPA Report No. 550/9-74-004, March 1974.

- The measure should lend itself to small, simple monitors, which can be left unattended in public areas for long periods.

Most federal agencies dealing with noise have formally adopted DNL. The Federal Interagency Committee on Noise (FICON) reaffirmed the appropriateness of DNL in 1992. The FICON summary report stated: "There are no new descriptors or metrics of sufficient scientific standing to substitute for the present DNL cumulative noise exposure metric."

In 2015, the FAA began a multi-year effort to update the scientific evidence on the relationship between aircraft noise exposure and its effects on communities around airports.[5] This was the most comprehensive study using a single noise survey ever undertaken in the United States, polling communities surrounding 20 airports nationwide. The FAA Reauthorization Act of 2018 under Section 188 and 173, required FAA to complete the evaluation of alternative metrics to the DNL standard within one year. The Section 188 and 173 Report to Congress was delivered on April 14, 2020[6] and concluded that while no single noise metric can cover all situations, DNL provides the most comprehensive way to consider the range of factors influencing exposure to aircraft noise. In addition, use of supplemental metrics is both encouraged and supported to further disclose and aid in the public understanding of community noise impacts. The full study supporting these reports was released in January 2021. If changes are warranted in the use of DNL, which DNL level to assess or the use of supplemental metrics, FAA will propose revised policy and related guidance and regulations, subject to interagency coordination, as well as public review and comment.

In simple terms, DNL is the 24-hour L_{eq} with one adjustment; all noises occurring at night (defined as 10 p.m. through 7 a.m.) are increased by 10 dB, to reflect the added intrusiveness of nighttime noise events when background noise levels decrease. In calculating aircraft exposure, this 10 dB increase is mathematically identical to counting each nighttime aircraft noise event ten times.

DNL can be measured or estimated. Measurements are practical only for obtaining DNL values for limited numbers of points, and, in the absence of a permanently installed monitoring system, only for relatively short periods. Most airport noise studies use computer-generated DNL estimates depicted as equal-exposure noise contours (much as topographic maps have contours of equal elevation).

The annual DNL is mathematically identical to the DNL for the average annual day; i.e., a day on which the number of operations is equal to the annual total divided by 365 (366 in a leap year). **Figure A-6** graphically depicts the manner in which the nighttime adjustment applies in calculating DNL. **Figure A-7** presents representative outdoor DNL values measured at various U.S. locations.

[5] Federal Aviation Administration. Press Release – FAA To Re-Evaluate Method for Measuring Effects of Aircraft Noise. https://www.faa.gov/news/press_releases/news_story.cfm?newsId=18774

[6] Federal Aviation Administration. Report to Congress on an evaluation of alternative noise metrics. https://www.faa.gov/about/plans_reports/congress/media/Day-Night_Average_Sound_Levels_COMPLETED_report_w_letters.pdf

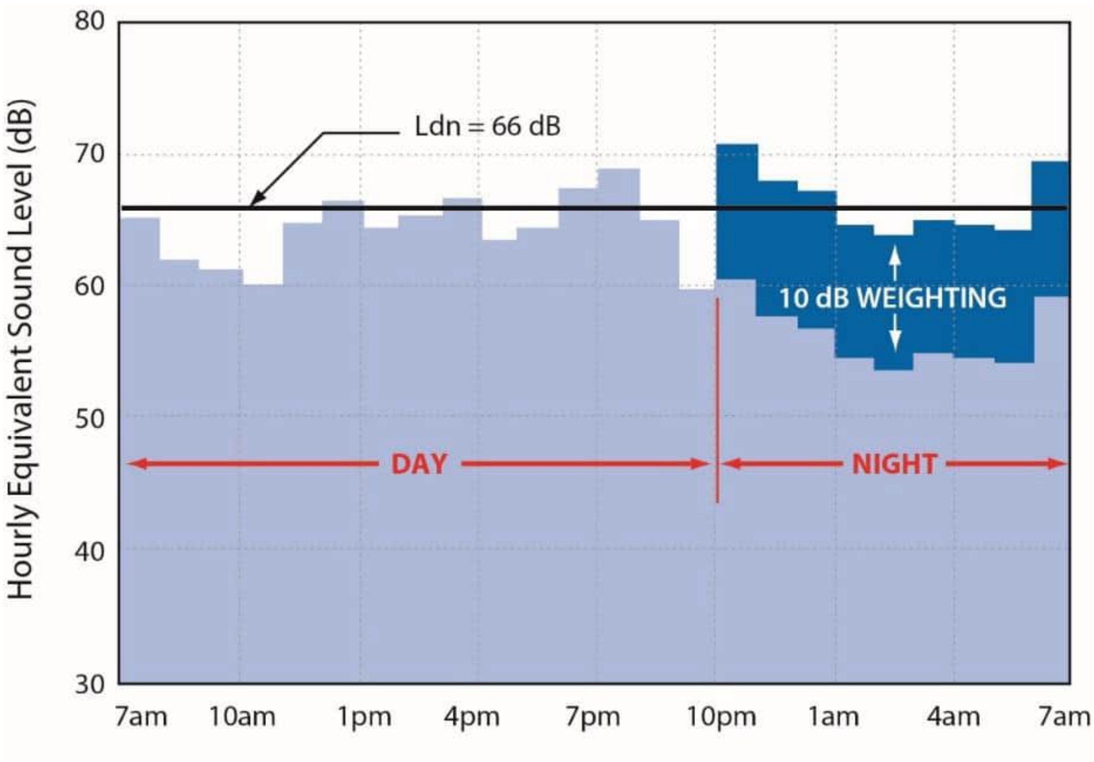


Figure A-6. Example of a Day-Night Average Sound Level Calculation

Source: HMMH

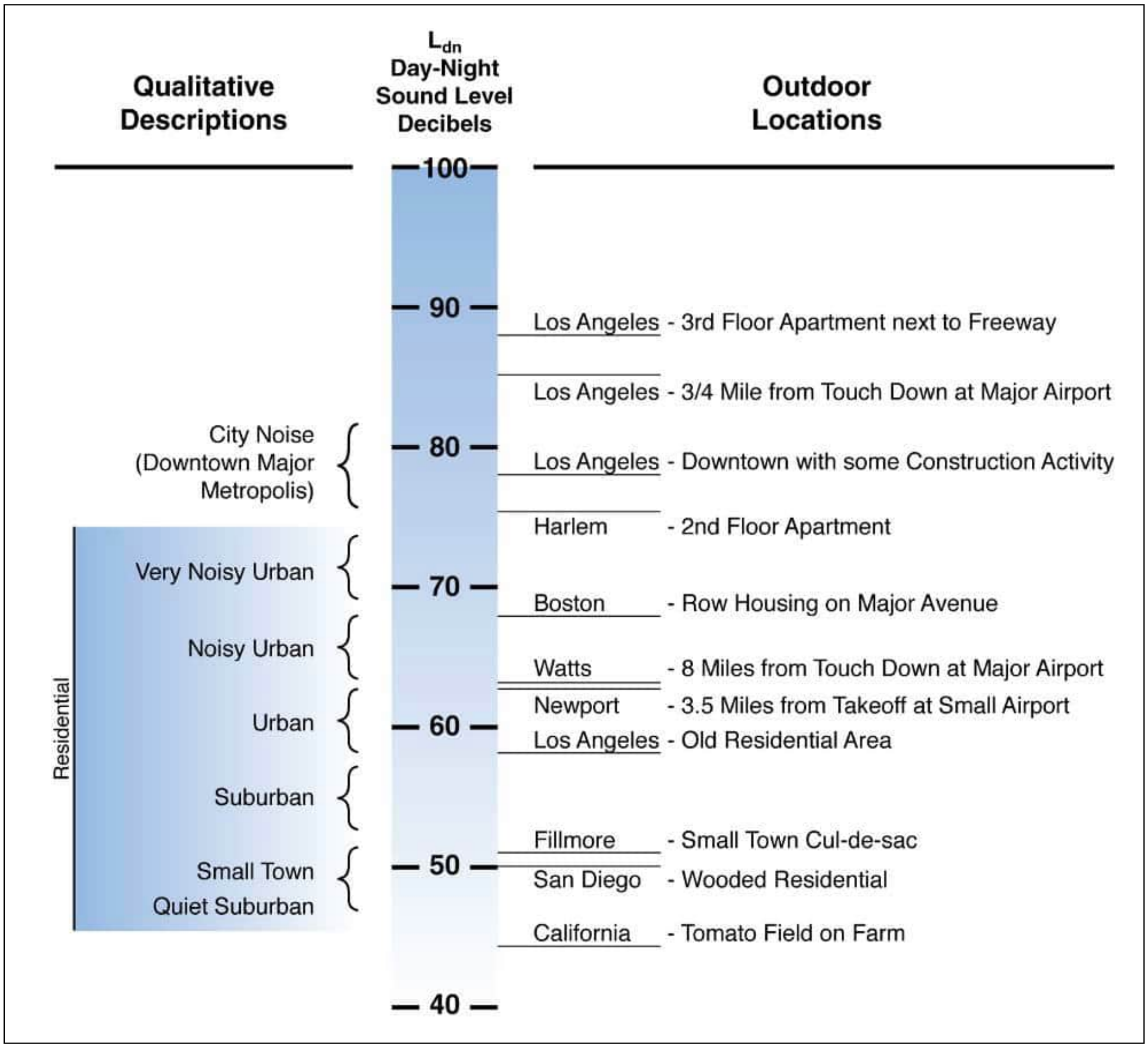


Figure A-7. Examples of Measured Day-Night Average Sound Levels, DNL

Source: U.S. Environmental Protection Agency, "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety," March 1974, p.14.

A.2 Aircraft Noise Effects on Human Activity

Aircraft noise can be an annoyance and a nuisance. It can interfere with conversation and listening to television, disrupt classroom activities in schools, and disrupt sleep. Relating these effects to specific noise metrics helps in the understanding of how and why people react to their environment.

A.2.1 Speech Interference

One potential effect of aircraft noise is its tendency to "mask" speech, making it difficult to carry on a normal conversation. The sound level of speech decreases as the distance between a talker and listener increases. As the background sound level increases, it becomes harder to hear speech.

Figure A-8 presents typical distances between talker and listener for satisfactory outdoor conversations, in the presence of different steady A-weighted background noise levels for raised, normal, and relaxed voice effort. As the background level increases, the talker must raise his/her voice, or the individuals must get closer together to continue talking.

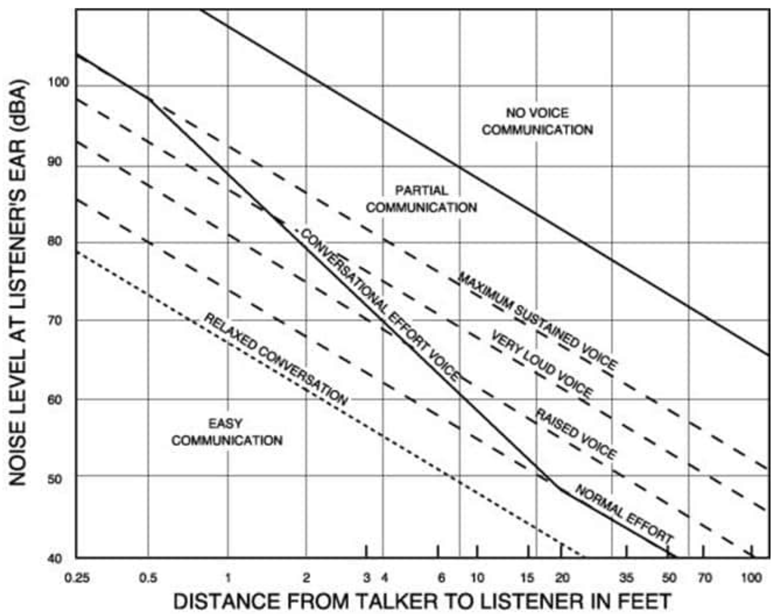


Figure A-8. Outdoor Speech Intelligibility

Source: U.S. EPA, "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety," March 1974, p.D-5.

Satisfactory conversation does not always require hearing every word; 95% intelligibility is acceptable for many conversations. In relaxed conversation, however, we have higher expectations of hearing speech and generally require closer to 100% intelligibility. Any combination of talker-listener distances and background noise that falls below the bottom line in the figure (which roughly represents the upper boundary of 100% intelligibility) represents an ideal environment for outdoor speech communication. Indoor communication is generally acceptable in this region as well.

One implication of the relationships in **Figure A-8** is that for typical communication distances of three or four feet, acceptable outdoor conversations can be carried on in a normal voice as long as the background noise outdoors is less than about 65 dB. If the noise exceeds this level, as might occur when an aircraft passes overhead, intelligibility would be lost unless vocal effort were increased or communication distance were decreased.

Indoors, typical distances, voice levels, and intelligibility expectations generally require a background level less than 45 dB. With windows partly open, housing generally provides about 10 to 15 dB of interior-to-exterior noise level reduction. Thus, if the outdoor sound level is 60 dB or less, there is a reasonable chance that the resulting indoor sound level will afford acceptable interior conversation. With windows closed, 24 dB of attenuation is typical.

A.2.2 Sleep Interference

Research on sleep disruption from noise has led to widely varying observations. In part, this is because (1) sleep can be disturbed without awakening, (2) the deeper the sleep the more noise it takes to cause arousal, (3) the tendency to awaken increases with age, and other factors. **Figure A-9** shows a summary of findings on the topic.

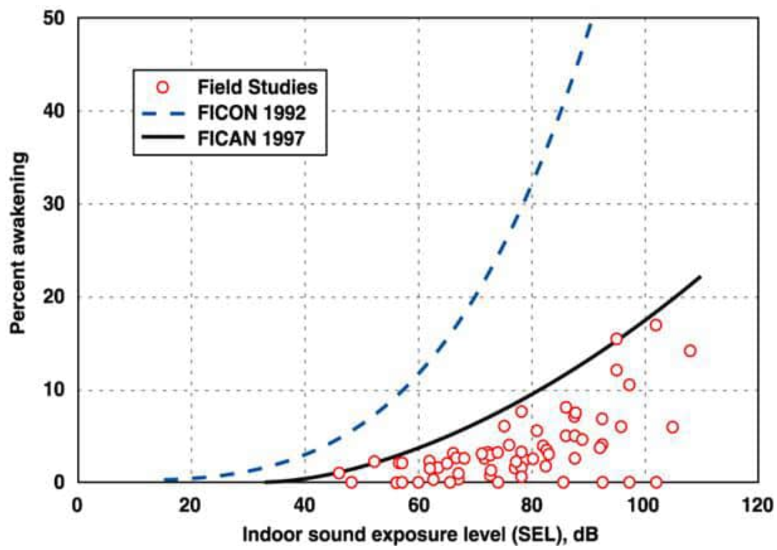


Figure A-9. Sleep Interference

Source: Federal Interagency Committee on Aircraft Noise (FICAN), "Effects of Aviation Noise on Awakenings from Sleep," June 1997, pg. 6

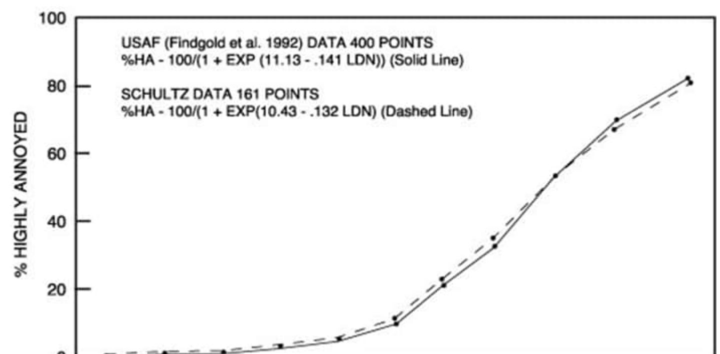
Figure A-9 uses indoor SEL as the measure of noise exposure; current research supports the use of this metric in assessing sleep disruption. An indoor SEL of 80 dBA results in a maximum of 10% awakening.[7]

[7] The awakening data presented in Figure A-9 apply only to individual noise events. The American National Standards Institute (ANSI) has published a standard that provides a method for estimating the number of people awakened at least once from a full night of noise events: ANSI/ASA S12.9-2008 / Part 6, "Quantities and Procedures for Description and Measurement of Environmental Sound – Part 6: Methods for Estimation of Awakenings Associated with Outdoor Noise Events Heard in Homes." This method can use the information on single events computed by a program such as the FAA's AEDT, to compute awakenings.

A.2.3 Community Annoyance

Numerous psychoacoustic surveys provide substantial evidence that individual reactions to noise vary widely with noise exposure level. Since the early 1970s, researchers have determined (and subsequently confirmed) that aggregate community response is generally predictable and relates reasonably well to cumulative noise exposure such as DNL. **Figure A-10** depicts the widely recognized relationship between environmental noise and the percentage of people "highly annoyed," with annoyance being the key indicator of community response usually cited in this body of research. Separate work by the EPA showed that overall community reaction to a noise environment was also correlated with DNL. **Figure A-11** depicts this relationship.

As noted above in the discussion of DNL, the full report on the FAA's recent research, polling communities surrounding 20 airports nationwide, was released in January 2021. At the time of this reporting, the public review and comment period on that research had ended but FAA had not yet issued new guidance.



Day - Night Average Sound Level in dB		40	45	50	55	60	65	70	75	80	85	100
Calculated %HA Points	USAF	0.41	0.831	1.66	3.31	6.48	12.29	22.1	36.47	53.74	70.16	82.64
	SCHULTZ	0.576	1.11	2.12	4.03	7.52	13.59	23.32	37.05	53.25	68.78	81

Figure A-10. Percentage of People Highly Annoyed

Source: FICON, "Federal Agency Review of Selected Airport Noise Analysis Issues," September 1992

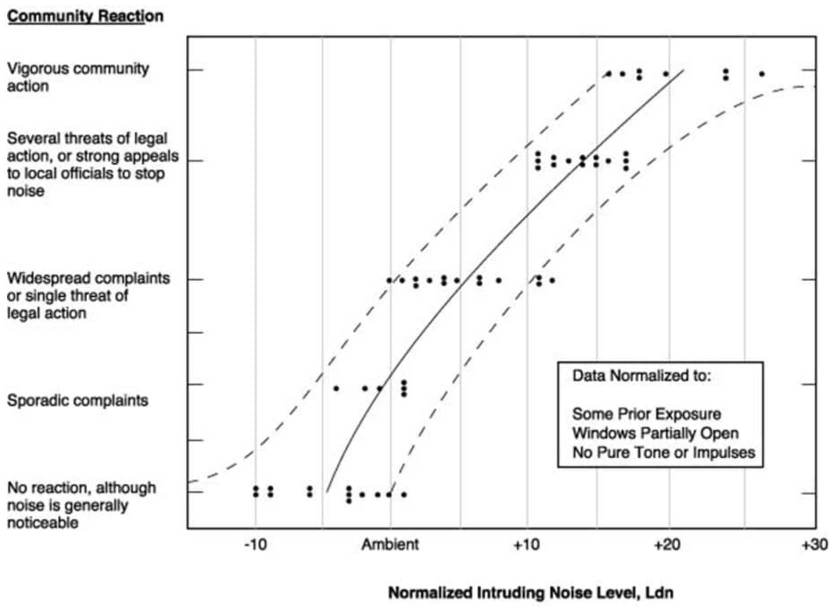


Figure A-11. Community Reaction as a Function of Outdoor DNL

Source: Wyle Laboratories, Community Noise, prepared for the U.S. EPA, Office of Noise Abatement and Control, Washington, D.C., December 1971, pg. 63

Data summarized in the figure suggest that little reaction would be expected for intrusive noise levels five decibels below the ambient, while widespread complaints can be expected as intruding noise exceeds background levels by about five decibels. Vigorous action is likely when levels exceed the background by 20 dB.

A.3 Noise Propagation

This section presents information sound-propagation effect due to weather, source-to-listener distance, and vegetation.

A.3.1 Weather-Related Effects

Weather (or atmospheric) conditions that can influence the propagation of sound include humidity, precipitation, temperature, wind, and turbulence (or gustiness). The effect of wind – turbulence in particular – is generally more important than the effects of other factors. Under calm-wind conditions, the importance of temperature (in particular vertical "gradients") can increase, sometimes to very significant levels. Humidity generally has little significance relative to the other effects.

A.3.2 Influence of Humidity and Precipitation

Humidity and precipitation rarely effect sound propagation in a significant manner. Humidity can reduce propagation of high-frequency noise under calm-wind conditions. This is called "Atmospheric absorption." In very cold conditions, listeners often observe that aircraft sound "tinny," because the dry air increases the propagation of high-frequency sound. Rain, snow, and fog also have little, if any, noticeable effect on sound propagation. A substantial body of empirical data supports these conclusions.[8]

A.3.3 Influence of Temperature

The velocity of sound in the atmosphere is dependent on the air temperature.[9] As a result, if the temperature varies at different heights above the ground, sound will travel in curved paths rather than straight lines. During the day, temperature normally decreases with increasing height. Under such "temperature lapse" conditions, the atmosphere refracts ("bends") sound waves upwards and an acoustical shadow zone may exist at some distance from the noise source.

Under some weather conditions, an upper level of warmer air may trap a lower layer of cool air. Such a "temperature inversion" is most common in the evening, at night, and early in the morning when heat absorbed by the ground during the day radiates into the atmosphere.[10] The effect of an inversion is just the opposite of lapse conditions. It causes sound propagating through the atmosphere to refract downward.

The downward refraction caused by temperature inversions often allows sound rays with originally upward-sloping paths to bypass obstructions and ground effects, increasing noise levels at greater distances. This type of effect is most prevalent at night, when temperature inversions are most common and when wind levels often are very low, limiting any confounding factors.[11] Under extreme conditions, one study found that noise from ground-borne aircraft might be amplified 15 to 20 dB by a temperature inversion. In a similar study, noise caused by an aircraft on the ground registered a higher level at an observer location 1.8 miles away than at a second observer location only 0.2 miles from the aircraft.[12]

A.3.4 Influence of Wind

Wind has a strong directional component that can lead to significant variation in propagation. In general, receivers that are downwind of a source will experience higher sound levels, and those that are upwind will experience lower sound levels. Wind perpendicular to the source-to-receiver path has no significant effect.

The refraction caused by wind direction and temperature gradients is additive.[13] One study suggests that for frequencies greater than 500 Hz, the combined effects of these two factors tends towards two

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[8]Ingard, Uno. "A Review of the Influence of Meteorological Conditions on Sound Propagation," *Journal of the Acoustical Society of America*, Vol. 25, No. 3, May 1953, p. 407.

[9]In dry air, the approximate velocity of sound can be obtained from the relationship:
$c = 331 + 0.6T_c$ (c in meters per second, T_c in degrees Celsius). Pierce, Allan D., *Acoustics: An Introduction to its Physical Principles and Applications.* McGraw-Hill. 1981. p. 29.

[10]Embleton, T.F.W., G.J. Thiessen, and J.E. Piercy, "Propagation in an inversion and reflections at the ground," *Journal of the Acoustical Society of America*, Vol. 59, No. 2, February 1976, p. 278.

[11]Ingard, p. 407.

[12]Dickinson, P.J., "Temperature Inversion Effects on Aircraft Noise Propagation," (Letters to the Editor) *Journal of Sound and Vibration.* Vol. 47, No. 3, 1976, p. 442.

[13]Piercy and Embleton, p. 1412. Note, in addition, that as a result of the scalar nature of temperature and the vector nature of wind, the following is true: under lapse conditions, the refractive effects of wind and temperature add in the upwind direction and cancel each other in the downwind direction. Under inversion conditions, the opposite is true.

extreme values: approximately 0 dB in conditions of downward refraction (temperature inversion or downwind propagation) and -20 dB in upward refraction conditions (temperature lapse or upwind propagation). At lower frequencies, the effects of refraction due to wind and temperature gradients are less pronounced. [14]

Wind turbulence (or “gustiness”) can also affect sound propagation. Sound levels heard at remote receiver locations will fluctuate with gustiness. In addition, gustiness can cause considerable attenuation of sound due to effects of eddies traveling with the wind. Attenuation due to eddies is essentially the same in all directions, with or against the flow of the wind, and can mask the refractive effects discussed above. [15]

A.3.5 Distance-Related Effects

People often ask how distance from an aircraft to a listener affects sound levels. Changes in distance may be associated with varying terrain, offsets to the side of a flight path, or aircraft altitude. The answer is a bit complex, because distance affects the propagation of sound in several ways.

The principal effect results from the fact that any emitted sound expands in a spherical fashion – like a balloon – as the distance from the source increases, resulting in the sound energy being spread out over a larger volume. With each doubling of distance, spherical spreading reduces instantaneous or maximum level by approximately six decibels and SEL by approximately three decibels.

A.3.6 Vegetation-Related Effects

Sound can be scattered and absorbed as it travels through vegetation. This results in a decrease in sound levels. The literature on the effect of vegetation on sound propagation contains several approaches to calculating its effect. Though these approaches differ in some respects, they agree on the following:

- The vegetation must be dense and deep enough to block the line of sight
- The noise reduction is greatest at high frequencies and least at low frequencies

The International Standard ISO 9613-2[16] provides a useful example of the types of calculations employed in these methods. Originally developed for industrial noise sources, ISO 9613-2 is well-suited for the evaluation of ground-based aircraft noise sources under favorable meteorological conditions for sound propagation. ISO 9613-2’s methodology for calculating sound propagation includes geometric dispersion from acoustical point sources, atmospheric absorption, the effects of areas of hard and soft ground, screening due to barriers, and reflections. The attenuation provided by dense foliage varies by octave band and by distance as shown in **Table A-1**.

For propagation through less than 10 m of dense foliage, no attenuation is assumed. For propagation through 10 m to 20 m of dense foliage, the total attenuation is shown in the first row of **Table A-1.** For

[14] Piercy and Embleton, p. 1413.
[15] Ingard, pp. 409-410.
[16] International Organization for Standardization, Acoustics – Attenuation of sound during propagation outdoors – Part 2: General Method of calculation, International Standard ISO9613-2, Geneva, Switzerland (15 December 1996).

distances between 20 m and 200 m, the total attenuation is computed by multiplying the distance of propagation through dense foliage by the dB/m values shown in the second row of **Table A-1.**

Table A-1. Dense Foliage Noise Attenuation
Source: ISO 9613-2, Table A.1

Propagation Distance	Nominal Midband Frequency (Hz)							
	63	125	250	500	1,000	2,000	4,000	8,000
10 m to 20 m (dB Attenuation)	0	0	1	1	1	1	2	3
20 m to 200 m (dB/m Attenuation)	0.02	0.03	0.04	0.05	0.06	0.08	0.09	0.12

ISO 9613-2 assumes a moderate downwind condition. The equations in the ISO Standard also hold, equivalently, for average propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights. In either case, the sound is refracted downward. The radius of this curved path is assumed to be 5 km. With this curved sound path, only portions of the sound path may travel through the dense foliage, as illustrated by **Figure A-12**. Thus, the relative locations of the source and receiver, the dimensions of the volume of dense foliage, and the contours of the intervening terrain are essential to the estimation of the noise attenuation.

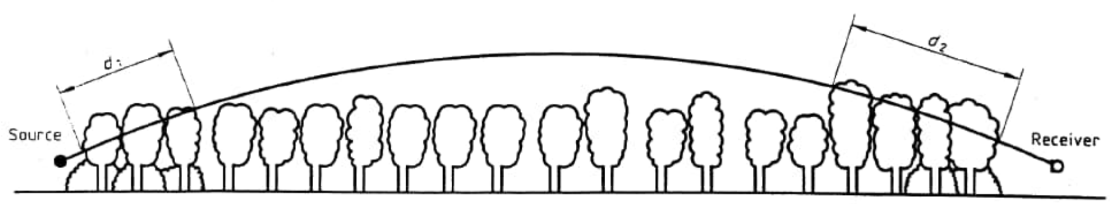


Figure A-12. Downward Refracting Sound Path
Source: ISO 9613-2

As illustrated in **Figure A-12,** the foliage only provides attenuation if the sound path passes through the foliage. For aircraft in the air, the sound will pass through little, if any foliage. Additionally, either the noise source or receiver must be near the foliage for it to have an effect.

Appendix F

Sustainable Master Plan Web Summary

EASTERN IOWA AIRPORT

FLYCID

EASTERN IOWA AIRPORT (CID)
SUSTAINABLE MASTER PLAN

EASTERN IOWA AIRPORT

FLYCID

The Eastern Iowa Airport (CID) is preparing a Sustainable Master Plan. This document provides an overview of the master planning process and highlights the need to develop a plan that is rooted in sustainability, economic vitality, and partnership between CID and surrounding communities.

SUSTAINABLE MASTER PLAN

WHAT IS AN AIRPORT MASTER PLAN?

An airport master plan is a forward-looking, comprehensive study that identifies short-, medium-, and long-term development needs to meet projected aviation demand. It serves as a road map for airport staff, public officials, and other stakeholders in developing an organized plan for maintaining and developing airport facilities into the future.

WHY A MASTER PLAN?

The Federal Aviation Administration requires airports to update their long-term plans as market conditions evolve. CID's previous master plan was prepared in 2014, and many of the projects outlined in that plan have been completed. Additionally, the aviation industry continues to evolve, which has a material effect on the Airport and its anticipated needs. Due to a growing region, changes in the industry, and increased levels of aviation demand, the time is right for CID to develop a new master plan.

SUSTAINABLE MASTER PLAN

The Sustainable Master Plan emphasizes overall sustainability in all facets of planning, including specific considerations for environmental, economic, and social sustainability. Examples within the study include efforts to reduce greenhouse gas emissions associated with Airport operations, a land use compatibility plan to direct sensitive land uses (houses, schools) away from CID, and an attainable, recommended development plan to promote financial self-sufficiency.

THE CID SUSTAINABLE MASTER PLAN PROCESS INCLUDES MULTIPLE KEY ELEMENTS:

GOALS

The goals of the Sustainable Master Plan were developed to address future needs at CID based on regional growth, rapidly evolving demands of the industry, and emerging technologies.

GOALS INCLUDE:

- Determine future aviation demand, including passengers, operations, air cargo, and based aircraft.
- Identify facility needs to accommodate future demand and to satisfy FAA design standards.
- Develop an attainable and financially responsible implementation plan for facility improvements.
- Incorporate sustainability into the plan.
- Update the Airport Layout Plan to reflect facility improvements and FAA design standards.

FOCUS AREAS

The following focus areas of the Sustainable Master Plan highlight the unique challenges and opportunities at CID.

Greenhouse Gas Emissions
This study will document current greenhouse gas emissions (GHG) associated with Airport operations. CID can leverage the GHG baseline data to evaluate future projects and reduce the overall carbon footprint.

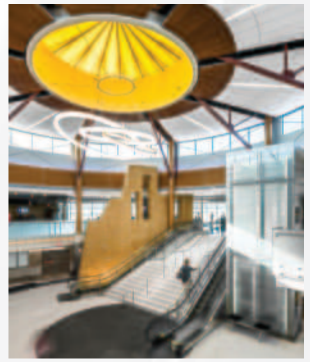
Land Use Planning
Recent approvals of residential developments near the Airport have put a sharp focus on managing incompatible land use. Noise exposure and aircraft overflight data will be used to identify areas where noise-sensitive land uses should be avoided. This study and subsequent recommendations will serve as a foundation from which ongoing land use compatibility efforts will be based.

Air Cargo
Air cargo operations at CID provide exceptional economic benefits to the Airport, region, and beyond. This master plan will include specialized research to inform the air cargo forecasts and the Airport's long-range planning efforts.

Aircraft Deicing
Passenger aircraft deicing operations are currently conducted by individual airlines. This master plan will explore locations for dedicated deicing facilities.

Stakeholder Engagement
This study will foster meaningful opportunities for engagement with the Airport's many stakeholders.

Forecasts
Forecasting is a critical component in determining future aviation demand. The forecasts within this study will consider the impacts of the COVID-19 pandemic and explore various potential scenarios to account for the uncertainty of future aviation activity.



Airport Financial Planning
The financial component of the master plan is intended to position the Airport for future success with the confidence to implement the recommended development plan with the goal of financial self-sufficiency.

STUDY SCHEDULE

The Sustainable Master Plan is expected to be completed in 2023.


THE JAVA HOUS


Arrivals
Arrivals


Self-Service Check
American
American
UNITED


THE EASTERN IOWA AIRPORT
DONALD D. SWANSON
EXECUTIVE CONFERENCE ROOM
EXIT

EXISTING AIRPORT CONDITIONS

The Airport is publicly owned and operated by the City of Cedar Rapids. Located approximately seven miles southwest of downtown Cedar Rapids, the Airport serves the Iowa City/Cedar Rapids Corridor and the border regions of Illinois and Wisconsin. The Airport accommodates commercial air service, general aviation (GA), and air cargo operations. Passenger air carriers servicing the region include Allegiant Air, American Airlines, Delta Air Lines, Frontier Airlines, and United Airlines. Cargo operators at the Airport include UPS, FedEx, and DHL.

AIRFIELD

The airfield has two runways: Primary Runway 9/27 (oriented east/west to align with prevailing wind patterns) and Runway 13/31 (oriented southeast/northwest and used when winds favor that direction).

PASSENGER TERMINAL COMPLEX

The passenger terminal, named the Donald J. Canney Terminal, has nine commercial aircraft gates. Airport leadership has been modernizing and expanding the terminal over the last seven years to enhance the passenger experience and expand to accommodate growth. Improvements were recently made to an expanded security screening checkpoint, new passenger concessions and amenities, and two new passenger gates. Additional construction (to be completed by 2024) will add four new gates to accommodate projected growth.

GENERAL AVIATION

GA includes all civil aviation operations that are not passenger airlines. GA activities at CID are supported by a fixed based operator (FBO), Signature Flight Support, which provides services such as fueling, aircraft parking, and aircraft maintenance.

SUPPORT FACILITIES

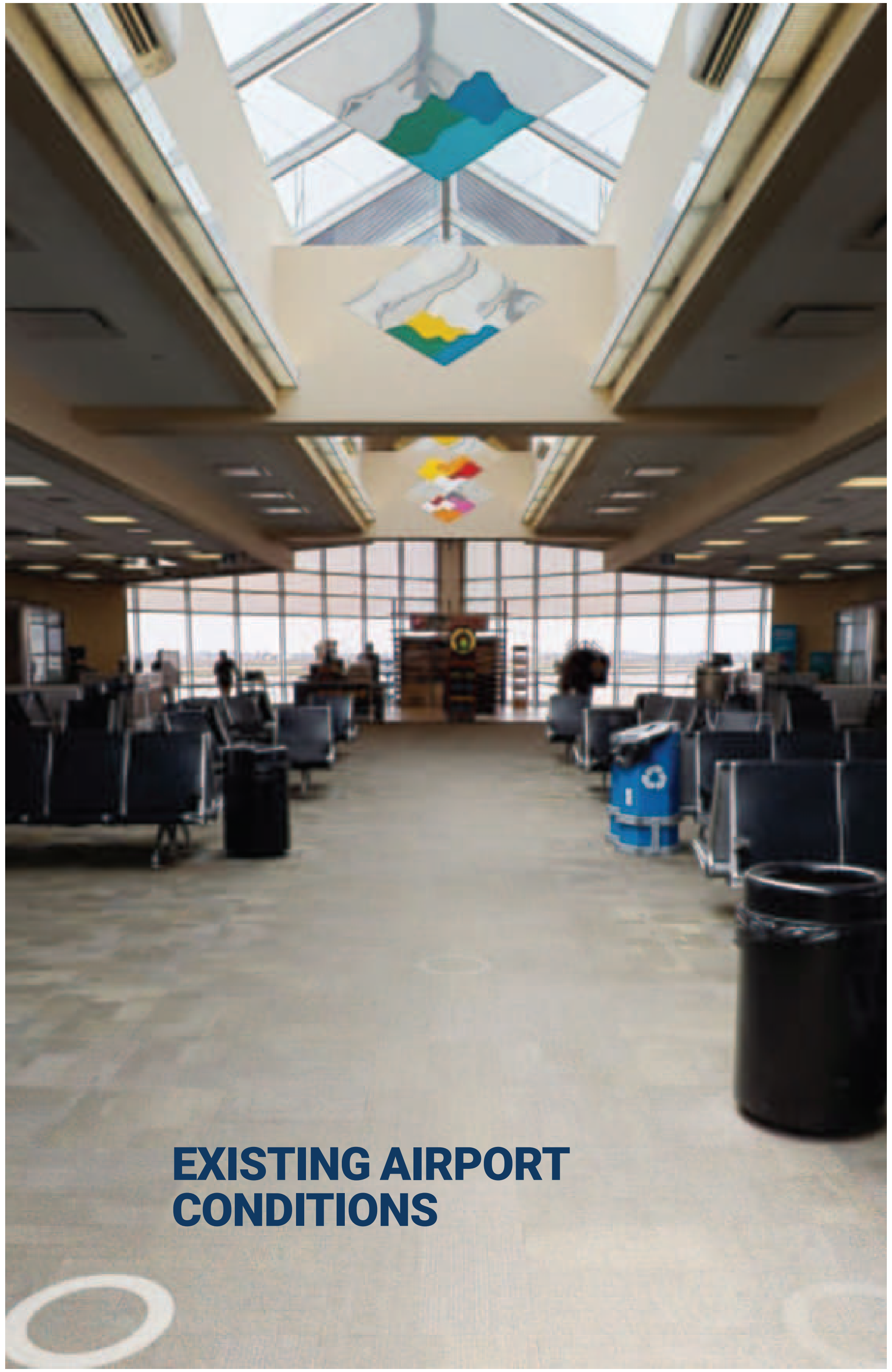
Support facilities are available throughout the Airport and include an aircraft rescue and firefighting (ARFF) facility, fuel storage facilities on both the west and east side of the airfield, the Airport's administration building, FAA Airport Traffic Control Tower facilities, employee parking, and airfield maintenance facilities.

LANDSIDE ACCESS AND PARKING

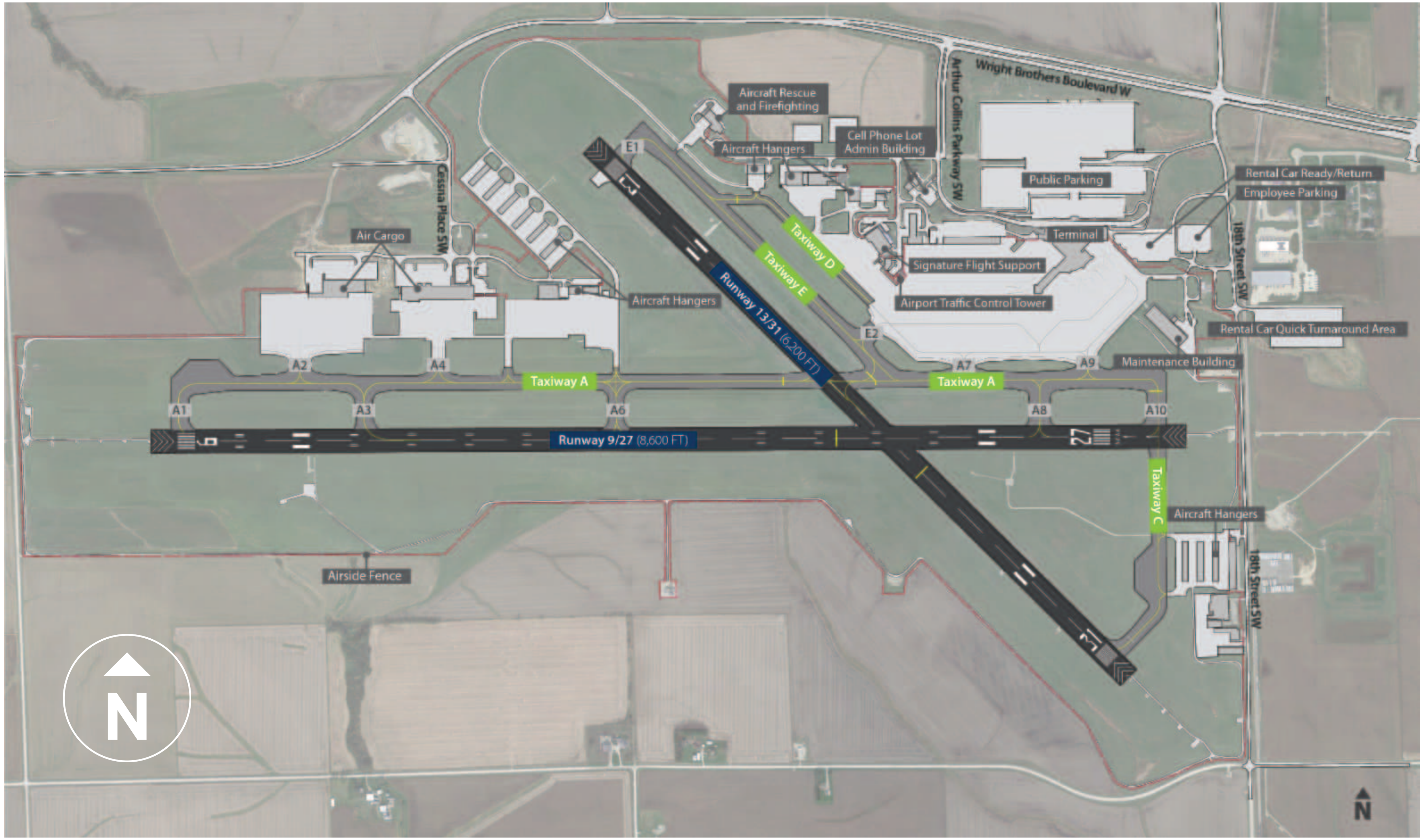
Airport access roadways connect the regional roadway network to Airport facilities, including the passenger terminal, rental car lot, parking areas, commercial vehicle loading, and support facilities. Wayfinding signage is provided throughout Airport property to guide passengers, employees, cargo operators, and other visitors to their desired destinations.

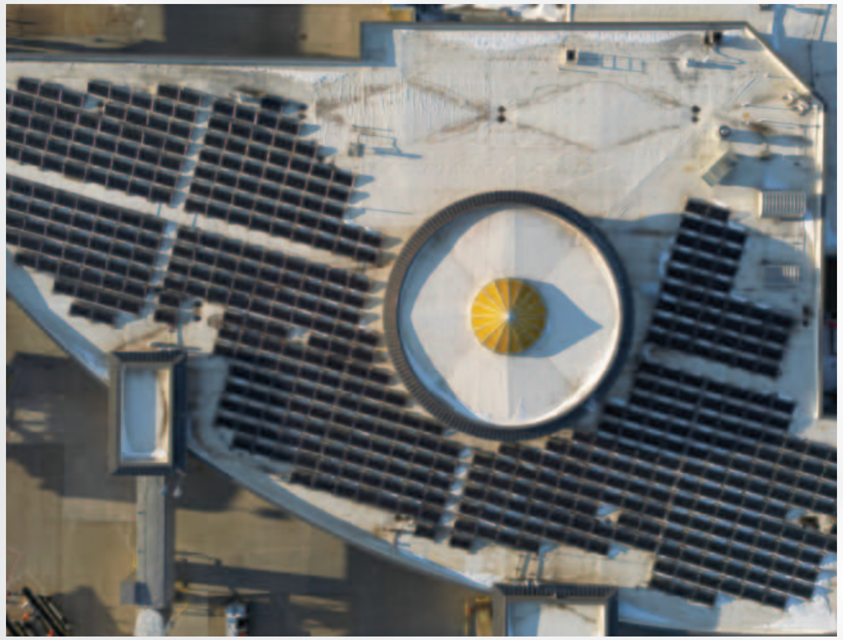
AIR CARGO

Air cargo services at the Airport are provided by FedEx, UPS, and DHL. UPS and FedEx each have their respective facilities on the west side of the Airport, while DHL operates out of a building near the passenger terminal. Some air cargo also is transported in the bellies of passenger airlines. This cargo is processed and loaded/unloaded in the passenger terminal area.



EXISTING AIRPORT CONDITIONS





SUSTAINABILITY

The Airport has a long history of prioritizing sustainability. CID has incorporated sustainability in four key management and operational practices: emissions and energy, water use and water quality, stakeholder engagement, and recycling and waste management.

GREENHOUSE GAS EMISSIONS AND ENERGY USE

In recent years, the Airport took an inventory of existing energy systems to serve as a baseline for future energy conservation opportunities. In this time, the Airport has installed 738 solar panels on the terminal roof, providing enough electricity to power nearly 20 households per year. New solar panels also were constructed on five airport buildings.

The new terminal facility expansion is completely heated and cooled by geothermal technology. The concrete steps leading into the terminal building and the public safety building also are equipped with geothermal technology.

Energy use has been reduced by 80 percent through various lighting efficiency efforts, including the implementation of natural lighting in the terminal building and the use of energy-efficient LED lighting. Additionally, four electric vehicle charging stations are available for parking customers at no additional cost.

WATER USE AND QUALITY

The Airport founded the Wings2Water (W2W) program, a non-profit partnership with Linn and Johnson counties, to help fund water quality improvement projects that help reduce nutrient runoff and improve local water quality. Now, a separate, 501c3 non-profit organization, the Airport continues to highlight the efforts of W2W throughout the terminal and on the Airport website.

Sustainable farming practices are used on the Airport's farmland, which accounts for 2,000 acres of Linn County's total 324,000 acres of farmland. This includes planting cover crops, no-till farming, and not allowing the use of fertilizers in the fall. These practices help reduce nutrient runoff in local waterways.

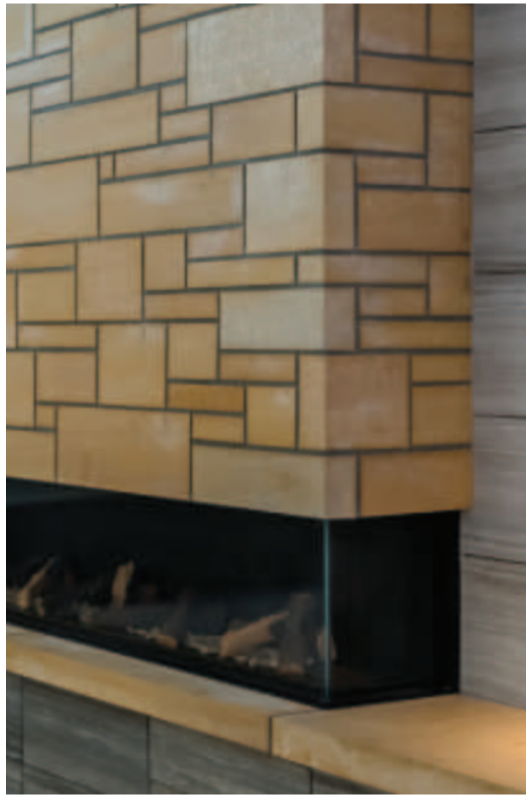
In the terminal building, sensory-operated toilets and faucets, low-flow sinks, and a water bottle refill station have been installed to improve water efficiency. The Airport also has installed drought-resistant native species and adapted landscaping.

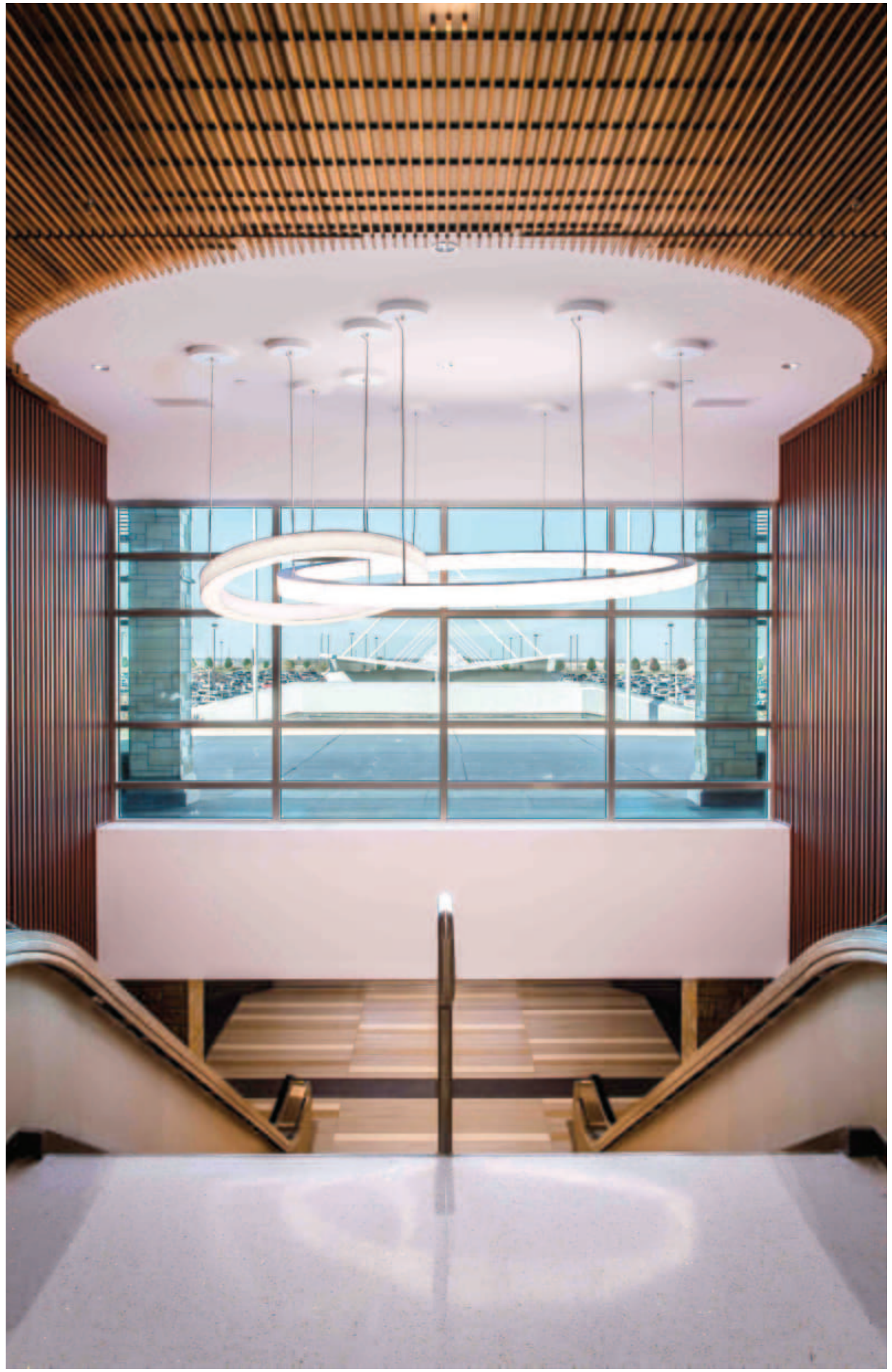
STAKEHOLDER ENGAGEMENT

The Airport actively seeks partnerships with local organizations for pilot projects and sustainability initiatives. This includes the Iowa State University Research study on planting native crops to reduce nutrient runoff and the University of Iowa's pilot project to grow 70 acres of miscanthus grass as part of a biomass fuel study. Displays are present in the Airport's terminal to engage and inform the public on sustainability initiatives. A library kiosk also provides stories, essays, poems, and other educational materials.

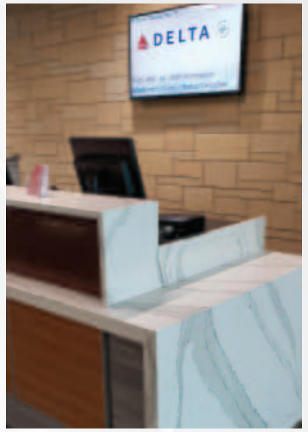
WASTE MANAGEMENT

The Airport is equipped with recycling bins for the traveling public. The Airport also recycles oil, scrap metal, and light bulbs. Airport vendors and the FBO also recycle reusable materials when possible. Contractors also are required to dispose of waste and recycle reusable materials during demolition and construction projects.






AVIATION FORECASTS



Aviation forecasts provide the basis for determining future facility requirements and justification for investments. Forecasting elements include passenger enplanements, aircraft operations (commercial, GA, air cargo, military), based aircraft, and air cargo tonnage. The development of forecasts considered historical trends, aviation industry trends and forecasts, and local socioeconomic information

INDUSTRY TRENDS AND COVID-19 IMPACTS

The COVID-19 pandemic greatly impacted the global aviation industry in 2020. Aviation activity began recovering in most U.S. commercial markets in 2021 as vaccinations became available to the public.

It has taken several years for passenger activity to rebound to pre-pandemic levels.

- **Airline Fleet Changes** – Airlines are restructuring their aircraft fleets to focus on new, quieter, and more efficient aircraft.
- **Low-Cost Carriers** – Recovery and growth in the leisure travel market supports expanded service for low-cost carriers. Low-cost carriers generally offer less-frequent service with lower airfares and fewer complementary amenities.
- **Charter Activity** – Increased demand for non-scheduled charter flights is expected to influence the GA fleet mix and activity levels.

COMMERCIAL ACTIVITY

Enplanements, or the number of passengers departing the Airport, is an important measure to determine future infrastructure and terminal needs. CID passenger activity rebounded quickly from the pandemic, and activity is expected to experience steady, long-term growth. An aggressive air servicing campaign at CID positions the Airport well to grow 2 percent to 4 percent annually over the next 20 years, fueled by opportunities to attract new airlines and offer routes to more non-stop destinations. Alternatively, the number of commercial operations is expected to grow at a more gradual rate compared to passenger enplanements as airlines operate larger aircraft at CID with more passengers.

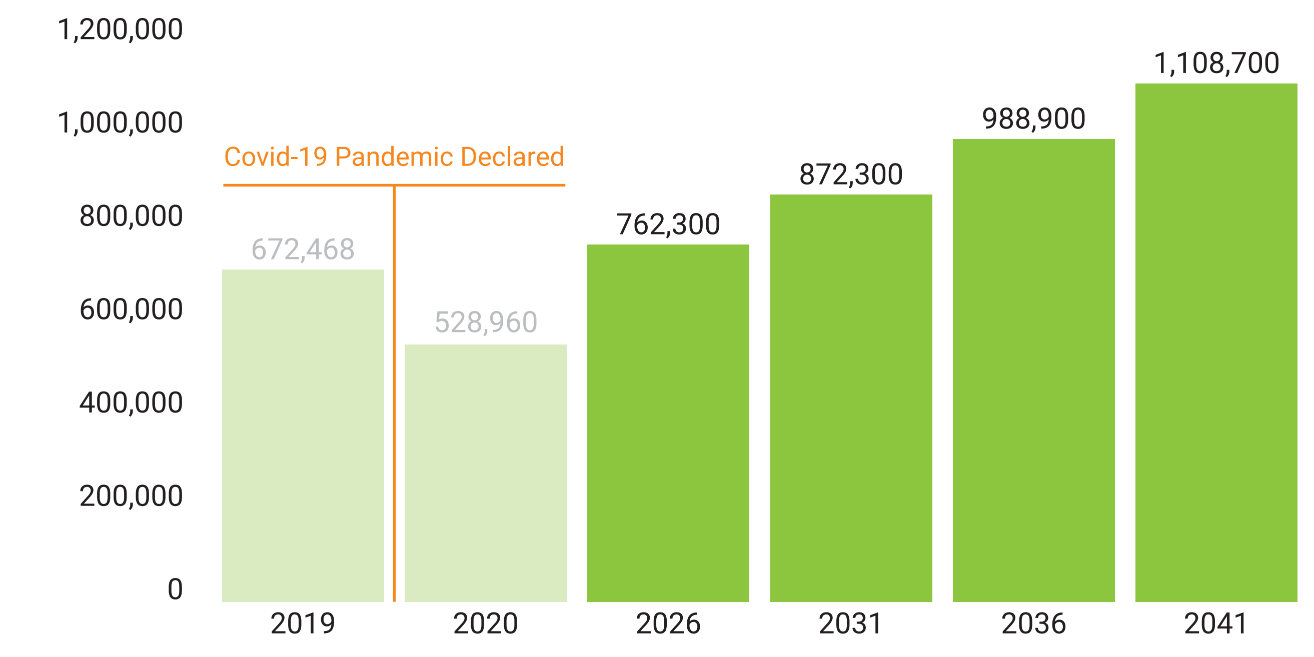
GENERAL AVIATION ACTIVITY

GA includes all operations that are not associated with commercial, cargo, or military activity. GA-based aircraft are expected to grow from 128 in 2021 to 142 aircraft in 2041. GA operations are anticipated to grow at the same rate as based aircraft over the next 20 years.

CARGO ACTIVITY

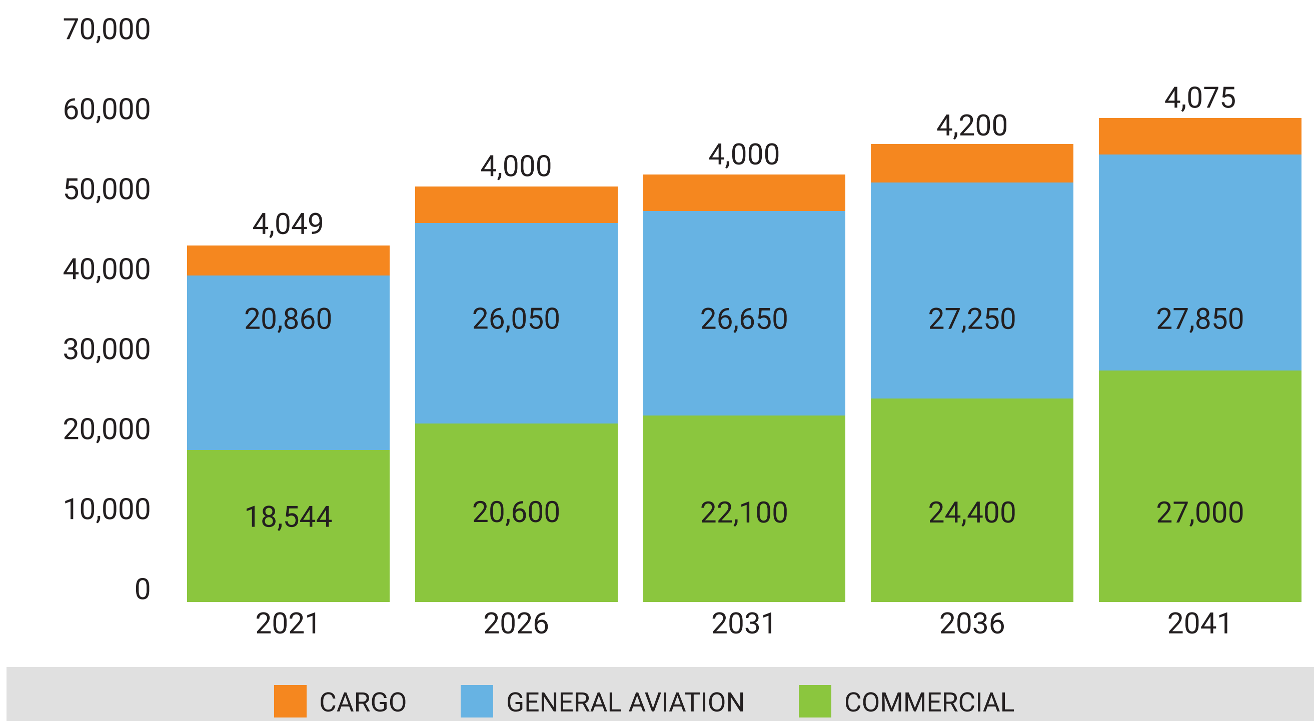
As the largest cargo hub in Iowa, air cargo activity is a strong economic driver for the region. The forecasts incorporated direct input from key air cargo stakeholders and industry data regarding the outlook of the U.S. domestic air cargo market. Annual air cargo at CID is expected to grow from 33,934 metric tons in 2022 to 69,500 metric tons in 2041, a higher growth rate than is expected for the industry nationwide.

PASSENGER ENPLANEMENTS



Compounded Annual Growth Rate – 2021-2041: 3.77%

AIRCRAFT OPERATIONS



Compounded Annual Growth Rate – 2021-2041: Cargo 0.03%, General Aviation 1.45%, Commercial 1.90%

Note: Military operations are not shown as they comprise less than 1% of annual operations.

FACILITY REQUIREMENTS

Facility requirements at CID were developed to support future aviation activity by identifying necessary improvements to existing facilities and development of new infrastructure to meet forecast demand and satisfy FAA design standards.

RUNWAY 9/27

To accommodate future aircraft serving existing and new routes, it is recommended the Airport extend Runway 9/27 from 8,600 feet long to 10,000 feet long.

PASSENGER TERMINAL

Projected passenger needs will be met with the ongoing expansion of the terminal building, anticipated for completion in 2024. The new facility will be viewed through the lens of sustainability, incorporating efforts to reduce greenhouse gas emissions and conserve water use.

AIRPORT ADMINISTRATION FACILITIES

The Airport is including administrative office space as part of Phase IV of the terminal expansion program. These new offices will allow Airport management to have adequate space inside the terminal building.

DEICING FACILITIES

A dedicated deicing pad is required to minimize mixing deicing fluids with stormwater/melted snow runoff, which is currently processed for treatment off Airport property. New deicing pads will collect deicing fluids to be recycled or responsibly disposed of.

AIRPORT MAINTENANCE AND SNOW REMOVAL EQUIPMENT BUILDING

A new Airport Maintenance and Snow Removal Equipment (SRE) Building is needed. The new building also will incorporate this Master Plan's sustainability initiatives.

AIR CARGO

The Airport will plan for areas that can be developed to support additional air cargo operations, including a potential new air cargo operator.

AIRPORT ACCESS AND PARKING

To accommodate growing passenger activity, improvements are recommended for the arrival curbside area, passenger parking facilities, rental car ready-return stalls and customer service counters.




RECOMMENDED DEVELOPMENT PLAN

The Recommended Development Plan (RDP) represents the most logical solutions to satisfy forecast demand and enhance the traveler experience at the Airport over a 20-year period. Solutions were identified for airside, landside, cargo, terminal, and support facilities. The RDP considers future aviation demand, the needs of Airport users and stakeholders, environmental constraints, and environmental sustainability. The plan is affordable for the Airport, and its implementation is achievable.

RUNWAY 9/27 EXTENSION

An extension of Runway 9/27 to 10,000 feet accommodates the runway length required for the Airport's design aircraft, the Boeing 767-300F. This project also includes extending parallel Taxiway A, constructing an additional taxiway connector to provide access to the new runway end, relocating runway lighting, and modifying Cherry Valley Road SW and Tissell Hallow Road SW to account for runway protection areas.

AIR CARGO FACILITIES

Two air cargo facilities are recommended. The first satisfies air cargo demand for the planning horizon, which includes a multi-tenant facility on the west side of the airfield. The second facility is planned in the event a new air cargo opportunity beyond forecast operations arises. This cargo expansion would occur adjacent to the existing air cargo area and includes new structures, apron pavement, and aircraft and vehicle parking.

GENERAL AVIATION FACILITIES

Multiple general aviation, aircraft-storage hangar areas are identified on the Airport. Hangars will be developed based on customer needs and priority of location. Notably, the development options along Runway 13/31 would require the construction of a parallel taxiway before development could occur.

CENTRALIZED DEICING FACILITIES

Two centralized deicing facilities are recommended. The first is located near the passenger terminal building and provides convenient access to service passenger aircraft. The second deicing facility is located near the west end of Runway 9/27, providing convenient access to cargo aircraft.

AIRPORT SNOW REMOVAL EQUIPMENT AND MAINTENANCE FACILITY

An area in the north-central portion of the airfield was selected for the new Snow Removal Equipment and Maintenance facility due to its proximity to the airfield and other support facilities. This project also includes the construction of a new taxilane.

TERMINAL CURBSIDE

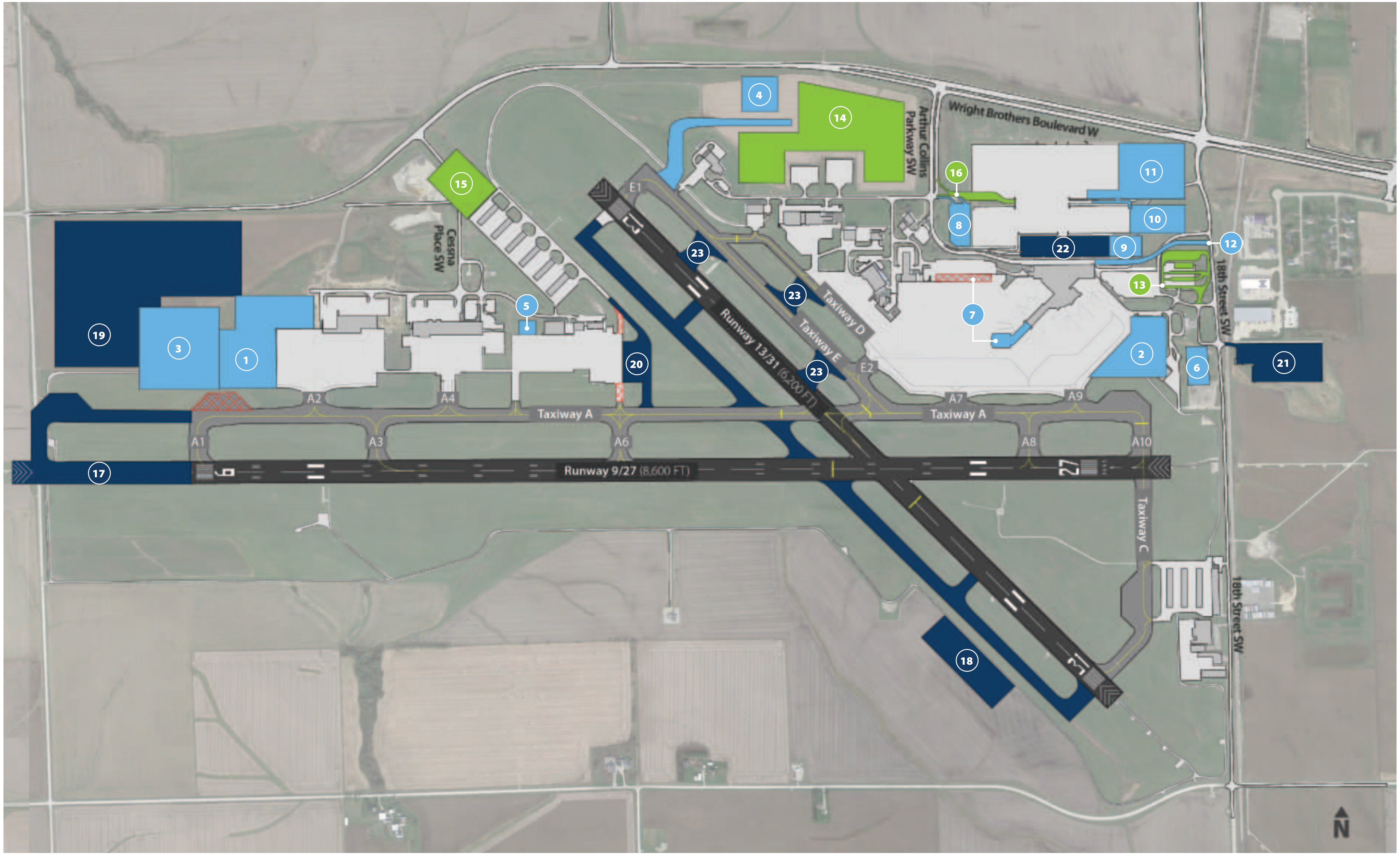
The plan includes extending the terminal curbside to provide additional space for dropping off and picking up passengers in front of the terminal. It also separates commercial and private vehicles, reducing congestion on the curbside.

MULTI-MODAL FACILITY

The recommended plan includes a new multi-modal facility that will serve taxis, rideshare services, shuttles, and buses, with built-in flexibility for a future rail connection. This project would further reduce congestion in front of the terminal during periods of peak activity.

AUTO PARKING

The existing long-term and short-term parking lots are proposed to be expanded. The exit plaza will also be relocated to maximize space for vehicle parking. This plan includes flexibility to construct a parking structure if future demand warrants it. It is also recommended that the employee parking lot be relocated to the west of the existing long-term lot to streamline employee terminal access.



SHORT-TERM *(2023 - 2028)*

1. West Cargo Expansion
2. East Consolidated Deicing Facility
3. West Consolidated Deicing Facility
4. Snow Removal Equipment, Maintenance Facility, and Taxilane
5. New FBO
6. Fuel Farm
7. Terminal Expansion/ Belly Cargo Demolition
8. Employee Parking
9. Short-Term Parking Lot Expansion
10. Long-Term Parking Lot, Phase 1
11. Long-Term Parking Lot, Phase 2
12. Arrivals Curbside and Roadway Improvement

INTERMEDIATE-TERM *(2029 - 2033)*

13. Multi-Modal Facility
14. Future Hangars
15. Aircraft Hangar Expansion
16. Future Exit Plaza and Parking

LONG-TERM *(2034 - 2043)*

17. Runway 9/27 and Associated Taxiway Extension
18. Aircraft Hangars and Parallel Taxiway
19. West Cargo Expansion, Phase 2
20. New Taxilane A6 Connector
21. New Fueling and Car Wash Facilities
22. Potential Parking Structure Footprint
23. Taxiway E Connectors

LEGEND

- Existing Airfield Pavement
- Existing Airport Buildings
- Proposed Demolition

EASTERN IOWA AIRPORT

FLYCID

The Airport is publicly owned by the City of Cedar Rapids and operated by the Cedar Rapids Airport Commission.

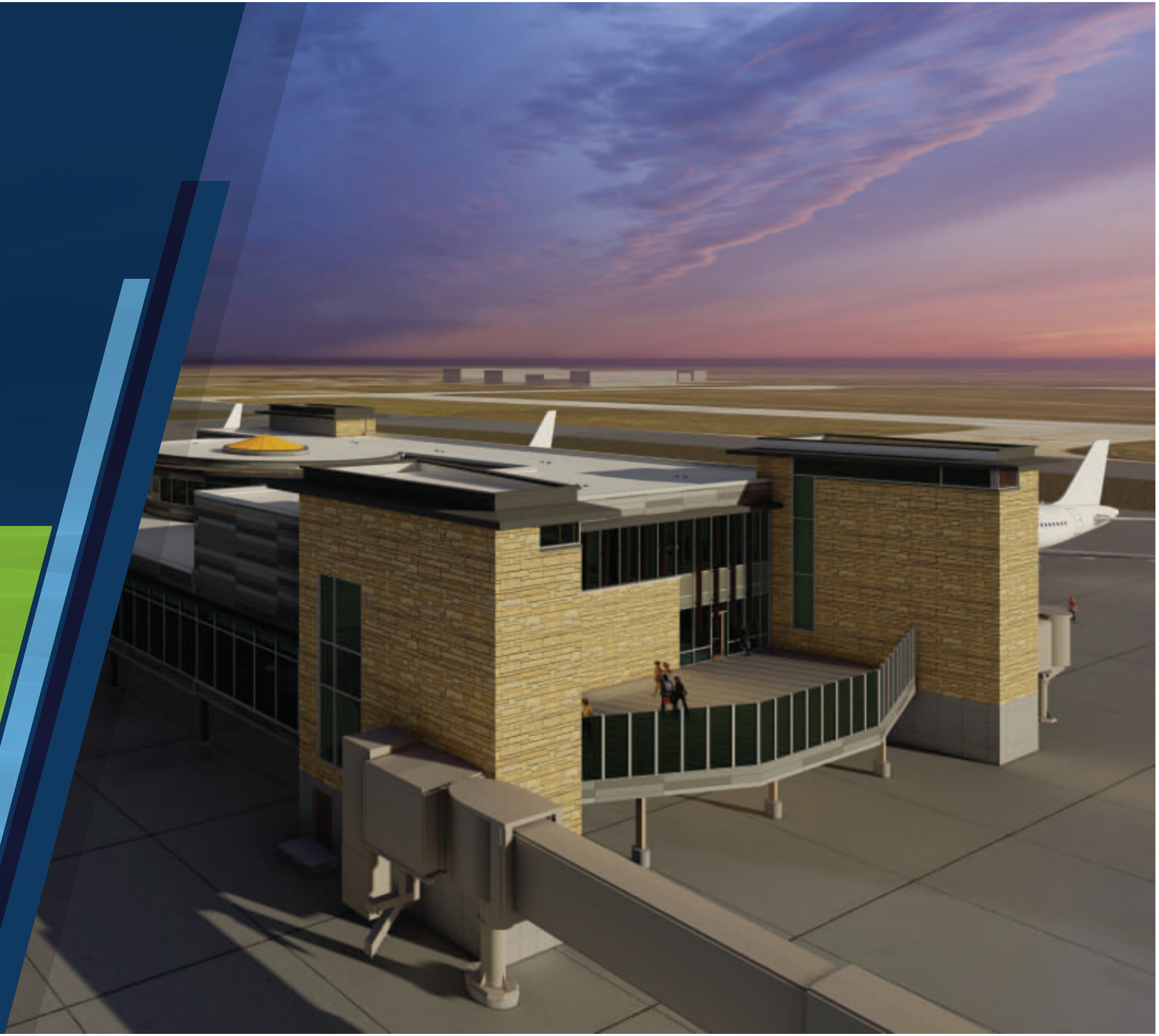
EASTERN IOWA AIRPORT

FLYCID

2515 Arthur Collins Parkway SW
Cedar Rapids, IA 52404-8952

319.362.8336
info@FlyCID.com

FlyCID.com



Appendix G

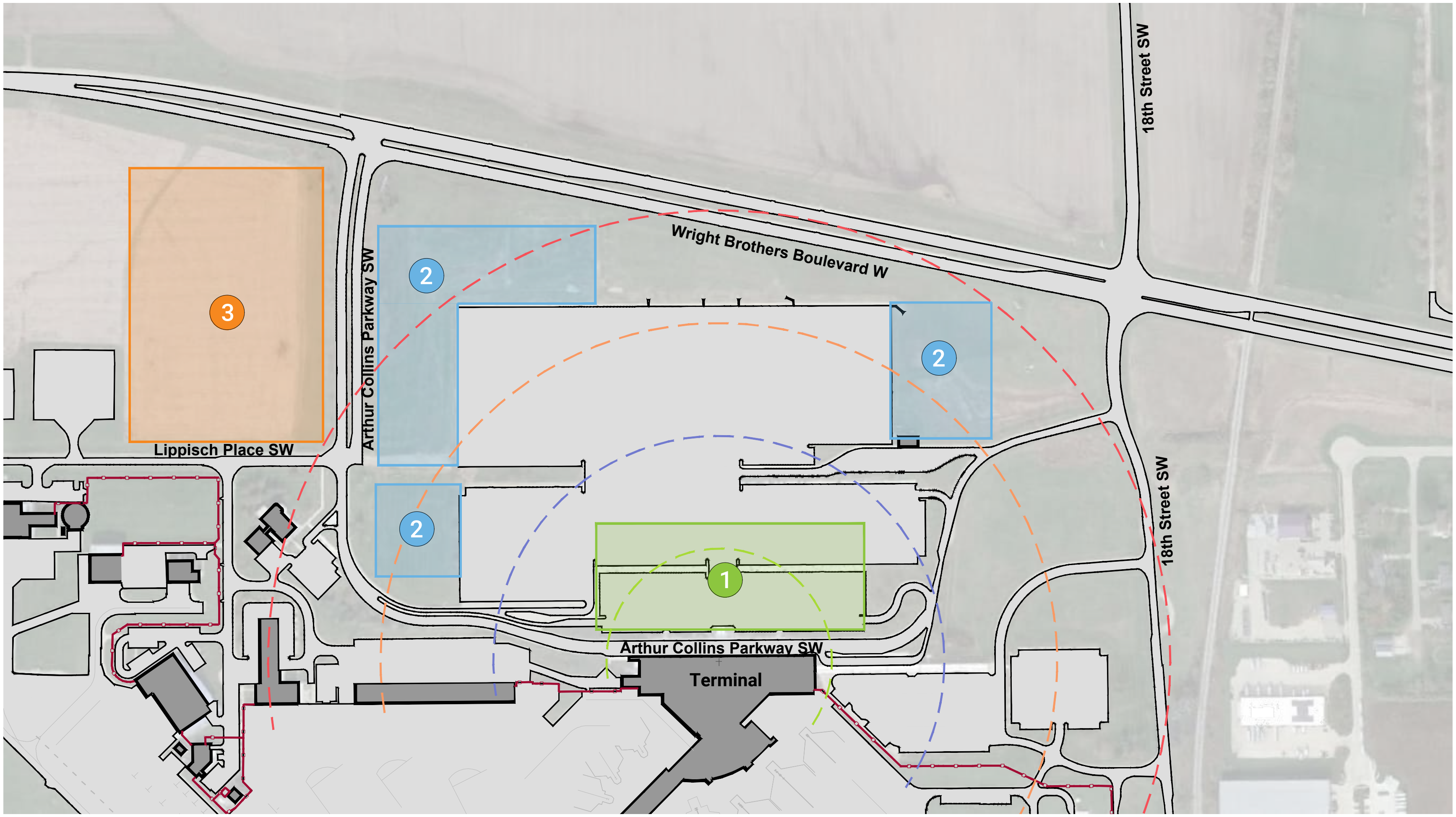
Other Landside Alternatives

APPENDIX G

Other Landside Alternatives

EASTERN IOWA AIRPORT FLYCID

Other Public Parking Alternatives



LEGEND

- Existing Pavement
- Existing Airport Buildings
- Airfield Fence
- 1 Two Structured Level Garage
- 2 Additional Surface Parking to the West
- 3 Lippisch Place SW Remote Parking
- Walking Level of Service A: 350'
- Walking Level of Service B: 700'
- Walking Level of Service C: 1050'
- Walking Level of Service D: 1400'

0 125 250 500 Feet

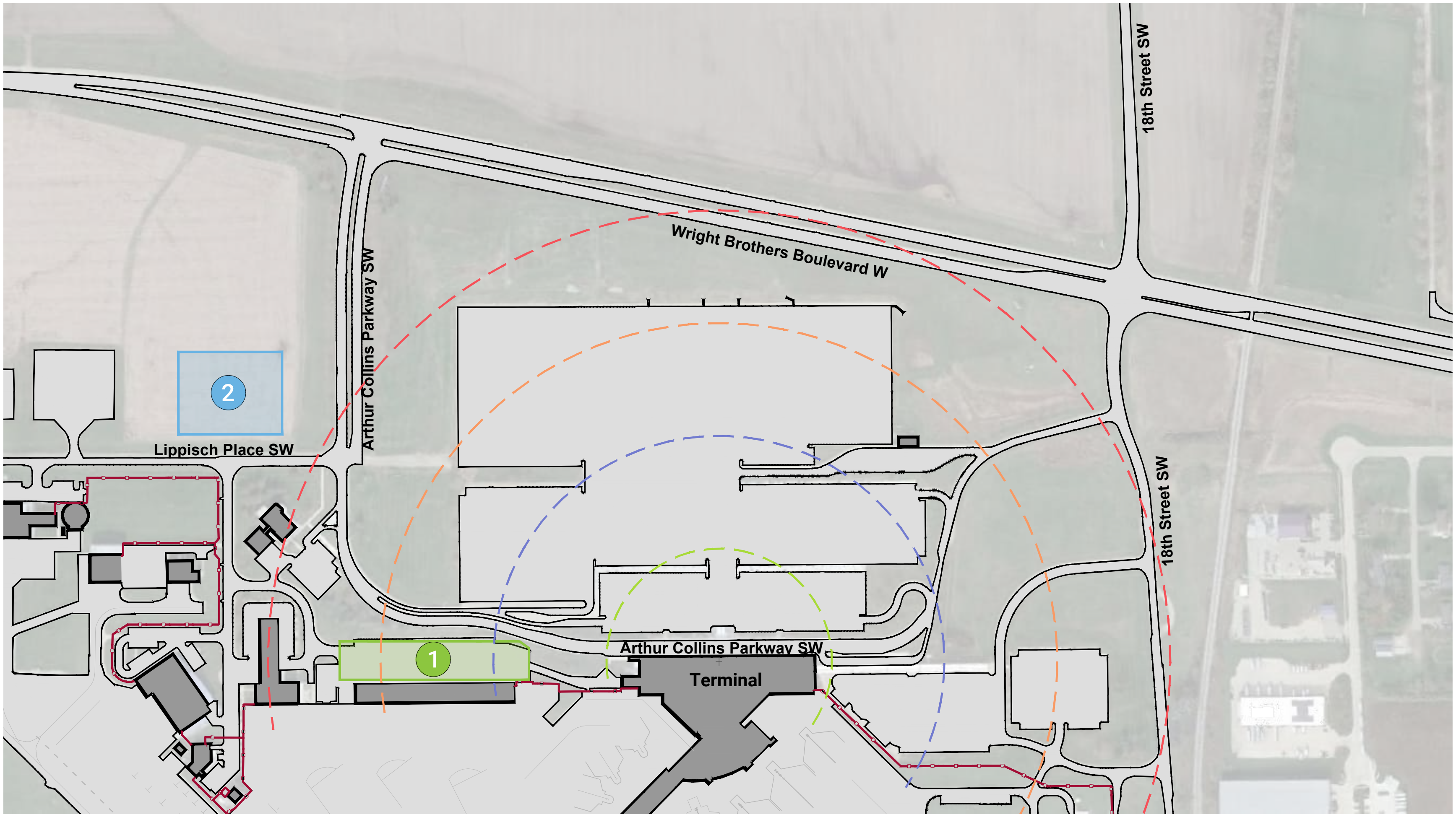
N

Prepared by: Kimley-Horn, 2022.

Kimley»Horn

EASTERN IOWA AIRPORT FLYCID

Other Public Parking Alternatives



LEGEND

- Existing Pavement
- Existing Airport Buildings
- Airfield Fence
- 1 West Terminal Lot
- 2 Lippisch Place SW Lot
- Walking Level of Service A: 350'
- Walking Level of Service B: 700'
- Walking Level of Service C: 1050'
- Walking Level of Service D: 1400'

0 125 250 500 Feet

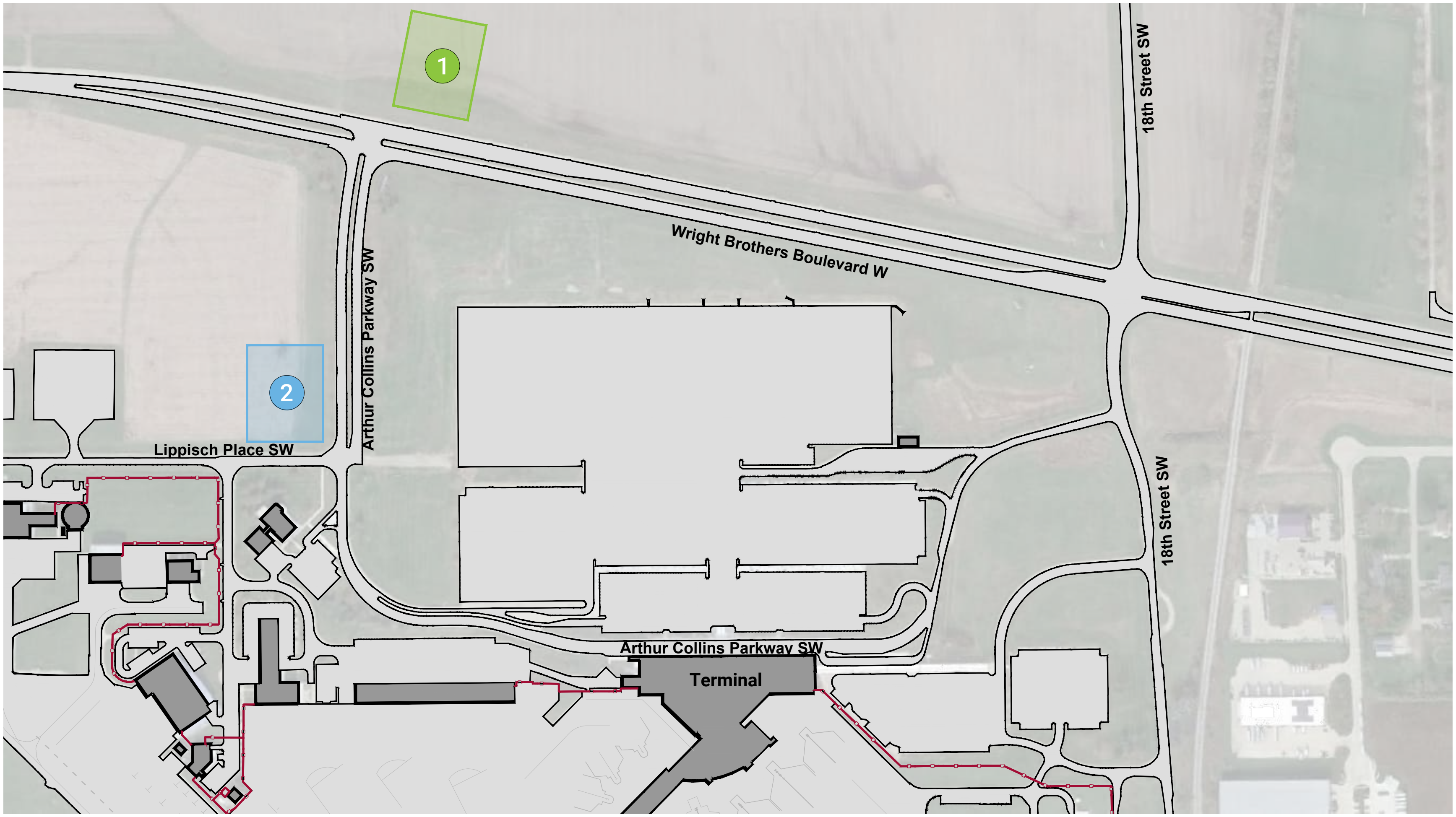
N

Prepared by: Kimley-Horn, 2022.

Kimley»Horn

EASTERN IOWA AIRPORT FLYCID

Other Cell Phone Lot Alternatives



LEGEND

- Existing Pavement
- Existing Airport Buildings
- Airfield Fence
- 1 Wright Brothers Blvd Lot
- 2 Lippisch Place SW Lot

0 125 250 500 Feet

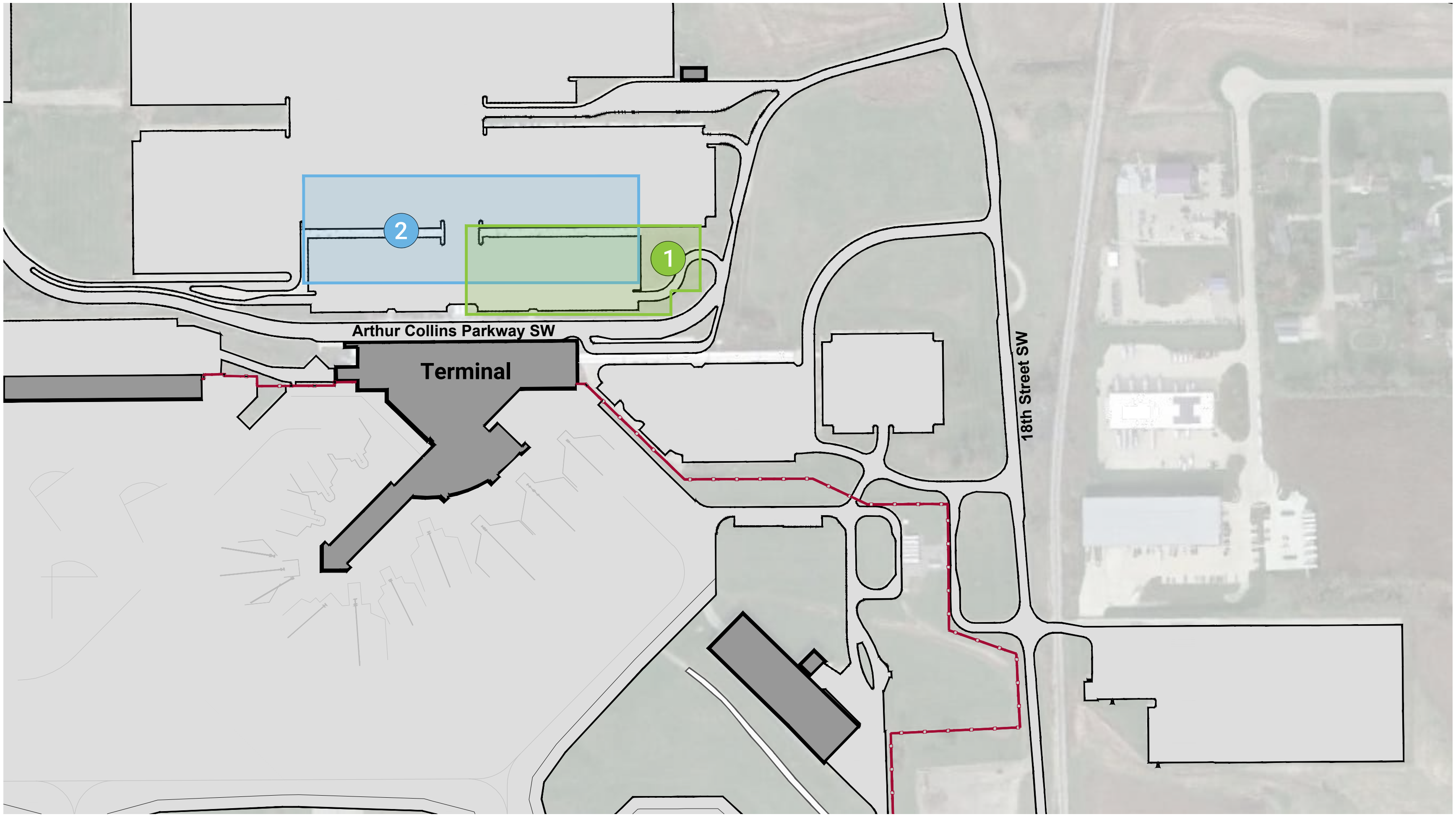
N

Prepared by: Kimley-Horn, 2022.

Kimley»Horn

EASTERN IOWA AIRPORT FLYCID

Other Ready and Return Lot Alternatives



LEGEND

- Existing Pavement
- Existing Airport Buildings
- Airfield Fence
- 1 East Short-Term Lot
- 2 Parking Structure Ground Level

0 100 200 400 Feet

N

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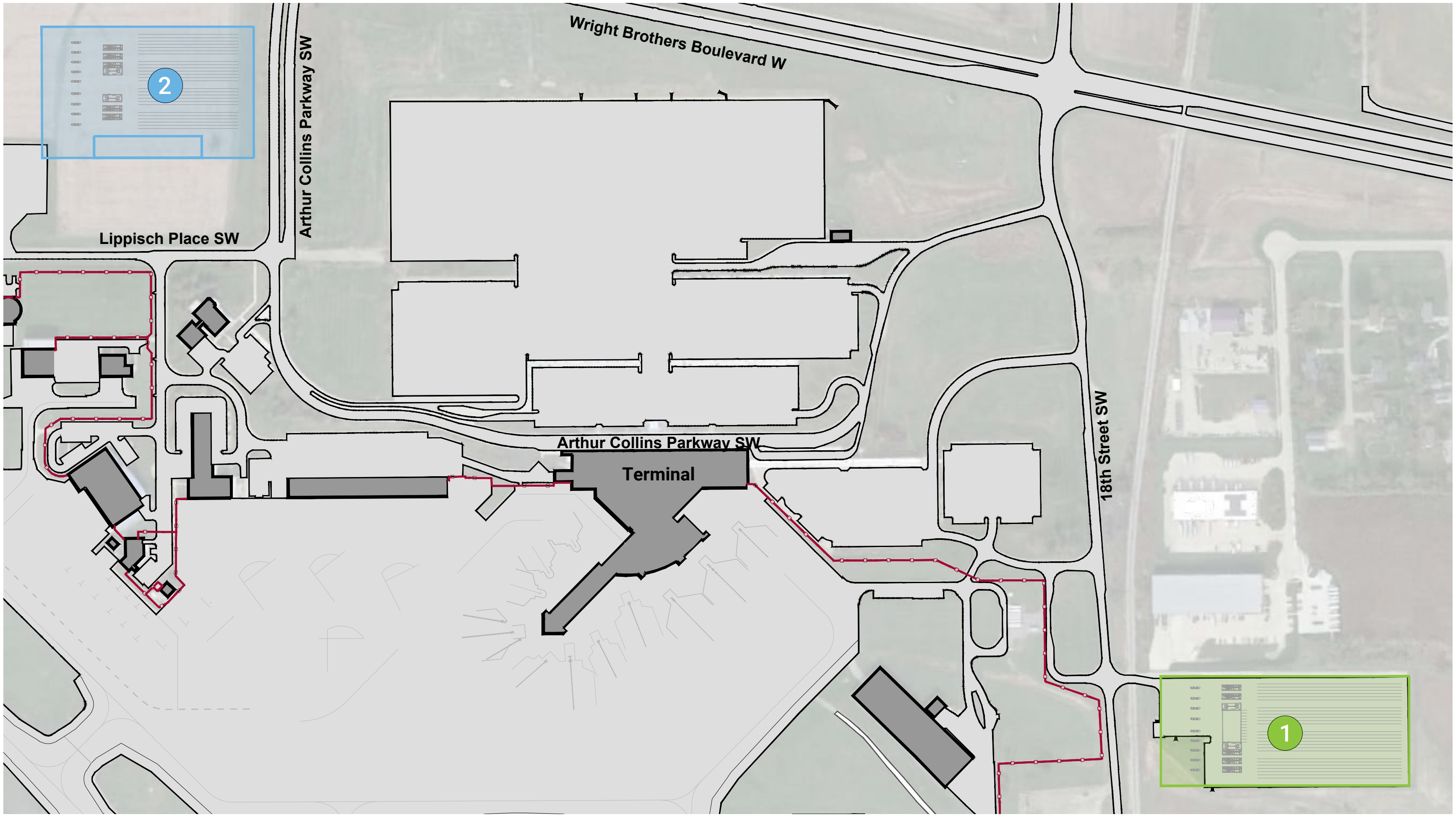
EASTERN IOWA AIRPORT FLYCID

Other QTA Alternatives



LEGEND

- Existing Pavement
- Existing Airport Buildings
- Airfield Fence

1. South Facility Expansion
2. Remote Consolidated Rental Car Center

0 125 250 500 Feet

N

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